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Research on the Innovation Strategy of Ctrip Based on the Application of AI

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Abstract. With the rapid development of AI technology, Ctrip, China's leading online travel service provider, is innovating its business model through AI technology to enhance user experience and market competitiveness. The purpose of this paper is to explore how Ctrip uses AI technology to achieve innovation in three key areas, namely, creating an intelligent travel assistant (Ctrip Ask), a reliable answer bank for the travel industry (Content List), and a sustainable development model for the travel industry (ESG Hotel), and to analyse the far-reaching impacts of these innovative strategies on the development of the travel industry and society. The results of the study show that Ctrip's AI-based innovation strategy not only improves user satisfaction and loyalty, but also provides a useful reference for the digital transformation of the entire travel industry, demonstrating its foresight and practical ability in upgrading the intelligence of the travel industry, and promoting the sustainable development and upgrading of the company's business.

Keywords: Generative AI; Content List; ESG.

1. Introduction

With the rapid development of AI technology, its application in various industries is becoming more and more extensive, especially in the tourism industry, the introduction of AI technology is gradually changing the traditional tourism service mode. Ctrip, as China's leading online travel service provider, has made a number of innovative attempts to use AI technology to improve user experience and optimise service processes, and the application of AI technology has not only brought new impetus to Ctrip's business growth, but also provided new ideas for the digital transformation of the entire travel industry.

This study focuses on the innovation strategy of Ctrip based on AI. Through an in-depth analysis of how Ctrip integrates AI technology into its business processes, this study aims to explore the specific applications and effects of AI technology in improving the quality of travel services, enhancing user experience, and optimising operational efficiency. The study will focus on analysing the application of generative AI in Ctrip, Ctrip's AI-based ESG hotel standard innovation, Ctrip's development issues under the AI framework, and AI-based Ctrip's future development strategy. The significance of the study is to provide enterprises in the tourism industry with a case study of innovation using AI technology, to help them better understand how AI technology can help their business development, as well as to provide academics with in-depth research on the application of AI in the tourism industry.

This study will adopt the case study method, combining qualitative and quantitative analyses. By collecting Ctrip's publicly available business data, user feedback, and industry reports, a comprehensive analysis of Ctrip's AI application strategy will be conducted. First, the research background and research questions are introduced to provide readers with a macro perspective of the study; second, the current status of the application of AI technology in the tourism industry is reviewed to provide a theoretical foundation for the study; then, Ctrip's AI application strategy is elaborated and its effects are analysed; then, Ctrip's development issues and future development strategies under the AI framework are introduced; finally, the research findings are summarised and conclusions and recommendations are presented.

2. Literature Review

2.1. Introduction to Ctrip

Ctrip is China's leading online travel service company, founded in 1999 and headquartered in Shanghai, China. As a full-service travel platform, Ctrip provides over 300 million members with a wide range of services, including hotel booking, flight booking, holiday travel and business travel management. Ctrip has China's leading hotel booking service centre, with more than 1.2 million bookable hotels and over 3,000 suppliers in 200 countries and regions around the world. Ctrip also provides air ticket booking and domestic train services. Ctrip's air ticket agents cover almost all domestic airlines and major international airlines, with more than 500 cooperating airlines and over 3,400 airports in more than 220 countries and regions around the world, and as of September 2023, Ctrip's Zhixing Train Tickets have 17 million MAUs [1]. In addition, Ctrip has opened up the entire ecological chain from financial service providers, car manufacturers to car rental suppliers to users.

Ctrip's history is also quite iconic, having been listed on the NASDAQ in 2003, making it the highest-growing stock on the opening day of the NASDAQ market in three years at the time. In addition, Ctrip has launched a number of innovative services, such as Ctrip Advisor, a personal travel sharing economy service based on the "B2C2C" model, and Ctrip Gift Cards, which are designed to provide a more personalised and convenient travel experience. Ctrip's business continues to expand and innovate, and it is committed to improving the quality and efficiency of travel services through technology, providing consumers with more abundant and convenient travel choices [2].

