AEMPS

# Advances in Economics, Management and Political Sciences

Proceedings of the 3rd International Conference on Financial Technology and Business Analysis

Murcia, Spain

December 4 — December 11, 2024

EWA Publishing

Volume 117

Editor
**Ursula Faura-Martínez**
University of Murcia

ISSN: 2754-1169
ISSN: 2754-1177 (eBook)

ISBN: 978-1-83558-657-0
ISBN: 978-1-83558-658-7 (eBook)

Publication of record for individual papers is online:
https://www.ewadirect.com/proceedings/aemps/home/index

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# Preface

The 3rd International Conference on Financial Technology and Business Analysis (ICFTBA 2024) is an annual conference focusing on research areas including digital economy, business, and finance. It aims to establish a broad and interdisciplinary platform for experts, researchers, and students worldwide to present, exchange, and discuss the latest advance and development in digital economy, business, and finance.

This volume contains the papers of the 3rd International Conference on Financial Technology and Business Analysis (ICFTBA 2024). Each of these papers has gained a comprehensive review by the editorial team and professional reviewers. Each paper has been examined and evaluated for its theme, structure, method, content, language, and format.

Cooperating with prestigious universities, ICFTBA 2024 organized four workshops in Mucria, London, Galati and Oxford. Dr. Ursula Faura-Martínez chaired the workshop "New Current Trends Related to Economics: Special Focus on Inequality and Poverty", which was held at University of Murcia. Dr. An Nguyen chaired the workshop "Human Capital Management in a Post-Covid World: Emerging Trends and Workplace Strategies", which was held at King's College London. Dr. Habil. Alina Cristina Nuţă chaired the workshop "Finance's Role in the Just Transition", which was held at Danubius University from Galati. Dr. Natthinee Thampanya chaired the workshop "Finance in the Age of Environmental Risks and Sustainability", which was held at Oxford Brookes University.

Besides these workshops, ICFTBA 2024 also held an online session. Eminent professors from top universities worldwide were invited to deliver keynote speeches in this online session, including Dr. Manjeevan Singh Seera from Monash University Malaysia, Dr. Natthinee Thampanya from Oxford Brookes University, Dr. Javier Cifuentes-Faura from University of Murcia, etc. They have given keynote speeches on related topics of digital economy, business, and finance.

On behalf of the committee, we would like to give sincere gratitude to all authors and speakers who have made their contributions to ICFTBA 2024, editors and reviewers who have guaranteed the quality of papers with their expertise, and the committee members who have devoted themselves to the success of ICFTBA 2024.

Dr. Ursula Faura-Martínez

General Chair of Conference Committee

# Workshops

**Workshop – Murcia: New Current Trends Related to Economics: Special Focus on Inequality and Poverty**




December 4th, 2024 (GMT+1)

Department of Quantitative Methods for Economics and Business, University of Murcia

Workshop Chair: Dr. Ursula Faura-Martínez, Professor in University of Murcia

**Workshop – London: Human Capital Management in a Post-Covid World: Emerging Trends and Workplace Strategies**




November 20th, 2024 (GMT)

King's Business School, King's College London

Workshop Chair: Dr. An Nguyen, Lecturer in King's College London

**Workshop – Galati: Finance's Role in the Just Transition**




December 18th, 2024 (UTC+3)

Department of Finance and Business Administration, Danubius University from Galati

Workshop Chair: Professor Dr. Habil. Alina Cristina Nuţă, Professor in Danubius University from Galati

**Workshop – Oxford: Finance in the Age of Environmental Risks and Sustainability**




October 24th, 2024 (UTC+1)

Oxford Brookes Business School, Oxford Brookes University

Workshop Chair: Dr. Natthinee Thampanya, Senior Lecturer in Oxford Brookes University

# The 3rd International Conference on Financial Technology and Business Analysis

# ICFTBA 2024

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# *The Impact of Inflation on Commercial Banks in China*

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***Abstract:*** Inflation is an important issue that affects the profitability and operational stability of commercial banks. Conducting an in-depth analysis of these influences while putting forward effective countermeasures can be beneficial to ensuring the stable operation of commercial banks. This paper focuses on the period from 1937 to 1949 where the Second Sino-Japanese War and the Chinese Civil War, which had contributed to severe inflation and disrupted the banking sector, and the formation of the modern Chinese banking system. This study critically examines the main causes behind inflation, evaluates their implications on the functioning of commercial banks. It also assesses both the positive and negative impacts on commercial banks, pointing out the challenges commercial banks face during different periods. For example, the market turmoil and policy changes in the 1940s have made it difficult for commercial banks to retain normal operation; therefore are suffering from making profits and inflation has made the situation even worse. In addition, this paper provides short-run and long-run strategies for reducing the negative effects of inflation, with consideration of China's unique economic structure and historical context. By integrating insights from historical and contemporary perspectives, this analysis aims to offer valuable views on the micro and macro impacts inflation could bring.

***Keywords:*** Inflation, Inflation Influences, Commercial Banks, Financial Instability.

## 1. Introduction

Inflation is the rate of increase in price level, usually measured by the consumer price index (CPI). Rising inflation typically leads to higher interest rates, which may compress net interest margins and reduce lending profitability. This environment increases the cost of borrowing for consumers and businesses, potentially leading to higher default rates and elevated credit risk. Furthermore, inflation can erode the real value of banks' assets and capital, complicating balance sheet management. Operational costs, including wages and technological investments, also tend to rise, squeezing bank margins further. Given China's unique economic structure and regulatory environment, commercial banks must adopt different strategies and enhance their inflation forecasting capabilities to mitigate these risks. During the period from 1937 to 1949, China experienced severe inflation driven by the Second Sino-Japanese War and the Chinese Civil War. The wars disrupted the economy, leading to government decisions of extensive money printing, which impacted the banking sector significantly. Commercial banks lost control over money supply due to government's concentration of the power to issue banknotes, which further exacerbated the economic instability and inflationary pressures. In modern China, the causes of inflation are more complex and multifaceted. Due to economic reforms

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DOI: 10.54254/2754-1169/117/20242038

and the transition towards a market-oriented economy that have introduced new dynamics, public inflation expectations, price reforms, structural changes, and policy implementation have emerged as significant factors. The long-standing fixed price system, heavy state subsidies, and excess demand from businesses, consumers, and government spending contribute to inflationary pressures.

This paper critically examines the main causes behind inflation, evaluates their implications on the functioning of commercial banks, and also assesses both the positive and negative impacts on commercial banks, points out the challenges commercial banks face during different periods, so as to offer some valuable views on the micro and macro impacts inflation could bring.

## 2. Close Analysis

### 2.1. Causes of Inflation in Different Periods

The period from 1937 to 1949 in China has experienced profound turbulence and transformation, as it was heavily influenced by the Second Sino-Japanese War (1937-1945) and the Chinese Civil War (1946-1949). This era was influenced by extreme inflation, which had significant impacts on the banking sector. After the implementation of the legal currency policy in November 1935, the power to issue banknotes was concentrated in the four national banks of the central government from 1937 to 1949. Since then, the first way commercial banks create credit, the right to issue money, has been deprived [1]. Without the right to issue currency, commercial banks gradually lost their control over the money supply within the economy, reducing their ability to quickly respond to changes in economic conditions and manage liquidity. The government's monetary policy during times of war has exacerbated this situation. The Chinese government resorted to quantitative easing as a means of financing the war effort, resulting in extensive money printing and subsequent severe inflation. Prices for goods and services skyrocketed without a corresponding rise in output, eroding the purchasing power of the yuan and limiting the operations of commercial banks. With lower Purchasing Power Parity (PPP), the relative value of the yuan decreases compared with other currencies. Therefore, the price of imports increases and the value of exports decreases, ultimately causing a decline in the real value of Gross Domestic Product (GDP) [2].

In the contemporary Chinese economy, changes in the public's inflation expectations rather than changes in the aggregate money supply have emerged as a significant cause of inflation. The relationship between money supply and inflation, especially when measured by the CPI, has increasingly weakened due to rising income and wealth levels. Consequently, policymakers should prioritize managing the public's inflation expectations through policy instruments that are directly perceived by them, as these measures may exert a more substantial impact on shaping such expectations. Other policy measures targeting monetary aggregates may not be as effective in the short term [3].

Price reforms and structural changes associated with economic reforms, as well as mistakes in the formulation and implementation of economic policies, are also among the primary causes of inflation in China. The inflation experienced during China's reform period is attributed to artificially low prices caused by heavy state subsidies for food, housing, cooking fuel, and other goods and services. This longstanding fixed price system, which has been in place for more than 30 years, has distorted resource allocation and economic development [4]. The pressure of institutional reform led to price adjustments that contributed to an overall increase in price levels. Excess demand inflation in China originates from three sources: businesses, consumers, and the government. Newly granted corporate autonomy has led to a significant surge in autonomous investment demand, while consumer demand for durable goods has been pent up [5]. Moreover, government spending on capital investment exerts upward pressure on aggregate demand. The growth rate of China's money supply is determined by

DOI: 10.54254/2754-1169/117/20242038

government spending; thus, increased spending by state entities results in greater money creation, leading to high inflation.

## 2.2. Impacts of Inflation on Commercial Banks

### 2.2.1. Negative Impacts

The wars resulted in extensive infrastructure and industrial destruction, causing severe disruptions to trade and production. Major cities and industrial centers were bombed or occupied, leading to the displacement of businesses and workers. Therefore, most people's demands shifted towards meeting their basic needs. The shortage of supply led to price hikes and high inflation rates, which could dismantle the critical role played by commercial banks step by step. Inflation eroded the value of money, diminishing the real value of customer deposits and, consequently, reducing public confidence in the banking system [6]. As a result, individuals sought to withdraw their deposits and reinvest in assets that retained value better than cash did. Apart from that, investors were likely to postpone their investment decisions or move their money abroad. During the 1940s, many savers transferred their funds into more stable currencies like the Hong Kong dollar or invested in tangible assets like gold. While the remaining parts were not all absorbed by commercial banks; instead, the majority portion was centralized within state banks, further shrinking the amount of deposits received by commercial banks [7].

After the conclusion of the Second Sino-Japanese War, economic instability still persisted. Due to the extensive devastation inflicted upon its infrastructure, trade networks, and industrial base, post-war China faced the enormous task of reconstruction. The war effort exhausted the government's financial, labour, and material resources. Worse still, efforts to rebuild the economy were hampered by continued internal strife. The resumption of the Chinese Civil War between the Nationalists and Communists exacerbated the country's economic difficulties. The economic instability and wartime destruction led to a significant increase in bad debts. Many businesses and individuals defaulted on their loans, which negatively impacted the balance sheets of commercial banks. These lingering bad debts continued to burden commercial banks even after the Civil War had ended, impending their ability to generate profits. Shanghai Commercial Savings Bank has been the largest depositor among major commercial banks since 1930. Even so, the real value of their deposits has shrunk sharply as prices have accelerated. On July 7, 1937, the deposit amount of Shanghai Commercial Savings Bank was 201.94 million yuan, equivalent to 1,769,851 tael of gold. In December 1946, after the victory of the Anti-Japanese War, although the absolute amount of deposits expanded to 4,528,555 million yuan, equivalent to only 142,947 yuan in gold, the real value dropped to 8.01% of the pre-war value [1]. In the worst situation, the commercial banks that failed to find a way of survival ended up bankrupt. While some international aid was available, it was insufficient to meet the massive reconstruction needs. Additionally, political alliances and the onset of the Cold War influenced the distribution and effectiveness of aid. More importantly, it takes time to raise funds and build new infrastructure. So, in the short run, the economy will be in a recession.

### 2.2.2. Positive Impacts

Just as everything has two sides, inflation still has its positive effects. Although inflation erodes the value of assets, it also reduces the debt burden of commercial banks. During periods of inflation, the real value of loans decreases, this means that the debt they owe becomes less burdensome in real terms, making it easier for them to repay their loans [8]. This can reduce the level of non-performing loans in a bank's portfolio. Banks can also increase interest rates on loans during inflationary periods, leading to higher interest income. This profit margin may compensate for the part they lose from their

DOI: 10.54254/2754-1169/117/20242038

asset. For instance, in post-WWII China, banks raised interest rates to keep up with inflation, thereby maintaining their profitability [3].

In addition, inflation often leads to an increase in the nominal value of real estate and other assets. Banks holding these assets can see an increase in the value of their asset portfolios. For example, Chinese banks that held substantial real estate assets saw significant appreciation in those assets during the late 1940s inflation period. In the long run, inflation can create an incentive for saving and investment. When inflation is expected to occur, individuals may be motivated to spend or invest their money rather than hold onto it, as the value of money is expected to decrease over time. This can help to stimulate economic activity and promote investment in productive assets [4].

## 3. Strategies to Reduce the Negative Effects of Inflation

### 3.1. Short-run Measures

Because of China's unique blend of government intervention and market-oriented reforms, it is described as a "socialist market economy." In this case, government adjustments would be necessary. Firstly, the People's Bank of China (PBOC) can tighten monetary policy by raising interest rates to reduce consumer spending and business investment. Increasing the reserve requirements for banks can reduce the amount of money available for lending, thereby reducing the money supply. And encouraging the Yuan to appreciate can reduce the cost of imports, which can help lower domestic inflation. A stronger currency makes imported goods cheaper, helping to control prices. Supply-side measures such as reducing tariffs on imported goods can make them cheaper, increasing supply and reducing inflationary pressures [8].

### 3.2. Long-run Measures

In the long-run, the government can formulate more effective and appropriate policies to avoid inflation caused by government policies by collecting more and more accurate relevant data as well as the implementation intensity and effectiveness of previous policies.

In addition, the establishment of the People's Republic of China after the wars marked the beginning of a new era in Chinese economic history. Opening the economy facilitated trade liberalization, allowing China to export goods and earn foreign exchange, which increased trade opportunities and helped boost industrial production and economic growth. This also enabled foreign currency to join the Chinese market, and formed foreign direct investment, which could accelerate the speed of rebuilding infrastructure. Over the period of 2003-2009, the banking sector is experiencing the final round of reform focusing on banking modernization and partial privatization. The government and banking regulatory authority allow foreign share purchases of any domestic bank, and the banks are encouraged to be listed on Chinese stock exchanges in order to improve their management, all of which are supposed to have a positive effect on bank profitability [9]. During that period, the transfer of technology and knowledge from more advanced economies was crucial for modernizing China's industrial base and improving productivity in all sectors. Modernization efforts especially strengthened the banking sector by introducing better financial practices and technologies as well as the collaboration of foreign commercial banks and domestic commercial banks. By the mid-1950s, China had established trade relationships with several countries, exporting agricultural products and raw materials in exchange for machinery and technology [10].

## 4. Conclusion

This paper examines the impacts of inflation on commercial banks in China in different periods. The findings indicate that severe inflation, primarily driven by the Second Sino-Japanese War and the

DOI: 10.54254/2754-1169/117/20242038

Chinese Civil War, significantly disrupted the banking sector. Commercial banks lost their control over the money supply, leading to diminished customer deposits, increased bad debts, and overall financial instability. Despite these negative impacts, inflation still has some positive effects. Inflation reduced the real value of debt, making it easier for banks to repay loans, and allowed banks to increase interest rates, which helped maintain their profitability. The complexity of inflation affects commercial banks, highlighting both the challenges and opportunities it presents. Effective strategies in the short term such as tightening monetary policy, raising interest rates, and appreciating the yuan can help control inflation. In the long term, implementing more effective government policies, collecting accurate data, and facilitating economic reforms can stabilize the banking sector and enhance its resilience to inflationary pressures. However, the analysis of this essay relies on historical records and expert interviews, a more comprehensive understanding could be achieved by incorporating qualitative insights from quantitative data. Future research should focus on the long-term impacts of inflation on banking sector reforms and the role of international financial cooperation in stabilizing economies during periods of high inflation. In conclusion, understanding the multifaceted impacts of inflation on commercial banks is beneficial for developing effective strategies to mitigate these effects. From current Chinese economic policy, it would be worth sacrificing short run growth to achieve a long run target to stabilize the economy.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242012

# *The Current Status of Digital Currency Development in China*

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***Abstract:*** Digital currencies, as innovative products in the field of financial technology, are characterized by their decentralized structure and strong encryption based on blockchain and other technologies. Although your mention of 'relying on local area networks' may be a bit of a misnomer in the broad sense, as the operation of digital currencies relies more broadly on the Internet rather than a single local area network, the concepts of digital encryption and decentralization it emphasizes are accurate. Legal digital currencies, such as the Digital Currency Electronic Payment (DCEP) issued by the People's Bank of China, represent a milestone in this field. They not only integrate the security and transparency of blockchain technology but also achieve a perfect combination of controllable anonymity and legal tender status through the deep integration of the generalized account system with the banking system. The issuance of DCEP marks an important step forward for China in the field of digital currencies and is expected to have a profound impact on the financial market, promoting the modernization and upgrading of the payment system, enhancing transaction efficiency and security, and at the same time, providing the public with more convenient and secure payment options, further integrating into and changing people's daily lifestyles.

***Keywords:*** digital currency, current status, countermeasures, impact.

## 1. Introduction

Amidst the digital tide of the 21st century, digital currencies, as a pivotal innovation in the realm of financial technology, are progressively reshaping the global financial landscape. China, a pivotal driver of the global economy, has taken the lead in launching the Digital Currency Electronic Payment (e-CNY), marking a significant step forward in the digital currency domain and sparking widespread international attention and discourse.

This paper endeavors to delve into the current status, characteristics, and profound implications of China's digital currency, the e-CNY, on economic and social structures. By contrasting traditional monetary systems with digital currencies, we aim to uncover the unique advantages of e-CNY in fostering financial inclusion, enhancing transaction efficiency, and bolstering financial security. Simultaneously, we will confront the challenges posed by the adoption of e-CNY, including privacy protection, cybersecurity, and the refinement of regulatory frameworks, to provide insights and guidance for policymakers, financial institutions, and various sectors of society.

As the digital economy thrives, digital currencies have emerged as an irreversible trend. China, as a pioneer in the digital currency realm, its practices and explorations with e-CNY not only hold

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DOI: 10.54254/2754-1169/117/20242012

significance for the development of its own financial system but also offer valuable experiences and lessons for the future evolution of global digital currencies. Consequently, this research not only deepens our understanding of the essence and impacts of digital currencies but also contributes to the innovation and advancement of the global financial system.

## 2. The Development History of Digital Currency

Initially, there was no currency, and people exchanged goods for the items they needed through barter. Gradually, this developed into the use of a general equivalent for exchange, and then the general equivalent was fixed as gold and silver. The emergence of paper currency was an important event in history, and the Jiaozi in the Northern Song Dynasty was the earliest paper currency used in the world. Paper currency is lighter and more portable than metal currency, making it easier to circulate. After the first millennium, most countries in the world gradually transitioned to the use of paper currency, and with the emergence of legal financial institutions such as central banks, paper currency gradually gained acceptance by the people. With the prosperity of the Internet technology in the fourth industrial revolution, the rapid development of virtual currency has attracted the attention of governments around the world. In 2019, China officially issued digital renminbi and conducted pilot projects in developed cities and provincial capitals such as Shenzhen, Suzhou, and Chongqing, adapt to the development of the times.

In the early 2000s, the concept of digital currency was introduced, primarily with the emergence of Bitcoin, the world's first decentralized cryptocurrency. Bitcoin's blockchain technology revolutionized the way this study think about money and transactions, providing a secure and transparent way to transfer value without relying on traditional banks or financial institutions.

Since then, digital currency has evolved rapidly. this study have witnessed the emergence of numerous cryptocurrencies, each with its own unique features and use cases. The industry has also seen significant innovation in terms of scalability, privacy, and interoperability, all aimed at improving the efficiency and usability of digital currencies.

China, a global leader in digital currency development, has taken a unique approach with the introduction of the Digital RMB (e-CNY). This digital currency is backed by the central bank and designed to coexist with traditional cash, providing an alternative payment method for individuals and businesses. The Digital RMB's adoption has been growing rapidly, as more people realize its convenience and benefits.

In summary, the development history of digital currency has been a remarkable journey, driven by innovation, experimentation, and the quest for a more efficient and inclusive financial system. As this study move into the future, digital currency is poised to continue evolving and transforming the way this study conduct financial transactions.

## 3. The Current Status of Digital Currency in China

### 3.1. Lack of Advanced Technology

Digital currency, which has only emerged in recent years, has received considerable attention, but its short emergence time and insufficient related laws and regulations have posed challenges. Additionally, the technological level related to digital currency is not yet mature, resulting in risks and security issues during circulation. While some enterprises like Tesla and related organizations accept Bitcoin for settlement, China still maintains a reserved attitude towards it. If the technology is not perfected, hackers may infiltrate and steal account passwords, causing significant property losses. China's digital currency ecosystem is supported by cutting-edge technology and continuous innovation. The Digital RMB utilizes blockchain technology, ensuring the security and transparency of transactions. At the same time, Chinese technology companies and financial institutions are

DOI: 10.54254/2754-1169/117/20242012

actively exploring new use cases and applications for digital currency, driving further innovation and development. For example, some platforms are integrating digital currency into their mobile payment systems, making it even more convenient for users to make payments.

### 3.2. Incomplete Legal Regulations

Although there are laws and regulations concerning digital currency in the market today, digital currency is a relatively new product that has emerged in recent decades, and there are always some loopholes that cannot be considered by laws and are exploited by those with ill intentions. Digital currency, with its characteristics of being invisible and easy to carry, is likely to become a new carrier for money laundering activities. Digital currency implements peer-to-peer settlement methods, bypassing third-party institutions to a certain extent, and existing anti-money laundering detection methods cannot fully and effectively prevent it. Nowadays, the behavior of stealing credit cards and savings cards still exists, and it is difficult to recover the stolen money in most cases. Digital currency is likely to be even more difficult to monitor. Most current laws and regulations are targeted at physical currency, and there are no comprehensive regulations for digital currency, a virtual currency[1].

### 3.3. Low Public Acceptance

Despite the significant progress made in China's digital currency landscape, there remains a considerable level of low public acceptance. This reluctance to adopt digital currency can be attributed to a variety of factors.

Firstly, many individuals in China are accustomed to traditional payment methods like cash and bank cards. The shift to digital currency requires a change in habits and familiarity with new technology, which can be daunting for some. The lack of direct experience and understanding of digital currency's benefits further compounds this reluctance.

Secondly, security concerns are a significant barrier to public acceptance. While digital currency utilizes advanced technology to ensure transaction security, there are still fears about potential risks such as hacking and fraud. These fears, coupled with a lack of trust in new financial systems, can deter people from using digital currency.

Furthermore, the lack of widespread education and awareness about digital currency also contributes to low public acceptance. Many people in China may not be fully informed about the benefits, features, and use cases of digital currency. This lack of knowledge makes it difficult for them to make informed decisions about whether to adopt this new payment method.

In summary, low public acceptance of digital currency in China is a complex issue that requires a multifaceted approach to address. By increasing education and awareness, alleviating security concerns, and providing convenient and accessible options for digital currency use, China can foster greater acceptance and utilization of this innovative payment method.

### 3.4. Social and Economic Impact

Finally, the development of digital currency in China is having increasingly significant social and economic impacts. By providing a convenient, efficient, and secure payment method, digital currency is helping to promote economic growth and digitalization in the country. It is also enabling financial inclusion, allowing more people to access financial services and participate in the economy. In addition, digital currency is helping to reduce the costs and risks associated with traditional payment methods, further enhancing its appeal and adoption[2].

In conclusion, the current status of digital currency in China is promising and exciting. With a robust regulatory framework, widespread adoption, technological innovation, international

DOI: 10.54254/2754-1169/117/20242012

cooperation, and significant social and economic impacts, digital currency is poised to play an increasingly important role in China's financial sector and economy.

## 4. Impacts of the Digital Currency Issued by the Central Bank

### 4.1. Positive Impacts

#### 4.1.1. Digital Currency Enables Offline Payments

If the internet malfunctions, payment methods like Alipay and WeChat Pay will become unusable. However, as long as your phone has battery, digital currency payments will not be affected. This means that whether people are on a plane or in a high-speed train passing through a tunnel, they can still pay for the goods they want. This greatly facilitates people's lives.

#### 4.1.2. Improves the Accuracy and Efficiency of Market Feedback Information

Currently, domestic consumers rarely use cash in daily life, and instead rely more on payment platforms like WeChat and Alipay. Behind these quick payment methods are still bank cards from commercial banks, and essentially, they still cannot bypass third-party institutions. The digital currency launched by the central bank realizes peer-to-peer settlement without relying on third-party institutions. Relevant departments can obtain more accurate data more quickly and easily, and the analyses and policies based on these data will also be more effective[3].

#### 4.1.3. Enhances Deposit Security

Both WeChat and Alipay payments require binding to bank cards from commercial banks. These banks, theoretically, may face bankruptcy. People's deposits in rural banks in Henan cannot be withdrawn, and while the probability of bankruptcy for large state-owned enterprises is extremely low, it is not impossible. From a security perspective, the central bank is obviously several levels higher.

#### 4.1.4. Reduces the Costs of Issuing, Circulating, and Destroying Traditional Paper Currency

According to the Federal Reserve's statistical information on the US dollar, the average life cycle of non-polyester dollar bills classified by denomination is only 6.9 years, and the average life cycle of coins is 25 years. Once paper money reaches its service life, it will be recycled, shredded, and pressed into bricks, then sent to government-designated incinerators for burning[4].Water consumption, waste ink and pulp sludge, electricity used in printing and pulp manufacturing, metal mining, and coin minting all consume resources during paper production and printing. The impact of paper money and coins on the environment further increases the cost of using physical currency. Once the environment is polluted, it is extremely difficult to restore it to its original state, requiring not only a large amount of money but also an incalculable cost of time.

#### 4.1.5. Driving Innovation and Economic Development

The application of digital currency not only promotes innovation in the financial sector but also positively impacts the entire economy. Firstly, the introduction of digital currency stimulates innovation vitality in financial technology. Financial institutions and technology companies have devoted themselves to the research, development, and application of digital currency, promoting the rapid development of financial technology. Secondly, the popularity of digital currency promotes the development of emerging industries such as e-commerce and mobile payments. In China, with the

DOI: 10.54254/2754-1169/117/20242012

widespread application of digital currency, more people are choosing online shopping and mobile payments, which not only drives the prosperity of e-commerce but also boosts the rapid development of related industries. Finally, the application of digital currency helps optimize monetary policy transmission mechanisms and improves monetary policy effectiveness. Through digital currency, central banks can more precisely control the money supply and circulation speed, achieving precise monetary policy regulation.

## 4.2. Negative Impacts

### 4.2.1. Incomplete Regulatory Laws and Regulations may Lead to Risks

Although there are laws and regulations regarding digital currency in the market today, digital currency is a relatively new product that has emerged in recent decades. There are always some loopholes that laws cannot consider, which may be exploited by malicious individuals. Digital currency, with its invisibility and portability, is highly likely to become a new carrier for money laundering activities. Digital currency implements peer-to-peer settlement, bypassing third-party institutions to a certain extent, and existing anti-money laundering detection methods cannot fully and effectively prevent it. Nowadays, the behavior of stealing credit cards and savings cards still exists, and it is difficult to recover the stolen money in most cases. Digital currency is likely to be even more difficult to monitor and trace.

### 4.2.2. Weakens the Traditional Business Functions of the Banking Industry

The digital currency issued by China's central bank is a legal currency with national credit guarantees that can be circulated and exchanged in the market. It also follows the general principle of "decentralization" of digital currency, meaning that it does not need to rely on any third party and can conduct free and convenient transactions on the internet based on its unique algorithms. This means that the functions of traditional commercial banks are weakened. As digital currency gradually gains popularity, people will no longer need to go to offline counters to handle business, and most issues can be resolved through the internet. Settlement, transfer, and other activities will exist in the form of digital currency, giving people more choices in payment methods and weakening the payment functions of commercial banks.

### 4.2.3. Causes Employment Difficulties for Banking Industry Employees

The development of digital currency has a significant impact on the employment of staff at traditional bank branches' offline counters. With the popularization of digital currency, people will reduce their frequency of visiting counters, just as after the popularization of mobile payments, most issues can be solved with a mobile phone, and people do not frequently go to relevant service windows for utility payments. To reduce operating costs, commercial banks will reduce their operating scale. Without physical currency, vaults, currency detectors, and other equipment will also gradually decrease, and related security service positions will be reduced, causing employment difficulties for relevant personnel.

### 4.2.4. Environmental Impact

The mining process of digital currencies, especially Bitcoin, is highly energy-intensive. This mining process involves solving complex mathematical problems using powerful computers, which requires a significant amount of electricity. In China, where coal-fired power plants provide a significant portion of electricity, the environmental impact of digital currency mining can be significant. The carbon emissions generated by digital currency mining not only contribute to climate change but also

DOI: 10.54254/2754-1169/117/20242012

pose a threat to the environment and public health. As digital currency gains popularity in China, the environmental impact of its mining process will become an increasingly important issue to address[5].

## 5. Policy Suggestions on Issuing Digital Currency in China

### 5.1. Increase Investment in More Advanced Technology

Digital currency, which relies on the Internet and emerged relatively late, faces issues such as technical vulnerabilities and imperfect operational technology, making it prone to the theft of user account passwords and causing financial losses to users. As the legal official currency of China, the safety of digital currency issued by the central bank is crucial to China's financial market and people's lives. Therefore, it is essential to ensure the security of transactions and storage. The central bank needs to strengthen the upgrading and maintenance of the secret protection system to prevent hackers from breaking through.

### 5.2. Increase Publicity Efforts for Digital Currency

Digital currency is a brand-new product that has emerged in recent years, and many middle-aged and elderly people, as well as teenagers, are not very familiar with it. They are relatively unfamiliar with the procedures required for the issuance and circulation of digital currency. This requires relevant departments to invest more time and energy in promoting and publicizing related policies during the initial stage of digital currency issuance to better enable people to accept digital currency and bring it into people's lives. Combining developed online media and offline promotional methods, this study can popularize the usage methods and operating skills of digital currency among the public, truly realizing the idea that digital currency is convenient for people's lives.

### 5.3. Improve Laws and Regulations Related to Digital Currency

As a legal currency, digital yuan can be revised and supplemented with content related to digital currency based on existing laws and regulations for physical currency, standardizing the ownership of digital currency and relevant departments. Establish a sound regulatory system to combat money laundering, tax evasion, and fraud, maximizing the protection of people's property security. As a new phenomenon, digital currency is bound to encounter some problems during its use, requiring timely improvements and perfection of laws and regulations. Therefore, relevant department personnel need to be flexible.

### 5.4. Strengthen Ties with Other Countries and International Organizations

China's economy is closely intertwined with the global economy, and win-win cooperation in the current world is the right choice. For digital currency, the laws and regulations of different countries may vary, and various countries and international organizations are accelerating the establishment of digital currency systems. Establishing good cooperative relations is conducive to combating cross-border illegal and criminal activities and building a sound international financial system.

## 6. Conclusion

The conclusion of China's digital currency development journey thus far is nothing short of remarkable. The Digital RMB, or e-CNY, has not only established itself as a viable alternative to traditional cash and bank payments, but it has also demonstrated its potential to reshape the financial landscape in China and beyond.

DOI: 10.54254/2754-1169/117/20242012

The rapid growth in wallet openings and transaction volumes speaks volumes about the popularity and convenience of the Digital RMB. As more and more individuals and businesses embrace this digital form of currency, it is becoming a crucial component of China's digital economy. This trend is expected to continue, further accelerating the digitization of payments and financial transactions in the country.

The diversification of application scenarios for the Digital RMB is another noteworthy aspect. From public services to transportation to cross-border payments, the Digital RMB is finding its way into various sectors, unlocking new opportunities and use cases. This diversification not only expands the reach and utility of the digital currency, but it also helps to address some of the challenges faced by traditional payment systems.

Moreover, the Digital RMB holds significant promise for international trade and finance. As China continues to explore the use of the digital currency in cross-border payments, it has the potential to revolutionize the way international transactions are conducted. This could lead to faster, more efficient, and more secure payments, ultimately benefiting both businesses and consumers.

In conclusion, the current status of China's digital currency development is both impressive and exciting. The Digital RMB has demonstrated its potential to reshape the financial landscape, providing convenience, efficiency, and security to its users. As China continues to push the boundaries of digital currency technology, it is likely that the Digital RMB will play an increasingly important role in the country's digital economy and beyond.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242040

# *From Algorithms to Market Dynamics: A Literature Review on High-Frequency Trading*

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***Abstract:*** High-frequency trading (HFT) uses advanced technologies and sophisticated algorithms to make transactions at unprecedented speeds, which could significantly impact modern financial markets. This literature review examines the technological foundations, primary trading strategies, market impacts, regulatory environment, risk management practices, and future research directions in HFT. The findings reveal that HFT could increase market liquidity and price discovery but also increase volatility during periods of high market stress. Regulatory frameworks such as the SEC's Market Access Rule and MiFID II aim to monitor and control HFT activities, at the same time effective risk management practices are crucial for maintaining market stability. Future research should focus on emerging technologies such as AI, ML, quantum computing, and blockchain, along with a better understanding of market structure and global regulatory coordination. This review provides valuable insights for market participants, regulators and researchers, contributing to a balanced perspective on HFT's role in contemporary financial markets.

***Keywords:*** High-frequency trading (HFT), Market liquidity, Trading algorithms, Risk management.

## 1. Introduction

High-frequency trading (HFT) refers to when investors take advantage of advanced computing technology and high-speed networks to execute large volumes of trades within an extremely short time, which makes their trading speeds surpass other ordinary computers by milliseconds and ordinary human traders by whole seconds, thereby profiting in rapidly changing markets. With the development of the internet, HFT emerged in the early 2000s, and HFT has become a significant force in the financial markets. Statistics show that HFT accounts for 30% to 50% of trading volume in the U.S. stock market and also has a significant impact on other financial markets such as futures or foreign exchange markets [1].

The rapid development of HFT has caused widespread attention from both academia and the public, due to its significant role in improving the efficiency and changing structure of the whole market, understanding the HFT also makes economy profits for the investors. On the one hand, HFT is believed to enhance market liquidity and price discovery [2]. On the other hand, HFT also could bring potential risks and impacts on market stability, which could also cause considerable debate [3].

This paper aims to review a series of existing literature to analyze the technological foundations, primary strategies, and market impacts of HFT, and provide a reference for future research. This

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DOI: 10.54254/2754-1169/117/20242040

paper is structured as follows: section 2: Explores the technological foundation of HFT, which includes the algorithm design, computational speed, and data processing techniques; Section 3: Explores the primary strategies of HFT and the optimization methods; Section 4: Discusses the impact of HFT on market liquidity, market efficiency and market volatility; Section 5: Discusses the regulatory and risk management issue related to the HFT; Section 6: Look forward to future research directions in HFT; Section 7: Finding and conclusion.

## 2. Technological foundations of High-Frequency Trading

High-frequency trading (HFT) relies heavily on sophisticated algorithms to execute trades at extremely high speeds and volumes unattainable by human traders. So the design and implementation of these algorithms are crucial for the success of HFT strategies. Statistical arbitrage algorithms exploit price inefficiencies between correlated assets. These algorithms use statistical methods to identify groups of assets in which price movements are historically correlated but have temporarily diverged, the mean-reversion methods are often used, where the algorithm takes long positions in undervalued assets and short positions in overvalued assets, expecting the prices to revert to their historical relationship [4]. Market making is another algorithm that provides liquidity to the market by continuously quoting bids and asking prices. This algorithm profits from the bid-ask spread by simultaneously placing buy and sell orders. The primary challenge for market-making algorithms is to manage the inventory risk that arises from holding positions in assets [5]. Order flow analysis algorithms predict future price movement by analyzing the flow of orders in the market. These algorithms monitor the order book and use machine-learning techniques to identify patterns that precede price changes [6]. By short-term price movements, these algorithms could place advantageous trades and make profits.

The success of HFT is mostly dependent on the speed of execution. Therefore, substantial investments are made in computational infrastructure to achieve minimal latency. Low-latency networks are essential for HFT firms to gain speed advantages. Technologies such as fibre-optic cables and microwave communication are used to transmit data as quickly as possible between trading venues. This network reduces the time for trade orders to reach exchanges, providing competitive advantages in executing trades. Efficient software plays an important role in the HFT. Programming languages such as Python and C++ are commonly used in high-frequency trading systems due to their performance advantages [7]. At the same time, Lockwood et al. state that some software providers such as Mantara, Ullink and QuantHouse could offer customizable trading software which could minimise the latency [8]. Additionally, low-latency APIs are utilized to streamline the interaction between trading algorithms and exchanges. To achieve high-frequency trading, high-performance computing systems are commonly used in reality. Field-Programmable Gate Arrays (FPGAs) offer higher performance of low latency and flexibility compared to other platform such as Application-Specific Integrated Circuits (ASICs) and Graphics Processing Units (GPUs) [8]. These specialized hardware components are optimized for the rapid calculations required in HFT.

