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A study of the Impact of AI and New Media on Trade Development in the Retail Sector and Coping Strategies

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Abstract:

The rapid advancement of global information technology is transforming industries at an unprecedented pace, with emerging technologies becoming integral to our daily lives and reshaping traditional business models. The retail industry, in particular, has witnessed a significant evolution over the past three decades. What once relied solely on face-to-face interactions has now shifted through the e-commerce revolution and into a highly sophisticated model powered by artificial intelligence (AI) and big data. These technological breakthroughs have redefined the retail landscape, enabling businesses to harness data-driven marketing strategies and leverage the growing influence of social media for promotion. As a result, geographical barriers are no longer a limitation, and retailers can reach a global audience with ease. However, this transformation also brings new challenges, such as increased competition and the need for product differentiation in a crowded marketplace. The evolution of retail not only reflects the broader impact of global technological advancements but also highlights the opportunities and complexities of operating in the digital age. By exploring these cutting-edge technologies, this paper can better understand the forces shaping modern retail and gain valuable insights into this rapidly changing era.

Keywords: Retail Industry; AI; Big Data; Social Media

1. Introduction

1.1 Revolution of the Retail Industry

With the development of the times and information technology, the influence and coverage of the Internet have become increasingly powerful. A massive amount of data is continuously generated through the use of the network, pushing society into the era of big data and the Internet. Traditional retail has also adapted to the trend of the times by evolving new trade models. People have begun to focus more on online social networking and consuming news, especially young people who are increasingly inclined to

follow trends on the Internet. The emergence of new media platforms such as Instagram, Facebook, and YouTube has attracted significant attention and usage. The survey on social media usage in the US by Auxier & Anderson shows that new media has already started to amass a large user base. Among the respondents, 81% reported using YouTube, while 71% of young adults aged 18-29 use Instagram, a figure that has shown significant and sustained growth since 2019 [1].

This set of data also proves that the era of new media is arriving, and compared to traditional ways of obtaining information, new social media offers a more convenient and fast experience while being independent of geography. The widespread use of the Internet and increased online traffic have also driven the rise of online shopping. Compared to offline shopping, online shopping offers consumers several advantages, such as efficiency and lower prices. Consumers can purchase the products they want at any time, and they have a wider range of options. For businesses, online shopping can reduce offline costs such as rent, utilities, and labor expenses. These cost savings can be reflected in lower prices, providing a greater competitive advantage over other products.

Especially since the COVID period, people were unable to go out, which led them to rely on the Internet for communication with the outside world, such as purchasing daily necessities and socializing. This situation also encouraged more retailers to develop online sales platforms like Amazon and Temu. According to Danneberg's research, COVID-19 resulted in a sharp increase in online trade, particularly in the food retail sector, which showed an upward trend. In March 2020, online food retail saw a growth rate of 150% compared to the same period in the previous year, gradually replacing offline retail [2].

Moreover, online sales have also facilitated cross-border trade. Through e-commerce platforms, businesses can directly sell their products and services globally rather than being limited to local markets. This reduces dependence on intermediaries and allows for a true B2C (Business-to-Consumer) model, minimizing price differences and additional service fees. It also enables better management of sales and quality control, thereby maintaining the brand image. At the same time, the process of online shopping has generated a vast amount of consumer data, and businesses have taken note of this and started combining AI with big data to help them better adjust their sales strategies. For instance, AI can use big data to generate consumer profiles, thereby offering targeted products. Xie and Zhang explained why the retail industry needs to integrate AI and big data. Firstly, AI can help businesses accurately understand user preferences through big data; secondly, it enables them to grasp market trends and set optimal prices; finally, it helps to adjust the overall supply chain [3]. Compared to manual control, AI is more efficient and accurate in these aspects, and it also comes with lower costs.

1.2 Modern Transformation

With the development of internet technology and communication methods, online shopping has also become more diverse and widespread. The continuous growth of internet users has driven the emergence of various forms of online shopping models, such as live-streaming sales and influencer marketing. These models promote sales by collaborating with influential bloggers on various new media platforms or showcasing products through various catchy live streams. Research by Su shows that in 2023, China's total online retail sales reached 1.54 trillion yuan, with live-streaming sales accounting for 18.1%, amounting to 2.2 trillion yuan [4]. New media platforms have started to invest heavily in live-streaming sales, capturing a share of the traditional e-commerce market. This trend is expected to continue growing. This article mainly explores the application of new technologies in the retail industry and their impact on the transformation of trade models.