2.2. Ctrip's Market Positioning Analysis

Ctrip is positioned as a "global one-stop travel service" and is committed to providing users with a full range of travel services. Ctrip started by combining online services with offline investments and acquisitions to focus on hotels and hostels, and is now positioning itself as a "high-quality + globalisation" company that mainly serves mid-to-high-end customers, with its outbound travel business becoming its core strength. In addition, Ctrip is also laying out in the sinking market, supplementing its traffic flow with offline light-asset hostels. Through mergers and acquisitions and other means, it has achieved strong control over its supply chain, providing a comprehensive product matrix covering all aspects from pre-trip booking to post-trip sharing. Ctrip segments the market into different target customer groups based on users' travel needs, spending habits, age and other factors. Specifically, Ctrip mainly targets the following groups of customers: firstly, young user groups, who pursue fresh, exciting and personalised travel experiences; secondly, business travel user groups, who focus on comfortable, convenient and efficient travel experiences; and thirdly, middle-aged and old-aged user groups, who pay more attention to the cost-effectiveness and comfort of travel products. In order to better meet the needs of these different customer groups, Ctrip has launched customised products and services for different customer groups. For example, Ctrip has launched creative and unique travel products such as "Free Tours" and "Theme Tours" for young users, and "Business Tours" and "High-end Tours" for business travellers. "For middle-aged and old-aged users, Ctrip's Old Friends Club, a brand that offers exclusive travel products and prices, is available at multiple entrances on Ctrip's homepage, such as the Special Offer Zone, where users can complete age verification and book the Old Friends Club. Users can complete age verification to book "Old Friends Club" exclusive products or enter "Old Friends Group" to enjoy 1V1 customer service [3].

2.3. The Use of AI in Consumer Markets

Artificial intelligence technology is profoundly changing the landscape of the travel consumer market. It can not only provide travellers with personalised travel recommendations and itinerary planning by analysing their historical search, purchase behaviour and social media data, but also provide in-depth understanding and accurate prediction of travellers' preferences and needs, so as to enhance user experience [4]. At the same time, AI technology can also help travel agencies and hotels and other organisations to carry out accurate market positioning and advertising, and adjust marketing strategies

in real time to enhance market competitiveness. In terms of tourism safety, the application of AI enables tourist attractions to monitor the safety of tourists in real time through intelligent security monitoring systems, and to detect and respond to abnormal behaviours in a timely manner. In addition, AI intelligent customer service, with its efficient and accurate service capability, not only improves service quality, but also reduces the burden of manual customer service. Combined with Virtual Reality (VR) and Augmented Reality (AR) technologies, AI brings travellers an unprecedented immersive tourism experience [5]. What's more, AI technology can also reveal market trends by analysing tourism data, help companies optimise their products and services, improve customer satisfaction, and play a role in destination management and resource planning to promote the sustainable development of the tourism industry [4].

3. An Analysis of the Application of Generative Artificial Intelligence in Ctrip

3.1. Ctrip Ask

Using Generative Artificial Intelligence technology, Ctrip launched the vertical model "Ctrip Ask" after screening 20 billion high-quality unstructured travel data, combining Ctrip's existing accurate structured real-time data with Ctrip's historically trained bots and search algorithms, and training a self-developed vertical model. The model is able to intelligently identify user questions and provide accurate, personalised answers to help users solve their travel queries. With the help of Ctrip Ask, Ctrip has doubled its customer service self-service rate in 3 areas, including online self-service response rate in more than 20 languages, email self-service response rate, and telephone voice self-service resolution rate. Currently, the assistance of Ctrip Ask can save Ctrip customer service more than 10,000 hours of working time per day, which is equivalent to freeing more than 1,000 customer service manpower per day [6]. According to the financial report issued by Ctrip on 30 April 2024, the annual net operating income of 44.51 billion yuan, an increase of 122% year-on-year, net profit of 10 billion yuan, an increase of 614% year-on-year, the gross profit of 36.389 billion yuan in 2023, with a gross profit margin of 82% as shown in Table 1 [7].

Table 1. Ctrip Financial Results for 31 December 2023

Year ended 31 December						
	2019	2020	2021	2022	2023	
	RMB	RMB	RMB	RMB	RMB	USD
(In millions, except for stock and per share data)						
Selected consolidated income statement data						
Net income	35,666	18,316	20,023	20,039	44,510	6,269
Business costs	7,372	4,031	4,598	4,513	8,121	1,144
Gross profit	28,198	14,285	15,425	15,526	36,389	5,125
Business expense						
Product Development	10,670	7,667	8,992	8,341	12,120	1,707
Sales and Marketing	9,295	4,405	4,922	4,250	9,202	1,296
General and administrative	3,289	3,636	2,922	2,847	3,743	527
Total operating expenses	23,254	15,708	16,836	15,438	25,065	3,530
Business profit/(Deficit)	5,040	1,423	1,411	88	11,324	1,595
Net interest income/ (Expenditures)and Other operating income/ (Expenditures)	4,047	198	840	2,547	644	91