HFT requires a high-speed data processing and analysis system and sophisticated techniques to make split-second trading decisions. Real-time data acquisition is important for HFT. Market data such as price quotes, trade volumes and order book information is continuously collected from exchanges. HFT firms try to collect premium data seed to find up-to-date information. Machine learning (ML) and artificial intelligence (AI) as new advanced data modelling techniques, are used to identify trading opportunities. These model could used to analyzed historical and real-time data to forecast market movements and inform trading decisions. Fischer and Krauss showed that machine learning models, such as neural networks and decision trees, are particularly useful in detecting complex patterns in large datasets [9].

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## 3. Strategies and methods in High-Frequency Trading

High-frequency trading strategies operate under various market conditions, so the strategy design is crucial for the HFT firms which will help them to make profits. At the same time, the strategies' design and implementation could directly influence the trading performance. So we analyse some main strategies in today's market and try to find some inspirations. Arbitrage strategies exploit the price inefficiencies in the market by simultaneously buying and selling correlated assets. The arbitrage method is mainly divided into statistical arbitrage and cross-market arbitrage. Statistical arbitrage strategies are based on the historical correlation of asset prices, and using short-term price deviation to make profits [4]. Cross-market arbitrage captures the differences between different markets to get profits [10]. Market makers provide liquidity to the market by continuously quoting buy and sell prices, earning profits from the bid-ask spread. Ho and Stoll explained that market-making strategies require constant quote updates to respond to market price fluctuations [5]. The key elements of success for market-making strategies depend on efficient risk management and quick reaction capabilities. Order flow analysis strategies could predict short-term price movements by analysing the flow of orders in the market. HFT firms could use ML and AI techniques to identify the flow of order flow, which will help these firms predict price change and make profits.

Understanding these methods could help the HFT firms to make profits in the market, but how to adjust these methods and find the strategies optimization is another aspect that we need to consider. Machine learning as a new advanced modelling system is widely used in the optimization of HFT strategies. Algorithms learn patterns from historical data and automatically adjust strategy parameters to improve trading performance [9]. Risk management is another efficient method to adjust strategies in HFT. Common risk management techniques include stop-loss strategies, dynamic position adjustment, and real-time risk monitoring [1]. These techniques could ensure that trading strategies remain stable under extreme market conditions.

## 4. Impact of High-Frequency Trading on markets

Market liquidity refers to the ease of asset which an asset can be bought and sold in the market without affecting the asset's price. High-frequency trading has a significant impact on the market due to HFT could increase or decrease liquidity depending on the different market conditions.

HFT firms as a kind of market makers, providing liquidity by continuously quoting buy and sell prices. Studies have shown that HFT could improve liquidity by narrowing bid-ask spreads and increasing the depth of the order book [11]. This enhanced liquidity can lead to more efficient markets and lower transaction costs for all market participants. Although HFT could bring some benefits to the market, it also could lead to sudden liquidity withdrawals during the period of high market stress. HFT algorithms could simultaneously pull out the market, reduce volatility and create flash crashes. The "Flash Crash" of May 6, 2010, in the U.S. is a famous example in the financial market, an algorithm that precipitated the loss of $1 trillion of the US market capitalisation in a 10-minute-long cascade of falling prices. However, without any human intervention, the markets recovered to the previous levels in the following 15 minutes. KIRILENKO et al. analyzed the "Flash Crash" and explained how HFT could contribute to extreme volatility and rapid price declines [3].

Market efficiency refers to the extent to which asset prices reflect all available information in the market, it is mainly divided into weak forms of efficiency, semi-strong forms of efficiency, and strong forms of efficiency. HFT could influence market efficiency in several ways. Firstly, HFT could improve the ability of price discovery by quickly incorporating new information into asset prices, HFT algorithms analyze market data and execute trades at high speeds, which could ensure that the price reflects all the information in the market [12]. This rapid adjustment of prices to new information could make the market become more efficient. Secondly, HFT could contribute to noise

DOI: 10.54254/2754-1169/117/20242040

trading, where trades are based on short-term price movements rather than fundamental information. This could lead to increased volatility and potential mispricing of assets. The difficulty is distinguishing between trades that contribute to real price discovery and those that could cause noise [13].

Market volatility is another important topic when we consider the impact of HFT. Market volatility refers to the degree of variation in asset price over time. On the one hand, some studies suggest that HFT could increase short-term volatility due to the large volume of trades, which means the presence of HFT could increase price swings during periods of market uncertainty [14]. On the other hand, some research indicates that HFT could reduce market volatility by providing liquidity and stabilizing prices through market-making activities [2]. The effect of HFT on volatility depends on the specific strategies used in the market and the whole market environment.

## 5. Regulation and risk management in High-Frequency Trading

High-frequency trading could bring some benefits to the whole market, but the challenges with HFT are another important issue that we need to consider. HFT has posed significant challenges for regulators due to its complexity and potential to influence market stability. Different areas implemented different regulatory measures to address these challenges and ensure market efficiency.

In the United States, the Securities and Exchange Commission (SEC) and the Commodity Future Trading Commission(CFTC) have introduced regulations aimed at monitoring and controlling HFT activities. The SEC's Market Access Rule requires brokers and dealers to implement risk management controls to prevent inaccurate trade. The CFTC has also proposed rules to enhance the oversight of automated trading systems, which requires registration requirements and risk management [15].

The European Union also implemented some regulations such as the Markets in Financial Instruments Directive II (MiFID II) to control risk, the MiFID II came into effect in January 2018. MiFID II is a principle-based systemic regulation, with a clear objective of providing more transparency to the financial market structure through uniform EU regulations [16]. At the same time, MiFID II requires firms to store order data and implement circuit breakers, and firms also need to have effective systems to control and manage the risks, associated with algorithmic trading.

Due to the high speed of transactions, how to manage risk effectively is crucial for HFT firms to mitigate risk and maintain market integrity. Firstly, HFT firms implement various pre-trade risk controls to prevent high-risk trades. These controls are mainly divided into order size limits, price collars, and automated stop transactions if activities risk over the thresholds [1]. Secondly, HFT firms implement continuous real-time monitoring of trading activities, which is essential for firms to identify and address potential risks. HFT firms use sophisticated surveillance systems to track order flow, market conditions, and system performance, allowing them to respond quickly to any risk activities [17]. Thirdly, HFT firms could use post-trade analysis to assess the performance of trading strategies and identify the disadvantages. This analysis involves reviewing trade data, and market impact to improve algorithms and risk management practices [18].

The rapid development of HFT also raised many ethical and legal concerns, which prompted people to find more effective regulations and oversight. The first concern is about market manipulation. HFT strategies sometimes could be used to manipulate markets. These practices involve placing large orders but not executing them or creating false signals about supply and demand [19]. So regulators have increased efforts to detect and penalize these activities. Fairness and market access are other concerns that are mostly caused, by the high speed of HFT raising questions about fairness and market access. Critics argue that HFT will create an unfair competitive environment because traditional investors are disadvantaged. To find a fair trading opportunities is another challenge for the regulators.

DOI: 10.54254/2754-1169/117/20242040

## 6. Future research directions in High-Frequency Trading

The rapid development of technology could continue to influence the HFT. Future research about technological innovations could prompt and regulate HFT. For the aspect of technology, Artificial Intelligence (AI) and Machine learning (ML) in HFT algorithms bring significant opportunities in HFT development. Future studies could investigate how AI and ML could improve the accuracy optimize the trade strategies and improve the ability of risk management. Research also explores the ethical implications and regulatory challenges associated with the use of AI. Quantum Computing could revolute the HFT by solving complex optimization problems at high speed. Future research could explore the potential benefits and feasibility methods of quantum computing which improve the reliability of HFT [20]. Yermack stated that the use of blockchain and distributed ledger technology (DLT) in financial markets can enhance transparency and security [21]. Future research could explore how HFT firms use these technologies to improve transaction efficiency and reduce transaction risk.

Understanding the market structure is another aspect that future studies could consider. The behaviour of order books plays an important role in HFT. Researchers could analyse the dynamics of order books in different market conditions to find how the HFT influences market liquidity, price discovery and market stability [22]. At the same time, latency arbitrage exploits small time delays in the market, future research could examine the impact of latency arbitrage on market fairness and efficiency and find appropriate ways to eliminate the risks [23].

Regulatory and ethical considerations attract more attention in reality. So future research could evaluate the existing regulatory frameworks in managing risk associated with HFT. Researchers could propose enhancements to these frameworks to better address emerging challenges and ensure market integrity. Given the global nature of financial markets, international coordination in regulating and monitoring HFT is essential. Future research could focus on how to achieve the global coordination to achieve the goal of safety and effective transaction.

## 7. Conclusions

HFT relies on sophisticated algorithms, high-speed computational infrastructures, and real-time data processing techniques. Advances in AI and ML, along with the potential of quantum computing and blockchain technology could provide powerful power in the development of HFT. HFT also use multiple strategies such as statistical arbitrage, market making, and order flow analysis. These strategies could use the market inefficient to rapid transactions, while sophisticated risk management techniques could mitigate potential risks [4, 5, 6].

In conclusion, understanding the HFT has many practical implications for market participants, regulators and researchers. For market participants, understanding the technologies and strategies of HFT could improve trade performance and mitigate risk during the transactions. Regulators could benefit from the existing regulations and find more efficient regulations to regulate the financial markets. Researchers could identify higher research directions in HFT. While the literature provides a comprehensive overview, it also has its own limitations. The rapid speed of development of technologies and market changes means some of the discussions in this paper may quickly become outdated. Additionally, the complexity of HFT brings challenges in understanding their impacts.

Future research should focus on empirical studies to validate theoretical models and assess the real-world implications of HFT. Collaboration between academia, industry, and different countries can facilitate a more comprehensive understanding and effective oversight of HFT activities.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242055

# *Consumer-Oriented Marketing Strategy of Chinese Domestic Otome Games: A Case Study of Love and Deepspace*

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***Abstract:*** Otome games, story-based romance video games targeting women, originated in Japan in the late 1990s and have since gained popularity all around the world. This paper investigates the rise of Chinese domestic otome games, focusing on *Love and Deepspace*, a burgeoning and competitive title. The study analyzes its marketing strategy using the 4P model and examines the game's reflection on consumer behavior. The findings show that *Love and Deepspace* has innovated marketing approaches within the otome game industry, leveraging 3D modeling as the core of its product and price strategies and employing consumer-centric promotion strategies globally. As a conclusion, the paper states that understanding target consumers' preferences is vital for future market planning. The research uses *Love and Deepspace*'s success as an example to highlight the significant business value of domestic otome games and provide insights for companies to refine their strategies in this growing market.

***Keywords:*** Chinese domestic otome games, marketing strategy, *Love and Deepspace*, consumer feature.

## 1. Introduction

Otome games are story-based romance video games targeted at women who seek to develop romantic relationships between one female player and multiple male leads. Initiated by Japan in the late 1990s, the popularity of otome games has gradually spread to neighboring countries such as Korea and China, even extending its reach to some western countries. Since the release of Love and Producer in 2017, China has experienced unprecedented prosperity in domestic otome games, drawing scholars to dig into this phenomenon. While research quantity remains limited in such an emerging area, researches on Chinese domestic otome games are primarily analysed from a social-cultural perspective, such as the awakening of feminism, identification of female identities, and compensation for women's needs. However, as a growing type in the game market and an area with immense consumption potential, otome games have high business studying value waiting to be discovered. Also, existing research methods on domestic otome games are mostly studies of earlier otome game cases, but with the rapid development of the Chinese otome game industry, it's essential to update new cases and compare them with previous ones to gain insights into the future development of domestic otome games.

This paper cites *Love and Deepspace* as a burgeoning yet strongly competitive Chinese otome game to analyze the reasons for its success, thereby reflecting the characteristics of contemporary domestic otome game consumers. This paper probes into *Love and Deepspace*'s distinct marketing

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DOI: 10.54254/2754-1169/117/20242055

strategy by using the 4P model and incorporating data to support its effectiveness. By discussing *Love and Deepspace* alongside other domestic otome games, this article aims at reaching a generalized conclusion on how marketing strategies are formulated based on features of domestic otome game consumers, thus assisting otome game companies in market planning with a better understanding of their target users.

## 2. The Status Quo of Chinese Domestic Otome Game

### 2.1. The Development of Chinese Domestic Otome Game

As a type of female-oriented game (games designed specifically for female users), otome games started relatively late in China, with merely a few years' time to take root and sprout. Some researchers have categorized the development of female-oriented games in China into three periods, according to the release of certain phenomenal games [1].

During the earlier exploratory phase (2013-2016), games derivated from popular films and TV IPs unintentionally attracted the female audience. It was not until *Nikki Up2U: A Dressing Story (2013)*, a game of fashion and dress-up, that domestic games started targeting female players. One of the representative female-oriented games in the second phase (2016-2017) is *Onmyoj (2016)*, a card battle game with a female aesthetic visual presentation. Despite its large female player base, due to its overall intense competitiveness, *Onmyoj*'s initial female orientation faded into a gender-neutral one. In the current maturity stage (2017-now), following the *Nikki* series, Papergames released the first domestic otome game in China, *Love and Producer (2017)*, bringing unforseeable changes to the market: not only have female-oriented games thrived unprecedently, but the number and proportion of otome games in the domestic female-oriented gaming market have grown to a predominant state.

Take *Love and Producer*'s year of release as Chinese domestic otome game's milestone, as a result of which, the Chinese female gaming market was significantly influenced. Figure 1 below demonstrates information on the Chinese female gaming market from 2015 to 2019, reflecting that not only did the year 2017 embrace the sharpest growth in female gaming sales revenue (increased by 38% from 2016 to 2017), but after 2017, when Chinese domestic otome games started to flourish, the number of female gamers climbed significantly (increased by 11.5% from 2017 to 2018).

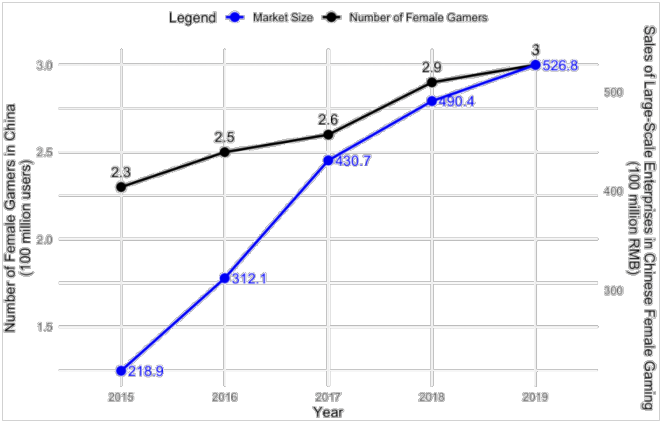



Figure 1: Chinese Female Gaming Market Condition (2015-2019) [2]

### 2.2. The Current State of Chinese Domestic Otome Game Industry

On January 18th, *Paper Studio and Netease launched Love* and *Deepspace and Beyond the World* respectively, igniting a competition for female users in 2024. These two dark horses have shaken up

DOI: 10.54254/2754-1169/117/20242055

the existing status of the "Big Four" (*Light and Night, Love and Producer, Tears of Themis* and *Time-Limited Drawing Traveller*) in the Chinese domestic otome game industry.

According to data compiled from Diandian Data and Qimai Data, up until the 1st quarter of 2024, *Love and Deepspace* and *Beyond the World* had surpassed the revenue of the "Big Four" established otome games, ranking first and second in the Chinese domestic otome gaming market. Moreover, revenue from *Beyond the World* in the first 3 months generated more revenue than the "Big Four" combined, and *Love and Deepspace*'s revenue was 1.5 times more than that amount. As a new entrant to the otome game market in early 2024, not only does *Love and Deepspace* boasts astonishing quarterly revenue, but also owns the highest number of servers and the highest overseas quarterly revenue among these six top domestic otome games. Hence, for its burgeoning and success, it would be beneficial to study the lightspots of *Love and Deepspace*'s marketing strategy. Moreover, this strategy, to some extent, accurately reflects the characteristics of contemporary consumers of Chinese domestic otome games, which is also worth summarizing.

## 3. Marketing Strategy of *Love and Deepspace*

Philip Kotler notes that marketing is a process of creating, communicating, and delivering values to customers in ways that benefit the organization and its stakeholders [3]. This definition is built upon Jerome McCarthy's 4P marketing model in the 1960s, which stated Product, Price, Place, and Promotion as four aspects of a strategic framework for marketers to meet consumer needs effectively [4]. As participants in the gaming market, otome game companies aiming at satisfying female players should not be any different when framing their marketing strategy.

### 3.1. Product Strategy

Like any other Chinese domestic otome game, *Love and Deepspace* aligns with the general game theme of adventure and romance. What makes it unique, however, is its art style. *Love and Deepspace* is the first Chinese otome game to replace semi-anime 2D character design with semi-realistic 3D modeling. It currently has the highest level of female protagonists' facial customization options: with 3D technology, female players are closer than ever to crafting their in-game characters to resemble their real-life appearance or ideal selves. Also, the game has incorporated dressing technology from its company's *Nikki* series, dressing up characters in realistically detailed outfits, and enhancing the realism of in-game characters on top of the already exquisite human modeling.

The 3D art style has offered *Love and Deepspace* the opportunity to make common otome gameplay more appealing and to create new gameplay, for it further enhances immersion for female players by simulating reality. In the essential otome game companion system, players can freely adjust their viewing angle, observing male leads with no blind spots during daily interactive scenes such as exercising or studying. This level of realness gives them the illusion that such perfect men exist. Among *Love and Deepspace*'s innovative gameplay, Photo Studio would not have acheive its current popularity without 3D design because female players obtain a sense of real intimacy with the male leads and they can use their own 3D avatars in the photos taken. Additionally, owing to 3D art design, *Love and Deepspace* is able to introduce the first lightweight PVE combat system in domestic otome games. Players fight against enemies alongside a male leading companion on a semi-AR platform [5]. This combating system has been welcoming because it is more engaging than the simple mini-games of traditional otome games and easier to pick up than other mainstream competitive games.

DOI: 10.54254/2754-1169/117/20242055

### 3.2. Price Strategy

*Love and Deepspace* follows the typical free-to-play and in-app-purchase pattern. The mainstream Chinese domestic otome games on the market provide purchases usually in the form of tiered-priced gift packs and monthly cards, providing game items mainly for gacha draws, and these gacha pools have a guarantee system---how many draws guarantee reward acquisition. *Love and Deepspace* 's gacha pool, called "wishes," unlocks different memories (interactions with different variants of male leads) of the male leads. Although the game guarantees players a 5-star memory (the highest quality memory) per 70 wishes, for players who want to collect different memories of their preferred male leads, it is almost impossible for them to obtain every desired memory under the game's 5-Star Limited Rate UP Pool's rules without making any in-game purchases. This is how *Love and Deepspace* makes its earning from gacha draws.

Currently, the game has categorized 5-star memories into permanent and limited ones, among which limited ones can only be drawn in corresponding 5-Star Limited Rate UP Pools. The limited pools adopt a dual guarantee system: if the first 5-Star memory drawn is permanent, the next one guarantees limited, meaning that limited memories are actually guaranteed per 140 wishes. According to Table 1, in the first 3 months of its opening, *Love and Deepspace* has organized 8 limited pools, with intervals of mostly 2 days or less. The duration of these pools is positively correlated to the number of limited 5-star memories released. During the first quarter of 2024, the longest interval between one character's two successive limited pools is 21 days (Xavier 2.19-3.11). On the premise of completing daily activities and subscribing to a monthly card, the collected game items, converted into wishes, would merely be around 37 draws. Compelled by a sense of urgency and exclusivity, players have no choice but to make more in-game purchases [6].

Table 1: 2024 1st Quarter Schedule of 5-Star Limited Rate UP Pool of Love and Deepspace

| Date \ Character / Number of Memories | Xavier | Zayne | Rafavel |
|---|---|---|---|
| 2024.1.18-2024.1.26 | 1 | | |
| 2024.1.27-2024.2.4 | | | 1 |
| 2024.2.5-2024.2.19 | 1 | 1 | 1 |
| 2024.2.21-2024.2.29 | | 1 | |
| 2024.3.1-2024.3.8 | | | 1 |
| 2024.3.11-2024.3.23 | 1 | 1 | 1 |

Another important source of revenue for *Love and Deepspace* is its exquisite yet exceptionally expensive male clothing. While the "Big Four's " male character costumes are priced at around 50 RMB, *Love and Deepspace*'s regular price is set at 128 RMB, doubling the regular price of other otome games' costumes even during discount periods. However, players are willing to "pay" the price because instead of purchasing them directly through top-up payments like other otome games, they can pay in "crystals," a type of in-game currency that the monthly card includes as a monthly bonuses. Generally, the crystals given with a 4-month subscription to the monthly card are enough to exchange one of set outfit. Hence, many players subscribe to this service for multiple months and find it very worthwhile, enjoying monthly resources and getting a set of clothing "for free" as a bonus. In turn, *Love and Deepspace*'s monthly card service not only generates revenue but also increases players' retention.

DOI: 10.54254/2754-1169/117/20242055

### 3.3. Place Strategy and Promotion Strategy

Basically, Chinese domestic otome games support digital downloads through websites and application stores, available on both Android and iOS platforms. With the floushing of otome game market, these domestic games are gradually achieving data interoperability between Android and iOS platforms, expanding from mobile to PC, and stepping foot into the overseas market. The most significant feature of *Love and Deepspace*'s place strategy is its extensive coverage. Currently, the game has provided free data interoperability service, accomplished comprehensive coverage of mobile and PC platforms, and launched the most overseas servers among mainstream domestic otome games. Not only has *Love and Deepspace* achieved remarkable success domestically, as stated above, but also it has entered Tier 1 markets in various countries and regions overseas. According to Dataeye's observation, as of March 2024, this game has topped multiple free charts and entered the Top 10 of best-seller charts in Taiwan, Canada, Japan, and other countries worldwide [7]. These remarkable global achievements are inseparable from *Love and Deepspace*'s strong promotion strategy.

The core of *Love and Deepspace*'s strategy is IP-based promotion. Based on the goals of building and utilizing a recognizable brand, strengthening connections with players, and driving revenue growth, IP-based promotion involves developing and promoting game-related contents that possess "inherent value and a dedicated fan base" [8]. Since the game's global promotion strategies perform similarly across countries, its promotion in China will be analyzed as an example.

Table 2: 2024 1st Quarter Promoting Activities of Love and Deepspace in China

| Date | Partner | Content | Promotion Type |
|---|---|---|---|
| 2024.1.8 | Sarah Brightman | Title Song Performance | Co-Branding |
| 2024.1.15-2024.2.13 | Changguang Satellite | Satellite Launch with Blessing | Cultural Integration |
| 2024.1.24 | ANAN Magazine | Inclusion of Game Illustrations | Co-Branding |
| 2024.1.18-2024.2.18 | Little Red Book, Tiktok, WeiBo, Bilibili | Content Creation Contests | Online-Media Propoganda |
| 2024.2.4 | Apple | Launch of Vision Pro Program | Co-Branding |
| 2024.2.5 | Sartoria Pirozzi | Male Leads' Ties Design | Co-Branding |
| 2024.2 | Harbin | Zayne's Snow Sculpture Show | Check-in Spots |
| 2024.2.3-2024.2.28 | Little Red Book | Unlock Male Leads' Voices Through Topic Participation | Online-Media Propoganda |
| 2024.3.1-2024.3.30 | Little Red Book,WeiBo | Rafavel's Birthday Themed Content Creation Contests | Online-Media Propoganda |
| 2024.3.6 | Xiyue Zhang | Preserved Shell Carving of Rafavel | Cultural Integration |
| 2024.3.6 | Bilibili | Rafavel's Birthday's Live Broadcast | Online-Media Propoganda |
| 2024.3.11-2024.4.21 | Little Red Book, Tiktok, WeiBo, Bilibili | Content Creation Contests | Online-Media Propoganda |

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It can be observed from Table 2 that *Love and Deepspace* comprehensively utilized various approaches to promotion, and these activities are scheduled back-to-back with no brakes. While the game's "inherent value" has been enriched by collaborating with renowned institutes and incorporating elements of local culture, *Love and Deepspace* has rapidly cultivated its fan base through cross-media expansion, broadening its impact through online propaganda and offline check-ins [8].

Specifically, *Love and Deepspace* takes great importance in building and running the game's online communities, especially Little Red Book and Weibo, which are where the game's most dedicated fans communicate and provide feedback to the game producer. In an era of customer advocacy and equal online expression, a well-managed gaming community is crucial for game promotion, as an active atmosphere is a major source of players' advertising, and their positive reviews enhance the credibility of such advertising, which is often more persuasive than advertisements issued by the game itself [9-10]. Besides, *Love and Deepspace*'s single-player combating system and no-chatting friend system shift the enthusiasm of players' discussion from within the game to mainstream social media, increasing discussion and visibility of the game's relative topics. On the other hand, the game increases positive reviews through frequent Content Creation Contests, while effectively collecting and addressing negative feedback in ways such as apologies and compensation, thus improving its reputation online.

## 4. Features of Chinese Domestic Otome Game Consumers

*Love and Deepspace*'s marketing strategy provides insights into its relationship with the characteristics of contemporary consumers of Chinese domestic otome games.

The game's two emphasis on price strategy reveals female players' willingness to consume visual stimulation and interactive bonds. For one thing, *Love and Deepspace*'s dress-up goods, combined with 3D modeling, satisfy players' desire for sexual tensions in male bodies, attire, and movements. For another, owing to the general guarantee rule of domestic otome games, players who spend money on gacha drawing are filled with the mindset that spending money guarantees better service from the male leads.

Regardless of the spending they choose, many female players show no regrets about lavishing on virtual characters as long as they obtain emotional joy. Yet, this does not mean that otome game consumption is blind. Rather, female players are aware of their spending actions and they are supporting their favorite characters, not the game itself [11]. This clear awareness is manifested in how they express their requests through game communities and utilize such communities's social attributes to unite and boycott spending when game producers keep going against their wishes [11]. Since female players are proactive in their spending, *Love and Deepspace* pays special attention to the operation of gaming communities in their promotion strategy. One of otome games' major features, is capitalizing on players' needs and continuously updating the contents that they are willing to consume.

Domestic otome game players' willingness to spend is driven not only by immersive romantic experiences like most would expect but, more importantly, by a sense of control over the game. *Love and Deepspace* created in-game power for female players in its product strategy by setting the female protagonist's role as someone who can influence the world built in the story with her great talent and intelligence. Also, the game reinforced her strength and independence through her leadership in the new combat system. Additionally, as has been mentioned before, female players possess the power to influence the game's development even outside of it. Therefore, it can be concluded that female players of Chinese otome games are seeking to mitigate their real-life disadvantages by surpassing male leads in games and fighting for rights against game producers outside games.

DOI: 10.54254/2754-1169/117/20242055

## 5. Conclusion

After a comprehensive analysis of *Love and Deepspace*'s marketing strategy, it can be seen that this dark horse has carried forward and innovated the marketing strategies of the Chinese domestic otome game industry. In its product strategy, *Love and Deepspace* boldly uses 3D modeling as the main selling point, deepening the immersive romantic experience and designing new gameplay based on this technology. Owing to 3D modeling, the game's pricing strategy promotes revenue and user retention primarily with its gacha draws and apparel commodies. The multifaceted, consumer-centric IP-based promotion strategy of *Love and Deepspace* serves as a key factor in its success in global positioning. This paper also emphasizes that such marketing choices are not without basis, they are instead founded on *Love and Deepspace*'s acute understanding of the majority of female consumers in Chinese domestic otome game market, such as players' willingness to pay for emotional joy through visional stimulation and romantic bonds with male leads, as well as the awakening of female consciousness, resulting in an eager to winning control over virtual characters and game development.

Companies can borrow *Love and Deepspace*'s marketing strategy or learn about otome game's target users from this case. Yet this does not interprets that the game's strategy is not without its flaws. This paper has not discussed the issues of player dissatisfaction and operational missteps that actually occured after the *Love and Deepspace*'s release. Moreover, current analysis only concludes the game's boom during its first 3 months, it is possible that its popularity is merely a hallmark of any newly released game. After the novelty wears off, the answer to how a large player base and their willingness to consume will be maintained, lies in future tests of *Love and Deepspace*'s marketing strategy.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20241993

# *An Analysis of MUJI's Successful Strategy in the Chinese Market*

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***Abstract:*** The Chinese consumer market has changed significantly in the last few years due to a tendency toward simplicity and a change in customer sentiments. MUJI has effectively entered the Chinese market by using its sustainable development idea and minimalist style, allowing it to adapt to this shift. This paper aims to examine the innovative marketing strategy employed by MUJI in the Chinese market, its capacity to achieve long-term growth, and its role as a symbol of the minimalist lifestyle, while demonstrating an ability to adapt to the changing needs of its customers. In this paper, both literature review and data analysis are employed to provide an in-depth study of MUJI's strategy to enter the Chinese market. The results show that Chinese consumers' preference for MUJI products not only stems from their simple and practical design, but also coincides with the concept of minimalist aesthetics in traditional Chinese culture. In addition, MUJI's unique advantages in product quality, brand image and marketing strategy further enhance its competitiveness in the Chinese market. Through specific analysis, it comprehensively discusses the success factors of this Japanese brand's minimalist design style in the Chinese market, which provides a reference for the design and marketing of other international brands in the Chinese market.

***Keywords:*** Minimalism, Environmental Concept, MUJI's Successful Strategy, Consumer Insights.

## 1. Introduction

Driven by the wave of globalization, more and more international flat rackets are entering the Chinese market in an attempt to cater to the increasingly diverse needs of Chinese consumers. A prominent lifestyle and design idea in recent years, minimalism emphasizes sustainability, use, and simplicity. Due to the growing desire among Chinese consumers to find alternatives to the traditional consumer culture of materialism and over-consumption, this trend has become very popular there. In this regard, the Japanese retail company MUJI has found great success in the Chinese market by implementing minimalist ideas into its branding, products, and advertising tactics. Examining the relationship between cultural values, consumer behavior, and marketing strategy is made intriguing by the minimalist movement's phenomenal growth in China. In order to succeed in a market where Chinese consumers are known for their preference for luxury goods and status-driven consumption, this paper aims to investigate how MUJI shapes its brand image in the Chinese consumer market through innovative marketing strategies, environmental concepts, and minimalist design style. The results are of great significance for both scholars and practitioners alike, contributing to the expanding corpus of

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DOI: 10.54254/2754-1169/117/20241993

knowledge about consumer culture, cross-cultural marketing, and minimalism. Moreover, they will prove beneficial to individuals and organizations advocating for responsible and sustainable consumption, as well as companies trying to understand and meet the constantly shifting tastes of Chinese customers.

## 2. History of MUJI and Its Minimalism Design Concept

MUJI, was founded in Japan in 1980. Originally, MUJI was launched as a private label of Seiyu Department Store, with the aim of providing high-quality household goods at reasonable prices. Its name, derived from "quality products without a brand logo," expresses the brand's core concepts of simplicity, functionality, and lack of excessive ornamentation [1]. MUJI's initial product lines included food, home furnishings, and apparel, and it quickly gained popularity with consumers for its minimalist design and eco-friendly concepts [2]. In 1983, MUJI opened its first stand-alone store in Tokyo, marking the transition from a department store private label to an independent retail brand, and in 1989, Ryohin Keikaku Co., Ltd. was established to specialize in the management and operation of the MUJI brand, which gave further impetus to the brand's development. In the 1990s, MUJI began to expand internationally, opening its first overseas store in London, UK, in 1991, followed by stores in Europe, North America, and other Asian countries and regions. MUJI's internationalization strategy not only raised the brand's global awareness, but also made it a representative of the minimalist lifestyle recognized by consumers around the world. MUJI's product design focuses on practicality and environmental protection, emphasizing the reduction of unnecessary waste in the production process. For example, MUJI utilizes unbleached paper and uncoated metal to minimize its impact on the environment. This environmental awareness and design philosophy not only meets the needs of contemporary consumers, but also promotes the idea of sustainable consumption. In the 21st century, MUJI continues to innovate and expand its product lines in a variety of areas, including furniture, electrical appliances, and stationery. MUJI also launched the "MUJI to GO" series, a line of portable products designed specifically for travelers to meet the needs of different consumer groups. In addition, MUJI has opened MUJI Hotels, which provide a minimalist accommodation experience in line with the brand's philosophy, further enriching the brand's connotation and influence. MUJI's success has been particularly notable in the Chinese market, where MUJI opened its first mainland China store in Shanghai in 2005. With its simple and practical design and high-quality products, MUJI quickly won the favor of Chinese consumers. To date, MUJI has opened hundreds of stores in China, and has become an important choice for Chinese consumers in their pursuit of a simple and environmentally friendly lifestyle.

## 3. MUJI's Successful Strategies in the Chinese Market

### 3.1. China's Consumer Culture and Market Demands

The CEO of The Spanish Group LLC, a translation company based in the United States, Salvador Ordorica, believes that the "localization" development of businesses essentially reflects the concept of customer first, requiring businesses to transform the idea of maintaining consistency in global markets and shift to a local perspective. This means that businesses must modify their sales methods and strategies to provide personalized customization for local customers in addition to altering the overall presentation and language of output [3]. Shimizu Zhi, the General Manager of MUJI China, says that localizing development in the Chinese market entails offering more targeted and superior products to cater to the varied consumption needs of Chinese consumers. For instance, MUJI has introduced pet supplies, organic produce, electric bicycles, and other items in the Chinese market in addition to opening "MUJI Hotels" in Beijing and Shenzhen. Every product is developed with knowledge of the regional Chinese market. In terms of service concept, MUJI is actively developing

DOI: 10.54254/2754-1169/117/20241993

instant online retail in response to the current state of "everything can be delivered to home" in the Chinese market. MUJI has been preparing for "just in time delivery of takeout" since April of this year. As of October, Meituan takeaway accounted for around 70% of the nation's over 250 outlets, satisfying customer demand for on-demand delivery. Furthermore, MUJI is relocating its vegetable markets, which were initially established in the urban centers of Tokyo and Osaka, to Shanghai, China. In stark contrast to the bustling, crowded vegetable markets of the public's daily lives, which are often perceived as chaotic and lacking in organization, MUJI's vegetable markets maintain MUJI's previous monochromatic, straightforward aesthetic [4]. Consequently, this divergence from the conventional "anti-vegetable market culture" or public acceptance of vegetable markets is particularly noteworthy. It has the potential to attract younger customers and facilitate the exportation of the brand and its products by establishing a variety of "third spaces" that are centered around the needs of everyday life and increase the frequency of interaction between the brand and its customers [5].

### 3.2. MUJI's Marketing Strategies

MUJI products spend very little on classic marketing in product advertising or promotional forms. In fact, it doesn't even advertise on its own products, which aligns with its minimalist ethics. Its success is attributed to word-of-mouth, a simple shopping experience, and conveying its anti brand identity. Instead of using traditional advertising to convey a story, MUJI concentrates on presenting the concept and philosophy of its products to its audience, which is achieved through lectures, in-store events, and the media. In 2016, MUJI, which specializes in apparel created from recycled materials, hosted a speech at its flagship store in New York [6]. Over a hundred individuals visited the store as a result of this event, which was presented by textile designer Riko Suto. MUJI uses its internet platform in addition to its storefronts to communicate its anti-brand identity. The company's website features a series of 10-second movies that illustrate how its goods are used at home and how they make users' lives easier and better in order to communicate its brand concept. The films employ a key element of straightforward communication techniques, utilizing only video clips to illustrate the benefits of the product with minimal use of music. Social media platforms such as Facebook, Instagram, and Twitter represent another digital medium through which MUJI disseminates its brand image. Moreover, the brand's promotional material on social media is direct and concise, eschewing the use of comedy or gimmicks. Additionally, MUJI uses promotional events to convey the beauty of its brand. Under the leadership of Japanese graphic designer Kenya Hara, MUJI launched its "Horizon" print advertisements in 2003 [7], which continued until 2009. He claims that rather than transferring information from one entity to another, MUJI's commercials encourage information interchange. Essentially, the items and commercials for Indianapolis allow viewers a blank space to fill up whatever they see appropriate. Though there are no MUJI products in this visual design, customers are at liberty to project their own conceptions of what such products might look like [8]. MUJI boasts an extensive and rapidly growing supply chain, comprising 800 subcontract manufacturers and 200 suppliers from 20 Asian countries. The scale of MUJI's production of apparel, home furnishings, and food products is considerable, as is its impact on the environment. Apart from adhering to production guidelines, MUJI concentrates its efforts on sustainable development initiatives that aim to engage and impact nearby communities. The "100 Good Things" corporate social responsibility plan, which is broken down into 5 pillars—think of the Earth, connect with local surroundings, think like a consumer, work with suppliers, and respect colleagues—is displayed on the company's website. One of the most imaginative of them is thinking like a consumer. MUJI seeks to optimize the value that MUJI brands may provide to customers under this pillar. This includes a proposal for mothers to rent cribs and a "children's chemotherapy room" that serves as a cancer treatment facility for kids with the goal of improving their quality of life [9].