2. Era of Retail Industry

2.1 Early Development of the Retail Industry

The retail industry can be historically divided into four eras, from Retail 1.0 in the mid-18th century to the current era of Retail 4.0 [5]. The birth of the retail industry occurred in the 18th century when industrial development led to the emergence of numerous factories and attracted a new generation of workers to cities. This shift transformed the goods used by humans from traditional handmade items to mass-produced mechanical products. These products were then sold by merchants who provided comprehensive services to customers, explaining product details, and customers purchased them using cash.

Retail 2.0 emerged during the Second Industrial Revolution when low-cost mass production further propelled the development of the retail industry. At the same time, the introduction of credit cards stimulated consumer spending and allowed for the collection of consumer data, providing valuable insights for retailers. Retail 3.0 marked a significant turning point in the evolution of the retail industry due to the global expansion of the Internet, which prompted the development of online sales channels. This shift transformed the traditional competitive landscape of retail, enabling consumers to purchase higher-quality and more affordable products globally via the Internet without

being constrained by factors such as time and location.

2.2 New Technology Application

In the era of Retail 4.0, besides the rapid growth of online sales, more and more companies are leveraging advanced technologies such as AI, cloud computing, big data analytics, and AR to meet customer needs. From 2022 onwards, the global retail industry is expected to spend $7.3 billion annually on AI [5]. The United States and China account for over 75% of the global public cloud market and 50% of global IoT spending [6]. In 2021, China became the world's largest digital seller, holding 33.3% of the total market share, with sales reaching 792.5 billion and e-commerce accounting for 56.8% of total sales [7]. Most developed and developing countries have started to follow the global trend of digital transformation. However, some underdeveloped countries are still lagging behind in this transition, further widening the technological gap between them and developed nations.

2.3 Application of Social Media

At the same time, they have also begun to widely use the Internet to promote and expand their brand influence. The importance of social media for e-commerce lies in its ability to provide a direct channel for engaging with consumers. Most companies use social media primarily to attract new customers and maintain interaction with existing ones. According to the findings of Imane, social media has a significant impact on brand attitudes, and consumers' attitudes toward a brand are closely related to whether they will convert into actual purchasing behavior [7]. The emergence of COVID-19 has further accelerated this phenomenon. As people were unable to go out and had to resort to shopping from home, retailers had no choice but to start using new technologies to remain competitive. They began to place more emphasis on digital marketing and social media to maintain competitiveness within the same category, further driving the evolution of Retail 4.0.

3. Impact on the Retail Industry

The full utilization of digital and electronic technologies in Retail 4.0 has brought significant changes to the retail industry. Compared to traditional retail, it offers higher supply chain efficiency and more precise marketing while also enhancing the customer experience. Unlike employee-driven services, AI can provide targeted, personalized service to customers 24/7, thereby improving the shopping experience. Additionally, the rise of social media has also impacted retail marketing and promotion models. Unlike traditional TV commercials or newspaper ads, social media allows interaction with users, attracting customer participation and increasing brand loyalty and user engagement. Compared to traditional promotion methods, social media marketing can more quickly target user groups. Through the combination of big data and AI, potential user groups can be filtered, and targeted ads can be delivered precisely. This not only improves efficiency but also significantly reduces costs.

Furthermore, social media provides a channel for brands to receive real-time customer feedback, helping retailers quickly adjust product strategies and services to improve customer satisfaction. While new technologies and social media provide more efficient and precise service experiences for retailers and consumers, they also bring some overlooked issues. Retailers' excessive reliance on technology and social media traffic exposure increases the risk of unpredictability. If networks are attacked or there are technical failures, significant operational risks could arise. Relying on big data for personalized marketing based on consumer profiles can potentially involve personal privacy and security issues. Moreover, the overwhelming amount of advertising on social media can obscure genuine feedback on products, leading brands to overlook inherent issues with their products, which could spark public controversy.

3.1 Privacy Security

In the era of Retail 4.0, a common feature is personalization. Retailers can use AI to create personalized services based on user consumption data or user data from social media platforms. These data, which often serve as the foundation, contain a wealth of personal information, such as browsing history, shopping habits, geographical location, and more. Users exchange this information with platforms in return for personalized services, but this exchange may often be a forced choice. Many apps require users to agree to terms of service upon initial login, which often includes consenting to the app's collection of usage data to provide better recommendations or to help improve and fix the app's content. Most apps require users to accept these terms to use them, and not all users are willing to share this information in the process.