3.2. Content List

Ctrip's content list creation process is a complex process based on big data and AI technology, aiming to provide users with high-quality, personalised travel recommendations. Ctrip has a huge amount of travel-related data, including user search history, browsing behaviour, purchase records, reviews and ratings. These data are first collected and processed through cleansing and integration for subsequent analysis and mining. Based on the processed data, Ctrip will use AI technology to build user profiles. These profiles include the user's interest preferences, travel habits, budget range, etc., providing the basis for subsequent personalised recommendations [8].

Through the application of AI in the content list, Ctrip has created a "reliable answer bank" in the travel industry by combining huge data computing and manual verification, covering more than 3,000 destinations around the world, including 45 commonly used topics, and recommending dimensions covering destinations, itineraries, hotels, flights, attractions, and other aspects. Each list undergoes an average of 5 million data operations to ensure that it provides the most accurate and valuable information [6]. This data helps Ctrip determine which destinations and themes are most popular among users and serves as an important reference for content lists. Based on the results of user profiling and analysis of destinations and themes, Ctrip builds different types of lists, such as "Ctrip Word of Mouth List", "Ctrip Hot Spots List" and "Ctrip Specials List". During the list building process, Ctrip will combine intelligent algorithms and manual verification to ensure the accuracy and reliability of the lists. At the same time, Ctrip also invites employees from multiple countries and regions around the world to participate in the verification process to ensure the breadth and diversity of the lists. Firstly, big data is used to select candidate products, then user votes are used to collect preferences, and then a professional jury reviews the list to ensure professionalism. Afterwards, Ctrip employees perform manual checks to ensure the recommendations are culturally sensitive and of high quality. The Board of Directors conducts a final review to ensure that the list meets industry standards. Ctrip also uses algorithms to assist in analysing user content to improve the accuracy of the list through multiple rounds of verification.

The content list can be updated and optimised in real time. By analysing user feedback and behavioural data, the list's content and recommendation strategy is adjusted in a timely manner to ensure that it is always aligned with market demands and user interests. In addition, Ctrip regularly updates the list according to holidays, seasonal changes and other factors. At the same time, Ctrip will promote and market the content list through various channels, including the official website, APP, social media, etc. This helps to increase the visibility and influence of the list and attract more users' attention and participation. By analysing and filtering a large amount of travel content, AI can identify high-quality and valuable information and prioritise it for display to users, which helps to enhance Ctrip's brand image and user trust.

4. Content List

4.1. ESG Hotels Overview

ESG hotels, as an emerging concept in the hospitality industry, aims to promote sustainable development in the hospitality industry by focusing on the three dimensions of Environment, Social and Governance [9]. Firstly, in terms of the environmental dimension, ESG hotels are committed to reducing their impact on the environment. This includes the use of energy-efficient equipment, green building materials, and environmentally clean products to reduce energy consumption and waste emissions. At the same time, ESG hotels also actively participate in ecological conservation projects, such as tree planting and wetland protection, to restore and protect the ecological environment. For example, some ESG hotels have achieved self-sufficiency in electricity and reduced carbon emissions by introducing solar power generation systems. Secondly, ESG hotels are concerned about employee rights and community development. They provide a good working environment and welfare benefits to ensure that employees' rights and interests are protected.

With global climate change and environmental issues becoming increasingly serious, Ctrip actively responds to the Science Based Targets Initiative (SBTi) and is committed to promoting the sustainable development of the travel industry. The ESG Low Carbon Hotel Standard is based on the provision of a friendlier and more assured customer experience, and comprehensively pushes forward the four major environmentally friendly, family friendly, community friendly and related party friendly strategies, and deepen the sustainable development strategy in a result-oriented manner. By implementing the ESG Low Carbon Hotel Standard, Ctrip aims to reduce greenhouse gas emissions, promote resource conservation and environmental protection, and encourage more people to choose low-carbon travel [9].