DOI: 10.54254/2754-1169/117/20241993

## 4. MUJI's Efforts to Maintain Competitiveness and Expand Markets

### 4.1. Efforts to Remain Competitive

This brand distinguishes itself from others by rejecting the traditional brand and marketing of the term "MUJI" and supporting a set of values that go beyond traditional brand standards. Rather of being the product of marketing departments linking their brands to appealing core values, their brand image is a natural reflection of the work they do. "Practice rather than preaching" is what they are most proud of. MUJI, or Mujirushi Ryohin, has pushed high-quality products without utilizing a name since its inception [10]. Since MUJI items lack a recognizable brand representation, logo, or insignia, they are referred to as "no-brand" products. Their fundamental concepts and visual styles remain constant despite their expanding influence.The product is so elegantly simple that it seems like they checked a box and achieved their goal. Even though it is common knowledge these days to streamline the production process, the simplification of MUJI goods has never resulted in a price decrease. Besides, it makes beauty easier to manifest. MUJI is already more than sufficient. This is enforced by the emptiness concept of Kenya Hara; in the book Designing Design, the art director of the firm passionately defends MUJI's ideology, arguing that exceptional results may be obtained through simplicity when handled with the right methodology [11].

MUJI carefully selects processes and materials to meet its specific price range, and focuses a lot of attention on minimizing waste and manufacturing costs, thereby making prices lower compared to competitors of the same quality. The ideology of "no-brand brands" has formed a complete cycle and is advancing alongside their sustainable development oriented moral values to achieve very small packaging and reduce ecological impact [12]. Matsuzaki posits that Japan underwent a period of export-oriented economic activity, a trend that was reversed by the prolonged economic downturn that commenced in the early 1990s. Japanese companies employed two distinct coping mechanisms. Some firms elected to offer inexpensive goods in order to support a low-margin, high-sales business model [13], while others opted to invest heavily in branding and design. MUJI has come to symbolize a third approach, which is to develop a brand around quality goods with no decorative elements. Before 1982, MUJI's products did not even have a trademark. Those who had become weary of the excessive commercialization of mass retailers demonstrated a willingness to embrace MUJI's unique approach, which emphasized simplicity and quality. Its operating profit is expected to expand by 10.4% to 50 billion yen by February 2019, while its operating revenue is expected to increase by 11.8% to 424.3 billion yen (3.77 billion US dollars). 40.7% of total income is anticipated to come from overseas operations. This indicates that MUJI has seen double-digit increase in operating profit for eight years in a run and revenue growth for sixteen years in a row [14].

### 4.2. Efforts to Expand Markets

The CSBR report claims that China is frequently a merciless market for Japanese companies. The unique bond between China and Japan may prompt Chinese consumers to engage in a boycott of Japanese products [15]. Some companies purposefully disguise their Japanese origins in order to create a more universally appealing image of themselves and their products. However, MUJI's merchandise challenges this trend by demonstrating to Chinese consumers the Japanese lifestyle and design that is genuinely appealing to them [16]. A previous study employed a retail ethnographic and semiotic approach to investigate how local Chinese consumers interacted with the retail environment in a multinational client's store. MUJI was the most popular and attractive retail space among the stores visited by locals. The minimalist design style of MUJI is highly regarded and sought after by Chinese consumers. By means of product introductions and displays set against a backdrop of literature, well-known photography, and pop culture items, MUJI offers a cultural and educational

DOI: 10.54254/2754-1169/117/20241993

journey. Furthermore, MUJI has established a customization area within the store, designated as the "MUJI Self-Service Area." This area enables customers to engrave personal messages on MUJI product bags and to create original cards utilizing stamps and blocks. Furthermore, MUJI's specialty restaurants contribute to the brand's "lifestyle" narrative. Rather than perceiving MUJI as a mere collection of products, it is more accurate to view it as an innovative experience.

## 5. Challenges and Future Prospects

The relatively high prices of MUJI products have presented a challenge to the company's market penetration, as they have limited the accessibility of MUJI products to a certain extent. In contrast, IKEA's more economical pricing approach has been a significant contributing factor to its success in China. Despite the strengths of MUJI's design philosophy and product aesthetics, there is a need to strengthen its localization efforts. Moreover, there is still potential for MUJI's brand awareness to grow in the Chinese market, especially in tier 2 and tier 3 cities. Therefore, MUJI can benefit from studying IKEA's experience in developing the brand awareness through large stores and intensive marketing campaigns. To address these issues, MUJI may wish to consider the following aspects for the way forward.

Firstly, MUJI can further streamline its supply chain management by reducing intermediate links and improving logistics efficiency. For instance, enhanced collaboration with suppliers in the China can facilitate a reduction in import tariffs and transportation costs, while simultaneously enabling the implementation of a more rational pricing strategy, thereby attracting a larger customer base that is price-conscious. The establishment of production bases in China will result in a reduction of transportation costs, the localization of the production of goods, and a more rapid response to market fluctuations. Besides, it can enhance its collaboration with regional designers and suppliers to develop new products that align with the preferences and preferences of Chinese consumers. Furthermore, MUJI can adapt its merchandise displays, store layouts, and other elements to align with the lifestyles and cultural characteristics of consumers in other regions through a more nuanced understanding of their needs, which enables the company to introduce product lines at varying price points, thereby satisfying the diverse needs of its customer base. For instance, the introduction of more affordable products could be employed to expand the market share, while the retention of select luxury product lines could be utilized to maintain the brand image, particularly in tier 3 and 4 cities.Secondly, MUJI can promote the brand through e-commerce platforms such as Tmall and JD as well as social media such as Weibo, WeChat, and RED to increase brand awareness in the digital space. It can also host brand events such as product premieres, themed exhibitions, and workshops in business districts and shopping centers, which aims to increase brand interaction and engagement, and allow customers to experience MUJI's products and brand culture firsthand. Products can be adapted to meet specific local requirements, and cultural norms and consumption patterns in different regions can be taken into account when developing customized marketing plans. For example, launching limited edition products on specific holidays or incorporating regional cultural features into product design and promotion can stimulate local economies in rural areas. MUJI can partner with other companies or economic sectors (such as coffee shops, bookstores, and art galleries) to attract more customers through joint merchandise, exhibitions, and other activities. By participating in or spearheading activities related to environmental protection and public welfare, MUJI demonstrates its commitment to social responsibility and sustainable development.

## 6. Conclusion

The paper assesses MUJI's marketing strategy in light of Chinese consumer culture and minimalism. Despite the fact that MUJI's products are somewhat more expensive than their competitors, this has

DOI: 10.54254/2754-1169/117/20241993

not stopped the its popularity from growing among its target demographic in China. However, more thorough investigation into sustainability and economical pricing is still required. The results not only provide valuable information for MUJI's future expansion in the Chinese market, but also for other local brands. MUJI's success shows that companies with a minimalist aesthetic can also thrive in China with the right marketing strategy and understanding of the local customer base. However, we must recognize the limitations of this study. Rapid changes in consumer behavior and market trends over time may ultimately limit the scope of application of this study's findings. In order to gain deeper insights, this study may require the collection of additional primary data, such as interviews with MUJI's customers and industry experts. Future research should focus on how cultural differences affect consumers' perceptions of minimalism and how MUJI has adapted its operations to fit the needs across China. In consideration of China's dynamic consumer trends, a fuller comprehension of the complex relationships between minimalism, consumer culture, and marketing tactics can be attained by looking at these factors.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242048

# *Research Progress in the Design Concept of Green Commuting Cities*

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***Abstract:*** The connection between green commuting and urban design was intimately intertwined in this study. As urbanization progressed, issues such as population growth, housing, transportation, and the environment had become increasingly salient. Green commuting had emerged as a vital strategy to mitigate these challenges and enhance the quality of life for urban residents. This paper elucidated the principles underlying green commuting, highlighting a human-centric approach, the interconnections between public transit, walking, and cycling as modes of travel, and the significance of the digital city paradigm. By examining the transportation systems and urban design methodologies, techniques, and characteristics of Vienna and Copenhagen, the paper delineated the strengths and weaknesses in the development of these cities. It delved into the design approaches and philosophies in green commuting from these two cities that were exemplary and worthy of emulation. The paper proposed potential strategies for green and low-carbon design in future urban transportation, aiming to construct a more ecologically sustainable urban transportation system and infuse new dynamism into urban development.

***Keywords:*** Green Commuting, Urban Design, Transportation System, Sustainable Development.

## 1. Introduction

As the global urbanization process continued, the population kept growing, urban spaces became increasingly congested, and the ownership of private vehicles persistently increased, urban traffic issues underwent a transformation. The city development model based on automobile traffic, which was popular in the last century, could no longer accommodate the increasingly severe problems of traffic congestion, environmental pollution, and energy consumption [1]. Therefore, constructing a green, sustainable, and efficient transportation system had become an important subject of urban development. Urban travel demanded not only diversification and efficiency of transportation modes but also consideration of green and low-carbon options alongside economic benefits.

The concept of green travel, introduced in the early 1990s, quickly gained public acceptance, yet its implementation and promotion still faced numerous constraints. Green travel referred to environmentally friendly modes of transportation, such as public transit systems, rail transit systems, cycling systems, and pedestrian systems, which were part of a low-carbon, green travel system [2]. The ultimate goal of the green travel philosophy was to achieve harmonious development between humans and nature, as well as between humans and society, in line with the concept of sustainable

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DOI: 10.54254/2754-1169/117/20242048

development. The realization of this philosophy depended on urban design that integrated spatial layout, functional zoning, and transportation planning. Through these means, cities could be organically planned and designed to coordinate and allocate resources rationally. Generally, green travel was reflected in various aspects of urban design concepts. Scholars such as Audrey de Nazelle conducted a literature review on policies that encouraged active travel, noting that while the comprehensive effects of these policies were not fully understood and were difficult to quantify, they did have a positive impact on health [3]. Research by Todor Stojanovski, Zhao Penglin, and Zhang Ning all emphasized the potential of Transit-Oriented Development (TOD) models in alleviating traffic congestion and reducing carbon emissions [4-5]. Barton, Hugh, and Marcus Grant analyzed responses to a comprehensive assessment questionnaire and identified the three most important Health Urban Planning (HUP) issues, concluding that health city initiatives had had a significant positive impact in advancing key planning policy areas, while also revealing the diverse challenges that cities prioritized in health urban planning [6]. Michael Southworth pointed out that walking not only reduced traffic congestion and environmental impact but also had social and recreational value and was beneficial to physical and mental health. Studies had shown that walking could promote psychological and physical well-being [7]. Nesti and Giorgia, through a case analysis of four European cities, explored the degree of transformation of smart city governance models, existing problems, and potential connections with the new public governance paradigm [8]. Their research provided valuable perspectives and insights for understanding the governance of smart cities.

Vienna and Copenhagen, recognized as international livable cities, had achieved notable success in the realms of green travel and urban design, with experiences that merited thorough investigation and emulation. This paper conducted an analysis of the characteristics and strengths of the green travel transportation systems in Vienna and Copenhagen, and proposed feasible recommendations for the implementation of green travel initiatives.

## 2. Urban Planning Cases for Green Travel

### 2.1. Austria's Vienna is characterized by its integrated planning of pedestrian and public transportation systems

Vienna, located in the northeastern part of Austria, was the most populous city in the country, accounting for approximately one-fifth of the national population. It served as Austria's economic hub with a developed industry and service sector. Vienna was a city with a long history, rich culture, and thriving economy. It was renowned worldwide for its unique geographical location, beautiful natural scenery, abundant historical and cultural heritage, and prosperous economy, making it a well-known livable city. In urban planning and design, Vienna adhered to the basic concept of sustainable development, always focusing on building walkable communities and creating vibrant public spaces [9]. In its planning, Vienna had implemented zoning, conducting detailed planning according to the current characteristics of different zones, and formed three typical models: a pedestrian-priority and traffic-calmed shared space model, a multi-level separated space model for pedestrians and vehicles, and a ground-level separated space model for pedestrians and vehicles.

### 2.2. Denmark's Copenhagen is distinguished by its comprehensive bicycle transportation system

Copenhagen, the capital of Denmark, was strategically located on the eastern part of Zealand, the main island of Denmark. It stood as the political, economic, cultural, and transportation nexus of the country, exuding charm in both its natural and anthropogenic landscapes. It was recognized by UN-Habitat as the "World's Most Livable City" and was lauded as the "Best Designed City." Copenhagen's urban planning was consistently aimed at achieving the status of the "world's first

DOI: 10.54254/2754-1169/117/20242048

carbon-neutral city." The city advanced its low-carbon development through the implementation of the "finger plan" approach to urban layout. Bicycling was a significant mode of transportation in Copenhagen, serving as a vital means for commuting and fulfilling various functions such as the delivery of goods, thus becoming an integral component of the city's daily traffic system. This status was a result of Copenhagen's continual focus on transformation and improvement of its transportation infrastructure.

## 3. Characteristics and Pros and Cons of Green Travel Urban Planning

Green travel planning aimed to construct an environmentally friendly and efficient transportation system, characterized by two main features: First, there was a close coordination between walking and public transportation, which encouraged short-distance walking and reliance on efficient public transit for medium to long distances. This approach reduced the use of private vehicles, alleviated traffic congestion, and lowered carbon emissions. Second, it advocated for human-centered bicycle city construction, incorporating infrastructure that created a safe and comfortable cycling environment, enhancing the convenience of travel, invigorating urban vitality, and popularizing green travel.

### 3.1. Integration of Walking and Public Transportation Modes: A Case Study of Vienna, Austria

Vienna focused on constructing pedestrian-friendly community spaces to improve the urban pedestrian traffic system and promote the construction of a low-carbon sustainable city [10]. The pedestrian path system was subject to the constraints of community space patterns; hence, Vienna undertook transformations with different emphases and methods according to the community space patterns of different zones. For instance, in the planning of the Neuburg district, the shared space model premised on pedestrian priority and traffic speed limits was emphasized. To ensure pedestrian priority, the district's planning reduced the behavior of motor vehicles continuously traversing urban blocks through a dense network of small-scale roads and restricted access controls. Moreover, the four boundary roads were connected to the urban road network and were planned as two-way traffic routes, attracting a larger volume of vehicle traffic. The internal roads of the district were mostly one-way and had a speed limit of 30km/h, which helped to reduce unnecessary vehicular traffic within the district. Some sections were only open to buses and taxis, with a speed limit of 20km/h, ensuring that the road space was neither too empty nor more suitable for walking. Activities such as walking, cycling, and stopping naturally had more space and opportunities to occur. The public transportation network in the Neuburg district also achieved full coverage, with subway and tram stations accessible within a 200m walking distance. At the same time, most transportation stations were equipped with public bicycle rental stops and public car sharing stops nearby.

The urban planning of Vienna in green travel brought significant positive impacts. Firstly, the environmental benefits were remarkable. The constraints on private car travel in Vienna encouraged citizens to more actively choose low-carbon travel methods such as walking, cycling, and public transportation, thereby effectively reducing carbon emissions in the transportation sector, improving urban air quality, and further positively contributing to the mitigation of the global warming trend. Secondly, it alleviated traffic congestion. The optimization design of the road network and traffic nodes improved Vienna's travel efficiency, reduced traffic congestion caused by an excess of private cars in the urban area, enhanced the fluency of urban traffic, and strengthened the convenience of citizens' travel.

However, the aforementioned planning had certain drawbacks during the preparatory stage and even after implementation. Firstly, there was considerable financial pressure. The construction of

DOI: 10.54254/2754-1169/117/20242048

bicycle parking stations and road networks, and the improvement of the public transportation system required substantial financial support, posing a significant challenge to the government's finances. For economically underdeveloped small towns, financial pressure was not negligible. Secondly, public acceptance and habits needed to change. Citizens' travel habits could not be changed in the short term simply due to policies and the construction of transportation systems, presenting some difficulties in implementation. Additionally, there were regional differences. Different regions varied in economic development levels, population density, and travel demands, and the implementation effects of green travel planning varied by region, necessitating attention to issues of equity between regions.

### 3.2. Human-Centered Bicycle City Construction Model: A Case Study of Copenhagen, Denmark

Copenhagen consistently adhered to the people-oriented sustainable development theory and was committed to creating and maintaining a livable urban environment. The city's construction model was based on the "finger plan" concept [11], which divided the city into different areas according to economic, population, development planning, and geographical conditions. The central urban area, as the "palm," focused on improving the public transportation system. The periphery consisted of five "fingers," providing new spaces for urban expansion, with an emphasis on infrastructure development and public transportation services. The spaces between the fingers were called "green wedges," used for greening.

Copenhagen's bicycle system could be divided into exclusive bicycle lanes and roadside bicycle lanes. Exclusive bicycle lanes included a network that crossed overpasses, tunnels, railways, and rivers, establishing direct cycling routes between large residential areas in the suburbs and the city center. Management measures for bicycle lanes included elevation changes and coloring to distinguish them. At public transport intersections, there were dedicated bicycle traffic lights, and lanes were designated for left turns, right turns, and straight movements to regulate cycling. Relying solely on bicycles to complete the city's transportation was not feasible. What Copenhagen had developed was a typical Transit-Oriented Development (TOD) model. The TOD model was not only beneficial for maintaining the strength of the central urban area but also achieved connectivity between newly developed areas (the "fingers") and the central urban area.

Copenhagen's urban planning had become very mature and well-developed, achieving significant results. However, there were also certain challenges. First, the planning and implementation requirements were high. Copenhagen's comprehensive bicycle traffic system and public transportation system required feasible, long-term planning and had been realized through long-term transformation, requiring the city to have patience and keen insight for development. Second, the initial investment cost was high. Building a comprehensive pedestrian path, bicycle path, and public transportation network required substantial financial input, facing significant financial pressure and implementation difficulties. Additionally, there were issues with facility maintenance and safety management. The maintenance and safety management of facilities such as pedestrian paths and bicycle paths required the establishment of a sound management mechanism to ensure the safety and sustainability of the facilities.

## 4. Green Urban Travel Optimization Strategies

The core of green urban travel optimization strategies lay in advocating and promoting low-carbon, environmentally friendly, and efficient modes of travel, such as walking, cycling, public transportation, and new energy vehicles. These modes of travel could not only significantly reduce carbon emissions and air pollution in the transportation sector but also effectively alleviate traffic

DOI: 10.54254/2754-1169/117/20242048

congestion and improve the operational efficiency of the urban transportation system. At the same time, green travel modes also contributed to enhancing the health level of urban residents, promoting social equity and harmony, and driving the comprehensive and sustainable development of the city's economy and society. However, the implementation of green urban travel optimization strategies was not something that could be achieved overnight and required the joint efforts of governments, enterprises, social organizations, and the public. Specific suggestions were as follows:

(1) Strengthen the construction of urban walking and cycling facilities. Walking and cycling are relatively flexible, low-carbon, and environmentally friendly, and are the best choice for short-distance travel. In urban construction, it is possible to consider building continuous walkways and cycling paths to ensure the safety of pedestrians and cyclists, focusing on areas with dense populations such as schools and residential areas.

(2) Strengthen the construction of the urban public transportation system. The distance that can be traveled solely by walking and cycling is limited. To reduce the extensive use of private cars, a comprehensive public transportation system is needed.

(3) Enhance intelligent monitoring systems to assist the transportation system. Strengthen big data monitoring to ensure the rationality of planned public transportation routes and station settings. In addition, continuous data monitoring and feedback can promptly identify and clear road obstacles, ensuring the accessibility and safety of various modes of travel.

(4) Increase citizens' willingness to participate in green travel. This requires not only the construction of improved green travel modes but also the promotion and encouragement of the concept and importance of green travel.

## 5. Conclusion

This study, grounded in an examination of the urban design approaches and philosophies related to green travel in Vienna and Copenhagen, explored the feasibility of green travel strategies within urban design. Initially, green travel emphasized the selection of transportation modes and travel methods that have a minimal environmental impact, such as cycling, walking, and using public transportation. These methods not only reduced carbon emissions and air pollution but also helped alleviate traffic congestion and enhance urban operational efficiency. Effective urban design was a crucial foundation for supporting green travel; cities should have prioritized the development of public transportation systems, improving the coverage and accessibility of transit networks to decrease the reliance on private vehicles, thereby reducing traffic congestion and air pollution. Additionally, dedicated bicycle lanes and pedestrian paths provided a safe and convenient environment for cycling and walking, encouraging citizens to choose more environmentally friendly modes of travel.

As renowned livable cities worldwide, their green travel plans were not without flaws and presented certain drawbacks. For instance, there was significant financial pressure from initial investments and high maintenance costs for facilities in the later stages. From the user's perspective, transitioning from private car travel to walking, cycling, and public transportation required an adjustment period. In the future, interdisciplinary collaboration beyond the aforementioned concepts and methods, integrating traffic engineering, environmental science, sociology, and other disciplines, could have led to more scientific, rational, and humanized planning strategies by considering various aspects comprehensively. While this paper discussed the relationship between green travel and urban design and proposed several strategies and suggestions, it lacked specific data support. The case selection was also somewhat one-sided and may not have represented the development status of most cities. The strategies were generalized and lacked specific policy recommendations tailored to the particular conditions of specific cities.

DOI: 10.54254/2754-1169/117/20242048

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242047

# *Enhancing Tram Safety in Mixed-Traffic Systems: A Case Study of Melbourne's Tram Collision Factors and Improvement Strategies*

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***Abstract:*** Trams, a vital component of public transportation, operate within diverse environments ranging from fully segregated tracks to mixed-traffic systems. This study investigated tram collisions in Melbourne—a city renowned for its extensive and historic tram network—and explored both systemic and behavioral factors contributing to these incidents. The analysis identified key factors such as the arrangement of tram platforms, intersection design, right-of-way (ROW) regulations, tram driver behavior, and the actions of other road users. The study revealed that inadequate tram platform arrangements and suboptimal intersection designs are major contributors to tram collisions. Recommendations for improvement include implementing elevated, standalone tram platforms with protective barriers and accessible ramps, expanding the use of Hook Turn intersections, and integrating intelligent transportation systems to enhance traffic management. Additionally, addressing behavioral factors is crucial. Enhanced training for tram drivers and educational campaigns for pedestrians and other road users are proposed to improve situational awareness and adherence to safety norms. By addressing both objective systemic issues and subjective behavioral factors, this study aimed to enhance the safety of tram operations in mixed-traffic environments, ultimately reducing collision risks and improving public confidence in tram systems.

***Keywords:*** Mixed-traffic, Tram collision, Safety issues, Melbourne tram system.

## 1. Introduction

Trams are a form of light rail public transportation that operates on fixed tracks located in the centre of city streets [1]. They operate in three types of environments: fully separated tracks from roads, tracks that are separated from other traffic but still cross shared intersections, and completely shared road systems where trams run alongside other vehicles in mixed traffic [2]. Based on these operating environments, tram systems are often referred to as mixed-traffic systems [1]. While many countries have light rail transit systems, those operating in mixed-traffic environments are particularly prone to safety issues.

These collision incidents pose significant dangers, not only potentially injuring vulnerable and unprotected pedestrians or passengers but also reducing public confidence in the reliability of the transit system. Given that tram networks are heavily dependent on their fixed routes with limited

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DOI: 10.54254/2754-1169/117/20242047

detour options, such incidents can cause major disruptions and delays [3]. Therefore, safety is a primary concern in the design, operation, and development of light rail systems, particularly tram systems. A substantial body of existing literature has begun to focus on the safety of trams within mixed-traffic systems, exploring various aspects and causes of this issue.

Currently, many countries around the world operate light rail transit systems. Although light rail vehicles operating in mixed traffic environments do not constitute the majority, it is precisely these tram systems operating in mixed environments that are most prone to safety issues. For example, in Currie & Smith's study in 2006, the United States was cited as an example: While only 15% of all tram track lengths in the United States are in mixed traffic conditions, over 90% of light rail transit accidents occur along these mixed traffic routes [4].

The safety concerns of tram in mixed traffic environments are particularly worrisome in Australia, which boasts over 270 kilometers of tram tracks, making it the largest and oldest light rail network in the world. Meanwhile, with cities and areas such as Melbourne, Adelaide, Perth, Sydney, and the Gold Coast planning, constructing, and/or operating new light rail projects, the construction of light rail in Australia is gradually revitalizing, and its scale is further expanding. Among these, Melbourne has the largest tram system in the world, with 29 routes and 250 kilometers of track length. However, of these, 167 kilometers of tram routes (approximately two-thirds, specifically 67% of the light rail system) operate in mixed traffic environments, a proportion that is significant on a global scale. Moreover, Australia's tram scale continues to evolve, necessitating a focus on safety in this area given the increase in operations, introduction of new trams, and technological advancements.

In this paper, the tram operation model in Melbourne will be regarded as a case study to explore the causes of tram collisions in mixed traffic environments worldwide. Firstly, typical tram collision incidents in Melbourne will be discussed. Secondly, key factors contributing to tram collisions, including the arrangement of tram platforms, the design of intersections and right-of-way regulations, tram driver behavior, and the actions of passengers, pedestrians, and other road users, will be analyzed in detail. Finally, the paper will provide recommendations for improvements based on the analysis of the discussed cases and collision causes.

## 2. Typical Tram Collision Incidents in Melbourne

On September 20, 2023, a severe tram accident occurred at the intersection of Victoria St and Nicholson St in East Melbourne. Unexpectedly, the accident involved not just regular vehicles but two trams colliding head-on at the intersection. Both tram fronts were heavily damaged, with shattered glass and debris scattered across the scene. According to eyewitnesses, one tram derailed and veered off track after the collision. Despite the severity of the crash, there were no reports of serious injuries, and the conditions of those involved were relatively stable. Emergency responders closed both directions of Nicholson St, significantly disrupting tram lines 35, 86, 96, and 30. Passengers were instructed to disembark at the tram stop behind the incident site and walk to the next two tram stops to continue their journey. Michelle Stevens, a tram passenger passing through the area, commented, "It's a bit inconvenient, but I hope everyone is okay." [5]

Similarly, on April 8, 3AW radio reported a tram accident near Elizabeth St by Queen Victoria Market in Melbourne, where a pedestrian was hit by a tram on Monday afternoon. The Victorian Department of Transport later stated that the man who was struck was conscious and had been taken to the hospital in critical condition. This incident was expected to impact several tram lines. A witness named Georgie described the scene to 3AW radio host Heidi Murphy, saying, "There was a loud 'bang' while I was on the tram, followed by an abrupt stop, and the doors opened. We thought it had hit a pole or something hard. After getting off, we saw a person trapped under the tram. Fire trucks, ambulances, and police cars arrived immediately. I hope they survive." Such tram-related accidents are frequent in Melbourne, partly due to the mixed-traffic system in which Melbourne trams operate.

DOI: 10.54254/2754-1169/117/20242047

Melbourne's mixed traffic includes pedestrians, trams, passengers, private cars, bicycles, and motorcycles, with trams often running in the middle of the road. Passengers need to cross the street to reach the central tram stops, contributing to the relatively high number of tram collisions in Melbourne. However, there is limited precise data or news reporting on these accidents. This is because such incidents are sometimes excluded from accident records if they don't directly involve tram collisions. Additionally, pedestrian-related accidents lack formal event coding, and many entries lack specific details like location, injury severity, or vehicle direction. Reports are often made only when tram delays occur, or the tram driver considers the accident severe. Consequently, the lack of reporting and data on these collisions is a common limitation in studying tram collision issues in Melbourne.

## 3. Factors of Tram Collision Problems in Mixed Traffic Systems

Despite the multiple possible scenarios for tram accidents in mixed-traffic, including collisions between trams and vehicles, trams and pedestrians, passenger falls within trams, and tram-to-tram collisions, this paper will consider all types of collision factors. In addition, recognizing the different terminologies used for trams across various regions—such as tram, light rail, and metro—this paper will uniformly refer to these public transportation systems as "tram" and will examine all situations where trams share roads partially or fully with other traffic.

### 3.1. Arrangement of Tram Platforms

Due to the operation of tram tracks in the center of undivided roads under mixed-traffic conditions, pedestrians need to cross the roadway with mixed traffic to reach the platform when there is no dedicated platform at the stops. Consequently, these stops have been identified as a major source of pedestrian safety issues [6]. Existing research indicated that 82% of safety incidents related to trams involve conflicts between automobiles and pedestrians [7]. Thus, the relationship between platform setup and pedestrian safety had been primarily established through comparative analysis of stops with and without platforms in existing studies.

Naznin et al. using the before-after crash analysis method and a control group (CG) approach, found that after the installation of platforms at 15 selected stops in Melbourne, which previously lacked platforms, pedestrian-involved injury crashes decreased by 43%, and FSI (pedestrian-involved fatal and serious injury) crashes decreased by 84%, disregarding the increase in passenger volume. This result clearly demonstrated that compared to traditional stops without platforms, platform installations lead to narrower lanes [8], thereby reducing traffic speed and subsequently the frequency and severity of tram-pedestrian collisions.

Similarly, Currie and Reynolds, and Currie and Smith both used before-and-after comparative analysis to argue that improved platform setups significantly impact the reduction of tram-pedestrian collisions. Studies showed that at one of Melbourne's most important stops, St. Kilda Road-Federation Square, the old platform experienced an average of 5 accidents per year, which reduced to 2.3 per year (a 53% decrease) after the introduction of new platforms [7]. Currie and Smith found that existing tram stops lacked the traffic-calming effects provided by new platform designs, potentially leading to more collisions around platform areas [4].

Hence, through a comparative analysis, it can be concluded that one of the reasons for the unsafe operation of Melbourne trams in mixed traffic conditions is the inadequate arrangement of tram platforms. Due to the insufficient separation of pedestrians or tram passengers from vehicles at certain platforms, passengers are prone to accidents when crossing the road to reach the centrally located tram platforms.

DOI: 10.54254/2754-1169/117/20242047

### 3.2. Design of Intersections and ROW Regulations

The design of intersections and the regulations regarding right-of-way (ROW) are additional critical systemic factors affecting the safety of mixed-traffic. Numerous previous studies had evaluated the impact of tram priority measures on road safety; however, the conclusions are inconsistent.

Naznin et al. reported a significant reduction in collisions following the implementation of tram signal and lane control measures in Melbourne [8]. Using the empirical Bayesian (EB) method for a before-and-after collision study, Naznin et al. analyzed collision data from 29 tram signal priority intersections and 23 tram lane priority arterial roads in Melbourne. They concluded that the implementation of tram priority measures resulted in a 16.4% reduction in collisions, further corroborating that the design of intersections and the regulations regarding ROW contribute to collision incidents under mixed- traffic conditions. Following this research, Naznin et al. conducted a focus group study from the perspective of tram drivers to analyze the design of intersections and ROW regulations. The 30 tram drivers surveyed indicated that lanes with tram signal priority were perceived as the safer system setup in Melbourne's tram network, and "Hook Turns" were identified as a safer form of signal priority handling [9].

Melbourne has employed the design of Hook Turn intersections in mixed-traffic since the mid-1950s, and it has been recently reintroduced to improve tram priority at CBD intersections. Using visualized crash conflict point diagram analysis and a series of safety data analyses, Currie and Reynolds demonstrated that intersections with Hook Turns had lower collision rates and better safety performance compared to traditional intersections without Hook Turns [10]. This intersection design has also been used in other regions, such as China and Canada, a highly relevant recent study by Richmond et al. used a quasi-experimental design to investigate the impact of ROW priority on pedestrian collisions in Toronto. The results showed a 48% reduction in pedestrian crashes following the implementation of ROW [11].

Therefore, in the absence of well-planned mixed-traffic roads, chaotic right-of-way (ROW) conditions can lead to a higher likelihood of collisions at intersections. However, Melbourne's implementation of signal control for the tram system is a highly effective measure in reducing tram collisions under mixed traffic conditions. Notably, the Hook Turn intersections, implemented in Melbourne since the 1950s, serve as a highly effective and safer form of signal prioritization in mixed-traffic scenarios.

### 3.3. Tram Driver Behavior

As the most direct participants in mixed traffic, tram drivers significantly impact the safety of the tram system. The safety of tram operations is influenced by various factors related to the drivers, including their experience, situational awareness, punctuality pressure, and organizational behavior. These elements collectively affect the driving safety of tram drivers.

Naweed and Rose, and Nazin et al. were among the first researchers to analyze tram driver behavior and their daily challenges as significant factors impacting tram safety in mixed traffic. Naweed and Rose collected data from Australian tram organization in three phases: the first phase involved reviewing existing tram collision incident reports, the second phase included on-site observations at high-risk locations identified in the reports, and the final phase involved semi-structured focus group discussions with 23 participants, including 13 tram drivers. The interviews and observations concluded that deficiencies in tram drivers' situational awareness, such as failing to anticipate passenger behavior, played a major role in many collisions and nearmiss incidents. Additionally, the pressure to maintain on-time operations posed significant stress for tram drivers [2].

Nazin et al. employed a similar methodology, conducting five focus group discussions with 30 tram drivers. They found that one possible cause of mixed-traffic collisions was tram drivers' inability

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to accurately predict the behavior and movements of other road users, making it difficult to adjust speed and avoid danger. Despite having emergency brake systems, this method could cause standing passengers to fall, leading Nazin et al. to find that tram drivers would avoid using emergency brakes whenever possible [9]. Both studies noted the challenges posed by the pressure to maintain on-time operations, with this pressure potentially negatively impacting driver performance and safety.

### 3.4. Actions of Passengers, Pedestrians and Other Road Users

Actions of other road users besides tram drivers, including passengers, pedestrians, and cyclists, are also considered potential factors in collisions within mixed-traffic conditions. Existing research indicates that distractions among passengers and pedestrians, disregard for traffic rules, and incidents of bicycle tires getting stuck in tram tracks can all contribute to tram collisions.

Castanier et al. conducted a survey to determine the perceived risk of collisions with trams among pedestrians, cyclists, and drivers. Analyzing feedback from 973 road users, they found that most respondents believed their likelihood of being involved in a tram collision was lower than that of others, which is comparative optimism. This suggested that most pedestrians and other road users underestimate the risk of collisions with trams in mixed-traffic conditions [12]. Subsequently, Marti et al., and Soczówka & Żochowska conducted more targeted analyses of tram and pedestrian interactions respectively. Marti et al. using methods such as Bern Accident Cluster Analysis, weighted comparisons, and accident photo analysis, found that pedestrians' attention might be distracted by smartphones or headphones, and physical obstacles could block their visibility, leading to tram collisions [13]. Soczówka and Żochowska analysed routes taken by passengers to different types of platforms, finding that one likely cause of tram-passenger collisions was passengers' non-compliance with traffic regulations while crossing roads to reach tram platforms [3].

Cyclists, as other road users, also pose collision risks with trams. Teschke et al. compared 87 bicycle crashes directly involving tram or train tracks, finding that 32% of injured cyclists had been in accidents directly involving tracks, with the majority caused by bicycle tires getting caught in gaps beside the rails [14].

Passengers, pedestrians, and cyclists, as other road users, are recognized as factors contributing to tram collisions in mixed traffic. As mixed traffic system covers a wide range of traffic participants and complex situations, collisions are more likely to occur. Most pedestrians and other road users tend to be overly optimistic about the possibility of collisions, leading to a lack of risk awareness while participating in traffic. Non-compliance with pedestrian behavior norms at crosswalks and typical distractions, such as looking at phones, further increase the likelihood of collisions in mixed traffic conditions.

## 4. Recommendations for Improvements

Based on the study of Melbourne's mixed-traffic system, the following recommendations for improvements are proposed to address the causes of various collision incidents.

To enhance safety and accessibility, more secure and accessible tram platforms should be implemented. Compared to traditional Melbourne tram stops, new tram platforms should be elevated, creating a standalone platform in the center of the road. Protective barriers should be installed on both sides to ensure passenger safety while waiting for trams. Additionally, these elevated platforms should feature ramps with appropriate gradients to allow wheelchair access. To ensure passenger safety when crossing the road to reach or leave the tram platform, it is crucial to enhance the pedestrian crossings and traffic signals on both sides of the platform. Installing warning signs to alert private car drivers and other road users to the presence of tram platforms and potential safety hazards

DOI: 10.54254/2754-1169/117/20242047

is also recommended. Furthermore, tram platforms should be positioned away from high-traffic, congested intersections and instead placed in areas with slower, calmer traffic.