3.1.1 Retailers perspective

For brands, collecting and analyzing user data is fundamental to understanding market dynamics and studying consumer behavior. Through this process, companies can better understand market demand and enhance their competitiveness to achieve profitability. Particularly in the current era of rapid technological development, analyzing big data with AI has become very easy. However, there are still some negative risks associated with this practice.

Firstly, the maintenance of daily data and the use of AI can increase daily operational costs, which can be a significant expense for small businesses. Moreover, over-reliance on AI and data analysis results can severely impact a company's fundamental judgment. When data is insufficient, or errors occur in the analysis for various reasons, it could be a major blow to the company.

Additionally, the behavior of data collection and usage may lead to a decline in consumer trust in the brand, ethical controversies, or even legal disputes. For instance, when brands frequently use user data for personalized promotions on social media, it can lead to privacy concerns and avoidance behavior among users, resulting in negative impacts. Research shows that when mechanisms rely on users' personal data, the visibility of privacy can create a sense of privacy invasion, prompting users to become more concerned with privacy than with the need for personalized services. This can lead to worry and distrust, potentially damaging the brand's image to a certain extent [8].

3.1.2 Consumers perspectives

For consumers, the unintentional leakage of personal privacy online can lead to financial and reputational losses. Once privacy data is leaked, it can be exchanged among countless third parties, with many companies profiting from it. This can result in substantial harm to consumers, such as telecom fraud. Different countries and societies have varying regulations and penalties regarding the scope of privacy rights, which makes effective regulation difficult. At the same time, the technologies for regulating and protecting privacy data lag behind other rapidly advancing technologies [9]. As a result, users' personal privacy rights cannot be effectively protected by law, leading to feelings of insecurity among users.

In the United States, the data collected by most products that people use daily is not regulated by law. Companies can use or share users' data at any time without even needing to notify them [10].

3.2 The Brick-and-Mortar Crisis

3.2.1 Offline shopping challenge

As consumer behavior shifts, more people are opting for online shopping rather than visiting physical stores. This trend has created significant competitive pressure on traditional brick-and-mortar stores. The challenge now lies in redefining market segments and providing more competitive services than online shopping. Online retailers often have a price advantage because they do not incur costs associated with rent, utilities, and other expenses. Additionally, various discount events make online shopping even more affordable. Studies have shown that prices for similar products online are 9-16% lower than in physical stores, but if brick-and-mortar stores try to compete on price with online retailers, they only risk losing more revenue [11].

Moreover, with the support of AI, e-commerce platforms have more advanced supply chains and distribution systems, allowing them to offer more efficient logistics and comprehensive supply chain management for consumers. When it comes to pricing, physical stores are at a significant disadvantage compared to online shopping, and price is often the most sensitive and decisive factor for consumers when choosing products. It is undeniable that the rapid development of online shopping has dealt a severe blow to physical stores.

3.2.2 COVID-19 impact on in-store shopping

Starting in 2019, the COVID-19 pandemic forced people to stay home and avoid social gatherings, dealing a devastating blow to brick-and-mortar stores. From March to April 2020, the number of people staying at home in the United States increased by an average of 32 million per day, while total trips decreased by 2.5 billion [12]. At the same time, online retail sales for food and beverages in the US doubled in growth rate. During this period, consumers became accustomed to online shopping, as the comprehensive product information and the ease and efficiency of the shopping experience attracted more and more customers.

According to research, approximately 75% of consumers indicated that they would maintain their online shopping frequency even after the COVID-19 pandemic ends [12]. Therefore, it is predicted that once people transition to online shopping during the pandemic, they will likely continue this habit in the future. Although some consumers will return to in-store shopping after the pandemic, the overall foot traffic for brick-and-mortar stores is expected to remain lower than before, as a portion of it will continue to shift to online shopping.

Online shopping has fundamentally changed consumer expectations, leading them to seek the same convenience and benefits in physical stores that they experience online. Furthermore, price differences are forcing brick-and-mortar stores to cut into their profit margins, squeezing their viability. Unhealthy competition and price wars are gradually pushing physical stores toward decline.