The Hook Turn intersections, implemented in Melbourne since the 1950s, have proven effective in reducing intersection collisions and should be more widely introduced and implemented in the central business district (CBD). Additionally, Melbourne's tram operating authorities could consider integrating intelligent transportation systems (ITS) to enhance the efficiency of traffic flow at intersections. For example, ITS could be used to dynamically adjust traffic light timings, extending red lights for private cars when there are fewer vehicles, thereby increasing the crossing time for pedestrians and tram passengers, and vice versa. ITS can also provide real-time monitoring of different traffic participants, allowing for immediate response and adjustment in the event of collisions or monitoring traffic flow, pedestrian movement, and tram passenger numbers to reduce the complexity and confusion of mixed traffic. Finally, the Melbourne transportation management department should optimize the design of right-of-way (ROW) regulations, clearly establishing the priority of different traffic participants. Penalties should be imposed on those who violate ROW rules to ensure compliance and improve overall traffic safety.

To enhance the safety of tram drivers, pedestrians, tram passengers, cyclists, and motorcyclists, comprehensive measures must be undertaken. Firstly, it is imperative to strengthen the training programs for tram drivers. These programs should focus on improving drivers' observational skills and their ability to respond promptly to unexpected situations. Emphasis should be placed on maintaining situational awareness and effectively managing the pressures associated with avoiding delays without compromising safety. To ensure adherence to safe driving practices, strict penalties should be imposed for any violations of driving regulations. Furthermore, there should be increased educational efforts targeting pedestrians and tram passengers to raise their awareness of potential dangers and improve their self-protection instincts while participating in traffic. Campaigns should be designed to reduce distractions, such as looking at phones or listening to music, while crossing streets or waiting for trams. Promoting a sense of responsibility and adherence to traffic norms is crucial in ensuring that all road users safely and correctly utilize their designated spaces.

In addition to education, implementing additional safety measures to protect vulnerable road users, such as pedestrians and tram passengers, is essential. This can include better signage, more visible pedestrian crossings, and traffic signals near tram stops. Educational campaigns should highlight the importance of staying alert and following traffic rules to minimize risks. Moreover, fostering a culture of responsible road use among all participants, including cyclists and motorcyclists, is critical. Educational initiatives should inform these groups about the importance of sharing the road safely with trams and other vehicles and the necessity of adhering to traffic regulations. Promoting responsible behavior will help create a safer and more orderly traffic environment. Finally, it is crucial to strengthen the enforcement of traffic regulations, focusing on ensuring that all road users comply with safety norms. Severe penalties should be imposed on drivers who violate regulations, and awareness programs should highlight the importance of traffic safety and the consequences of non-compliance. By adopting these comprehensive measures, the overall safety of Melbourne's mixed-traffic system can be significantly improved, reducing the risk of collisions and ensuring a safer environment for all road users.

## 5. Conclusion

Melbourne's long history of operating a mixed-traffic system has resulted in frequent collisions between trams and other road users. This paper, using Melbourne as a case study, explored the causes of tram collisions in mixed-traffic environments globally and proposed methods for improvement. From an objective perspective, the arrangement of tram platforms and the design of intersections and right-of-way (ROW) regulations were identified as two primary factors contributing to tram collisions

DOI: 10.54254/2754-1169/117/20242047

in Melbourne. To address these issues, several improvement strategies were recommended. These included establishing elevated tram platforms separated from the road, implementing newer, safer tram station designs, expanding the use of Hook Turn intersections, and integrating intelligent transportation systems. Such measures aimed to mitigate the objective factors leading to tram collisions. From a subjective perspective, tram driver behavior—including situational awareness, time pressure, and organizational behavior—and the actions of passengers, pedestrians, and other road users, such as distractions from mobile phones, contributed to tram collisions. To reduce these human factors, enhancing tram driver training to alleviate stress and providing education for pedestrians and passengers to increase their awareness of traffic risks were effective approaches.

Due to the limitations of the current database, this paper cannot perform more accurate and direct quantitative analyses using firsthand data. Based on the above research and proposed measures, Melbourne's tram mixed traffic situation is expected to improve, helping to reduce tram collisions under mixed traffic conditions, as exemplified by Melbourne. This improvement not only enhances the safety and reliability of tram operations but also contributes to a more efficient and sustainable urban transport system. By addressing both systemic and human factors, the proposed measures aim to create a safer environment for all road users, fostering a more cohesive and cooperative traffic culture.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242036

# *Analysis of Financial Performances for Merck&Co: Comparison with Johnson&Johnson, Pfizer, and Bristol-Myers Squibb*

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***Abstract:*** Medicines and medical resources are necessities of human society, and human beings often rely on them to speed up recovery or save lives. Especially since the society has just experienced an epidemic, namely COVID-19, the pharmaceutical industry is often in the spotlight. The prospects of the pharmaceutical industry are optimistic, and people often make profits by purchasing a company's stock. This study will analyze and evaluate the operating status of the four leader companies in the pharmaceutical market through data and theories, in order to figure out the most suitable company to buy shares. By comparing various data, Bristol-Myers Squibb's stock is the most suitable to buy. Because it has great potential in the future, high profitability, and high operation efficiency. The significance of this study is to enable people to discover companies worth investing in, provide professional advice to buyers, promote audiences for worthy companies, and discover companies with development prospects for the market.

***Keywords:*** Financial analysis, pharmaceutical market, Merck&Co.

## 1. Introduction

The pharmaceutical industry was early in the 19th century. The US pharmaceutical industry originated in the early 19th century, when pharmaceutical production was mainly carried out by individual pharmacists in small-scale laboratories. The first pharmaceutical company, Merck, was established in the United States in 1823. Patented drugs also began to appear. In the early 20th century, with the development of the Industrial Revolution, the production of drugs became industrialized and standardized. The pharmaceutical industry began to achieve large-scale production. Some drugs had fixed preparation tables and proportions. At the same time, people began to realize that drug research and development was dangerous and expensive. In 1906, the Federal Food and Drug Act was passed and the FDA was established. The US began to institutionalize the regulation of drug safety and effectiveness [1].

In the mid-20th century, the US pharmaceutical industry had biotechnology development. For example, the development of antibiotics during World War II. From the late 1970s to the 1980s, advances in biotechnology gave rise to the development of genetic engineering and biopharmaceuticals. Large pharmaceutical companies such as Pfizer, Merck, and Johnson & Johnson began to expand globally. The current development status of the US pharmaceutical industry is

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DOI: 10.54254/2754-1169/117/20242036

relatively stable. Most pharmaceutical companies invest heavily in drug research and development. Many new drugs and innovative therapies such as gene therapy and immunotherapy originate from American companies such as Merck and Johnson & Johnson. American pharmaceutical companies have a rich R&D pipeline, including hundreds of drugs under development. In terms of regulations and supervision, the FDA is responsible for supervising the development, testing, approval and market supervision of drugs to ensure the safety and effectiveness of drugs. The patented drug (branded drug) and generic drug markets coexist, and drugs after patent expiration are usually replaced by generic drugs, thereby reducing drug prices. Every company is committed to developing patented drugs to gain market share. There is a clear trend of mergers and acquisitions and integration among large pharmaceutical companies, aiming to expand product lines, increase market share and enhance R&D capabilities. This market has good prospects because technologies such as artificial intelligence, big data and precision medicine are changing the R&D and production model of the pharmaceutical industry. In addition, emerging treatments such as cell therapy, gene therapy and RNA therapy have broad prospects and are expected to completely change the treatment of certain diseases [1].

Johnson & Johnson has made significant contributions in the healthcare sector, with two achievements standing out in particular. One of these achievements was the mass production of sterile sutures, which revolutionized surgical practices. This breakthrough played a key role in minimizing the risk of death by reducing the infection rate associated with surgery. From research to marketing, the biopharmaceutical corporation is in complete control of its operations. In addition to prescription medications, it also specializes in vaccinations, biologic therapies, and items for animal health. Nonetheless, the company's primary focus areas are diabetes and oncology; according to Statista, its top-selling medications in 2022 were Januvia, a type 2 diabetes treatment, and Keytruda, a cancer medication. Pfizer effectively addresses a wide range of medical conditions, including women's health concerns and cardiovascular disease. Pfizer is the first FDA-approved COVID-19 vaccine manufacturer, which reflects its innovation. In addition, the business has a long history of accomplishments, including being the first to produce vitamin C and penicillin on a significant scale, which have made significant contributions to advances in healthcare [2]. Bristol-Myers Squibb has made significant contributions to healthcare with its exceptional research capabilities and innovative drugs. Among its notable products are the blood thinners Eliquis and Plavix, as well as the psychiatric medication Abilify. Furthermore, the business created the immunotherapy Opdivo for combating certain forms of cancer [3].

As shown in Fig. 1, Merck, Johnson & Johnson, Bristol Myers Squibb each of them has 5% market share. Pfizer has 7% of the market share. The market is relatively competitive due to huge number of competitors [4]. The reference sources are articles from Google scholar, news, and online articles. There are four companies that are giants in the pharmaceutical industry, and all four of them are great investments. Merck is one of the world's largest pharmaceutical companies. Sales of the company's top cancer medication, Keytruda, increased by 20% during the first quarter, contributing to a 9% gain in revenue. Gardasil, Merck's vaccine against human papillomavirus, saw a 14% rise in sales as well. Strong Keytruda sales, according to analyst Geoff Meacham, helped Merck outperform analysts' forecasts for first-quarter results. Meacham anticipates Merck to maintain its current pace in 2024, when it will launch key products such as V116, HER3-DXd, and sotatercept. Additionally, Merck just disclosed a reorganization plan to improve its manufacturing network and increase efficiency [5]. The second company is Johnson & Johnson. It is a large pharmaceutical company. J&J offers a wide range of products, such as the immunology medications Tremfya and Stelara and the cancer medications Darzalex and Erleada. In 2023, Johnson & Johnson intends to split off its consumer health segment into an independent company. This will provide the corporation access to its two fastest-growing business segments, which are medical devices and pharmaceuticals. J&J has

DOI: 10.54254/2754-1169/117/20242036

increased its yearly dividend for fifty nine consecutive years and is named the dividend king. However, with the spinoff of the company's consumer health business, investors don't have to worry about the dividend. J&J expects its dividend plus the expected dividend from the new entity to remain at least at the same level as before the deal is completed [6].




Figure 1: Market share each company has in pharmaceutical market in 2022.

Pfizer sells a variety of blockbuster products. These include the blood thinner Eliquis (marketed by Pfizer in partnership with Bristol-Myers Squibb), the cancer medications Ibrance and Xtandi, and the pneumococcal vaccination Prevnar. Most notably, Pfizer developed the first COVID-19 vaccine. Sales of Pfizer's COVID-19 pill Paxlovid have generated $4.1 billion in revenue for Pfizer. The drugmaker has more than 30 clinical programs in late-stage testing or awaiting regulatory approval. Particularly intriguing is the company's potential vaccination candidate against respiratory syncytial virus. For a long time, income-seeking investors have favored Pfizer. The business has distributed a quarterly dividend for over 83 years. The dividend of Pfizer has grown by 25% in the last five years [6]. Bristol-Myers Squibb (BMS) has acquired several companies to expand its product range. BMS is working on more than 50 clinical testing projects. In an effort to treat more cancer kinds, the business is investigating the use of Yervoy in conjunction with Opdivo as an immunotherapy. Also, the business is testing a number of new cancer immunotherapies. BMS has increased its yearly dividend for the past 13 years. The dividend payout has increased by almost 38% during the previous five years. Therefore, it's a wise investment [6].

Medicines, medical facilities, and medical technology are necessities for human beings because people will get sick. Some diseases are mild, while others are more serious. The development of the pharmaceutical industry is vital in society. In addition, human society has just experienced an epidemic, namely COVID-19. This further highlights the indispensability of the pharmaceutical industry in society and the huge attention it has attracted recently. The potential consumers facing the pharmaceutical industry are all human beings, so investing in pharmaceutical companies is based on prospects. Therefore, it is necessary to analyze the four giant companies in the pharmaceutical industry. This article will analyze which company is the worthiest of investment through various data and calculated ratios, evaluate return rates, profitability, growth rates, and other factors.

## 2. Data and Method

The data is collected from the website Estimize, an open financial estimates platform of listed stocks. The company Johnson & Johnson, Pfizer, and Bristol-Myers Squibb are chosen to be compared with

DOI: 10.54254/2754-1169/117/20242036

Merck, because these companies are the leading company in the global range. The prosperity of these companies is positive and the size, sales, potential consumers are considerable. There is high competitiveness between them. These companies operate in the similar areas. They compete each other in the same industry. All of them have research and development in similar therapeutic areas. Examples include oncology, immunology, cardiovascular disease, and infectious diseases. These companies want to increase sales of medicine and thereby increase revenue by gaining a larger market share. These companies operate globally and compete for market share in different regions. They all want to become the global market leader and maintain their existing market positions. The data collected are from 2023 second quarter to 2024 first quarter, and with the forecasted data from 2024 second quarter to 2025 first quarter.

TTM and NTM EPS, TTM and NTM P/E ratio, EPS growth rate, Revenue growth rate, PEG ratio, and GP/A ratio of the companies are compared. TTM EPS represent the earnings per share of a company over the most recent 12 month. NTM EPS represent the forecasted earnings per share of a company for the upcoming 12 months. Both of the values measured company's profitability. The higher the EPS ratio, the more profitable the company is. TTM P/E ratio is used to evaluate the current stock price relative to its profitability over the past twelve months. NTM P/E ratio is to used to evaluate for the upcoming twelve months in the future. It is used to determine whether the stock is overvalued or undervalued. It is calculated by $Current\ stock\ price/TTM\ or\ NTM\ EPS$. If the P/E ratio is significantly lower than the overall market, then the stock is undervalued which means the stock price is lower than the real value of the stock. If the P/E ratio is significantly higher than the overall market, then the stock is overvalued which means the stock price is relatively higher than its real value. Undervalued stock is more worthwhile to invest in. EPS growth rate measures the increase of a company's profitability. The greater the EPS growth rate, the greater the increasing of the company, which is calculated as EPS growth rate $= (NTM\ EPS - TTM\ EPS)/TTM\ EPS \times 100\%$. Revenue growth rate measures the change of a company's sales revenue over certain period. It is calculated by $(Current\ Revenue - Forcast\ Revenue)/Current\ Revenue \times 100\%$. PEG ratio is used to evaluate the Price to Earnings ratio by taking into account the growth of earnings [7], hwihc is calculated as $PEG\ ratio = TTM\ P/E\ ratio/EPS\ growth\ rate$. Gross profits to Assets ratio (GP/A) is used to measure a company's efficiency in using its assets to generate profits. The higher the GP/A ratio, the more efficient the company can use its assets to generate profits [8], which can be obtained as $GPA = Gross\ profit/Total\ Assets$.

## 3. Results and Discussion

Seen from Table 1, MRK and JNJ are expensive stocks, by contrast, PFE and BMY are cheaper stocks. The trend of EPS is most steady in JNJ. It is very fluctuated in Merck, PFE, and BMY. JNJ has a high TTM and NTM EPS ratio, which means that it has better profitability. PFE has the lowest TTM and NTM EPS ratio, which means the profitability is not good, and PFE is not good to invest in when only looking at EPS ratio. MRK and BMY has a similar TTM and NTM EPS ratio, so the profitability is roughly similar. BMY has a very high TTM P/E ratio and a very low NTM P/E ratio of 6.22. This trend shows in the future, it is expected that investors will paying less for each dollars of earning in the future. MRK, JNJ, and PFE has similar NTM P/E ratio, so their competitiveness is not as great as BMY. JNJ has a negative revenue growth ratio, so its sales are decreasing and is not suggested to invest it.

As presented in Table 2, both MRK and BMY has a really high EPS growth rate, which is very attractive because the company is increasing its profitability. Merck has several large acquisition cooperation agreements in 2023 [9]. BMY has also acquired many companies in recent years [10]. This also leads to a small EPS base for both companies. BMY has the highest EPS growth rate of 550.5%, and then is the MRK which is 310.6%. However, in the past four quarter, both MRK and

DOI: 10.54254/2754-1169/117/20242036

BMY has a fluctuating EPS ratio that include a negative EPS ratio in one of the quarters, so more analysis is required. PFE has the highest revenue growth ratio, which means the company is operating very well in gaining market share.

Table 1: Stock price, EPS ratio, and P/E ratio of four stocks.

| | Merck | J&J | Pfizer | BMY |
|---|---|---|---|---|
| Stock prices | 131.50 | 146.82 | 27.42 | 42.50 |
| TTM EPS | 2.17 | 10.46 | 1.42 | 1.05 |
| NTM EPS | 8.91 | 10.6 | 2.44 | 6.83 |
| TTM P/E | 60.60 | 14.04 | 19.31 | 40.48 |
| NTM P/E | 14.76 | 13.85 | 11.24 | 6.22 |

Table 2: EPS growth rate, Revenue growth rate, PEG ratio, and GP/A ratio of four stocks.

| | Merck | J&J | Pfizer | BMY |
|---|---|---|---|---|
| EPS Growth Rate | 310.6% | 1.3% | 71.8% | 550.5% |
| Revenue Growth Rate | 5.70% | -0.6% | 12.6% | 1.0% |
| PEG | 0.20 | 10.80 | 0.27 | 0.07 |
| GP/A | 41.2% | 35.0% | 14.8% | 36.1% |

JNJ has the highest PEG ratio, so it is overvalued which is not suitable to invest in. For the rest of the company MRK, PFE, and BMY, all of them has a PEG ratio below 1 which means the stock is undervalued relative to growth. MRK and PFE has similar PEG ratio which is 0.2 and 0.27. While BMY has the lowest PEG ratio 0.07, which has more attraction. There is a huge difference between EPS Growth Rate and Revenue Growth Rate for both BMY and MRK. This is due to the increase in operation efficiency to reduce production cost and paying off debt to reduce interest expenses (according to the 10-k report of these two companies). Merck paid off the debt by selling bonds, and BMY paid off 3 billion debts in 2022. MRK has the highest GP/A ratio of 41.2%, which means it is very efficient in using its assets to generate gross profits and reasonable cost management. The trend of GP/A ratio for MRK is very good because it is keep increasing for three years ago. BMY is the stock has the second high GP/A ratio. It is also good at using assets to generate gross profits efficiently. However, the GP/A ratio increases from 2020 to 2022, but with a slight drop in 2023. JNJ has the third high GP/A ratio and with growth trend. PEF has the lowest GP/A, so it is utilizing the assets the least efficient. The Net margin of Merck and Pfizer of both annual and quarter is very unstable and fluctuated. The gross margin and net margin are decreasing for Merck. The gross margin and net margin are increasing for Pfizer. BMS has a stable gross margin for both annual and quarter but also with a sudden negative trend from 2022 to 2023. So according to these two data, Pfizer is more attractive. Overall, the suggested stock is common stock of Bristol-Myers Squibb due to its cheap stock price, low NTM P/E ratio, high EPS growth rate, and low PEG ratio. However, there is still some risk factors that may fail the investment. Here are the three mean risk factors. The Increasing pricing pressure and other restrictions in the U.S. and around the world are negatively impacting Bristol-Myers Squibb's revenue and margins. Increasing pressures are being imposed in the U.S., the European Union, and other parts of the world to gain access to pharmaceutical products and to impose pricing controls and other discounts. This has led to price cuts, lower reimbursement rates, and a smaller population of payers to reimburse. And market access restrictions, pricing controls and discounts, and other restrictions will become more severe in the future. So, the company's future revenue and margins may be negatively impacted [11].

DOI: 10.54254/2754-1169/117/20242036

Contributing to these are changes in laws and regulations related to medicine pricing and reimbursement (such as potential penalties/price controls for price increases that exceed the rate of inflation), and other changes related to federal healthcare programs. Then cost-cutting measures in federal healthcare programs and increased scrutiny of medicine manufacturers (including any additional scrutiny of BMS or Celgene by the House Oversight and Reform Committee) could also negatively impact margins [11].

The company has a significant amount of debt, which could have a negative impact. Bristol-Myers Squibb's acquisitions of Mirati, MyoKardia, and Celgene increased the company's debt amount, resulting in higher interest costs, and they plan to take on more debt to finance their next acquisitions, such as Karuna and RayzeBio. This can make it harder for the business to afford to make more capital expenditures, create new goods, and announce dividend payments in the future [11]. For instance, Standard & Poor's reduced BMS's long-term credit rating from A+ to A (Long-Term Credit Outlook Stable) after the company announced the recent acquisitions [11].

Regarding to Difficulties or delays in the development and commercialization of new products, BMS expects sales of its major branded products, such as Revlimid, Eliquis, Sprycel, Abraxane and Pomalyst, to decline upon loss of market exclusivity for such products. Therefore, the company's future success is highly dependent on its new product pipeline. The failure rate inherent in the process of developing new medicine is high [11]. Therefore, it is very likely that the funds invested by BMS in research projects will not generate a return. Developing new compounds and products involves inherent risks and uncertainties, including efficacy and safety issues, which may result in failure of the company's investment and may have a negative impact on BMS' image if it enters the market. There are also delays or rejections of regulatory approvals, including due to difficulties in recruiting patients and completing clinical trials in a timely manner. Delays or challenges in large-scale manufacturing of products or excessive costs of manufacturing products leading to revenue declines [11].

## 4. Conclusion

According to the comparison and analysis of the data, Bristol-Myers Squibb's stock is the most suitable to be purchased. Because it is a very cheap stock at present, but it has a very prosperous development. It is a very cost-effective thing to obtain stocks at a low price and then obtain high profits in the future. According to the calculated data, the profitability growth rate of this stock is very high, so it is a very attractive stock. Because it is very efficient in using total assets to produce gross revenue. The four companies studied this time only have a lot of market share and potential consumers in the current pharmaceutical market. There are still many potential stocks worth investing in that have not been analyzed in this article. There can be more comprehensive papers on pharmaceutical analysis in the future. These results provide professional advice and valuable analysis for stock buyers, and helps professionals in the exploration and research of the pharmaceutical market.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242045

# *The Marketing Strategy Analysis of Jellycat*

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***Abstract:*** This paper is based on Jellycat's new marketing strategy of selling toys with a additional show, and there is only little research on the influence of such a marketing strategy on Jellycat's brand by scholars. Therefore, this paper aims to study the influence of Jellycat's offline stores by combining performance and sales. This paper uses qualitative data collection on the website and different models to analyze Jellycat's marketing strategy, including marketing mix, SWOT analysis, and Pestle analysis. The research results show that the new sales method, that is, on-site sales with corresponding short performances, can affect multiple factors on many levels. For example, the price of the product will increase, the value of the product itself will also increase, and the brand image will be well established as a relatively high-end positioning. Therefore, although this marketing strategy may have many shortcomings, it has brought more good effects to the brand as a whole for the business to improve the brand image and increase their sales and profit.

***Keywords:*** Marketing strategy, Jellycat, Swot analysis.

## 1. Introduction

### 1.1. Research Background

Jellycat, the British soft toy manufacturer, has captured hearts across the globe with its quirky, cuddly creations. Founded in 1999 by brothers Thomas and William Gatacre, the company quickly rose to fame for its unique and innovative designs that appeal to both children and adults [1].

Over the past decade, Jellycat has evolved from a niche novelty gift to a collectible item. Last year alone, the company generated more than $58 million in global sales. Figures on social media show that the brand has 619,000 followers on Instagram and 46,000 followers on Facebook, making it a big presence in pop culture [2]. The brand promoted its marketing strategy in the form of performance in offline stores on the social platform. The marketing strategy in the form of performance refers to a series of performances when the shop assistants pack plush dolls for customers. For example, the doll is a potted plant, and the clerk will take out a watering can and a small rake to use the doll to perform, and tell the customer to take good care of the doll, the doll likes the sun. This series of behaviors attracted a large wave of traffic online, and at the same time attracted many customers to offline stores to experience this marketing strategy.

The theme of this paper is the performance marketing strategy, and the question is the impact of this marketing strategy on the brand. This study also has a great impact on the future because the success of a brand's marketing strategy determines whether the brand's future marketing mode should

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DOI: 10.54254/2754-1169/117/20242045

be changed and whether other competitors can use the same marketing strategy to achieve the same effect. A good marketing strategy can enable a company to have its brand characteristics while also improving profits, which is one of the most important factors in brand operation. This research will use marketing mix, SWOT analysis, and Pestle analysis to explore and analyze the influence of Jellycat's marketing strategy on the brand.

### 1.2. Research Gap

In the existing research, people mainly pay attention to the influence of plush dolls themselves on customers, including consumer psychology. Very little attention has been paid to Jellycat's marketing strategy and to what effect it had on Jellycat and what effect it would have on the brand.

So why has Jellycat's marketing, shown in videos that are now widely circulated on the Internet, attracted so much attention? Since the pandemic, Jellycat has expanded beyond selling toys for babies and has become a fashion icon for young people [3]. This article explains the positive and negative effects of Jellycat's marketing strategy combined with the current market, and discusses whether it has been successful.

## 2. SWOT Analysis

### 2.1. Strength

For one thing, Jellycat's marketing strategy involved an elaborate show where employees packaged the dolls in elaborate shapes. The exquisite packaging can prevent breakage or wear off the doll, and the packaging prevents liquids such as ink and perfume from evaporating. The paper changes color in the air, and the glue cannot be used, but it will remain in the packaging for years. Plush toys can also be protected from damage during transportation after packaging [4]. In the packaging, customers can be assured that they will not be damaged when they take them home, and the subsequent return and exchange problems caused by damage caused by transportation are avoided, effectively saving customers time and energy.

Second, Jellycat's marketing was similar to that of the fashion world, with a series of new releases in January and July each year [5], accompanied by beautifully photographed and themed brochures, and Jellycat dolls appeared on magazine covers and classic albums, as well as movie posters and world-famous paintings. Beautiful goods combined with interesting sales models have attracted the attention of most young people and become a fashion trend. Jellycat got Jellycat customers to punch in because it got more customers and boosted sales and profits.

Finally, Jellycat's products have passed the European toy safety standard and the American material testing standard, and are also accessible to newborns, which greatly increases consumer trust. After attracting a large number of customers, Jellycat's excellent quality maintained consumer loyalty and made Jellycat's sales steadily increase.

### 2.2. Weakness

Jellycat's high price was resisted by some consumers [6] and made them less willing to buy Jellycat. Combined with the sale of offline shows, high labor costs, and complex, beautiful packaging, Jellycat's price rose further, and the move lost some consumers due to the higher price.

At the same time, because the packaging takes more time and leads to a long queue, some consumers will choose to buy other brands because of the short time or do not want to spend time waiting to waste energy.

DOI: 10.54254/2754-1169/117/20242045

### 2.3. Opportunities

For one thing, Jellycat is a high-end brand that works from a "small" point of view, creating a foundation of emotional value for customers with its beautiful packaging and the care it gives to its dolls as small animals. This unique brand positioning allows it to cross over from the children's market to the young adult market. A large number of young people will be attracted by this marketing strategy because the store staff attaches great importance to the doll and has been in line with the exquisite packaging of the doll background so that customers feel the details of the brand and the mood of being taken care of. A good mood increases the probability that customers will come back for more.

Secondly, Jellycat is a current fashion trend. Customers will be delighted by the staff's patience and kindness and may post it online to show the Jellycat's childlike approach. This kind of publicity is undoubtedly the best for the brand because they can get free publicity and have a lot of circulation. Therefore, the brand can get a lot of potential customers to lay the foundation for future sales.

Finally, there are more and more young people suffering from mental illness, and research shows that dolls can relieve people's pressure and alleviate some mental diseases [7], bringing hope and companionship to some young people and children. The good implied meaning also allowed Jellycat to increase sales invisibly.

### 2.4. Threats

Jellycat is so popular that there may be a lot of counterfeits on the market, which is a threat to Jellycat's brand image and sales. Because Jellycat is a high-end product, its quality is guaranteed. However, imitation products may greatly reduce the production cost for greater profits, so the quality of imitation products will be greatly reduced. Jellycat could leave a bad impression on unsuspecting consumers.

In addition, if competitors adopt a lower price strategy, it may also pose a threat to Jellycat's market position. Jellycat has always had a high price policy, and competitors sell Jellycat if they give up some of their profits to attract more customers.

## 3. Marketing Mix Theory

### 3.1. Price

Jellycat's prices are relatively high, mainly due to the high quality and unique design of its products. Because of the higher costs, Jellycat may run the risk of having too much inventory. However, Jellycat's prices are still competitive compared to other high-end plush toy brands. Jellcat's high price allowed consumers to recognize its excellent quality and build a brand image with its high price. Jellcat also appealed to those who wanted to use Jellcat as a gift for children or friends, because Jellcat's high price allowed the Jellycat recipients to feel the Jellycat as a gift.

In addition, Jellycat offers various promotions and discounts to appeal to different consumer groups. Jellycat's unique design made it look cheap to those who liked it too much but didn't want to spend a lot of money on a doll. However, Jellycat's promotional campaign is a good way for this group to buy. Let them love the product and still get it at the price they want. The pricing mechanism has helped Jellycat expand its audience.

### 3.2. Place

Jellycat's products are sold worldwide, primarily through online and offline channels. Online channels include official websites, e-commerce platforms (such as Amazon, eBay, etc.), and social

DOI: 10.54254/2754-1169/117/20242045

media platforms (such as Facebook, Instagram, etc.). Offline channels include specialty stores, department stores, gift shops, etc. Jellycat sells mostly in high-end shopping malls because it focuses on people with spending power. The exquisite decoration style will make customers want to spend money when they pass by Jellycat, and the location is set in a high-end area so that customers can see the doll after shopping because the price of the product is acceptable to them.

In addition, Jellycat has partnered with several well-known brands and designers to sell exclusive products in its stores. Jellycat's sales have been further boosted by increasing distribution points.

### 3.3. Product

Jellycat's products include soft toys in a variety of shapes, colors, and sizes. These toys often have unique designs and personalized features such as different facial expressions, colors, and patterns. In addition, Jellycat offers a range of branded-related merchandise such as clothing, homewares, and stationery. The main features of these products are cute, soft, comfortable, and of good quality. Whimsy and Playfulness Beyond softness and quality, Jellycat plush toys also infuse a touch of playfulness and whimsy into every creation [8]. Jellycat plush toys also infuse a touch of playfulness and whimsy into every creation. Most people can find a look they like in Jellycat's many dolls. Good quality and unique shape received the current people's favor.

Jellycat's product has its flaws, however. Some products have low sales due to their niche design in Thailand. So that's the end of it. There's no way to sell this inventory of goods. This will lead to a high cost, and also cause a certain degree of waste and environmental pollution because the fiber material after the destruction of goods is harmful to the environment [9].

### 3.4. Promotion

Jellycat uses a variety of marketing strategies to promote its brand and products.

First, Jellycat engages with consumers through social media platforms (such as Facebook, Instagram, etc.), publishing product images, videos, and stories to increase brand awareness and appeal. Whether shopping online or in person, interactive shopping experiences create more engagement, these types of experiences are often memorable, can increase customer satisfaction, encourage customers to engage with the brand, and can lead to more customers talking to others about their experiences, whether on social media or in person with friends and family [10]. The combination of performance and interactive shopping not only makes the product more childlike and unique but also satisfies consumers with a beautiful shopping experience. Watching the Jellycat staff package their product is a novelty because no one else is selling it the same way. This unique marketing method distinguishes Jellycat from its competitors.

Secondly, Jellycat works with several well-known brands and designers to organize events and exhibitions to enhance the brand image. Holding an exhibition in the city will also introduce Jellycat as a high-end image to people who may not have known about Jellycat before, and allow them to think of the Jellycat brand when they want to buy a doll in the future. An exhibition is a very good way of publicity. While charging exhibition fees to earn profits, it can also promote products to attract customers to buy exhibition peripheral products or buy products from brands in the future. This approach attracted many potential customers and helped Jellycat's future sales.

In addition, Jellycat expands its brand presence through advertising, public relations, and sponsorship activities. These traditional propaganda methods are also essential. Now in the Internet age, people get information through various electronic devices. Advertising on online platforms does not have the expensive advertising costs of billboards, nor does it target Jellycat's main audience, as newspapers do. The online promotion will help Jellycat improve its brand image and provide a direct channel for Jellycat to buy. After consumers read the publicity, they can easily place orders

DOI: 10.54254/2754-1169/117/20242045

immediately. The conspicuous purchase channel and very favorable publicity increase the possibility of consumers buying products and improve the profits of the brand.

## 4. PESTLE Analysis

First, on the political front. Jellycat, which sells nationwide, takes into account the politics of its supply chain, such as tariffs and trade agreements [11]. Jellycat complies with the relevant regulations of different countries, and also complies with the regulations of different countries and takes appropriate measures to ensure the safety of its products. The safe and compliant products have been trusted by consumers so that consumers can buy Jellycat with confidence.

Second, in environmental terms. Jellycat's products are usually made from cotton, and some of the plastic in the packaging creates waste. Therefore, its production process may have a certain impact on the environment. To reduce this impact, Jellycat can take steps such as using recyclable materials and reducing packaging materials. Jellycat could also consider developing more environmentally friendly products, such as toys made from degradable materials.

Third, on the social side, Jellycat's main market is for children and young adults. Now that Jellycat is becoming a fashion trend, Jellycat is a great gift for personal relationships. As a result, many people think of the Jellycat brand first when choosing a gift. In addition, Jellycat could consider partnering with charities to provide support to people in need.

Fourth, Jellycat uses sophisticated technology to make high-quality dolls that appeal to parents who are concerned about their babies' health. Qualified dolls make it easier for parents to buy Jellycat to accompany their children's growth. At the same time, Jellycat's packaging technology has also attracted a large number of consumers. They designed the packaging according to the different characteristics of different goods. For example, the packaging of the hamburger plush doll is a hamburger box and a snack bag. The funny and humorous packaging has been praised by young people on the Internet.

Fifth, on the legal side. Jellycat complies with various laws and regulations, such as consumer protection laws and intellectual property laws. In addition, Jellycat ensures that its products comply with local standards and regulations to avoid legal disputes.

Finally, in ethics. Jellycat adheres to business ethics and ethics, such as honesty and fair competition.

## 5. Conclusion

The research found that Jellycat had a lot of positive effects on Jellycat by using performance and marketing strategies to interact with the audience. First of all, this interesting and interactive way of selling plush toys attracted a lot of customers to come to experience, which generated their sales. In addition, customers experience good service in online stores and see interesting and unique sales methods, so many customers will take photos of interesting sales methods and post them on the Internet. This approach not only shows that consumers are happy with Jellycat but also helps Jellycat complete very good publicity. Jellycat has become a fashion item because research has shown that its main market is now young people who follow trends. A lot of publicity on the Internet will not only let more people know the brand, but also its interesting packaging will strengthen the brand image. However, the operation of this packaging system requires a lot of staff and relatively expensive packaging costs. However, the good publicity effect will bring greater benefits to the future and cover the cost of packaging.

This study provides a certain reference for scholars who want to conduct in-depth research on Jellycat and fills the gap in the research on the influence of Jellycat's performance to pack plush toys on the whole brand. It will also help people get to know the Jellycat brand and the interesting

DOI: 10.54254/2754-1169/117/20242045

packaging it uses, and increase sales. However, this study lacks the support of actual data, so it is necessary to complete deeper exploration and collect a large amount of data for further analysis in the future.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242058

# *The ECB's Solution to the Inflation Caused by the Russia-Ukraine Conflict*

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***Abstract:*** The Russian-Ukrainian War saw a major escalation on February 24, 2022, when Russia invaded Ukraine, sparking the biggest battle in Europe since World War II. In addition to negatively affecting international relations, this lengthy conflict has had a significant negative influence on world markets, especially those in the Eurozone. The ongoing conflict has intensified inflationary pressures, necessitating the implementation of strong fiscal and monetary measures by the European Central Bank (ECB). This study analyzes the inflationary effect of the Russia-Ukraine crisis on the economies of the Eurozone and assesses the ECB's policies using macroeconomic models, such as the IS-PC-MR model. It explores the complex economic fallout, which includes unstable energy supply, higher industrial prices, and a decline in consumer confidence. The economy has stabilized largely because of the ECB's initiatives, which have included coordinated fiscal policies, interest rate hikes and asset purchase adjustments. Despite these initiatives, problems still exist, such as controlling the growing public debt and striking a balance between inflation management and economic growth. In order to strengthen economic resilience, the conclusion highlights the need for ongoing adaptation and international cooperation. Investments in integrated fiscal measures, diverse supply chains, and renewable energy are suggested as being crucial for long-term stability. The purpose of this study is to provide insights for future economic crisis management and to contribute to policy-making conversations.

***Keywords:*** Russia-Ukraine Conflict, IS-PC-MR model, Cost-pushed inflation, monetary policies, fiscal policies.

## 1. Introduction

The majority of the research being done today on the economic ramifications of the conflict between Russia and Ukraine is on the short term, looking at things like interrupted energy supply, spikes in inflation, and the larger macroeconomic effects on the Eurozone. Models such as the IS-PC-MR have been used in studies to examine the dynamics of inflation and the monetary actions of the European Central Bank (ECB). Nonetheless, there are still knowledge gaps, especially when it comes to the long-term effectiveness of the European Central Bank's combined fiscal and monetary policies and the contribution of international cooperation to the reduction of energy dependence and supply chain disruptions. This paper specifically investigates the ECB's strategies to counteract inflation resulting from the Russia-Ukraine conflict. It delves into the multifaceted impact of the conflict on Eurozone

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DOI: 10.54254/2754-1169/117/20242058

economies, the ECB's monetary and fiscal policies, and the role of energy and supply chain management.

This study aims to explore how these measures collectively address the economic challenges posed by the conflict and what gaps might still exist. The core problem discussed is how well the ECB's policies have stabilized the economies of the Eurozone in the face of hitherto unseen inflationary pressures and energy shortages. The importance of this report is in its thorough examination of existing policies, future plans for bolstering economic resilience, and projections for sustained economic stability. This study aims to contribute to policy-making conversations that could direct future actions in comparable crises by analyzing the ECB's responses and offering improvements.

## 2. The Impact of the Conflict between Russia and Ukraine on the Economies of Eurozone Countries

On 24 February 2022, Russia invaded Ukraine in a major escalation of the Russo-Ukrainian War. The invasion, the largest conflict in Europe since World War II [1]. The crisis between Russia and Ukraine has had a significant and lasting effect on the economies of the Eurozone nations, escalating pre-existing weaknesses and posing new difficulties. For example, it can be seen that from Figure 1, the inflation rate kept rising since the conflict between Russia and Ukraine escalated in February, 2022, and it peaked in October of the same year at 10.6% [2].

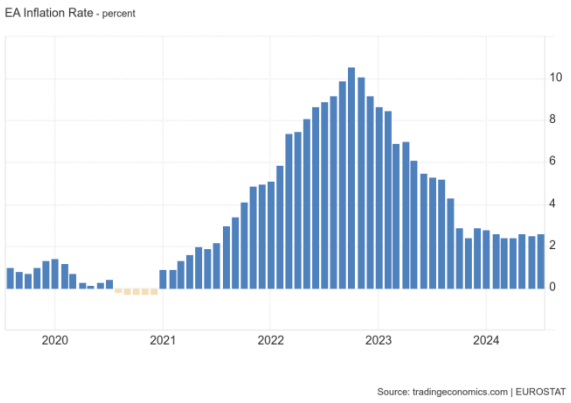



Figure 1: Euro Area Inflation Rate from EUROSTAT [2]

According to the European Investment Bank, Ukraine and Russia are major suppliers of energy and agricultural products. As the war damages production capacities, the price of many core products that are difficult to substitute will rise [3]. Furthermore, unprecedented increases in energy prices were also caused by the European Union's (EU) sanctions against Russia in retaliation for its aggression, as well as Russia's countermeasures, which included reducing and eventually ceasing natural gas deliveries to Europe. The energy shock had an impact on inflation, consumer pricing, industry production, and overall economic stability throughout the economies of the Eurozone. To explain this result, the IS-PC-MR model could be adopted. The IS-PC-MR model was first developed by Wendy Carlin and David Soskice in 2005 to replace the traditional IS-LM-AS model. Wendy and David stated this new model is a simple version of the one commonly used in central banks and captures the forward-looking thinking engaged in by the policymaker [4]. Within the model, IS refers to the curve of investment and saving, and PC represents the Philips Curve, while MR stands for the curve of monetary policy. Let's suppose the original equilibrium point was at point A, and the Europeans were under adaptive inflation expectation after the outbreak of the conflict between Russia and Ukraine, as shown in Figure 2. The equation for PC curve is $\pi_t = \pi_t^e + \alpha(y_t - y_e) + u_t$. And the

DOI: 10.54254/2754-1169/117/20242058

war would be considered a shock as $u_t$, which would influence π directly and shift the PC curve to PC' curve. As a result, the inflation in the Eurozone would be increased from $\pi_e$ to $\pi'$.

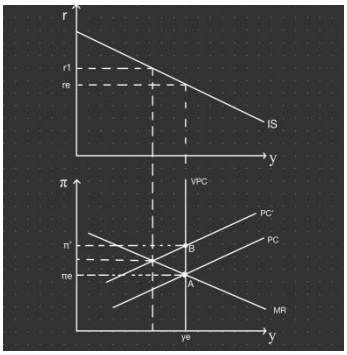



Figure 2: The IS-PC-MR model for the Eurozone after the outbreak of Russia-Ukraine Conflict

Moreover, manufacturing and chemical industries, which rely significantly on energy, were severely disrupted. Production costs skyrocketed, which decreased output and made a company less competitive in international markets. Many businesses had to make the tough decision of either absorbing the increases, which would have reduced profit margins and threatened financial stability, or passing the higher prices on to customers and causing higher inflation. Due to their lower financial resilience than larger firms, small and medium-sized enterprises (SMEs) suffered the most, leading to closures and employment losses. The industrial decline exacerbated the economic crisis by spilling over into allied industries. In addition to industrial, the violence presented significant hurdles for the agricultural sector as well. Due to the interruption of farming operations and export routes, Ukraine, dubbed the "breadbasket of Europe", witnessed a sharp decline in its agricultural output. Within the Eurozone, this had a direct effect on food costs. Millions of Europeans' cost of living was impacted by food price inflation as a result of the country's dependency on imports of Ukrainian wheat, maize, and sunflower oil. In certain areas, rising food costs exacerbated social unrest and income inequality by disproportionately affecting lower-income households. As a result, the conflict and its effects on the economy had a significant negative impact on consumer confidence throughout the Eurozone. Reduced consumer spending resulted from energy price volatility and uncertainty, increased food prices, and concerns about a protracted economic slowdown. Due to increased groceries and utility expenditures, households tightened their belts, which had an impact on the retail and service industries. The economic downturn was exacerbated by this fall in consumer spending, which further hindered economic growth and created a negative feedback cycle.

The external trade of the Eurozone was significantly impacted by the conflict as well. There was a serious disruption in trade relations with Russia, which is an important economic partner for many Eurozone countries. Energy imports as well as exports of consumer products, autos, and machinery to Russia were harmed by the sanctions placed on the country. Businesses that depended on the Russian market were impacted by this disruption, which resulted in a drop in trade volumes. The battle also made international trade channels and logistics more expensive and complicated, which put additional pressure on the trade balance of the Eurozone.

These elements combined to cause a notable slowdown in the Eurozone's economic development. Germany and Italy, two nations that rely heavily on Russian energy, were more severely affected than those with a wider range of energy sources. Numerous Eurozone nations accelerated their shift to renewable energy sources and decreased their dependency on Russian fossil fuels as a result of the conflict, which highlighted the significance of energy security and diversity. Much still, this shift came with a high price in terms of time and money, which made the process of economic recovery much more difficult.

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## 3. The ECB's Monetary and Fiscal Policies to Combat Inflation

### 3.1. The ECB's Monetary Policies

A series of monetary policy measures targeted at stabilizing the Eurozone economy were implemented by the European Central Bank (ECB) in response to the economic upheaval created by the conflict between Russia and Ukraine. The ECB faced difficult choices in trying to balance promoting economic development and reducing inflation due to the conflict-related energy crisis, supply chain interruptions, and rising prices.

To begin with, addressing the surging inflation rates was one of the ECB's main solutions. The Russia-Ukraine conflict caused energy costs to spike, and as a result, the Eurozone experienced its highest levels of inflation in decades. According to the IS-PC-MR model in Figure 2, it is obvious that the ECB needs to raise the real interest rate from $r^e$ to $r^1$ in order to gradually reduce the severe inflation within the Eurozone. Since the situation the ECB faced at the time was actually very similar to that in the run-up to the Great Inflation, when inflation expectations rose sharply because of the energy crisis, the ECB should take measures to prevent the same situation from happening again as soon as they perceive the potential threat of conflict between Russia and Ukraine. Clarida et al. suggested one of the main reasons why the Great Inflation happened was that the Fed did not raise nominal interest rates sufficiently in response to increases in expected inflation during the 1970s [4]. Therefore, the European Central Bank decisively raised its key interest rates in response to this. With its first rate increase in almost ten years, the ECB signaled a departure from its ultra-loose monetary policy stance in July 2022. Subsequent rate hikes followed, aimed at tempering inflation expectations and preventing a wage-price spiral. From the table of ECB monetary policy and other measures between April 2021 and December 2023, the ECB has continued to raise the deposit facility rate (DFR) by 4.5% since July 2022 [5]. By making borrowing more costly, these rate rises were intended to reduce demand and subsequently investment and consumer expenditure.

The European Central Bank modified its asset acquisition initiatives in accordance with increases in interest rates. In order to boost the economy during the COVID-19 pandemic, the European Central Bank (ECB) had been purchasing a lot of assets before the conflict through its Pandemic Emergency Purchase Programme (PEPP) and the Asset Purchase Programme (APP). The APP started as part of a package of non-standard monetary policy measures that also included targeted longer-term refinancing operations, and which was initiated in mid-2014 to support the monetary policy transmission mechanism and provide the amount of policy accommodation needed to ensure price stability [6]. However, as inflation became a more pressing concern, the ECB decided to phase out the PEPP and scale back the APP so that there were no reinvestments of redemptions since July 2023. The goal of this tapering—a steady decline in asset purchases—was to tighten financial conditions without suddenly upsetting the market. The ECB underlined that it was prepared to modify or resume these measures in the event that the economy demanded it.

The ECB encountered formidable obstacles in reconciling its twofold mandate of price stability and economic expansion, even with its massive efforts. Even if the sharp rate increases were required to fight inflation, there was a chance that they would hinder economic growth and raise unemployment. Furthermore, the effectiveness of monetary policy alone was constrained by the global character of the inflationary pressures, which were mostly caused by supply-side forces outside of the ECB's control. In order to prevent starting a recession and guarantee that inflation expectations were well-anchored, the ECB's measures had to be carefully calibrated.

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### 3.2. The ECB's Fiscal Policies

The European Central Bank (ECB) has played a crucial role in developing and influencing fiscal policy responses during the Russia-Ukraine crisis, despite its primary concentration on monetary policy. Strong fiscal measures were required to supplement the ECB's monetary policy initiatives as a result of the conflict's exacerbation of the Eurozone's economic vulnerabilities. The fiscal reaction addressed the immediate effects of the conflict on oil prices, inflation, and public finances while also aiming to preserve long-term stability, encourage economic recovery, and provide targeted relief.

In order to encourage coordinated fiscal action among Eurozone member states, the ECB was a key proponent. The European Central Bank urged for stronger fiscal measures to lessen the impact on the economy, acknowledging that monetary policy was insufficient to address the supply-side shocks and fiscal inequalities brought on by the conflict. The European Union (EU) and national governments were greatly aided by this campaign in putting into action a comprehensive fiscal response.

The Recovery and Resilience Facility (RRF) was created as one of the major budgetary initiatives pushed by the ECB. The goal of the RRF is to address the danger for the sound economic development of the EU and the euro area emanating from increased divergence following the Covid-19 pandemic because of differences in the ability of countries to offset the negative shock [7]. Even so, the RRF became a vital tool in the response to the Russia-Ukraine conflict. In order to lessen the Eurozone's reliance on Russian energy and increase energy security, the ECB encouraged the use of RRF funds to finance investments in energy infrastructure, renewable energy projects, and energy efficiency upgrades. This helped to ease some of the inflationary pressures brought on by energy price shocks.

Additionally, the ECB approved targeted fiscal assistance programs for companies and households in need. Lower-income households experienced severe financial difficulty as food and energy prices rose. To lessen the burden on these households, the ECB encouraged member states to enact temporary tax reductions, direct income support, and energy bill subsidies. The European Community Bank (ECB) promoted grants, low-interest loans, and tax relief for businesses, especially small and medium-sized enterprises (SMEs) that were severely affected by the conflict, in order to maintain operations and safeguard jobs. However, massive subsidies will also cause the government to run a budget deficit. According to the Financial Stability Review, May 2024 from ECB, rising debt service costs are challenging euro area households, firms and sovereigns with weak balance sheets, and the downturn in property markets is, in some cases, compounding household and corporate vulnerabilities [8]. As a result, in order to guarantee long-term budgetary sustainability, the ECB exerted influence over fiscal consolidation initiatives. Sound public finances must be maintained, the ECB said, even as it argued for immediate fiscal stimulus. This required striking a precise balance between preventing unnecessarily high public debt accumulation and offering the required fiscal boost. The ECB collaborated closely with the European Commission and member states to develop budgetary policies that were sustainable over the long run and supportive in the medium term.

### 3.3. Energy Policy and Supply Chain Management Policy

The governments of the Eurozone need to put strong supply chain and energy management policies into place in order to prevent economic shocks and maintain long-term resilience following the energy price shock brought on by the conflict between Russia and Ukraine. Diversification of energy sources is one important energy policy. Infrastructure for renewable energy sources like wind, solar, and biomass should be invested in more quickly by nations like Germany, which is highly dependent on Russian natural gas. As an example, Germany's Energiewende plan seeks to decrease reliance on imported fossil fuels by boosting the proportion of renewable energy in the country's energy mix.

DOI: 10.54254/2754-1169/117/20242058

Furthermore, increasing the capacity to import liquefied natural gas (LNG), as demonstrated in Spain and Italy, can offer substitute natural gas sources. To step up LNG imports, Member States have undergone a fast and significant expansion of LNG regasification capacity. This has resulted in an extra capacity addition of 50 bcm since 2022 [9]. Improving energy efficiency is another crucial policy. Energy-saving technologies and practices in homes and businesses should be encouraged by governments. The energy efficiency programs in France are a good example because they provide financial incentives for upgrading buildings and acquiring energy-efficient appliances. These actions cut expenses for both consumers and businesses in addition to reducing energy use.

The Eurozone countries ought to concentrate on fortifying and broadening their supply chains when it comes to supply chain management. For instance, the Netherlands is making investments in digital infrastructure to improve the resilience and transparency of its supply chain. That's because the government suggested that many opportunities remain unexploited. Examples include the potential role of digitalisation in achieving a sustainable food supply, in the use of renewable energy sources and in the climate transition [10]. To prevent becoming overly dependent on any one nation or area, nations should also diversify their import sources and establish strategic stores of essential minerals. The Eurozone nations may better withstand the financial effects of the conflict and develop more resilient and sustainable economies by putting these energy and supply chain management policies into practice.

## 4. International Cooperation

Working together to improve energy security, stabilize markets, and foster economic resilience among member states is essential if the Eurozone is to successfully address the energy-price shock brought on by the Russia-Ukraine conflict.

The cooperative acquisition of energy resources is one essential area of collaboration. The members of the Eurozone can lower overall costs and improve energy security by negotiating better terms and prices for energy imports by combining their purchasing power. This strategy is demonstrated by the European Commission's proposal for a unified gas purchasing platform, which seeks to guarantee steady and reasonably priced gas supplies for each and every member state. The creation of an integrated energy infrastructure is another crucial element. The effective distribution of energy resources throughout the region can be facilitated by funding cross-border energy projects, such as the European Green Deal's focus on trans-European energy networks, which represents one of the most ambitious and transformative initiatives undertaken by the European Union (EU) to address the pressing challenges of climate change and environmental degradation. Announced in December 2019 by the European Commission, the Green Deal sets the ambitious target of making Europe the first climate-neutral continent by 2050. [11]. One such example is the Baltic Connector gas pipeline, which improves energy connection and lessens dependency on Russian gas between Finland and Estonia. The Eurozone countries may better handle the energy price shock by strengthening international cooperation, which will provide a more secure, resilient, and sustainable energy future for the area.

## 5. Conclusion

The crisis between Russia and Ukraine has severely damaged the Eurozone's economy by drawing attention to weaknesses in supply chain resilience and energy dependence. The response from the ECB, which included large fiscal and monetary interventions, demonstrates a thorough strategy for stabilizing the economy. The goal of the ECB's asset purchase plans and interest rate increases was to reduce inflation and boost economic confidence. Even though these monetary measures were required, it was difficult to strike a balance between stabilizing employment and economic growth

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while controlling inflation. The Recovery and Resilience Facility (RRF), in particular, and other ECB fiscal policies were essential in mitigating both the short- and long-term effects. Reducing reliance on Russian energy required significant investments in energy infrastructure, renewable energy initiatives, and energy efficiency improvements. Targeted fiscal support for SMEs and households also lessened the impact of the economic shock, yet worries about the nation's growing public debt still exist. The management of energy supply chains and energy policy have become crucial domains for guaranteeing economic resilience. Strategies such as increasing energy efficiency, diversifying energy sources, and allocating resources towards digital infrastructure for supply chain transparency are crucial. International collaboration, exemplified by cooperative energy procurement and interconnected energy infrastructure, fortifies the Eurozone's capacity to weather future shocks, including energy price volatility. In conclusion, ongoing cooperation and adaptation are required, even if the ECB's actions have been crucial in controlling the economic effects of the Russia-Ukraine war. To improve economic resilience, future policy should concentrate on resilient supply chains, renewable energy solutions, and integrated fiscal initiatives. This study emphasizes the value of a multimodal approach to crisis management by offering information that can guide future policy choices and guarantee the stability of the Eurozone in the face of uncertainty around the world.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20241992

# *Research on Marketing Strategies for Optimizing Entertainment Products Using the Internet*

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***Abstract:*** The rapid development of science and technology has profoundly altered the way people live and consume. As a significant aspect of cultural consumption, the marketing approach to entertainment products has undergone a profound transformation in response to the Internet. The traditional marketing of entertainment products is mainly reliant on the use of television advertisements, newspaper publicity, and other offline activities. Though these methods have achieved notable results over time, their reach and marketing power are constrained, making it challenging to meet the diverse and personalized needs of today's consumers. The paper aims to explore the potential of the Internet and online media to enhance product marketing strategies in the entertainment industry in the digital age. Through a comprehensive analysis of literature reviews, case studies and data studies, this paper explores the concept and current status of online marketing, as well as the application of online marketing in entertainment industries such as movies, music and games, and how existing data analysis can be used to help the modern entertainment industry optimize its existing online marketing strategies. The results show that by rationally applying online marketing strategies and adapting them to local conditions, not only can audience and user engagement be increased, but sales performance and brand image can also be significantly improved.

***Keywords:*** Entertainment Industry, Online Marketing, Digital Marketing, Marketing Strategy.

## 1. Introduction

In the digital age, the internet and online media have profoundly changed people's lifestyles and consumption habits, and the entertainment industry is no exception. Under today's market conditions, more than 75% of consumers spend a large part of their daily lives in a digital environment [1]. Therefore, using the internet for new marketing techniques based on information and communication technology, entertainment industry companies can use online media platforms to promote and sell to different groups in a personalized way, which not only expands market coverage, but also more accurately reaches target consumers and discovers more potential consumers [2]. There is no doubt that digital marketing has become a prerequisite and a key factor for the success of entertainment industry companies [1]. This paper examines the application and effectiveness of online marketing strategies in the entertainment industry through a comprehensive review of the relevant literature, detailed case studies, and rigorous data analysis. In particular, the extant literature is examined in order to gain insight into the current state of different types of online marketing strategies employed

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DOI: 10.54254/2754-1169/117/20241992

in the entertainment industry. Three specific case studies are employed to analyze successful online marketing strategies and their efficacy. Furthermore, data analysis is employed to assess the efficacy of distinct strategies and to identify avenues for enhancing their effectiveness. In conclusion, this paper explores the current status of online marketing strategies in three distinct entertainment industries, evaluates the efficacy of various online marketing strategies, and explores methods for optimizing the online marketing strategies of the entertainment industry through the use of existing data analysis tools, with a view to providing reference for relevant enterprises to help them better utilize the Internet for marketing and sales, and to improve their market competitiveness and brand influence.

## 2. Overview of the Entertainment Industry and Online Marketing

### 2.1. Entertainment Industry Development and Current Situation

The global economy has been significantly affected by numerous considerable challenges in recent years, including inflation, disease, and armed conflict. Figure 1 demonstrates that, despite a 5.4% increase in global entertainment and media revenue in 2022, there has been a notable deceleration in growth compared to the 10.6% expansion observed in 2021. Forecasts indicate that this growth trajectory will continue to decelerate in the coming years. However, the advent of e-commerce and the concomitant increase in the time consumers spend on digital platforms have created a significant opportunity for growth and development in certain entertainment industries. The number of people watching movies worldwide is currently increasing year by year, and by 2025, box office revenues will reach pre-pandemic levels, increasing from $39.4 billion in 2019 to $43 billion [2].

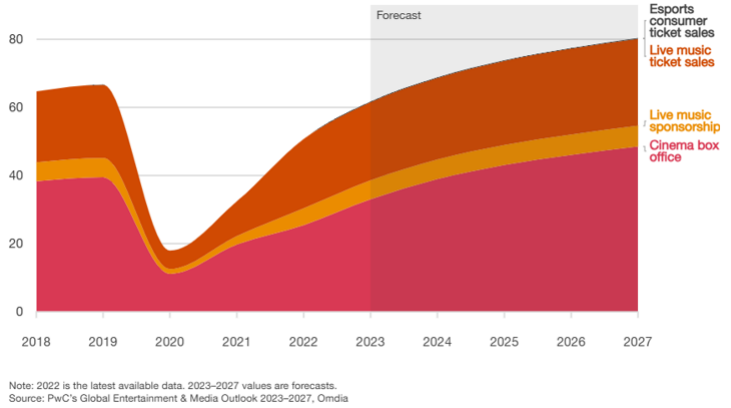



Figure 1: Global Live Event Revenue [2]

In addition, live music has become more popular in recent years. In 2023, revenues from live music and cultural events exceeded the pre-pandemic peak in 2019. In April 2023, Tokyo hosted a number of live music events, including concerts by Bob Dylan, Eric Clapton and the local leading punk band Starbems. In the same month, the Nita Mehta Ambani Cultural Centre in Mumbai was inaugurated as a pioneering multidisciplinary cultural space. Indian and international superstars, fashion leaders and renowned artists took part in the launch of the center [2].

Figure 2 shows the rapid growth of the gaming industry, which is now one of the pillars of the global entertainment industry. As this ever-expanding industry continues to attract the attention of all demographic groups, especially the younger ones, gaming is becoming an important medium for consumer spending, advertising, and industrial creativity. Some well-known video games have evolved into significant inspiration for some popular movies and TV series. For example, The *Super Mario Bros. Movie* became the first game-based IP to gross over $1 billion worldwide [2].

DOI: 10.54254/2754-1169/117/20241992

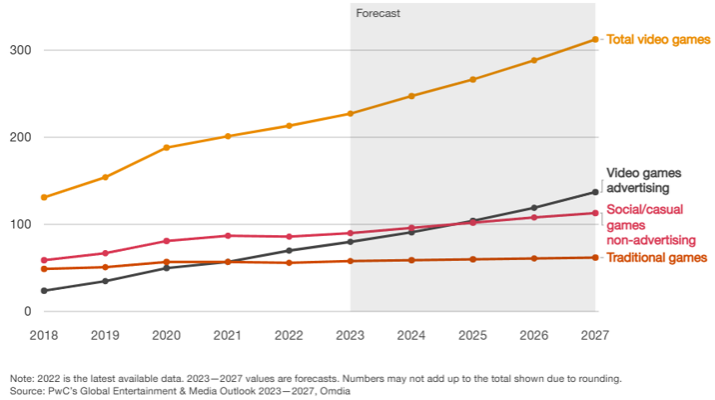



Figure 2: Global Entertainment Industry Revenue Comparison [2]

## 2.2. Internet Marketing Basics

The principle of online marketing is to use the internet to collect information and support marketing activities through the use of communication technology to better meet consumer needs. Online marketing is an integral part of the digital transformation process of a business, with the aim of increasing sales revenue and profits and achieving higher customer satisfaction. Through websites, emails, social media platforms, and blogs, online advertising is used to find and engage users and provide opportunities to help customers [3]. Inbound marketing is the primary form of online marketing that requires companies to carefully target groups and communicate with these potential customers through high-quality content and a high level of integration with the Internet (e.g., through the use of themed blogs, social media campaigns, and email marketing). This type of marketing helps to showcase the company's quality products and services to consumers. Therefore, companies need to optimize their search engine rankings through search engine optimization and provide their customers with the necessary information. This is the key to successful inbound marketing [4]. Currently, the world's major social networks are estimated to have 3.1 billion online users [5]. The vast number of users and the diversity of social media platforms on the Internet are creating new opportunities for consumers to share products. In recent years, the development of digital marketing through social media has gone beyond its original purpose as a social networking platform. By making good use of digital marketing, companies can quickly gain market insights, make their products known to more people, enter new markets and gain a competitive advantage [6].

# 3. Application of Online Marketing Strategies in the Entertainment Industry

## 3.1. Online Marketing Strategies for the Film Industry

The film industry has undergone various technological changes over the course of its long history, but the changes in the digital age have been even more profound. The advent of the digital age has changed the way the traditional film industry sells its products. For example, the severe pandemic has fueled the growth of streaming services, and people have spent more time watching movies on TV, computers, tablets and other digital devices instead of going to the cinema. As a result, some companies have begun to try new ways to sell their films. For example, Universal/Comcast's *Trolls World Tour*, released for the first time as a video on demand, generated close to $100 million in pay-per-view revenues, most of which went directly to the studios. At the same time, these films can be released on different digital platforms, and they can be distributed to every corner of the world at a much faster rate [7]. The use of emerging platforms, such as digital internet, can provide considerable direct benefits for these films. In addition, digital online media platforms also provide powerful tools

DOI: 10.54254/2754-1169/117/20241992

for filmmakers. Through platforms such as Amazon Prime and Netflix, filmmakers can not only use back-end data to analyse which narratives are effective and which stories are more in line with the tastes of the audience, and better predict the popularity of films, but they can also visualize these stories to meet consumer preferences [7].

### 3.2. Online Marketing Strategies for the Music Industry

Relevant studies have shown that marketing methods and strategies in the music industry have undergone a radical and systematic transformation in the digital age. Most music artists, whether they have already gained fame or not, now use social media platforms to promote self-marketing. The rise of diversified social media, such as Instagram and TikTok, has significantly weakened the control of traditional record companies over song marketing. Through the Internet and social media platforms, more and more music artists can interact directly with their fans [8], and release new songs, music videos or behind-the-scenes footage. This strategy not only increases exposure but also fosters a closer relationship between consumers and music artists, which is more conducive to artists' understanding of consumers' preferences and feedback on their work. Some music creators value the evaluation of user communities on social media platforms such as YouTube, which has gradually become a user-driven marketing strategy that not only affects consumers but also artists. The two-way interaction between community music authors and consumers on social media platforms proves that this initiative can encourage artists to adopt more "pro-social" behaviour and make their works more in line with social needs. These social media platforms have also become one of the tools for artists to promote their works and reputations [8].

### 3.3. Online Marketing Strategies for the Gaming Industry

The gaming industry has emerged as one of the most competitive and attractive sectors for Internet start-ups in recent years due to the Internet's rapid development [9]. By 2017, sales in the computer and video game business had increased to $82 billion from $67 billion in 2012 [10]. Over 120 million Chinese citizens have played at least one online game, according to a poll conducted in that country. According to the poll, Chinese gamers play for 7.3 hours on average per week, and 21 percent of them play for more than 10 hours [11]. This shows that the gaming industry is an integral part of the entertainment industry, and the gaming industry is developing at an astonishing rate. For example, the famous Chinese mobile game "Honor of Kings" has been a huge success in mainland China, with the number of users increasing from 120 million to 201 million from December 2016 to May 2017. The success of the game is inextricably linked to its accurate positioning, which is manifested in the use of game stories and mechanics that meet the preferences of young people to target users in the young population. At the same time, the vendor has developed a pricing strategy based on consumer psychology, with a free-to-play in-game purchase mechanism to generate profits with lower in-game spending, while frequent promotions during holidays attract consumers to purchase. In addition, the manufacturer is good at promoting and live-streaming on major social media platforms to attract potential customers to play and learn. In addition, the game has followed the rise of eSports, often hosting competitive tournaments in the Internet age to attract the attention of other groups [9]. The vendor is also adept at publicizing and live streaming on major social media platforms to attract potential customers to play and learn.

DOI: 10.54254/2754-1169/117/20241992

# 4. Internet-Optimized Entertainment Product Marketing Strategy

## 4.1. Content Marketing Strategy

Nowadays, with the continuous development of the Internet and the birth of various social media platforms, the proliferation of various online social networks has been promoted [12]. These networks can generate a huge amount of data, and in the face of this data, companies need to focus on data-driven strategies when using the Internet for online marketing. A data-driven strategy involves collecting appropriate data, analyzing it in a scientific and effective manner, and then passing it to the marketing department and strategic partners to use the data to improve marketing efficiency, make decisions based on the data, and communicate the decisions to key stakeholders [13] [14]. In the current business environment, consumers are able to learn about the details of goods and the reviews of other users on the Internet, so consumer demand and choice are more uncertain than ever. Understanding consumer behaviour is an integral part of organizing marketing planning, and it is particularly important to use digital-driven strategies to help companies market and achieve business goals [14]. The collection of large data sets via the Internet enables data companies to analyze and comprehend consumer behaviour and the purchasing proclivities that underpin these behaviors, which facilitates the understanding of customer needs, the enhancement of customer experience and satisfaction, and the subsequent increase in sales. Concurrently, the utilization of big data analysis enables more accurate prediction and analysis of the market dynamics in which the company operates, allowing for optimization of marketing decisions via observation of the market and competitors, timely adjustment of marketing plans and policies, and reduction of resource wastage. Concurrently, the comprehension of consumer data enables the presentation of tailored advertisements, thereby enhancing the efficacy of advertising and marketing initiatives and the return on investment, while simultaneously attracting a larger pool of prospective consumers. The implementation of data-driven strategies can effectively enhance the competitiveness of enterprises. However, the implementation of data-driven strategies necessitates the availability of specialized personnel to oversee the handling of data. Besides, the challenges of data storage and the protection of customer privacy present significant obstacles for organizations seeking to leverage data-driven strategies. As a result, it is imperative for companies to gain a comprehensive understanding of their market positioning in order to guarantee that they allocate the optimal level of financial resources towards the development of a digital-driven strategy.

## 4.2. Data-Driven Strategy

In today's digital society, content marketing, as an important part of digital inbound marketing, has the potential to generate value and engagement among consumers. Therefore, content marketing aims to allow companies to attract and retain target customer groups by creating and distributing personalized and valuable content that is relevant to the target customer group, ultimately driving customer behaviour to purchase [15]. The three characteristics of content marketing are "non-paid", "paid" and "social", which are reflected in content marketing encouraging companies to build a good relationship with customers, provide product knowledge and services, and make sales. It also allows customers to express their own opinions. Companies can develop brand stories and product advantages through blog posts, infographics and videos. Through these channels, consumers can learn valuable information about the company and its products in a variety of ways [15]. In conclusion, based on data, it is possible to develop personalized marketing plans, optimize the timing and channel selection for advertising entertainment products, and improve the relevance and effectiveness of content promotion.

DOI: 10.54254/2754-1169/117/20241992

## 5. Recommendations for Implementing Online Marketing

New changes in technology, socio-economics, and geopolitics are all having a significant impact on the future of marketing, particularly internet marketing, in today's digital age [16]. The ongoing advancements in computer, communication, and information technologies have made it possible for businesses to handle vast volumes of customer data and, as a result, tailor their marketing more precisely to individual consumers, boosting customer loyalty [16]. The domain of online social media platforms represents a complex, expansive, and rapidly evolving area of digital marketing. The popularity of social media has now surpassed that of email in terms of online campaigns, which demonstrates the vast user base that these social media platforms have amassed. The strategic placement of brief video content and online advertisements across diverse digital platforms can significantly influence the promotion of a company's products [17, 18]. Entertainment companies should diversify their marketing by combining digitally driven strategies with content marketing. In order to increase the profitability of their products, entertainment companies should also use a variety of marketing methods. A digitally driven strategy enables companies to analyze and categorize their customer base. This can be done by starting with a small amount of data and gradually expanding the amount and type of data analyzed using methods such as regression analysis, as well as recruiting professionals who are adept at processing data and building databases in order to develop data processing capabilities. By gradually expanding the database, it is possible to summarize and organize customers' purchasing behaviors and needs, as well as determine its own market position, thereby guiding the improvement of existing products and the planning of future products. For example, regression analysis can be used to determine the appearance of existing game characters preferred by consumers, thus determining the design of future characters. At the same time, companies should carry out content marketing. Once the market positioning has been completed, it would be advisable for companies to enhance the description of the brand value. For instance, it would be advisable to establish official social media accounts and official website pages, with the objective of providing a clear description of the brand advantages. Moreover, businesses should proactively expand their promotional channels and adapt them to the specific characteristics of each channel. For example, enterprises should utilize a variety of social media platforms, blogs, videos, and other digital avenues to disseminate information about their brands and products. Furthermore, they should adapt their promotional strategies to align with the unique characteristics of each platform in order to reach a broader consumer base. In conclusion, when utilizing social media platforms for promotional purposes, it is of utmost importance to pay close attention to all customer comments: timely responses help to build positive relationships with customers and potential users; encouraging users to participate in the secondary creation of the product is an effective strategy to promote the product in the long term [19].

## 6. Conclusion

This paper investigates the potential of employing online marketing to enhance marketing strategies within the entertainment industry. To this end, a comprehensive literature review is conducted, accompanied by an in-depth analysis of select case studies. The results show that through the implementation of optimized online marketing strategies, entertainment companies can not only enhance user engagement but also more effectively attract target audiences and cultivate intimate interactive relationships with them. The Internet and social media platforms afford entertainment industry companies the opportunity to promote and market their products in a variety of ways, thus increasing profits and enhancing product competitiveness. In addition, entertainment companies may wish to consider combining digital-driven strategies with content marketing, enabling them to analyse consumer behavior and infer consumer preferences based on the results of the analysis, which in turn

DOI: 10.54254/2754-1169/117/20241992

can help improve existing products and optimization of the design of future products. In the future, more sophisticated artificial intelligence, big data and social media platforms could also be utilized to enhance existing marketing strategies. However, the data and information in this paper are secondary and lack comprehensive primary data, which may lead to less generalizable and professionally rigorous findings. Future research should focus on designing more comprehensive studies to obtain more comprehensive professional information and analysis.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242010

# *Changes and Solutions in the Education Market*

## *—Economic Research Based on Era of Negative Population Growth in China*

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***Abstract:*** Faced with the current negative population growth in China, the education market will face new challenges and changes. The top priority of the economic downturn in the education market is, first and foremost, to solve the problem of a decrease in the number of students. Based on the reduction of student sources, the supply-demand imbalance in the education market can be analyzed first, followed by several direct reasons, such as social pressure and government fiscal deficits. After identifying the problem, the root cause of the school's student population can be solved based on the problem, or corresponding measures can be taken to alleviate the surplus of teaching staff caused by negative population growth, such as providing no age-limitation or establishing international enrollment, adjusting regional development imbalance in the education field, adjusting teacher resources and the nature of work, and reallocating learning resources. These measures can promote the reform of the Chinese education market, alleviate the financial crisis caused by the decrease in enrollment in Chinese schools, and make the Chinese education market constantly full of vitality and vigor.

***Keywords:*** Education market, negative population growth, supply-demand imbalance, student population, international enrollment.

## 1. Introduction

This article focuses on the plights and challenges that the Chinese education market will experience in the context of negative population growth. This article discusses the impact of China's negative population growth, the problems that have arisen in the Chinese education market, and how to alleviate the crisis in the education market through education reform.