4. Suggestion of Privacy Protection and

Offline Store

4.1 Privacy Protection

In the era of the Internet, vast amounts of data have helped companies generate enormous profits, but they have also increased the risk of privacy breaches. Data security and privacy protection in cloud storage systems still lack comprehensive legal frameworks and effective measures. When it comes to protecting user data, this paper needs to consider both dynamic and static security aspects. Static security refers to the protection of data during storage, ensuring it is not subject to risks such as theft or intrusion. Dynamic security, on the other hand, ensures the confidentiality and integrity of data during transmission.

4.1.1 Technological securities measures

First, this paper can encrypt information using security keys. For example, the Identity-Based Encryption (IBE) scheme and security model proposed by Boneh and Franklin in 2001 is one such key-based encryption method [13]. A third-party private key generator can create keys for both the sender and receiver of information. When the receiver needs to view a message, they must authenticate with the generator to obtain the key. Once the private key expires, the receiver will need to re-authenticate to request a new key, and when the public key is revoked, the private key will no longer be updated, preventing further information dissemination. This greatly reduces the risk of data being intercepted during transmission.

Furthermore, if data is personalized and stored in private cloud environments without external sharing, the security level can be easily enhanced. However, when data is shared externally, especially in a one-to-many sharing scenario, the risk of information leakage increases significantly [14]. When a single key can open multiple "doors," it implies that the locks are identical, meaning that once the key is duplicated, more information can be accessed.

Currently, more and more users are choosing to store data in personal cloud systems to ensure the integrity of their data storage. People are increasingly prioritizing the security of their personal information.

4.1.2 Law protection

At the legal level, regulating the privacy and security of user data has also proven to be highly effective. Various national or state-level laws address relevant areas. For example, the United States introduced the Computer Matching and Privacy Protection Act in 1974, which governs the personal information held by federal agencies but does not have the authority to regulate personal data collected by other entities [9]. Additionally, laws such as the National Education Statistics Act, the Tax Reform Act, and the Video Privacy Protection Act complement the scope of legal regulation on information security.

However, due to the multitude of these laws, individuals can easily become confused about their rights and the limits of those rights. In the US, consumer privacy laws differ significantly across states, with three distinct versions of privacy legislation in place in different states. Companies are only subject to the laws of the state in which they operate, leading to uncertainty about whether data is being used legally and whether individuals' personal privacy is being infringed upon [15]. This inconsistency also complicates the process of users filing complaints when their data privacy is violated.

4.2 Offline Store Evolution Direction

As online sales gradually become a global trend in the retail industry, the transition to a combined online and offline sales model is an inevitable step for many retailers. First, by leveraging the Internet, businesses can adapt to changing consumer habits and attract a broader range of potential customers. Second, by integrating online and offline channels, retailers can reduce their dependence on fixed in-store customer bases and slowly shift a portion of their sales online. Compared to physical stores, which often come with more restrictions, online shopping offers greater stability in customer relationships, as it eliminates time and geographical constraints—customers no longer need to worry about visiting the store regularly. Additionally, social networks can be used for low-cost promotions to enhance brand image.

The growth of the Internet is an unavoidable trend, and physical stores should adapt as much as possible to minimize losses. Due to the proliferation of online stores and the inability of customers to physically experience products, product quality often varies widely. In contrast to a purely online business model, combining online and offline channels can offer consumers a greater sense of trust. Physical stores provide a form of assurance to customers, which remains a key advantage of traditional retail. By offering dual purchasing channels and utilizing existing resources in conjunction with new technologies, retailers can maximize their strengths. Adapting to the evolving market while showcasing the brand's unique qualities will ultimately enhance competitiveness in the marketplace.

5. Conclusion

This article primarily provides an overview of the current state of the retail industry and offers new insights for its future development. With the integration of technology, many traditional practices have undergone subtle yet sig-

nificant changes. Since its inception, the retail industry has evolved over a vast span of time—from the early days of face-to-face trading of handcrafted goods to the modern era of global online shopping, which has transformed the industry dramatically. In particular, the introduction of AI and new media in this century has elevated the retail industry to new heights. These new technologies and business models have made retail operations more efficient and convenient. However, they have also inevitably introduced some additional challenges, such as data privacy concerns and the threat to brick-and-mortar stores. This article addresses some of the common characteristics of these issues and offers potential solutions for consideration. It is important to note that the challenges faced by the retail industry vary by region, and this article focuses primarily on issues that are nearly universal. In the future, more detailed research can be conducted by gathering both primary and secondary data from different regions, allowing for targeted studies to refine the specifics of this article.

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