## 2. The impact of negative population growth on education

In the 1970s, China gradually implemented a one-child policy, mainly advocating for late marriage, late childbirth, fewer births, and better birth, in order to systematically control the population. Since the formulation of this basic national policy on family planning, it has made an undeniable contribution to China's rapid population growth and population development issues[1]. At the beginning of the 21st century, China officially entered an aging population society, and China

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DOI: 10.54254/2754-1169/117/20242010

adjusted its population and childbirth policies. In 2015, the "two child policy" was lifted. As the birth rate in China continues to decline year by year, China will fully relax its family planning policy in 2021. The two slowdowns in the family planning policy have briefly increased the birth rate, but they have never been able to change the trend of negative population growth[2].In 2022, China officially entered the era of negative population growth. However, the number of applicants for the Teacher Qualification Certificate has been as a upward trend in these years. So the teaching market environment will face a long-term crisis because of the imbalance between supply and demand.

With the negative growth of China's population, the number of teenagers and young children in China has significantly decreased. The annual decline of China's new population will inevitably lead to a decrease in the number of eligible educated population. Referring to the situation of school mergers and teacher unemployment caused by negative population growth in Japan and the United States, such situations are not conducive to China's education and development[3]. In order to avoid such problems in Chinese schools, timely and reasonable education reform is of utmost importance for the development of education in the new era of China.

At present, there is a general trend of shrinking enrollment in Chinese schools. According to statistics, the number of preschool children aged 3-5 in China has shown a downward trend since 2022, a decrease of 3% compared to the previous year. At the same time, the number of kindergartens in 2022 is also decreasing yearly, a decrease of 5600 compared to 2021. It is estimated that by 2025, the number of preschool children in China will decrease by 39.9% compared to 2020[4]. The emergence of such an educational dilemma will inevitably affect the development of China's education market and economy, and China must find a suitable way out this decline trend of education market development[5].

On January 12, 2023, Minister of Education Jinping Huai mentioned four profound understandings at the National Education Work Conference, with the third key point being "a profound understanding of the urgent requirements of population and social structural changes for the adjustment of education layout structure and resource allocation". However, universities are still in a hot stage and never seem to expected to experience a decline in enrollment in 10 years. A lot of universities continuously expand campus to get enrollment expansion. However, 20 years later, there will be only half of the students. At that time, some universities will face the trend of closure and merger. In the "Opinions on the Establishment of Higher Education Institutions during the 14th Five Year Plan Period" released by the Ministry of Education in July 2021, it was emphasized to strictly control the number of university settings, focus on optimizing the stock, and avoid being greedy for perfection to make blind expansion[6].

## 3. Analysis of Education Issues Currently Faced by China

According to the data analysis, it can be known that the population of preschool, primary school, and school-age in China will reach their peak in 2022 and 2023, respectively. The school-age population of junior high school, high school, and higher education is expected to peak in 2029, 2032, and 2035. The number of the students has shown the downward trend in China.

However, at the same time, the team of teachers is still growing. According to statistics, the number of applicants for the Teacher Qualification Certificate in 2023 was 11.442 million(as shown in Figure 1), while the number of births in 2023 was 7.88 million, resulting in a significant mismatch between the supply and demand of teachers and students. The teaching staff is too abundant, and the school-age population is decreasing, which greatly occupies the education expenses of schools. At the same time, the unlimited quota of teaching materials and exams also brings greater pressure on many normal students.

DOI: 10.54254/2754-1169/117/20242010

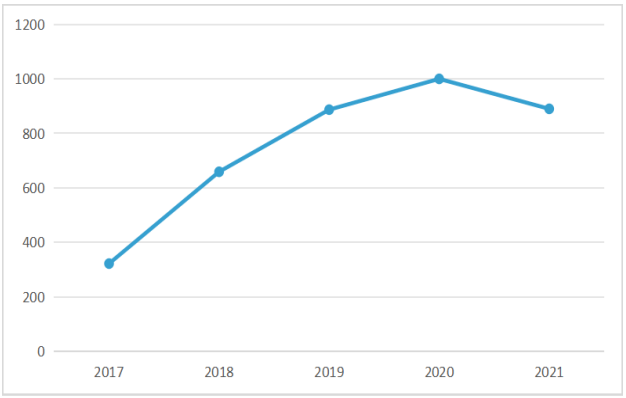



Figure 1: The number of applicants for the the Teacher Qualification Certificate in recent years

Education is a highly valued issue in the new era of China. The average length of education not only represents a country's education level, but also positively reflects individual income levels to a certain extent, promoting national economic development.The average length of education refers to the average total number of years a population group in a certain region has received academic education (including adult education, excluding various educational training) during a certain period of time. Academic education refers to the highest level of education that an individual receives, without distinguishing between graduation, dropout, and school completion[7].

The average length of education in China has been continuously increasing in recent years. From 5.5 years in the fourth population census to 8.8 years in the sixth population census, as of the seventh population census in 2020, the average education level of China's total population is 9.91 years. However, there are differences in the average level of education among different ethnic groups in our country. In western of China, there are lower length of education comparatively. There are some data to analysis the regional development differences(as shown in Figure 2).

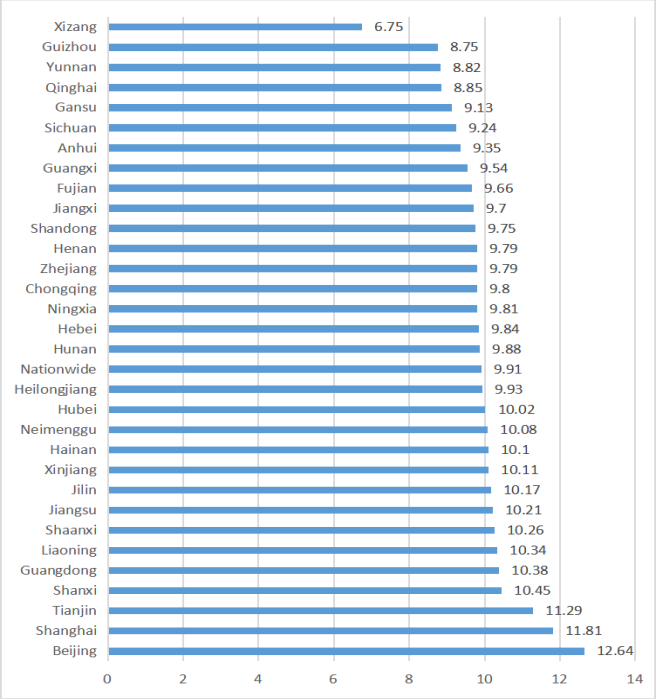



Figure 2: The average years of education for the population aged 15 and above in various regions of China's seventh population census

DOI: 10.54254/2754-1169/117/20242010

In 2020, referring to the per capita education years in developed countries, the United States had 13.4 years, Canada had 14.6 years, Australia had 14.4 years, the United Kingdom had 14 years, France had 13.1 years, and Japan had 11.1 years, all of which were longer than the average education level in China[8]. How to focus on improving China's per capita education years by spending more efforts om north-western of China has to be solved rapidly. Therefore, as a starting point to alleviate the decline of China's school-age population, it will inevitably bring more thinking to China's education reform.

According to the results of the seventh national population census, the total fertility rate of women of childbearing age in China in 2020 was 1.3, which is below the "highly sensitive warning line". Furthermore, the Chinese government's expenditure promotes post pandemic economic recovery and reduces funding for childbirth and education. The state must first ensure the healthcare and social welfare of the people, as well as the wages and salaries of national enterprises and units, to ensure the normal operation of necessary and important units of the state[9].

Meanwhile, some schools continuously create better learning resources and environments for students to enhance their competitiveness, such as inviting renowned teachers to teach, teaching on tablets, using built-in computers in the classroom, building laboratories, and enriching the variety of restaurant dishes. These increased funds for school construction will be transferred to teachers and students. Teachers will take more responsibilities to achieving the index rate of entering higher schools so that they can meet the standards setting by schools. As the number of students decreases, the pressure they bear will become more significant and bring hidden burdens to their families.

## 4. Education reform suitable for China's national conditions

To face the Difficulties that China has faced recently, it is appropriate for China to reform by carrying out age free education, establishing an international education department, and expanding the source of students.

As China's aging population becomes increasingly severe, the elderly population in China is gradually occupying an indispensable part of the country's population. According to statistics, there are 260 million people aged 60 and above in China, and both the quantity and quality are significantly increasing. Therefore, China can vigorously develop indefinite education and increase the average length of education in China. Chakraborty[10] demonstrated a positive relationship between secondary school enrollment and economic growth using cross-sectional data from 94 countries, while Lee[11] demonstrated a positive relationship between education inequality and economic growth. Therefore, improving the education level of the Chinese population can not only alleviate the problem of declining student sources, but also cultivate more talents. At the same time, establish international departments to promote international academic exchange and friendly exchanges. Recruiting international students can alleviate problems such as a decrease in the number of Chinese students and financial pressure on schools, and promote education reform in China.

It is definitely a good approach that the government make effort to promote innovative reform and adjustment of the teaching staff and redistribution of educational resources. Against the backdrop of a decrease in the number of students in schools, the corresponding demand for teachers has decreased due to the decrease in the number of students [12]. In order to balance income and expenditure, schools will definitely pay attention to resource conservation. The salary of surplus teachers is undoubtedly the primary consideration for schools. The decrease in teacher salaries and layoffs may affect the reform and change of the relatively fixed and stable nature of teaching profession in China. China should attach importance to teachers' structure reform. Therefore, the ratio between teachers and students can be adjusted to make it easier to achieve refined education from teachers to students. Such as the construction of a "dual teacher" teaching team, to improve the quality of education and teaching in higher education institutions [13].

DOI: 10.54254/2754-1169/117/20242010

Furthermore, the government should coordinate the allocation of educational resources, provide students with richer educational resources, improve the basic qualities of students in the new era, and enable them to develop comprehensively [14]. In order to achieve refined education, some universities in the United States and Japan have abolished the evaluation of tenured professor positions, and full-time teachers are gradually being transformed into part-time or specialized teachers[15]. This allocation method not only allows students to learn the most advanced and refined education for each part of knowledge, but also stimulates their learning potential and enjoyment, achieving twice the result with half the effort. It should be noted that the reduction of full-time teachers will inevitably affect the teaching enthusiasm of teachers. The country and schools need to strictly control the quality of teaching to provide protection for students. In recent years, China has gradually transformed its "demographic dividend" into a "talent dividend". Only by continuously improving the quality and ability of future labor force, enhancing the knowledge reserves and practical skills of students in the new era, can China make greater contributions.

## 5. Conclusions

Overall, China is facing a situation of negative population growth, which has been gradually demonstrated in preschool childcare institutions and will invade primary schools in the coming years. According to population inertia, unless there are special circumstances, China will continue to develop according to this population trend in the next decade, and education reform is urgent. Among the solutions proposed in this article, implementing age free education and establishing an international education department are the basic measures to expand the student source in the Chinese education market. The development of "indefinite education" provides new and valuable learning opportunities for the middle-aged and elderly groups in China (the group with the largest number of people in China at this stage), increases the average number of years of education and the level of cultural knowledge in China, and then contributes to China's economic development. The decline in teacher salaries and the cancellation of staffing in society will greatly affect the relatively fixed and stable nature of the teaching profession in China, causing many people to hesitate about the teaching profession. At the same time, the cancellation of teacher staffing has complex and far-reaching impacts on the education industry and society. How the country and society will control the quality and salary of teachers is a question worth considering. The new social changes in China will have a significant impact on the country, government, society, schools, families, and other aspects. Faced with the many difficulties and development risks brought by the education market in the new era, China should accelerate the speed and intensity of education reform, create more scientific solutions, and bring more "talent dividends" to China's development.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242087

# *Research on Portfolio Investment in the Risky U.S. Stock Market Based on the Mean-Variance Model*

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***Abstract:*** Against the backdrop of a thriving securities market and economy, there is a growing demand among investors for stock portfolio models in risky markets. This paper explores the application of the mean-variance model in this context, aiming to assist investors in making more informed investment decisions in an uncertain market. Through an in-depth analysis of the mean-variance model, the main conclusion of this paper is that certain stocks, such as AAPL, receive a higher investment proportion due to their lower risk and stable expected returns. In contrast, some high-risk or low-expected-return stocks, such as SBUX, MSFT, and QCOM, hold a smaller or zero proportion in the portfolio. This conclusion highlights the importance of balancing risk and return when constructing a portfolio and provides investors with specific asset allocation recommendations. It can help them effectively control risk while pursuing maximum returns, thereby achieving long-term stable investment gains.

***Keywords:*** Mean-variance model, Risky market stock portfolio model, Efficient frontier portfolio.

## 1. Introduction

As China's securities and economic markets continue to develop, an increasing number of investors are emerging in society. With the continuous purchase of stocks, funds, and other financial products by investors, the question of how to construct an appropriate stock portfolio model for risky markets to maximize investor returns has become an increasingly prominent topic. According to statistics, the Nasdaq Stock Market (NASDAQ) and the New York Stock Exchange (NYSE) are among the world's leading stock exchanges. As of February 2024, the two exchanges had 3,411 and 2,256 listed companies, respectively, with domestic market capitalizations of $24.97 trillion and $24.87 trillion, respectively. Globally, there are hundreds of millions of shareholders, making the study of stock portfolio models for risky markets highly relevant to assisting investors in making informed choices during investments.

This paper will employ the mean-variance model to explore stock portfolio construction from the perspective of risky markets. The mean-variance model can maximize investment returns under a certain level of investment risk, providing a basis for investors to select an efficient portfolio of securities. The model considers not only the expected returns of the portfolio but also its risk level. In this way, it can help investors make better investment decisions in uncertain environments.

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DOI: 10.54254/2754-1169/117/20242087

Therefore, using the mean-variance model to construct an appropriate stock portfolio can assist investors in identifying opportunities in the capital market that offer superior returns with lower risk.

This paper is broadly divided into six parts. The second part reviews classic literature, discussing the conceptual theories and previous research on the mean-variance model. The third part focuses on the application of the mean-variance model in constructing stock portfolios in risky markets. The fourth part presents the calculation results in the form of formulas, data, and charts. The fifth part offers subjective reflections on the research results, analyzing the reasons behind the findings. Finally, the sixth part concludes by discussing the limitations of this study and suggesting directions for future research.

## 2. Literature Review

In today's increasingly complex financial markets, the selection and application of stock portfolio models for risky markets have become a focal point for investors. This section provides a comprehensive overview of recent research achievements in the field of portfolio management from various perspectives.

Xu Yunhui and Li Zhongfei's research integrates the dynamic mean-variance model into the quadratic utility model, revealing the significant impact of serial correlation on the optimal strategy and the slope of the efficient frontier [1]. He Chaolin studied the application of the mean-variance model in optimal asset portfolio selection under a general uncertainty framework, finding that investors with a higher degree of risk aversion tend to adopt more aggressive investment strategies when faced with larger memory coefficients and smaller indifference coefficients [2]. Liu Tengjiao emphasized the unique advantages of the PBIL algorithm in solving portfolio problems, combining it with the mean-variance model to provide decision support for investors on the efficient frontier of portfolios [3]. The research by Qi Yue and Liu Tongyang revealed the performance of socially responsible investing in China's capital markets, proposing a method to transform the relationships among finance, business, and social responsibility into a multi-objective portfolio selection model [4]. Wang Xiaoqin and Gao Yuelin established a mean-variance lower semi-variance portfolio model incorporating a typical transaction cost function, revealing the influence of transaction costs on the risk value [5]. Zola reexamined the relationship between risk and return based on Australian stock market data, emphasizing that investors with different levels of risk aversion can obtain optimal investment strategies that align with their risk tolerance in markets where risk-free assets are available [6]. The research of Huang Lu and Zhou Tingse explored specific methods for constructing portfolios from different angles [7-8] . Huang Lu, based on factor analysis and the mean-variance model combined with tax indicators of listed companies, proposed the optimal investment portfolio proportions for sample stocks in the CSI 100 Index. Zhou Tingsen utilized cluster analysis and principal component analysis to select high-quality stocks, then constructed a portfolio using the mean-variance model, providing specific capital allocation proportions. The studies by Chen Long and Cao Hongbo examined fund and stock portfolio management strategies from different market scopes and time spans [9-10]. Chen Long focused on the SSE 50 constituent stocks and significantly improved portfolio performance by refining the mean-variance model. Cao Hongbo provided essential references for product allocation in fund advisory services by screening and managing funds in the market. The research of Li Shuli and Ma Tian focused on the expansion and application of the mean-variance model [11-12]. Li Shuli analyzed the impact of changes in mean and variance on the efficient frontier curve, providing theoretical support for investors to adjust their investment strategies in dynamic market environments. Ma Tian used Excel to implement quadratic programming, deeply investigating the relationship between portfolio returns and risk, offering strategy support to investors.

In summary, the selection and application of stock portfolio models are complex and variable processes, requiring investors to continuously monitor market dynamics and technological

DOI: 10.54254/2754-1169/117/20242087

advancements. By comprehensively applying various algorithms and models, this paper aims to better optimize portfolios and manage risks, ultimately creating greater value for investors.

## 3. Methodology

When the N-dimensional vector portfolio weights wp for portfolio p is the solution to the quadratic programming problem, portfolio p is an efficient portfolio:

$$\min_{\{w\}} \frac{1}{2} w^T V w \tag{1}$$

s.t.

$$w^T e = E[r_p] \text{ and} \tag{2}$$

where e represents the N-dimensional vector of expected returns of the N risky assets, E[rp] denotes the expected return of portfolio p, and 1 is an N-dimensional vector of ones.

$$A = 1^T V^{-1} e \tag{3}$$

$$B = e^T V^{-1} e \tag{4}$$

$$C = 1^T V^{-1} 1 \tag{5}$$

$$D = BC - A^2 \tag{6}$$

The unique set of efficient frontier portfolio weights for a portfolio with an expected return E[rp] is:

$$w_p = g + hE[r_p] \tag{7}$$

where

$$g = \frac{1}{D}\left[B\left(V^{-1}1\right) - A\left(V^{-1}e\right)\right] \tag{8}$$

and

$$h = \frac{1}{D}\left[C\left(V^{-1}e\right) - A\left(V^{-1}1\right)\right] \tag{9}$$

Here $E[r_p] > \frac{A}{C}$, g corresponds to the efficient frontier portfolio with an expected return of 0, and g+h corresponds to the efficient frontier portfolio with an expected return of 1.

## 4. Results

This study utilizes data from the “Stock Market: Historical Data of 10 Companies” dataset available on the Kaggle website, focusing on the daily closing prices of ten stocks—Apple, Starbucks, Microsoft, Cisco Systems, Qualcomm, Meta, Amazon.com, Tesla, Advanced Micro Devices, and Netflix—between January and June 2023. Through a three-round screening process, the final investable stocks were identified. The first round of screening is detailed as follows.

First, the return rate of each stock was calculated, and from these return rates, the expected return rate for each stock was derived, as shown in Table 1.

DOI: 10.54254/2754-1169/117/20242087

Table 1: Expected Return Rate of Each Stock (‰).

| Stock | AAPL | SBUX | MSFT | CSCO | QCOM | META | AMZN | TSLA | AMD | NFLX |
|---|---|---|---|---|---|---|---|---|---|---|
| Expected Return Rate (‰) | 3.66 | -0.04 | 3.02 | 0.70 | 1.08 | 7.22 | 3.65 | 7.84 | 5.22 | 3.54 |

Next, the covariance of the return rates was calculated, and the covariance matrix of the return rates (‰) was obtained, as shown in Table 2.

Table 2: Covariance Matrix of Return Rates (‰).

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.17 | 0.07 | 0.14 | 0.08 | 0.15 | 0.23 | 0.16 | 0.23 | 0.17 | 0.15 |
| 0.07 | 0.21 | 0.07 | 0.06 | 0.11 | 0.09 | 0.10 | 0.11 | 0.12 | 0.10 |
| 0.14 | 0.07 | 0.32 | 0.08 | 0.15 | 0.29 | 0.26 | 0.19 | 0.33 | 0.14 |
| 0.08 | 0.06 | 0.08 | 0.16 | 0.10 | 0.11 | 0.08 | 0.12 | 0.09 | 0.10 |
| 0.15 | 0.11 | 0.15 | 0.10 | 0.46 | 0.15 | 0.18 | 0.30 | 0.37 | 0.25 |
| 0.23 | 0.09 | 0.29 | 0.11 | 0.15 | 0.93 | 0.39 | 0.38 | 0.36 | 0.24 |
| 0.16 | 0.10 | 0.26 | 0.08 | 0.18 | 0.39 | 0.50 | 0.31 | 0.32 | 0.23 |
| 0.23 | 0.11 | 0.19 | 0.12 | 0.30 | 0.38 | 0.31 | 1.27 | 0.40 | 0.32 |
| 0.17 | 0.12 | 0.33 | 0.09 | 0.37 | 0.36 | 0.32 | 0.40 | 1.07 | 0.28 |
| 0.15 | 0.10 | 0.14 | 0.10 | 0.25 | 0.24 | 0.23 | 0.32 | 0.28 | 0.57 |

By calculating, the values of A, B, C, D, and A/C were obtained, as shown in Table 3.

Table 3: Calculated Values of A, B, C, D, and A/C in the First Round.

| A | B | C | D | A/C |
|---|---|---|---|---|
| 11.49 | 0.13 | 9957.72 | 1186.10 | 0.0012 |

Based on the formulas, the values of g and h were calculated, as shown in Table 4.

Table 4: Calculated Values of g and h in the First Round.

| g | h |
|---|---|
| 0.208 | 157.650 |
| 0.360 | -83.134 |
| 0.136 | -22.553 |
| 0.486 | -82.336 |
| 0.037 | -64.657 |
| -0.096 | 26.157 |
| 0.001 | -11.216 |
| -0.068 | 30.698 |
| -0.053 | 30.980 |
| -0.011 | 18.410 |

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Finally, the risk volatility (%) was calculated, as shown in Table 5, and the efficient frontier chart was plotted based on these values, as shown in Figure 1.

Table 5: Risk Volatility.

| Risk Volatility (%) | E(%) |
|---|---|
| 1.00 | 0.12 |
| 1.01 | 0.15 |
| 1.03 | 0.20 |
| 1.08 | 0.25 |
| 1.14 | 0.30 |
| 1.21 | 0.35 |
| 1.30 | 0.40 |
| 1.39 | 0.45 |
| 1.50 | 0.50 |
| 1.61 | 0.55 |
| 1.73 | 0.60 |
| 1.84 | 0.65 |
| 1.97 | 0.70 |

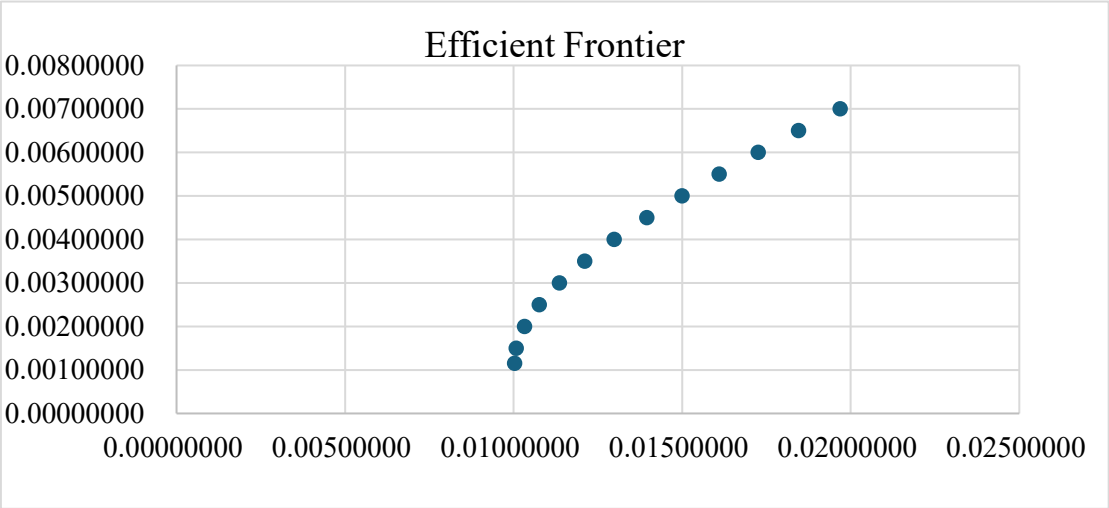



Figure 1: Efficient Frontier Chart.

This is a hyperbola where the horizontal axis represents risk and the vertical axis represents return. Points on the hyperbola represent frontier solutions, while points to the right of the hyperbola are non-frontier solutions. The upper right portion of the hyperbola is the efficient frontier. Points near MVP (0.01, 0.0012) represent risk aversion, while those further away represent risk preference. As seen from the graph, when E is 0.04, the return increases more rapidly while the risk increases less, thus E = 0.04 is selected.

Through calculation, the weights w for the first round are given in Table 6.

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Table 6: Weights win the First Round.

| w |
|---|
| 0.84 |
| 0.03 |
| 0.05 |
| 0.16 |
| -0.22 |
| 0.01 |
| -0.04 |
| 0.05 |
| 0.07 |
| 0.06 |

From the results, it is evident that the fifth stock (QCOM) and the seventh stock (AMZN) performed poorly, so these two stocks will not be included in the second round of calculations.

The second round of screening is as follows:

Since the fifth stock (QCOM) and the seventh stock (AMZN) are not invested in, their weights are set to zero. Based on the expected return rates of the remaining eight stocks, the values of A, B, C, D, and A/C are calculated and presented in Table 7.

Table 7: Values of A, B, C, D, and A/C in the Second Round.

| A | B | C | D | A/C |
|---|---|---|---|---|
| 10.73 | 0.12 | 9921.27 | 1039.03 | 0.0011 |

Based on the formulas, the values of g, h, and w are calculated and given in Table 8.

Table 8: Values of g, h, and w in the Second Round.

| g | h | w |
|---|---|---|
| 0.214 | 148.083 | 0.81 |
| 0.371 | -104.798 | -0.05 |
| 0.136 | -27.868 | 0.02 |
| 0.500 | -105.094 | 0.08 |
| 0 | 0 | 0 |
| -0.103 | 36.698 | 0.04 |
| 0 | 0 | 0 |
| -0.068 | 29.983 | 0.05 |
| -0.045 | 18.152 | 0.03 |
| -0.004 | 4.845 | 0.02 |

The results show that the second stock (SBUX) also performed poorly, so it will not be included in the third round of calculations.

The third round of screening is as follows:

Since the second stock (SBUX), the fifth stock (QCOM), and the seventh stock (AMZN) are not invested in, their weights are set to zero. Based on the expected return rates of the remaining seven stocks, the values of A, B, C, D, and A/C are calculated and presented in Table 9.

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Table 9: Values of A, B, C, D, and A/C in the Third Round.

| A | B | C | D | A/C |
|---|---|---|---|---|
| 14.33 | 0.10 | 8800.93 | 716.85 | 0.0016 |

Based on the formulas, the values of g, h, and w are calculated and given in Table 10.

Table 10: Values of g, h, and w in the Third Round.

| g | h | w |
|---|---|---|
| 0.30 | 123.98 | 0.79 |
| 0 | 0 | 0 |
| 0.20 | -46.34 | 0.02 |
| 0.81 | -191.64 | 0.04 |
| 0 | 0 | 0 |
| -0.17 | 56.91 | 0.05 |
| 0 | 0 | 0 |
| -0.11 | 40.81 | 0.06 |
| -0.05 | 18.84 | 0.03 |
| 0.02 | -2.55 | 0.01 |

The investment proportions for each stock are summarized in Table 11.

Table 11: Investment Proportions for Each Stock.

| Stock | AAPL | SBUX | MSFT | CSCO | QCOM | META | AMZN | TSLA | AMD | NFLX |
|---|---|---|---|---|---|---|---|---|---|---|
| Investment Proportion | 79.480% | 0 | 1.608% | 3.936% | 0 | 5.279% | 0 | 5.698% | 2.771% | 1.228% |

## 5. Discussion

Firstly, the selection of the ten stocks mentioned above as the research subjects was the result of a multi-factor consideration and filtering process. Given the numerous companies in the market, this study opted to select well-known enterprises as the initial sample to ensure both data representativeness and public attention, as well as to facilitate the applicability of subsequent analyses.

During the experimental design phase, a detailed screening process was implemented, removing stocks with poor performance, high volatility, or potential risks, leaving behind those with relative stability in the market. This process ensures the quality of the data and the reliability of the analysis results.

Since the popularity of stocks is not always directly related to their returns, a more scientific and efficient evaluation system was constructed after the preliminary screening of stocks, focusing on individual stocks more likely to produce meaningful conclusions. After further eliminating underperforming stocks, the remaining ten stocks were used for calculation and analysis.

Secondly, in exploring investment strategies, this study found significant differences between models that purely pursue return maximization and those that balance risk and return. These

DOI: 10.54254/2754-1169/117/20242087

differences are reflected in the rationality of investment decisions and directly impact the long-term stability of the investment portfolio.

Examining stock returns in isolation often neglects the crucial factor of risk. Investors might prefer stocks that perform well in the short term, ignoring the high risks associated with them. In contrast, the mean-variance model optimizes the portfolio by considering both the expected return and risk of assets, thereby effectively controlling risk while pursuing returns.

For example, the first stock (AAPL) has an expected return rate (3.66‰) that is noticeably lower than that of the eighth stock (TSLA) (7.84‰). However, since its risk (0.17‰) is significantly lower compared to the eighth stock (1.27‰), it receives a higher investment weight (79.480%) under the mean-variance model optimization, despite not having the highest expected return. This reflects the model's unique advantage in balancing risk and return.

Therefore, the difference between considering return alone and a comprehensive consideration of risk is that the latter can more thoroughly and scientifically assess the value of investment targets, achieving the best balance between risk and return when constructing an investment portfolio.

Finally, when discussing investment dimensions, this study uses six months of data for prediction. Short-term predictions often face cyclical issues because they effectively cover only the immediately following day or short period.

In multi-period prediction and optimization, although trading costs are a non-negligible negative factor, their relative impact is low in this study. This is because, with a higher set return level (0.4%), the trading costs associated with frequent transactions are relatively mitigated. Further analysis shows that an increase in the return level means a rise in potential risk. However, as trading costs are fixed and risk-free, the reduction due to these costs only affects the return level, while the risk level remains unchanged. This indicates that a higher return target can extend the effective prediction period, reducing constraints and negative impacts of non-ideal factors in multi-period prediction and optimization.

## 6. Conclusion

Based on the mean-variance model, this paper primarily discusses how to construct an appropriate stock investment portfolio model for risky markets. The problem is divided into two aspects: maximizing investment returns and controlling risk, with the aim of helping investors find a balance between expected returns and risk to achieve stable returns in the capital market.

Through the optimization of the mean-variance model, this paper identifies the seven optimal stocks from the "Stock Market: Historical Data of 10 Companies" dataset as Apple, Microsoft, Cisco Systems, Meta, Tesla, Advanced Micro Devices, and Netflix, with respective investment proportions of 79.480%, 1.608%, 3.936%, 5.279%, 5.698%, 2.771%, and 1.228%. Stocks such as Starbucks, Qualcomm, and Amazon.com are not recommended for investment due to their poor returns.

The limitations of this study mainly concern the cyclical issues that may arise from using a six-month dataset for predictions, which may not cover longer-term trends and changes. To address this issue, future research could implement multi-period forecasting strategies to optimize and maximize returns over a week or even longer periods.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20241987

# *Artificial Intelligence in Strategic Business Decisions: Enhancing Market Competitiveness*

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***Abstract:*** Integrating Artificial Intelligence (AI) into strategic decision-making is essential for enhancing market competitiveness in today's dynamic business environment. AI technologies such as machine learning, natural language processing (NLP), and predictive analytics optimize operations, personalize customer experiences, and drive product innovation. Machine learning algorithms analyze vast data to uncover patterns, aiding better decision-making. Predictive analytics forecasts market trends and consumer behaviors, allowing companies to anticipate demand and streamline supply chains, reducing risks like overproduction and stockouts. NLP-powered chatbots improve customer interactions by handling routine inquiries, freeing human agents for complex issues, and enabling personalized marketing. AI also accelerates product development by analyzing market data and consumer feedback, simulating scenarios, and predicting outcomes. Operational efficiency is enhanced through automation and optimized workflows, saving costs and increasing productivity. Despite these benefits, challenges such as data privacy, algorithmic bias, significant investment, and a shift to a data-driven culture must be managed. Effective AI integration offers significant competitive advantages, positioning companies to leverage predictive analytics, personalized customer interactions, and operational efficiency for growth and innovation.

***Keywords:*** Artificial Intelligence (AI), Strategic decision-making, Market competitiveness, Predictive analytics, Operational efficiency.

## 1. Introduction

In an era characterized by rapid technological advancements and intense market competition, businesses must continuously innovate to stay ahead. One of the most transformative technologies in this regard is Artificial Intelligence (AI). AI encompasses a range of technologies, including machine learning, natural language processing (NLP), and predictive analytics, each contributing uniquely to strategic decision-making[1]. By harnessing the power of AI, businesses can analyze vast amounts of data, uncover valuable insights, and make informed decisions that enhance operational efficiency, personalize customer experiences, and drive innovation. This paper explores the role of AI in strategic business decisions, highlighting its impact on market competitiveness, operational optimization, customer engagement, and product development. Additionally, it addresses the challenges and ethical considerations involved in integrating AI into business strategies. By examining these aspects, we

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DOI: 10.54254/2754-1169/117/20241987

aim to provide a comprehensive understanding of how AI can be effectively leveraged to achieve sustainable growth and competitive advantage in the modern business landscape.

## 2. The Role of AI in Strategic Business Decisions

### 2.1. Predictive Analytics and Market Forecasting

Predictive analytics, powered by AI, enables businesses to analyse vast amounts of data and generate insights that can forecast market trends and consumer behaviour. By leveraging historical data and real-time inputs, AI algorithms can predict future market movements, helping companies make informed decisions about product launches, marketing strategies, and resource allocation.

For instance, AI-driven predictive analytics can identify patterns in consumer purchasing behaviour, allowing businesses to anticipate demand and adjust their supply chains accordingly. This not only minimizes the risk of overproduction or stockouts but also enhances customer satisfaction by ensuring product availability.

### 2.2. Customer Relationship Management (CRM)

AI has revolutionized Customer Relationship Management (CRM) by enabling personalized interactions and improving customer service efficiency. AI-powered CRM systems can analyse customer data, such as purchase history, preferences, and feedback, to tailor marketing campaigns and provide personalized recommendations.

Moreover, AI chatbots and virtual assistants can handle routine customer inquiries, freeing up human agents to focus on more complex issues. This not only improves response times but also enhances the overall customer experience, fostering loyalty and retention.

### 2.3. Operational Efficiency

AI technologies can significantly improve operational efficiency by automating routine tasks and optimizing business processes[2]. For example, AI-driven automation can streamline supply chain management, from inventory tracking to logistics planning. Machine learning algorithms can also optimize production schedules, reducing downtime and increasing productivity.

In the financial sector, AI can automate risk assessment and fraud detection, improving accuracy and reducing operational costs. By automating these tasks, businesses can allocate resources more effectively and focus on strategic initiatives that drive growth.

## 3. Enhancing Market Competitiveness through AI

### 3.1. Innovation and Product Development

AI plays a crucial role in driving innovation and accelerating product development. By analysing market trends and customer feedback, AI can identify unmet needs and emerging opportunities. This allows businesses to develop innovative products and services that meet evolving consumer demands.

AI algorithms can sift through vast amounts of market data to detect emerging trends and consumer preferences. This proactive approach enables companies to stay ahead of the curve by anticipating market shifts and adjusting their product development strategies accordingly. For example, sentiment analysis on social media can reveal changing consumer attitudes and preferences, guiding the development of products that better meet current market demands.

AI can significantly enhance the product design process by simulating various scenarios and predicting potential outcomes. Machine learning models can analyse historical data and current trends to suggest optimal design features and functionalities. This iterative process helps in refining product

DOI: 10.54254/2754-1169/117/20241987

concepts and reducing the risk of failure[3]. For instance, in the automotive industry, AI can simulate crash scenarios to test the safety features of new vehicle designs, improving safety and performance before physical prototypes are built.

AI reduces the time and cost associated with traditional product development processes by optimizing testing and validation phases. AI-driven simulations can replicate real-world conditions to test product durability, usability, and performance, identifying potential issues early in the development cycle. This allows for quicker iterations and improvements, enabling faster time-to-market. Companies like IBM use AI to test software products, automating the detection of bugs and performance issues to ensure higher quality releases.

AI enables the development of personalized products by analysing individual customer preferences and behaviours. For example, in the fashion industry, AI can recommend personalized clothing designs based on customer data, leading to customized and unique product offerings. This level of personalization can enhance customer satisfaction and loyalty, providing a competitive edge in the market.

### 3.2. Marketing and Sales Optimization

AI-driven marketing strategies can enhance market competitiveness by targeting the right audience with personalized content. Machine learning algorithms can analyse consumer data to segment audiences based on their behaviour, preferences, and demographics. This enables businesses to deliver targeted marketing campaigns that resonate with specific customer segments.

Machine learning models can analyse vast datasets to identify distinct customer segments with similar behaviours and preferences. This allows marketers to tailor their campaigns to the specific needs and interests of each segment[4]. For instance, e-commerce platforms like Amazon use AI to segment their customers based on purchasing history, browsing behaviour, and demographic information, enabling highly targeted and effective marketing efforts.

AI enables the creation of personalized marketing campaigns by predicting which content will be most appealing to different customer segments. By analysing past interactions and preferences, AI can recommend personalized content, offers, and promotions. For example, Netflix uses AI to personalize its marketing emails, suggesting shows and movies based on individual viewing history, which significantly boosts engagement and retention rates.

AI can optimize pricing strategies by analysing real-time market conditions, competitor pricing, and consumer demand. Dynamic pricing algorithms adjust prices in real-time to maximize revenue and market share. For example, airlines and hotel chains use AI-driven dynamic pricing to adjust rates based on factors such as booking time, demand fluctuations, and competitor pricing, ensuring optimal pricing strategies that maximize profitability.

AI enhances sales forecasting accuracy by analysing historical sales data, market trends, and external factors. This enables businesses to make informed decisions about inventory management, sales targets, and resource allocation. Retailers like Walmart use AI to predict sales trends, ensuring they have the right products in stock and optimizing supply chain efficiency.

### 3.3. Data-Driven Decision Making

The ability to make data-driven decisions is a significant advantage in today's competitive market. AI provides businesses with actionable insights by processing and analysing large volumes of data. This enables executives to make informed strategic decisions based on accurate and timely information.

AI can analyze competitor strategies and market performance to identify areas for improvement and potential growth opportunities. By leveraging these insights, businesses can develop strategies that outpace competitors and capture market share. For instance, AI tools can monitor competitor

DOI: 10.54254/2754-1169/117/20241987

pricing, product launches, and marketing activities, providing valuable intelligence that informs strategic planning.

AI-driven insights help optimize operational efficiency by identifying bottlenecks and areas for improvement. Predictive maintenance, powered by AI, can forecast equipment failures before they occur, reducing downtime and maintenance costs. Manufacturers like GE use AI to monitor and predict machinery performance, ensuring optimal operation and reducing unexpected breakdowns.

AI provides deep insights into customer behaviour and preferences by analysing data from various sources, including social media, transaction history, and customer feedback. These insights enable businesses to tailor their products and services to better meet customer needs[5]. For example, Starbucks uses AI to analyse customer purchase data and tailor its menu offerings and promotions to local tastes and preferences, enhancing customer satisfaction and loyalty.

AI enhances risk management by identifying potential risks and suggesting mitigation strategies. Financial institutions use AI to detect fraudulent activities by analysing transaction patterns and flagging anomalies in real-time. This proactive approach to risk management protects businesses from potential losses and enhances security.

By integrating AI into their decision-making processes, businesses can harness the power of data to make strategic decisions that drive growth, improve efficiency, and enhance customer satisfaction. The continuous evolution of AI technologies promises even greater capabilities, offering businesses new opportunities to innovate and stay competitive in the dynamic market landscape.

## 3.4. Challenges and Considerations

### 3.4.1. Ethical and Legal Implications

AI offers many benefits but also raises ethical and legal issues. AI systems collect and analyse vast amounts of personal data, which can lead to privacy concerns. Companies must comply with regulations like GDPR and CCPA to protect user data. AI can perpetuate biases found in training data, leading to unfair outcomes. Measures should be taken to identify and mitigate these biases. AI decision-making processes can be opaque. Businesses should strive for transparency and provide clear explanations of AI-driven decisions[6]. Implementing robust data governance frameworks and adhering to regulatory requirements are crucial for responsible AI deployment.

### 3.4.2. Integration and Implementation

Integrating AI into existing business processes is challenging and requires substantial investment. Businesses need advanced computing resources and data storage solutions. Skilled professionals in data science and AI are essential. Companies should focus on recruiting and training employees. Effective change management is necessary to help employees adapt to AI-driven processes. Clear communication, training programs, and support systems are essential.

### 3.4.3. Continuous Learning and Adaptation

AI technology evolves rapidly, necessitating continuous learning and adaptation. AI models should be regularly updated to stay relevant with new data and changing market conditions. Businesses must stay informed about the latest AI advancements by engaging with industry research and trends. Companies should adopt agile strategies to quickly respond to technological changes and market dynamics, ensuring they maintain a competitive edge.

DOI: 10.54254/2754-1169/117/20241987

## 4. Case Studies: Netflix

Netflix exemplifies how AI can transform content delivery and viewer engagement, positioning itself as a leader in the streaming industry through innovative use of AI technologies.

### 4.1. Personalized Content Recommendations

Netflix's recommendation system is a hallmark of its user experience. The AI algorithms analyse extensive data on users' viewing habits, including what they watch, how long they watch, and their ratings. This data is used to build detailed user profiles and suggest shows and movies that align with their preferences. The personalized recommendations keep users engaged, leading to longer viewing times and increased subscription retention. The system also considers factors like the time of day and the device being used to tailor recommendations further.

### 4.2. Content Creation and Acquisition

Netflix uses AI not only to recommend content but also to guide its content creation and acquisition strategies. By analysing viewer data, Netflix can identify emerging trends and genres that are gaining popularity[7]. This data-driven approach allows Netflix to invest in original content that is likely to resonate with its audience. For example, the success of shows like "Stranger Things" and "The Crown" can be attributed to insights derived from AI analytics, which indicated a growing interest in science fiction and historical drama.

### 4.3. Optimizing Streaming Quality

Netflix employs AI to enhance the streaming experience by optimizing video quality. AI algorithms dynamically adjust the streaming bitrate based on the viewer's internet connection speed, ensuring minimal buffering and the best possible video quality. This adaptive streaming technology enhances user satisfaction by providing a smooth and uninterrupted viewing experience, regardless of varying network conditions.

### 4.4. Marketing and Customer Retention

Netflix leverages AI to optimize its marketing campaigns. By analysing user data, AI helps Netflix to segment its audience and target them with personalized email campaigns and notifications about new releases that match their interests. This targeted approach increases the effectiveness of marketing efforts and helps in retaining subscribers by keeping them engaged with content that interests them.

### 4.5. User Interface and Experience

The user interface (UI) of Netflix is another area where AI plays a significant role. AI algorithms personalize the UI for each user, highlighting shows and movies that are likely to attract their attention. The AI also organizes the content in a way that maximizes discoverability, ensuring that users can easily find new and relevant content.

### 4.6. Fraud Prevention and Account Security

Similar to Amazon, Netflix also uses AI to enhance security by detecting and preventing fraudulent activities. AI models monitor account activities for unusual behaviour that may indicate account hacking or sharing, ensuring that user data remains secure.

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By integrating AI across these domains, Netflix has not only enhanced the personalization and quality of its streaming service but also driven significant improvements in operational efficiency and customer retention. This strategic use of AI has allowed Netflix to dominate the streaming market and consistently deliver a compelling user experience that keeps its global audience engaged.

## 5. Future Prospects of AI in Strategic Business Decisions

### 5.1. Advanced AI Technologies

As AI technologies continue to advance, their applications in strategic business decisions will expand. For example, advancements in natural language processing and sentiment analysis will enable businesses to gain deeper insights into customer opinions and market trends. This will enhance the ability to make informed decisions and stay ahead of the competition.

### 5.2. AI and Human Collaboration

The future of AI in business will involve greater collaboration between AI and human decision-makers. AI will augment human capabilities by providing data-driven insights and automating routine tasks. This will allow executives to focus on strategic initiatives and creative problem-solving, enhancing overall business performance[7].

### 5.3. Industry-Specific AI Applications

AI applications will become increasingly tailored to specific industries. For instance, in healthcare, AI can assist in diagnostics and personalized treatment plans, while in manufacturing, AI can optimize production processes and predictive maintenance. Industry-specific AI solutions will provide businesses with targeted tools to address unique challenges and opportunities.

### 5.4. Ethical AI and Governance

The importance of ethical AI and governance will grow as AI becomes more integrated into business operations. Businesses will need to establish robust ethical guidelines and governance frameworks to ensure responsible AI use. This will involve addressing issues such as bias, transparency, and accountability to build trust with stakeholders.

## 6. Conclusion

Artificial Intelligence has the potential to revolutionize strategic business decisions, providing businesses with the tools to enhance market competitiveness. By leveraging AI technologies such as predictive analytics, personalized customer interactions, and operational optimization, businesses can achieve significant improvements in efficiency, innovation, and customer satisfaction.

However, the successful integration of AI requires addressing challenges related to ethical considerations, implementation, and continuous learning. By adopting a proactive and responsible approach to AI deployment, businesses can harness its full potential to gain a competitive edge in the market.

As AI technologies continue to evolve, their impact on strategic business decisions will expand, offering new opportunities for growth and innovation. Businesses that embrace AI and integrate it into their strategic planning will be well-positioned to thrive in the competitive landscape of the future.

DOI: 10.54254/2754-1169/117/20241987

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242077

# *The Current Situation of the Housing Market Bubble in China's First-tier Cities*

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***Abstract:*** With the progression of China's economy and urbanization, the real estate industry experienced rapid growth, accompanied by increasing speculative activities, which led to a continuous rise in housing prices and the formation of a bubble. Therefore, the focus of this study was the current state of China's real estate bubble and potential solutions. Given the issue of excessively high real estate prices, this study specifically examined the price trends and factors contributing to the real estate bubble in four Chinese cities: Beijing, Shanghai, Guangzhou, and Shenzhen. The research methodology was as follows: First, data on the price-to-income ratio was collected to analyze the current state of housing prices in China, revealing that housing prices were still far above their actual value and beyond a reasonable range, thereby indicating the severity of the real estate bubble in China. Second, by analyzing data and reviewing the literature, the factors contributing to China's real estate bubble were identified and categorized into two main groups: policy-related and economic. On the policy side, factors included policy reforms, monetary easing, and reductions in both the benchmark interest rate and the reserve requirement ratio. On the economic side, factors included the growth in per capita disposable income and speculative behavior. Finally, this paper analyzed how a property tax could curb speculative activities by increasing the cost of purchasing properties, thereby reducing demand and speculative behavior. The findings revealed that the real estate bubble in China's first-tier cities remained severe, and that a property tax could help curb speculative activities and slow the pace of bubble expansion.

***Keywords:*** Real estate, House market bubble, Inflation.

## 1. Introduction

A bubble generally refers to a situation where asset prices exceed their true value. The earliest recorded economic bubble was the 'Tulip Mania'. In the 17th century, tulips became highly popular among the Dutch [1]. However, as demand outstripped supply, tulip prices became exorbitant. Speculative activities further drove prices sharply upward, far beyond their actual value, forming a bubble. However, in 1637, when some began to realize that the prices had lost their meaning, people started to sell off their tulips at lower prices, causing market panic. Confidence plummeted, leading to mass sell-offs, which ultimately caused the market to collapse, with tulip prices plummeting as the bubble burst [2].

Similarly, speculative behavior led to the real estate bubble in Japan from the 1980s to the 1990s [3]. Rapid urbanization and increasing urban populations drove up housing demand. However,

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DOI: 10.54254/2754-1169/117/20242077

Japan's limited land area led people to believe that land prices would only rise. Consequently, large amounts of capital flowed into the housing market, causing housing prices to soar far above their actual value, resulting in a bubble. The government's implementation of financial liberalization and quantitative easing policies accelerated the bubble's inflation and eventual collapse [4].

Later, in 2001, the U.S. government implemented an expansionary monetary policy, cutting interest rates from 6% to 1% through multiple rate reductions to stimulate economic growth, which led to rising housing prices and the formation of a bubble [5]. Simultaneously, banks overestimated the liquidity of real estate collateral and underestimated the risks of subprime mortgages. From 2004 to 2006, the Federal Reserve began raising interest rates, gradually restoring the rate to 5.25% [6]. The higher interest rates made it difficult for many people to repay their mortgages, leading to increased foreclosures, property depreciation, and eventually, the bubble burst. The widespread mortgage defaults also caused bank failures, ultimately triggering a global financial crisis [7].

With the growth of China's economy and urbanization, the real estate industry rapidly grew, with speculative activities leading to continuous increases in housing prices and the formation of a bubble. According to data released by China Daily, in 2023, housing sales accounted for 24% of China's GDP. This revealed high housing demand and exorbitant housing prices, which most ordinary families could not afford. Even though housing prices have declined somewhat in recent years, the significant gap between income and housing prices has made homeownership unaffordable for many families.

This paper, focusing on the issue of excessively high real estate prices, studied the price changes in four Chinese cities: Beijing, Shanghai, Guangzhou, and Shenzhen, and the factors contributing to the real estate bubble. Furthermore, the paper analyzed the current state of the real estate market and explored ways to reduce housing prices to slow down the bubble's expansion. The paper aimed to better understand the current state of China's real estate market and explore methods to curb the bubble's growth.

## 2. Current State of Real Estate in First-Tier Cities in China

Figure 1 shows the changes in the price-to-income ratios in Beijing, Shanghai, Guangzhou, and Shenzhen from 2007 to 2016.

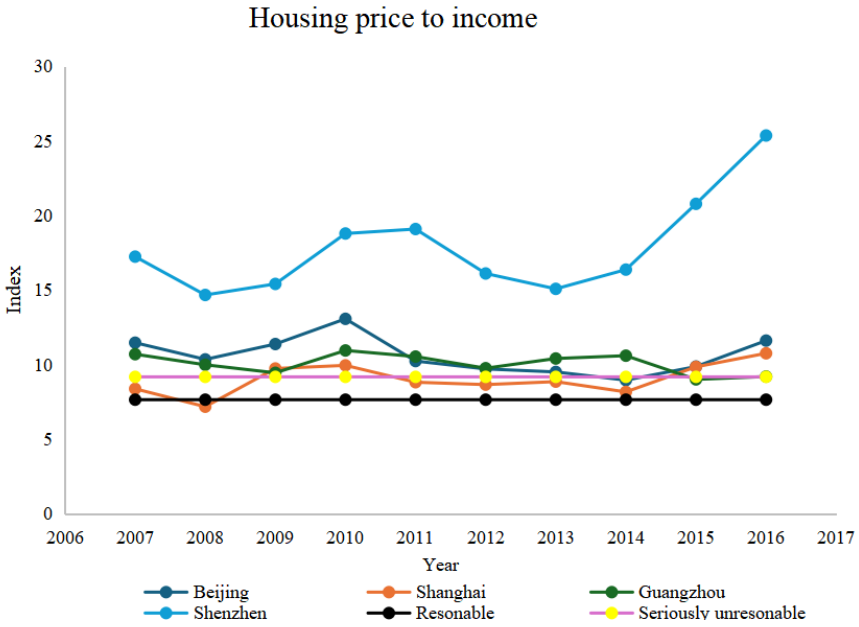



Figure 1: Price-to-Income Ratio in Beijing, Shanghai, Guangzhou, and Shenzhen

DOI: 10.54254/2754-1169/117/20242077

The data indicated that the price-to-income ratio in Shenzhen had the most significant increase, consistently exceeding that of Beijing, Shanghai, and Guangzhou since 2007. The price-to-income ratios in the four cities decreased from 2007 to 2008 but began rising again in 2009. With economic development, the ratio in Beijing, Shanghai, and Guangzhou fluctuated slightly from 2009 to 2016. However, Shenzhen's ratio surged significantly starting in 2013. By 2016, Shenzhen's price-to-income ratio reached 25.35, far surpassing the other three cities: Beijing and Shanghai stood at 11.6 and 10.75, respectively, with Guangzhou having the lowest at 9.19. Furthermore, data from the National Bureau of Statistics suggested that a price-to-income ratio below 7.64 is considered reasonable, while a ratio above 9.17 is deemed severely unreasonable. As shown in the figure, the price-to-income ratios in all four cities generally fell within the severely unreasonable range, with only Shanghai remaining in the moderately unreasonable range from 2011 to 2014, while Shenzhen exceeded the severely unreasonable standard by nearly three times in 2016. These data reflected the severe bubble conditions still present in China's real estate market.

## 3. Factors Contributing to the Real Estate Bubble in First-Tier Cities

Housing bubbles are typically caused by excessive demand and insufficient supply. The early stages of China's real estate bubble can be traced back to the 1980s. The contributing factors are as follows:

### 3.1. Government

Firstly, the formulation of government policies was closely tied to housing price fluctuations. The housing policy reforms marked the beginning of the rapid increase in housing prices. With the development of urbanization in China, the urban population gradually increased, thereby increasing the demand for housing. However, housing at that time was provided by the government and state-owned enterprises at extremely low prices, leaving little incentive for private enterprises to invest in the real estate sector, ultimately leading to a housing shortage. Thus, in 1988, the Chinese government implemented a series of housing reform policies, promoting real estate privatization to encourage the growth of the real estate industry. Consequently, China's housing sector shifted from a planned economy to a market economy, aiming to encourage more private home purchases and real estate investments. As most private enterprises aimed to maximize profits, they raised prices to achieve this, ultimately contributing to the real estate bubble. After implementing this policy, local government revenues declined significantly, with local fiscal revenue as a proportion of the national budget revenue dropping from 77.98% in 1993 to 44.3% in 1994 [8].

Secondly, to address the shortfall in fiscal revenue, local governments began selling land rights at high prices to generate income. More importantly, the scarcity of land resources and the monopolistic position of local governments further drove up housing prices. Local governments exacerbated the real estate bubble by selling land at high prices to increase fiscal revenue.

Thirdly, expansionary monetary policies also contributed to the rise in housing prices [9]. In response to the sharp decline in housing prices following the 2008 global financial crisis, the Chinese government injected 4 trillion yuan into the economy to prevent economic downturns and continued declines in housing prices. Subsequently, housing prices stopped falling and began to rise.

Finaly, to prevent economic decline and stimulate economic growth, the central bank repeatedly lowered base interest rates between 2008 and 2015 [10]. According to the data that from the National Bureau of Statistics, the base interest rate dropped from 4.14% to 1.50%. This measure reduced the cost of financing for enterprises and households, encouraging more investment by enterprises and home purchases by households, thereby driving up housing prices. The central bank also reduced the quantitative easing, allowing banks to lend more funds, increasing money supply in the market. Since the financial market was underdeveloped, real estate became the primary destination for capital

DOI: 10.54254/2754-1169/117/20242077

inflows. As a result, numerous amounts of capital flowed into the real estate market, rapidly driving up housing prices and exacerbating the real estate bubble.

### 3.2. Economy

First, increases in disposable income per capita and China's population growth contributed to the rise in housing prices [11-12]. As incomes increased, people's demand for housing also increased. Homeownership in China is largely associated with an individual's marital value and family formation. Traditionally, Chinese people consider owning a house a prerequisite for marriage, as it symbolizes certain assets and responsibilities, ensuring stability in married life. Additionally, in Chinese culture, a home symbolizes reunion and a sense of belonging [8]. According to data from the National Bureau of Statistics of China, in 2023, disposable income per capita grew by 6.3% compared to 2022, and China's population reached 1.4 billion in 2024. Therefore, more people would likely choose to buy houses, driving up housing prices. Secondly, compared to the stock market's uncertainties, real estate investment was considered a relatively safe and stable way for Chinese citizens to make money, driven by speculative activities [10]. Due to speculative activities, market demand drove prices higher, leading many to believe that real estate assets were highly valuable and appreciated quickly, with little risk of depreciation. As a result, many families chose to buy homes to increase their savings. This also led many businessmen to view real estate investment as a quick and profitable way to make money. Consequently, more businessmen engaged in speculative activities, purchasing homes and trading them repeatedly to earn the price difference. Ultimately, this led to a rapid rise in housing prices and the formation of a bubble.

## 4. The Impact of Property Tax on Curbing Speculative Home Purchases

The occurrence and subsequent bursting of real estate bubbles have had negative impacts on a nation's economic development and social stability. In China, current property prices have significantly exceeded their intrinsic value. Therefore, implementing appropriate measures has not only been critical for economic development but also for ensuring sustainable development and maintaining social order.

The introduction of a property tax has been identified as a potential method to curb speculative home purchases. China's existing tax system has levied property taxes since 1986; however, non-commercial residential properties were exempted, which limited the effectiveness of this policy in deterring speculative activities. As the economy developed, speculative behavior intensified, driving property prices far beyond their real value and making homeownership unaffordable for many households. In response, on January 28, 2011, China introduced a new property tax in Shanghai, extending the tax to non-commercial residential properties. The tax targeted homes purchased after the implementation date by both residents and non-residents. According to a statement from China Daily, the initial tax rate was calculated at 70% of the transaction price of the property [5]. This policy increased the cost of homeownership for families and raised the cost of speculative activities, as property purchases became taxable. Consequently, the higher the property value, the more tax was required, which significantly reduced demand for homes and speculative buying, particularly in first-tier cities where property prices were already high. The decrease in demand subsequently led to a decline in prices, thus mitigating the expansion of the bubble. Empirical evidence demonstrated that property taxes effectively suppressed speculative home purchases [13]. Following this, China began to implement property taxes on a broader scale nationwide, further curbing speculative activities and slowing the expansion of the real estate bubble.

DOI: 10.54254/2754-1169/117/20242077

## 5. Conclusion

This study found that the real estate bubble in China's first-tier cities remains significant. It also identified the factors that contributed to rising housing prices in China. By analyzing the price-to-income ratios in Beijing, Shanghai, Guangzhou, and Shenzhen, it was observed that all four cities had ratios far above reasonable levels, particularly Shenzhen, where the ratio significantly exceeded those of the other three cities. This finding underscored the severity of the real estate bubble in China. The study categorized the factors contributing to the bubble into two main groups: policy-related and economic. Policy-related factors included government housing reforms, monetary easing policies, and reductions in both the benchmark interest rate and the reserve requirement ratio. These policies collectively fueled the increase in housing prices. Additionally, local governments further exacerbated the bubble by selling land-use rights at high prices to offset fiscal deficits, which drove up land and housing prices. On the economic side, factors such as the growth in per capita disposable income and speculative behavior played crucial roles. As the income levels of Chinese residents increased, coupled with the traditional importance placed on homeownership, the demand for housing rose, leading to higher prices. Moreover, real estate speculation, viewed as a relatively stable investment, intensified, further inflating the bubble. Given the potential negative impacts of a large and bursting real estate bubble on China's economic and social environment, this study also analyzed how a property tax could mitigate speculative buying behavior. The findings suggested that a property tax could effectively curb speculative activities by increasing the cost of purchasing homes, which could reduce the demand and slow the expansion of the bubble.

This research contributed to raising awareness about the extent to which real estate prices in China have exceeded their actual value and sheds light on the underlying factors driving such high prices. It also provides a foundation for people to implement more targeted methods to curb the expansion of the bubble. However, the also included certain limitations. It focused solely on first-tier cities in China, which might not fully reflect the nationwide real estate market. Additionally, the study did not sufficiently consider the impact of global economic fluctuations on China's real estate market. Future research could broaden the scope to include a wider range of cities and further explore the long-term effects of global economic conditions on China's real estate bubble, providing policymakers with more comprehensive insights for decision-making.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20241996

# *The Impact of the Digital Economy on China's Economic Development*

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***Abstract:*** This paper explores the impact of the digital economy on China's economic development. The digital economy, as a new form of the economy following the agricultural and industrial economies, centres on data resources and modern information networks, driving the digital transformation of all factors of production. The Chinese government places great importance on the development of the digital economy, clarifying its direction and key tasks through policy documents such as the "14th Five-Year Plan for Digital Economic Development". This paper analyses the current state of development of the digital economy in e-commerce, digital payments, and big data applications, and discusses its impact on industrial structure, employment, and consumption patterns. The study shows that the digital economy has promoted the upgrading of traditional industries and the growth of emerging industries, while also bringing about changes in employment structure and innovation in consumption methods. However, it also poses challenges to the job market, which need to be addressed through skills training and educational reform.

***Keywords:*** Digital Economy, China, Economic development.

## 1. Introduction

The digital economy is a concept within the field of economics. "Father of the Digital Economy" Tapscoot first proposed the definition and scope of the digital economy in 1996, and since then, more scholars have added their unique insights, expanding the definition of the digital economy into a broader field. On January 12, 2022, the State Council issued the "14th Five-Year Plan for Digital Economic Development" policy document to guide the development of the digital economy by all regions and departments during the "14th Five-Year Plan" period. This is the first time that the concept of the digital economy has been defined in a national-level document in China. The digital economy is a new economic form following the agricultural and industrial economies, with data resources as the key elements and modern information networks as the main carriers. It promotes fair and efficient unity through the integrated application of information and communication technology and the digital transformation of all factors of production. The digital economy is a new economic form that uses big data for optimal resource allocation, improving production efficiency, and promoting economic development [1]. The rise of the digital economy is mainly attributed to the vigorous development of digital technology. In recent years, technologies such as blockchain, the Internet of Things, and big data have entered our lives, promoting industrial transformation and

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DOI: 10.54254/2754-1169/117/20241996

gradually becoming the dominant concept in industrial development.This paper will analyse the current state of development of the digital economy in e-commerce, digital payments, and big data applications, and discuss its impact on industrial structure, employment, and consumption patterns. This paper can provide some reference for researchers studying the digital economy in the post-epidemic era.

## 2. The Current State of Digital Economy Development in China

It can be seen from Figure 1 that before the 2008 economic crisis, the scale of China's digital economy development was small, accounting for a low proportion of Gross Development of Product (GDP), and was in the primary stage of digital economy development. However, with technological innovation, the scale of the digital economy has gradually expanded. In 2011, the output value increased to 95 trillion yuan, and the proportion of GDP increased from 15.2% to 20.3%. In 2016, the scale of the digital economy broke through 200 trillion yuan, and the proportion exceeded 30%. To date, the scale of the digital economy continues to grow, and the proportion also gradually increases.

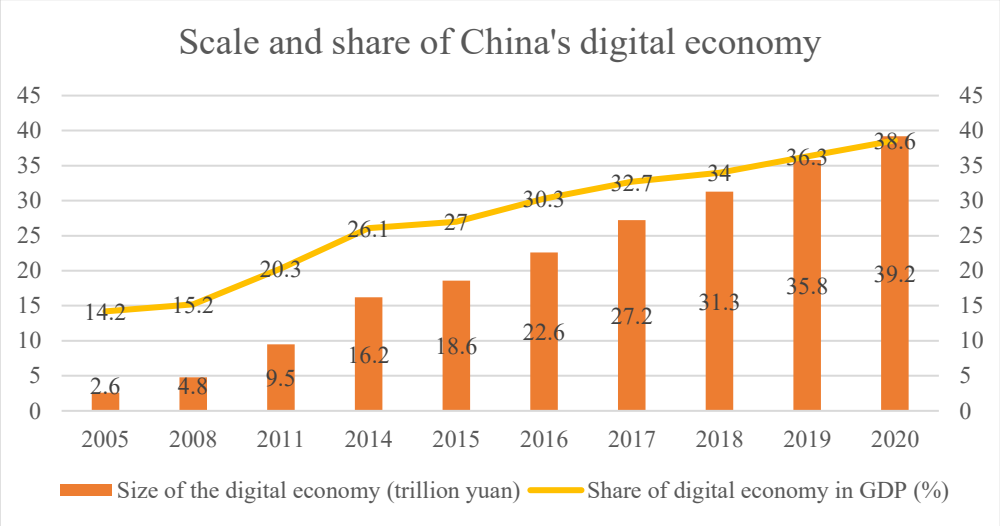



Figure 1: Scale and share of China's digital economy

### 2.1. E-commerce

In the post-epidemic era, the development of e-commerce has ushered in many major changes. Due to the non-circulation of personnel in different regions during the pandemic, emerging industries such as community group buying and online shopping have developed. These emerging industries will continue their influence in the post-pandemic era, injecting more fresh blood into e-commerce.

#### 2.1.1. Rising Consumer Confidence

In the post-pandemic era, the pandemic prevention and control measures of various countries have matured, and the economy, after a significant blow, has gradually entered the recovery stage. Consumer confidence in the market has also gradually increased. Chinese consumers are the most optimistic about economic recovery globally, stabilizing at around 50%, while the United States is at 22%, Australia at -4%, and Italy, the United Kingdom, and Japan are even more pessimistic [2]. Therefore, in China, consumers are more confident that the economy can recover quickly, and they are more willing to spend more money on e-commerce, helping e-commerce to recover.

DOI: 10.54254/2754-1169/117/20241996

#### 2.1.2. Mature E-commerce Infrastructure

Compared to other countries in the world, China started the development of e-commerce earlier, and years of experience have made China a leader in the trend of e-commerce, with a more mature e-commerce infrastructure [3]. The supporting e-commerce facilities and consumer willingness to shop online have helped the development of e-commerce in the post-pandemic era. Compared with the previous small commodity economy, now more luxury brands have also started online sales. LV Group took the lead in opening online virtual sales, by opening live broadcast rooms, one-on-one connection with consumers for exclusive remote sales, without the need for consumers to go to offline stores in person. Relying on high-speed networks and precise equipment, it can restore the most real shopping experience for consumers. At the same time, consumers can also obtain a richer consumption experience through e-commerce, and more and more people choose e-commerce.

#### 2.1.3. Booming O2O Services

During the pandemic, the emerging community group buying and Online To Offline (O2O) grocery retailers seized the surging consumer demand and vigorously expanded their business territory. Hema Xiansheng, Meituan Group Purchase and other grocery retailers have become leaders in community group buying during the pandemic. They have used the digital economy to master the omni-channel business model, efficiently connecting businesses with consumers, breaking the barriers between online and offline, using a complete supply chain and digital application infrastructure, providing consumers with lower prices and more convenient services [4]. Now more group buying leaders and platforms are emerging, allowing both businesses and consumers to benefit more, and also accelerating the development of e-commerce.

### 2.2. Digital Payments

#### 2.2.1. Introduction of Regulatory Policies

The People's Bank of China and other regulatory authorities adhere to the concept of "payments for the people", maintaining a consistent normalisation of strict supervision, vigorously carrying out work to prevent and resolve major financial risks, adhering to both "standardised development and encouraging innovation", and introducing a series of regulatory policies to promote the high-quality development of digital payment services [5]. In March 2024, the General Office of the State Council issued the "General Office of the State Council on Further Optimizing Payment Services", proposing tasks such as improving the card acceptance environment, optimizing the cash usage environment, and enhancing the convenience of mobile payments. On May 1, 2024, the "Supervision and Administration Regulations of Non-Bank Payment Institutions" came into effect, clarifying the access conditions, business rules, risk management, user rights protection, and penalties for non-compliant behaviour of payment institutions. On July 16, 2021, the central bank issued the "White Paper on the Research Progress of China's Digital Currency", clearly defining the digital yuan, design principles, operation system, technical route selection, regulatory framework, and possible impacts and response strategies to the whole country and the world.

#### 2.2.2. Rapid Development of Cross-Border Payments

Cross-border e-commerce is an emerging trade situation in the digital economy era. Trading entities can conduct online transactions and deliver goods in a contactless manner. Cross-border e-commerce has become a new business form and model for foreign trade. Third-party payment institutions focus on the payment and collection of cross-border e-commerce and B2B foreign trade

DOI: 10.54254/2754-1169/117/20241996

merchants, as well as digital pain points, to deeply empower them [6]. With the development of cross-border e-commerce, China has introduced relevant favourable policies, including reducing import tariffs and granting tax incentives. The development of digital trade has entered a golden stage. In order to improve import and export international trade, China has vigorously regulated cross-border payment risks and actively built a national service trade innovation development demonstration zone, creating a digital trade demonstration zone to promote the development and improvement of cross-border payments.

## 3. The Impact of the Digital Economy on China's Economic Development

China's digital economy has developed rapidly. With the continuous advancement of a new round of technological revolution and industrial upgrading, the digital economy has become one of the fastest-growing, most widely radiating, and most deeply influential economic forms, and is one of the core growth poles of the national economy.

China's industrial digital transformation has accelerated, and the development speed of the digital economy has been further improved. Overall, the penetration rate of the digital economy in China's three industries has increased year by year. The primary industry increased from 6.2% in 2016 to 8.9% in 2020, the secondary industry increased from 16.8% in 2016 to 21.0% in 2020, and the tertiary industry increased from 29.6% in 2016 to 40.7% in 2020 [7]. The development of the tertiary industry has been rapid, while there is still a lot of room for improvement in the digitalisation of the primary and secondary industries.

### 3.1. Impact on Industrial Structure Development

#### 3.1.1. Traditional Industries

Traditional industries mainly refer to labour-intensive industries, mainly manufacturing and processing industries. Traditional industries are more susceptible to the impact of the digital economy. With a little integration, the original traditional industries can greatly improve efficiency and reduce costs. There are a large number of simple and repetitive positions in the traditional primary and secondary industries. The digital economy penetrates and integrates into the primary and secondary industries through point-to-face and point-to-face integration, increasing dataisation and networking to varying degrees in production, distribution, exchange, and consumption, thereby reducing the communication and exchange costs in production and sales, and ultimately promoting the overall technological progress of the primary and secondary industry systems and achieving deep integration with the digital economy [8]. For example, the introduction of industrial robots can achieve semi-automation of production lines, reduce labour consumption, make the production process more efficient and environmentally friendly, reduce resource consumption, and achieve green production.

At the same time, the digital economy can also promote the integration of traditional industries. Digitalisation makes information transparent and more accessible. Different industries can obtain information from other industries and use it for their own purposes, which also promotes the integration and innovation between different industries. For example, financial technology combines the financial industry with information technology, allowing Internet technology and cloud computing technology to enter the financial services industry, helping traditional financial industries to use tools more conveniently and accurately to analyse customer returns and markets.

DOI: 10.54254/2754-1169/117/20241996

#### 3.1.2. Emerging Industries

Emerging industries are industries that have emerged with factors such as technological progress, changes in market demand, and policy orientation. These industries are often more dependent on emerging technologies, have high growth potential and innovation, and common emerging industries include big data, artificial intelligence, new energy, and digital creative industries, etc.

Traditional industries mainly rely on physical resources and labour, while emerging industries rely more on technological innovation and data assets. The digital economy just provides a lot of room for innovation and business opportunities for emerging industries. AI technology can help doctors quickly analyse medical images in the medical field, improving the efficiency and accuracy of diagnosis. At the same time, the digital economy helps gather talent and promotes knowledge innovation. For example, Silicon Valley, as a global technology innovation centre, gathers talent to make the primary contribution in industries such as the Internet, software, and semiconductors.

### 3.2. Impact on Employment

The digital economy is a double-edged sword. It can not only provide more employment opportunities for people, but also use digital technology to replace most repetitive and simple positions, leading to a certain degree of unemployment.

The rise of the digital economy has brought about the transformation of traditional industries. Many new positions have been added to traditional industries with emerging technologies, such as the development of Internet finance bringing an increase in positions in financial technology, and big data technology has also promoted the increase of positions such as data analysts and data mining engineers. People have more employment opportunities.

However, the rise of emerging industries also means the decline of old industries. Many repetitive and single-piece work on the assembly line has now been replaced by automation and digitisation, leading to a large number of factory workers losing their jobs. Intelligent customer service has led to the unemployment of traditional customer service personnel.

So the development of the digital economy has brought about both unemployment and employment at the same time. Unemployed people need to accept new skills training, move towards emerging industries, achieve redeployment, adapt to the development of the digital economy, and meet the challenges of the digital economy era.

### 3.3. Impact on Consumption

The digital economy has brought a brand new form of consumption, providing consumers with a more convenient and personalised consumption experience.

The development of e-commerce has promoted consumers' desire to consume. Unlike offline shopping, online shopping does not require consumers to go out of the house, saving transportation costs, parking fees, etc. It can let consumers enjoy a shopping experience almost the same as offline shopping. Because of the control of the epidemic, people will try to keep a safe distance from others in the post-epidemic era to reduce the risk of contact infection; at the same time, they continue the habit of online shopping during the epidemic, and more mature group purchases, online shopping and other technologies have promoted consumption growth.

As people reduced the opportunity for offline transactions during the epidemic, digital payments were promoted and popularised, and digital currency has also become a novel payment method. Consumers can use digital currency for online shopping transactions, making transactions more convenient and secure. Compared with traditional currency, digital currency has the characteristics of cross-border payment, real-time settlement, low cost, etc., which has a positive effect on promoting consumption [9].

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## 4. Conclusion

This paper comprehensively analyzes the multi-dimensional impact of the digital economy on China's economic development in the post-pandemic era. Firstly, the rapid development of the digital economy is due to national policy promotion and technological innovation, especially in the fields of e-commerce, digital payments, and big data applications. Secondly, the impact of the digital economy on the industrial structure is manifested in the digital transformation of traditional industries and the cultivation of emerging industries, promoting industrial upgrading and economic growth. In terms of employment, the digital economy has created new job opportunities while also having a substitution effect on the low-skill labour market, requiring the workforce to upgrade and transform skills. In terms of consumption patterns, the digital economy has brought a more convenient and personalised consumption experience, promoting consumption growth. This paper has not yet delved into the future of the digital economy. Due to the ever-changing nature of digital technology, it is difficult to predict the future prospects of China's digital economy, and more professional forecasting methods are needed to explore the future of China's digital economy.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242031

# *Research on the Impact of Artificial Intelligence Applications on the Workflow of Advertising Agencies*

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***Abstract:*** At present, AI has gradually penetrated various industries, but there is little application in the advertising industry. This study aims to understand how the introduction of AI will affect advertising agencies' workflows and develop strategies for practical AI applications. Before this, much research has also discussed the impact of AI on marketing, but rarely from the perspective of the workflow of advertising agencies. This study analyzes the advertising agencies' workflows and how they will change after the introduction of AI by using a literature review approach. A review and summary of many current studies culminates in the impact of AI on workflows and recommended strategies. The results show that AI affects workflows in four areas: market research, creative attributes, creative production, and intelligent advertising. The study recommends that advertising agencies prioritize experimenting with AI in both market research and the discovery of creative attributes.

***Keywords:*** Artificial intelligence, Advertising agencies, Advertising strategy, Market research, Creative attributes.

## 1. Introduction

Artificial intelligence (AI) has brought disruptive innovation to various industries, reshaping traditional workflows. Many companies are seeing improved convenience and increased revenue due to the application of AI. However, in the advertising industry, AI has not been genuinely involved in the workflow. Many advertising agencies are still searching for opportunities and strategies to look forward to the vast changes and benefits that AI will bring. There is a lot of research that combines AI technology and marketing methods, but there is less research from the perspective of advertising agencies. Advertising agencies cover a range of service processes, from customer service to media delivery and evaluation, and mere opinions on marketing methods cannot comprehensively address the industry's future development [1]. In order to analyze the impact of artificial intelligence on the workflow of advertising companies, this study reviews critical literature. It takes an in-depth look at advertising agency workflows and AI applications in light of current industry conditions. First, Mishra and Tripathi mentioned in their study that the rapid development of artificial intelligence today has transformed many industry workflows and business models [2]. However, Qin & Jiang conducted an extensive literature review with China as the background and found that the application of AI in the advertising agency process is still in the conceptual and explanatory stages [3]. Due to the gap between it and other mainstream industries, this study examines the workflow of the advertising industry. Second, current practice shows that AI can overcome some human limitations

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DOI: 10.54254/2754-1169/117/20242031

in computationally intensive intelligence and even creativity, thus opening up new areas of application for education and marketing, healthcare, finance, and manufacturing, with implications for productivity and performance [4]. Therefore, exploring the application and impact of AI in advertising agencies is a crucial topic. Lastly, integrating AI into advertising agencies' routine work necessitates comprehensive strategic planning to align the new approach with clients' long-term needs.

## 2. Literature Review

### 2.1. Workflow of Advertising Agency

Figure 2.1 shows a typical process for an advertising agency as proposed by Nicholson[5]. Starting from this series of steps, this study explores the application of artificial intelligence in the field of advertising and then analyzes which stages of work will be affected by the application of artificial intelligence. By listing the process of the advertising agency in Figure 2.1, the impact of AI applications can be more directly mapped to the various stages of work.

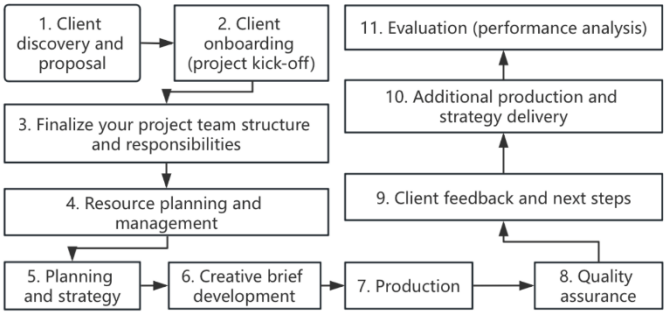



Figure 1: 11-Step advertising agency workflow process [5].

### 2.2. The Application Prospect of AI in Advertising Agencies

Putri et al. studied dance kreatif (an advertising agency in Indonesia), introduced AI to a range of the company's work, and measured the impact on the effectiveness of its advertising and financial returns [6]. The comprehensive evaluation shows that market research, creative, and production departments will become the leading application directions of AI technology for advertising companies. Firstly, AI for market research is an intelligent, extensive data taxonomy that can determine the appropriate marketing approach in different situations [7]. At the same time, their research also suggests the advantages of marketing automation in helping to understand potential customers. Secondly, Phay refers to advertising companies' AI integration. On the one hand, it has the ability to screen and analyze data points more quickly, primarily for the purpose of predicting the most influential creative points in advertising through big data [8]. On the other hand, the utilization of AI has the potential to produce innovative advertising. Thirdly, Gotab-Andrzejak mentions that artificial intelligence-generated advertising content has also been the subject of research [9]. He primarily focuses on generative AI-based tools and has developed a production model that involves conception, drafting, iteration, and testing. The study shows that the application of AI in advertising production has practical implications. Despite the lack of direct AI introduction by advertdvertising agencies, their production departments use AI-capable photo or video editing software, such as Canva. Haleem et al.'s study also mentions several applications, including predicting consumer trends, providing ideas, and generating marketing content [10]. However, it is worth noting that the study also points to AI support for programmatic advertising. This refers to the automated nature of ads, which constantly utilize machine learning to bid for space that is accessible to target audiences. Bir & Aksu pointed

DOI: 10.54254/2754-1169/117/20242031

out that intelligent advertising is the next stage of programmatic advertising [11]. As a result, people may think that programmatic advertising is the trial operation stage of AI, but intelligent advertising is entirely dependent on AI.

## 2.3. The Impact of AI on Advertising Agencies

### 2.3.1. Market Research

The study by Brand et al. on the use of GPT in market research can give a specific perspective on the impact of AI on market research [12]. First, AI provides accurate market data, and the data in the experiment shows agreement with mainstream economic theory. Second, GPT can provide a forecast of future commodity demand, which can also assist advertising agencies with strategic planning and the choice of media. In addition, Brand et al. 's research also shows that AI other than GPT can bring additional benefits to market research. Paliwal and Chatradhi's research shows that understanding the way AI is reshaping the market research industry can promote the adoption of AI for customer insights, allowing market researchers to not only do their jobs faster but also improve accuracy [13].

### 2.3.2. Predict the Optimal Creative Attributes

Ameen et al. 's research shows that there are three possible ways for AI technology to create ideas [14]. Firstly, it can merge with some well-known concepts to form innovative combinations. Secondly, AI can expand the conceptual space. Third, AI can also create ideas that are currently impossible to achieve. Through the analysis of art data sets, Cetinic and She also put forward that AI technology has a particular potential for understanding and creating art, but there is no specific analysis for specific AI operations [15].

### 2.3.3. Produce Advertising Material

Anantrasirichai and Bull's research focuses on how current AI technology excels at image creation by automatically creating new digital images based on specific data sets [16]. Second, AI also assists with sound design, which is beneficial for digital media advertising. Applications of AI include searching large databases to identify the most suitable music or rhythm for the creation of specialized music formats. Finally, the text integration technology of natural language processing (NLP) is a standard copywriting tool, a widely used computing technology that can help advertising agencies write copywriting and other work. However, the authors note that current AI technology can indeed make work more efficient, but it also needs to work with humans.

### 2.3.4. Intelligent Advertising

Yang et al. presented the AiAds system, a Baidu-developed system that leverages machine learning technology for advertising automation and intelligence [17]. Specifically, it optimizes some advertising workflows by designing and implementing automated bidding strategies as well as targeting and creating models.

## 3. Discussion

## 3.1. The Impact of Artificial Intelligence Applications in Advertising Agencies on Workflow

Firstly, this study posits that AI can significantly impact step eight of quality assurance due to its robust ability to read current market data and its remarkable accuracy in predicting future trends, surpassing human estimation. This finding is consistent with Pavl, D. [18]. Because of the accurate

DOI: 10.54254/2754-1169/117/20242031

market analysis, the final advertising effect will be significantly improved. Secondly, artificial intelligence's prediction of creative attributes can improve the workflow of advertising agencies, especially in the fifth step of planning and strategy and the sixth step of creative needs development. This improvement stems from the need to organize strategies and plans based on creative attributes and propose creative needs development based on these identified attributes. Thirdly, the replacement of specific job responsibilities by AI will also impact the third step, which involves finalizing the structure and responsibilities of the project team. The production of text, music, and images can directly simplify step seven. However, this study argues that it is not feasible to reduce human resources significantly in the workflow. Ultimately, artificial intelligence-driven intelligent advertising development streamlines the advertising process into an automated one. AI alters the third step of the workflow to determine the structure and responsibilities of the project team, as AI tools can perform specific job duties. Additionally, AI-led projects will need to explicitly analyze whether this change has a positive or negative impact on the Step 11 assessment (performance analysis). Figure 2 shows that seven steps are the simplified workflow presented after AI technology enters the advertising agency process through analysis in this study. Note that this is only a scenario and is not a fixed workflow.

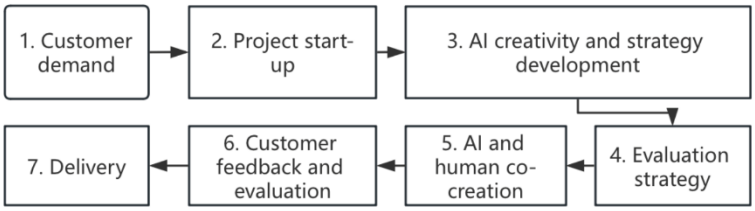



Figure 2: The workflow of advertising agencies after the introduction of AI.

### 3.2. Strategy for Advertising Agencies Using AI

The above considerations allow advertising agencies to introduce AI and its effect on workflow. This study proposes strategies for the current phase by assessing the changes brought about by this disruptive innovation and integrating the more immediate positive effects. The positive impact that AI can bring at this stage points to the introduction of AI in market research and creative attribute forecasting. This is because large amounts of data show that AI is able to integrate and update large amounts of information faster than humans. In addition, although many existing studies show that AI applications are promising in creative production and intelligent advertising, the current technology may require a significant investment, and the effect has yet to be measured. This study also takes into account that for the creative creation using AI and artificial co-creation mode, the ability of AI technology for artistic creation needs to be improved at this stage, and the specific mode makes it difficult to create personalized advertising products that meet the individual needs of customers.

## 4. Conclusion

In conclusion, first of all, the workflow of advertising agencies and viable AI applications. Many studies in the field of advertising propose that the workflow of advertising agencies is roughly 11 steps, as shown in Figure 2.1. This series of processes typically include client output, agency planning based on market research, idea generation, and final evaluation. At present, many studies believe that artificial intelligence has application prospects in four aspects: market research, creative attribute exploration, creative production, and intelligent advertising. Second, the impact of artificial intelligence on the workflow of advertising companies. In general, the application of AI will change

DOI: 10.54254/2754-1169/117/20242031

the resource allocation and personnel structure of projects. The workflow thus is greatly simplified and summed up in seven steps. From customer needs and project initiation to AI creative and strategic development, as well as evaluating strategies, AI and human co-creation, to final customer feedback and evaluation, and delivery. Third, the strategy of advertising agencies to use AI. Through a series of surveys, this study found that it is reasonable for advertising agencies to prioritize AI in market research and exploring creative attributes at this stage. In the production phase, we also need to supplement subjective creativity. Finally, this study provides general guidance and suggestions for the advertising agency industry. Its limitation is that it has not been studied for specific advertising agencies and may not apply to specific workflows of some companies, so additional market research and technical testing for the development and application of each company is required. In addition, as the current stage is the era of rapid development of digital marketing platforms and artificial intelligence and various electronic marketing platforms and new technical means are emerging in an endless stream, this study is time-sensitive, and future research may need to update the scientific and technological background and continuous research.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242039

# *The Study on the Impact of the New Third-board Firms Transfer Listing on Financial Flexibility*

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***Abstract:*** The transfer and listing of enterprises on the New Third-board is one of the specific reform policies in the capital market in China. As the third-board enterprises are small and medium-sized as well as start-ups, they have a greater need for money, and the policy of restricting their issuance and listing has seriously constrained the financing channels of these enterprises. After the reform, third-board enterprises can apply for transferring to the board for listing after one year of listing and meeting the requirements of the exchange, and do not need to be approved by the China Securities Regulatory Commission. This study wants to use a comprehensive index to examine the financial results of this behavior. Financial flexibility is an important indicator to measure the ability of enterprises to raise funds, and it is appropriate to use it to test the comprehensive effect of the behavior of enterprises. This study selects a sample of 127 firms around 2022 and conducts a difference-in-difference model on their transfer to public listing, obtains the conclusion that transferring to public listing reduces the financial flexibility of firms in the short term, and analyzes the attribution of this result from a theoretical point of view. Finally, this study gives some suggestions for firms that engage in such listing behavior to improve their financial robustness.

***Keywords:*** New Third-board, List, Transfer, Financial Flexibility.

## 1. Introduction

China's New Third-board market originated from the old Third-board, the "Equity Transfer System", which initially served the transfer of securities of de-listed companies, and in 2006, the board began to take over the trading of shares of unlisted companies, bringing transparency and liquidity to the shares of these relatively small enterprises.

Transfer listing refers to the act of a company transferring its shares for issuance to the stock exchange after satisfying the listing requirements of the exchange. Since stock listings face scrutiny and constraints from multiple parties, such as regulators and exchanges, the issuance and transfer of a company's stock to the stock exchange was not an easy task in the past, especially in China, where financial policies are relatively robust.

The transfer listing policy discussed in this study refers to an announcement by the Shanghai Stock Exchange in February 2021 on the administrative measures for transferring the Third-board to the Second-board [1] after the CSRC issued a guideline on transferring listings [2]. Following the release of this policy, the BSE issued a similar announcement on the transfer of listings [3]. This announcement stated that companies that have been continuously listed on the New Third-board for

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DOI: 10.54254/2754-1169/117/20242039

more than one year and have met other requirements such as the number of shareholders and the number of shares can apply for listing on the exchange's the Second-board. Since this action does not involve the issuance of new shares, no registration process is required.

This policy will theoretically be more favorable for both financing and development of enterprises. Trading in a more liquid market facilitates firms' access to relatively more stable external financing at lower costs. Nevertheless, this study wants to verify empirically whether firms that choose to implement this strategy actually derive these benefits from it. In order to use a single indicator to measure the combined changes suffered by the sample firms, this paper has chosen to measure the indicator of financial flexibility. The financial flexibility indicator selected in this paper is obtained by compounding the cash, leverage, and external financing factors as defined in [4], and the definition and calculation of the variables are described in detail in the next chapter.

Some studies have also tested the results from both theoretical and empirical perspectives regarding how the transfer of listings on the Third-board will specifically affect firms. While transferring listings is an attempt to transition from the approval system to the registration system, implying a move towards a freer and more liquid market, the current market mechanism may magnify the loopholes of the registration system [5]. Insufficient reforms and still facing constraints in transferring listings is also a potential problem [6,7]. Empirical studies, on the other hand, show that firms transfer listing may have improved financing ability [8] and efficiency [9], but there may also be some negative effects [10].

This study will use data from firms that engage in the act of switching boards for listing around 2022 to test the impact of this strategy on the financial flexibility of firms using a double difference model, with a view to evaluating this behavior empirically. The findings of this study can provide references and suggestions for policymakers, market investors, and potential listed firms, and provide examples for further optimization of relevant market policies in the future.

## 2. Methodology

### 2.1. Model Construction

In this study, the enterprises transferring from The New Third-board to The Second-board during 2019 to 2022 are taken as the experimental group, and the enterprises without transferring are taken as the control group. The DID method is used to study the role of enterprises' transferring on the financial flexibility, and the following DID model is constructed by taking the enterprises without transferring on The Third-board as the control group:

$$FF_{i,t} = \alpha_0 + \alpha_1 Treat_i \times Time_t + \alpha_2 Treat_i + \alpha_3 Time_t + \alpha_4 Control_{i,t} + u_{i,t} \quad (1)$$

In the above model, $FF_{i,t}$ is an explanatory variable indicating the indicator of firm financial resilience of firm i in year t, $Treat_i$ is a treatment group dummy variable, and $Time_t$ is a treatment effect period dummy variable, the definitions of which are specified in the next section. $Treat_i \times Time_t$ is the DID interaction variable used to estimate the effect of transferring, and $Control_{i,t}$ are control variables. Subscripts i and t stand for firm-specific and year-specific, respectively. $u_{i,t}$ is the random error term. $\alpha_1$ is the estimated coefficient of greatest interest here, and its economic implication in this model is the effect of transferring on the financial flexibility of each firm.

### 2.2. Data Descriptions and Variable Definitions

This study selects the New Third-board enterprises that transferred listing and the New Third-board that did not transfer listing in China from 2019 to 2022, excludes the enterprises in the financial industry as well as the samples with missing and abnormal financial data, and some of the missing

DOI: 10.54254/2754-1169/117/20242039

data are supplemented by manual collection. The data were obtained from CSMAR database, and the main data processing and analyzing software was Stata 17.

The explanatory variable of this study, financial flexibility, is a composite indicator that is calculated from the financial data of several firms. There are multiple ways to measure financial flexibility in different empirical studies, and both highly composite indicators and relatively simple measures exist [11,12]. As mentioned earlier, this paper mainly refers to the composite method used in Wang Li's article.

In this measure, the financial flexibility FF will be compounded by six variables from three indicators. These three indicators are the cash indicator, the leverage indicator, and the external financing cost indicator. The cash indicator consists of three variables, which are cash holdings, ROA (which represents cash generating capacity) and earnings per share. The leverage indicator includes two variables, which are unused debt raising ability and cash-to-debt ratio. Here, the unused debt raising ability is calculated in this study using the formula 1 - asset-liability ratio to simplify the operation. The external financing cost indicator is measured using the Z-value, where the larger the Z-value, the better the financial soundness of the firm. The Z-value is calculated by the formula Z=1.2X1+1.4X2+ 3.3X3+0.6X4+X5, where: X1=working capital/asset; X2= retained earnings/asset; X3 = EBITDA/asset; X 4 = market value of stock/liability; and X5 = revenue/asset.

Explained variables compounded by multiple indicators may have serious multicollinearity, so this paper uses principal component analysis (PCA) for dimensionality reduction. PCA is a statistical analysis method that transforms the original multiple variables containing repetitive information into a smaller number of composite indicators through linear transformation. Use Stata 17 for analysis to perform the following operations:

(1) Perform the Bartlett test, the result is p=0, there is a significant correlation between variables, suitable for analysis.

(2) Factor analysis was performed using the PCA command, and a total of two factors were extracted with a cumulative variance contribution of 47% and 74%, respectively.

(3) Use the predict command to calculate the principal component scores$F_1$and$F_2$, and calculate the composite score FF according to Equation below, which serves as a proxy for the firm's financial flexibility.

$$FF = (0.4718 \times F_1 + 0.2701 \times F_2)/0.7420 \quad (2)$$

The explanatory variable in this study is a DID variable to refer to the behavior of transferring to the Second-board in the companies. It is represented in the model by Treat×Time. Where Treat represents whether or not a company has made a transfer, and the value of Treat is 1 for firms that were transferred and 0 for those that are not; time is a time variable, and this value is 0 until a firm makes a switchboard listing and 1 for those that are not; therefore, the value of Treat×Time is 1 only after a firm that has finished transferring.

Since the explanatory variable of this paper, financial flexibility FF, is already a highly composite indicator, the logarithm of equity capital, stock, and asset-liability ratio, Lev, are selected as control variables.

Table 1: Variable Definition

| | Variable name | Symbol | Description |
|---|---|---|---|
| Explained variable | Financial flexibility | FF | Combined indicator |
| Explanatory variable | DID variables | Treat | Whether transferred company |
| | | Time | Whether after transferred |

DOI: 10.54254/2754-1169/117/20242039

Table 1: (continued).

| | | | |
|---|---|---|---|
| | | Treat x Time | |
| Control variable | Equity capital | Stock | ln (equity capital) |
| | Asset-liability ratio | Lev | Liability/Asset |

## 2.3. Results

In this study, regression analysis of panel data is conducted using DID model to validate the model 2. The regression results are shown in Table 2.

Table 2: Results

| Variable | FF (1) | FF (2) | FF (3) |
|---|---|---|---|
| Treat×time | -0.745** (0.351) | -0.554** (0.238) | -0.625** (0.294) |
| Treat | 0.851*** (0.248) | 0.312*** (0.189) | |
| Time | -0.603*** (0.139) | -0.735*** (0 .097) | |
| Stock | | 0.095*** (0 .062) | 0.511 (0.634) |
| Lev | | -4.569*** (0.266) | -1.338 (1.347) |
| Constant | 2.84*** (0.098) | 6.327*** (1.212) | -7.757 (12.191) |
| R-squared | 0.148 | 0.612 | 0.904 |

Note: ***, **, * represent coefficients that are significant at 1%, 5% and 10% significance levels, respectively.

The first column of Table 2 reports the variable names, and column FF (1) reports the OLS parameter estimates of model (1) without controlling other variables. It can be seen that the coefficient of the Treat×Time term is -0.745 and is significant at the 5% level, i.e., the transferring behavior reduces the financial flexibility of the firms by 0.745. Considering that the regression model in the column FF (1) may suffer from the problem of omitted variable bias, this paper introduces the logarithm of equity capital stock and the gearing ratio Lev as control variables.

Column FF (2) reports the re-estimated parameters of model (1) controlling for the above variables. It can be seen that, at this time, the coefficient of Treat×Time term is -0.554 and is significant at the 5% level, reflecting that the switching behavior of the New Third-board firms makes the financial flexibility of enterprises decrease by 0.554, and the coefficient decreases compared with that of the regression without control variables, indicating that the control variables have an optimizing effect on the model; as for the control variables, the coefficient of logarithm of equity capital (stock) term is 0.095, significant at the 1% level, indicating that for every 1% increase in equity capital, the financial flexibility of the enterprise increases by 0.095; the coefficient of the term of gearing ratio (Lev) is -4.569, significant at the 1% level, indicating that for every 1% increase in gearing ratio, the financial flexibility of the enterprise decreases by 4.569.

Column FF (3) reports the replacement of the Treat and Time terms with individual fixed effects and time fixed effects, at which point the coefficient of the Treat×Time term is -0.625 and is

DOI: 10.54254/2754-1169/117/20242039

significant at the 5% level, showing that the transferring behavior of these firms reduces the financial flexibility of the firms by 0.625. The regression results in this column can indicate that the findings of the present study are somewhat robust.

### 2.4. Discussion

The empirical study finds that a firm's transferring listing operation reduces the firm's financial flexibility in the following short term. In order to analyze this result, this study starts from the metrics of financial flexibility in this model. According to the definition of financial flexibility, there is a positive correlation between financial flexibility and cash indicators, and a negative correlation with leverage indicators and external financing cost indicators. After transferring, enterprises tend to expand their business scale and increase their balance sheet in order to expand their business to a larger market in the future. Financing and investing in plant, office space and equipment is a quicker thing to do, while the actual increase in production and sales and reflecting them in profits will take some time, which will lead to a decrease in the enterprise's cash indicator. On the other hand, after the transfer of enterprises to the board has gained a higher degree of attention, which is conducive to the enterprises to carry out financing, the enterprises will increase their own bank loans or the issuance of corporate bonds, which will lead to an increase in the leverage ratio of the enterprises. In addition, the incomplete reform of the approval system to the registration system mentioned in the previous article will systematically restrict the vitality brought to enterprises by the listing operation of the transfer board. Incomplete reforms may expose enterprises to additional regulatory pressures when submitting applications for transferring, and these regulatory pressures force enterprises to spend more resources on responding to the regulators, which may be reflected in the remuneration paid to financial, legal and consulting institutes, as well as some adjustments that have to be made to the accounting books.

## 3. Conclusion

In this study, 127 firms are selected to construct a quasi-natural experiment, and the DID method is applied to investigate the role of whether to transfer boards on the financial flexibility of listed firms from 2019 to 2022, respectively. Through the study, it is found that the transferring operation of the New Third-board listed firms will reduce the financial flexibility of firms in the following short-term time. And this trend is influenced by the firm's own equity capital and the firm's gearing ratio. The study shows that the reason for the decrease in financial flexibility of firms after transferring is, on the one hand, that firms use the cash they hold for expanding the scale of production; on the other hand, enterprises utilize their unused debt-lifting capacity to increase their liabilities and improve their debt leverage.

There are some degrees of shortcomings in this study. The first is due to the fact that this study only intercepts the data of the transferring firms between 2019 and 2022, and there is insufficient research on its long-term development. The long-term impact of the transfer plate on the financial flexibility of firms needs the data of subsequent years as a supportive study. Secondly, this study only collected the data of firms transferring to the Second Board, and does not intercept the data of enterprises transferring out to the Main Board. Whether the difference between different levels of market has an impact on the financial flexibility of enterprises is not discussed in this study.

Based on the research in this paper, the following suggestions are made:

First, improvement of the market registration system reform would be important. China is about to implement the registration system reform in all capital markets, and should improve the construction of supporting facilities in the market from all aspects, including improving the information disclosure requirements of listed companies, improving the audit and registration

DOI: 10.54254/2754-1169/117/20242039

procedures, and strengthening the supervision and enforcement as well as investor protection. Thorough reforms will bring the capital market into full play more effectively.

Second, firms should do a good job of capital management and maintain a moderate degree of financial flexibility. Enterprises can start from the following aspects to maintain financial flexibility: formulating a flexible financial budget, maintaining a flexible capital structure, flexible investment planning, and flexible profit distribution. Enterprise financial planning cannot be completely accurate, to retain adjustable margins can be avoided to make the enterprise into a financial crisis.

Third, individual investors and institutional investors should strengthen the supervision of enterprise financial risk and improve the internal and external risk supervision mechanisms. The interaction of multiple participants can better help the development of the enterprise.

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Proceedings of the 3rd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/117/20242030

# *Application of In-Feed Advertisements on Social Media*

## *- Taking RED as an Example*

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***Abstract:*** As a new type of advertisement supported by Big Data Calculus, in-feed advertisement is sought after by a wide range of brand merchants. The article introduces two basic advertising of feed: basic orientation and behavioral orientation. Basic orientation categorizes users based on region, age, gender, and login device, while behavioral orientation tags users based on their searches, comments, likes, and deeper engagement with bloggers. This article studied in-feed advertisements and their impact on the process of the RED platform, from clicking on the homepage to completing the advertisement push. Besides, the advantages of the long exposure time of traffic on the RED platform were listed, as well as the importance of search behavior and high-quality content for the platform, and there were also suggestions for search engine optimization (SEO). Finally, it is concluded that in-feed advertising can achieve precise advertising placement and brand promotion by leveraging the basic and behavioral characteristics data of each user on RED, creating many classic successful cases.

***Keywords:*** in-feed advertisements, social media, RED operation, new media marketing.

## 1. Introduction

In the context of the rapid development of big data computing, its optimal application in product promotion has become a key focus for major brands. Therefore, in-feed advertising was born. The combination of digital media platforms and in-feed advertising has gradually become a new type of promotion method. Unlike Instagram or Twitter, which can only share life experiences, and unlike Amazon or eBay, which can only sell products, RED stands out. It is not only a social media platform, but also provides e-commerce services, which greatly increases the entertaining features of RED. Meanwhile, RED is the largest platform for sharing lifestyle content among young people in China, and has now developed into an important platform to support new consumption and brands. Many articles focus on big data policies and applications such as transportation, healthcare, or food [1]. At the same time, many scholars have discussed the marketing strategies of social platforms such as Instagram or Twitter regarding their impact on their lives in the field of new media. When it comes to operational methods, many articles have studied the operation and marketing methods of social media, and some have studied the marketing methods of RED, but there is no mention of in-feed advertisement. Therefore, this article studies the impact of in-feed advertisement on RED. The article analyzes the application of in-feed advertisement in RED, which the usage of basic orientation and

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DOI: 10.54254/2754-1169/117/20242030

behavioral orientation to target users and disseminate products precisely. Besides, search engine optimization (SEO) strategies and the process of dissemination traffic on RED are recorded, helping brands in promotion.

## 2. The Concept of In-Feed Advertisement

In-feed advertisement refers to the personalized push of a large amount of user information collected and analyzed by various platforms and the backend searches for similar user characteristics and preferences based on calculations [2]. It mainly achieves marketing goals by inserting advertising content when users browse social media and read information. Compared to traditional banner advertisements and pop-up advertisements, in-feed advertisements focus more on the user's reading experience and enhance their interest. The feed embedded in social media is its main form [3].

### 2.1. Basic Orientation

Basic orientation refers to targeting based on the basic attributes of the audience, usually targeting a more targeted audience, suitable for brand penetration, product awareness, etc. There are 4 categories: regional orientation, age orientation, gender orientation, and device orientation. Regional orientation represents the precise positioning of products and services by enterprises based on population structure, consumption habits, and consumption ability in different regions, and the development of marketing strategies targeting their target markets. Location Based Services (LBS) is a basic service that provides information to devices by using mobile Internet and location services. In general, social media platforms use LBS to locate users and prioritize nearby posts to help businesses directly reach potential customers and improve promotion effectiveness. At present, the location, offline movement trajectory, and network behavior are the ways in which programmatic purchasing platforms locate users [4]. Age and gender orientation are preliminary advertising recommendations based on the characteristics and preferences of users' age groups and genders, respectively. Device orientation stands for the precise advertising placement based on the target audience of the device, such as different prices and functions. Table 1 below displays four types of basic orientation.

Table 1: Four types of basic orientation.

| Orientation | Content |
|---|---|
| Regional | Includes regional orientation and Location Based Services |
| Age | Positioning based on the age of the audience |
| Gender | Positioning based on gender |
| Device | Differentiating based on different devices and demographics |

### 2.2. Behavioral Orientation

Behavioral orientation refers to the use of big data to target user behavior, which is more precise and suitable for product sales. Behavioral orientation can usually be divided into the following three categories, search, interactive and turn-back orientation respectively.

Search orientation refers to the use of keywords searched by users and intent tags for targeting, more accurate visitors are captured. For example, Google and Baidu are typical search engines where people usually use them to hunt for basic knowledge they do not understand. Interactive orientation,

DOI: 10.54254/2754-1169/117/20242030

one of the orientations, targets specific groups of people through user interactions such as likes, shares, and comments on social media platforms. For instance, Wuling Hongguang Mini became popular due to the makeover made by the RED blogger, with 1.35 million views and 28000 favorites and likes [5]. Therefore, these people who like and bookmark will become the target of the next related car product advertising promotion. Turn back orientation is a targeted advertising strategy that involves following the blogger's channel.

## 3. The Marketing Strategies of RED

RED is a social platform for contemporary young people to share information including recommended items, travel guides, and beauty and fashion. It is also a very useful community e-commerce platform that can help consumers find their desired products through blogger recommendations. By 2024, RED already has over 80 million users and monthly active users (MAU) exceeding 300 million. The first and second tier cities account for 50% of the total users [6].

### 3.1. Long Term Traffic Push

For those businesses that want to promote their products in the long term, RED would be a good choice. The following chart shows the compares the likes of RED and article views of WeChat. It can be concluded that WeChat content only received significant traffic on the day of its release, and the promotion almost ended on the seventh day. In contrast, for RED, there is second traffic wave after a week and more exposure in second and third week. Even after one month, RED still receives traffic from 5 to 150 units of traffic [6].

### 3.2. Search Methods and Search Engine Optimization Suggestions

RED is a social platform with a high proportion of searches. There are two main ways for users RED obtain information: passive browsing (homepage feed push based on the "guess what you like" recommendation mechanism), and active search. Due to the "recommendation" attribute of RED, users need to find products of interest on this platform for evaluation, so the search function is very important. In order for the notes to appear at the top of the search results for relevant keywords, it is necessary to use the idea of SEO. The basic function of SEO is crawling, indexing, sorting, measuring importance, and searching make website rating and ranking data and design more optimized [7]. Here are some reference methods for optimization. Firstly, publishers can add core keywords in the title, first paragraph, and last paragraph of their notes, so that users can point out the topic in the first place. Next, spaces or separators can be used in the title to highlight key points, and publishers need to place core keywords as early and straightforward as possible. Besides, it is a good choice to ensure that the original content ratio takes more than 80%. Finally, adding hashtag topics containing core keywords at the end of the notes can also increase page views.

### 3.3. Creating High-quality Content, Rather Than Winning with Quantity

The content of RED is not as timely as that of TikTok. High quality content is continuously recommended for a long time, so it is very important to create high-quality content. For example, those long-lasting and valuable topics such as beauty tutorials, skincare tutorials, and skill learning, high-quality content will significantly increase traffic. In addition, online experimental research on Chinese consumers has shown that native advertising in soft articles has a stronger ability to induce users to purchase [8]. As a result, promoting products from the perspective of customers may be a more effective method.

DOI: 10.54254/2754-1169/117/20242030

### 3.4. Traffic Dissemination Process in In-Feed Advertisement and Its effect

When a new user registers on RED, the platform will automatically show a pop-up window with complete information. By checking the user's gender, age, and various interest areas, a preliminary understanding of the user will be obtained, and a large amount of relevant content will be pushed for selection. Unlike Instagram or Twitter, which can only be viewed on a single page, RED recommends 2 to 4 contents that users may be interested in based on the size of their device screen. This allows users to directly create character portraits through their clicks. In addition, when users search, follow, like, or comment, they trigger behavioral orientation, and the RED platform will recommend relevant products for them. Figure 1 illustrates the traffic dissemination process.

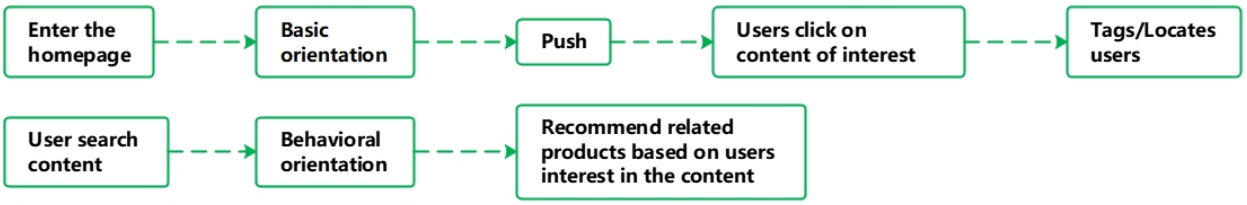



Figure 1: Traffic dissemination process.

Due to the strong promotional power of the RED platform, collaborating with the platform has become a choice for many businesses. As a mid-range beauty brand in China, Perfect Diary is one of the beneficiaries. The RED platform utilizes influencers' promotion and advertising cooperation to easily achieve huge commercial benefits for this beauty brand during the "Double Eleven" shopping festival [5]. The target audience by in-feed advertisements is an important reason for its success. Many studies have shown that social interaction between consumers is more effective for brand promotion compared to direct advertising [9]. The sense of brand identity will be enhanced in user communication, so embedding in-feed advertisements on social media like RED can more effectively engage a large number of potential consumers. The long tail theory suggests that even for non-mainstream products with low demand, as long as they are provided with convenient and smooth channels and have sufficient potential consumers, the sales of this product should not be under-estimated [10]. Thus, by using advertising promotion reasonably to increase potential customers, non-mainstream products can also achieve hot sales.

## 4. Conclusion

The development of big data has enabled digital media platforms to incorporate in-feed advertising technology. The article analyzes the definitions and functions of in-feed advertisement. There are two types of advertising methods, basic orientation and behavioral orientation respectively, which the former one can be divided into regional, age, gender and device orientation. Behavioral orientation is the mechanism that run through users' searches, comments, likes, and deeper engagement with bloggers. Moreover, the importance of search and its keyword improvement methods are mentioned. Last, the article elaborates the advertising process. It concludes that RED is a high-quality in-feed advertisement platform suitable for long-term use. The limitation of the article is lack of data analysis, models, user tracking, and further analysis on the impact of in-feed advertisement on social media. In the future, researchers can conduct exclusive interviews with some major bloggers or track their behavior changes for a long time to provide deeper suggestions for social media as a sales platform for promotion.

DOI: 10.54254/2754-1169/117/20242030

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