4.2. AI and ESG Standards Innovation

Ctrip has established a scientific and reasonable low-carbon hotel assessment system through AI technology. The system takes the gas and electricity bills (the main source of hotel carbon emissions) and low-carbon initiatives submitted by partner hotels as the calculation pool, and uses AI algorithms to conduct in-depth analyses and work backward to achieve the 1.5°C temperature control target of the Paris Agreement in 2030, so as to determine the carbon emission thresholds that should be achieved by hotels with different service capabilities and different star ratings. This strategy not only has significant features such as quantifiable, detectable and enhanceable, but also ensures the objectivity and accuracy of the assessment results. Ctrip's innovative strategy on the ESG Low Carbon Hotel Standard fully demonstrates its deep understanding and active practice of sustainable development and environmental protection. More than 1,500 partners have already been shortlisted for the standard, and the order volume of the first batch of selected hotels has increased by 43% sequentially, realising the environmental protection drive on performance, and in the entire Ctrip Group Low Carbon System, more than 16 million global travellers have already chosen to travel in a low-carbon way, with more than 90% of them experiencing low-carbon travel for the first time. Over 90% of these travellers are experiencing the benefits of low-carbon travel for the first time [10].

Ctrip uses AI technology to conduct real-time monitoring and data analysis to help hotels achieve energy saving and emission reduction. By accessing the hotel's energy management system, Ctrip can obtain the hotel's energy consumption data in real time and use AI algorithms to conduct intelligent analysis and provide targeted energy-saving suggestions and optimisation solutions for the hotel. In addition, Ctrip further improves the hotel's energy utilisation efficiency and reduces carbon emissions by introducing intelligent control systems, such as smart lighting and smart air conditioning. Ctrip also takes full advantage of AI technology. Through big data analysis, Ctrip can accurately identify user groups that have a high degree of identification with low-carbon environmental protection and recommend hotels to them that meet low-carbon hotel standards. At the same time, Ctrip also promotes the concept of low-carbon environmental protection and the advantages of low-carbon hotels to more users through social media, online advertisements and other channels, increasing user awareness and acceptance of low-carbon hotels.

Ctrip's innovative strategy on ESG low-carbon hotel standards fully demonstrates its deep understanding and active practice of sustainable development and environmental protection [9]. Through the use of AI technology, Ctrip has not only established a set of scientific and reasonable assessment system for low-carbon hotels, but also is able to monitor and analyse the hotel's energy consumption data in real time, and provide targeted energy-saving suggestions and optimisation solutions for the hotel. At the same time, Ctrip has also increased users' awareness and acceptance of low-carbon hotels through accurate promotion and cooperative promotion, which has promoted the green transformation of the entire hotel industry.

5. Ctrip Development Issues in the Framework of AI

Ctrip faces two major challenges, memory wall and computational power wall, when deploying hyperscale AI models. One is the memory wall problem which mainly manifests itself in the dramatic increase in memory requirements due to the scaling up of AI models, as well as single node memory limitations and data transfer synchronisation problems [11]. The second is the arithmetic wall problem, on the other hand, involves the huge arithmetic power demanded by ultra-large-scale AI models, as well as heterogeneous computing resource management and efficient communication parallel computing strategies. Ctrip is facing a series of challenges in its exploration and development in the field of AI technology, especially in the full-scene service model. Among them, model generality is a key part. Since Ctrip's business involves a variety of fields such as hotel booking, air ticket booking, and travel packages, each field has its own unique user needs and business logic, which requires the AI model to have a high degree of versatility and be able to flexibly adapt to the needs of different business scenarios. At the same time, data consistency and quality are crucial to the model's performance, and Ctrip needs to invest a lot of effort to ensure data cleaning, integration and standardisation to improve the accuracy of the model.

There are some problems in cross-domain knowledge migration and user behaviour diversity. Ctrip, as a comprehensive travel service platform, needs to handle data from different domains (e.g., hotels, air tickets, travel packages, etc.). The intermediate representation layer needs to be able to integrate and represent these cross-domain data, which requires a unified data format and standard to facilitate conversion and fusion between different data sources.AI models need to be able to understand and abstract the commonalities and differences between different domains when performing cross-domain knowledge migration.

Ctrip, as a leading travel B2C integrated online booking platform, is full of both opportunities and challenges for its development under the AI framework. In terms of B2C model competition, Ctrip not only has to deal with the challenges of comprehensive e-commerce platforms such as Tmall and Jingdong, but also travel vertical platforms such as Tuniu and Mafengwo. These competitors are actively expanding their market share and offering diversified travel products and services, which requires Ctrip to continuously innovate and improve its service quality to maintain its market position. User loyalty is a key competitive factor in the B2C model.

In terms of supply chain dependence, Ctrip's business model is highly dependent on its co-operation with upstream suppliers, including airlines, hotels and travel agencies. The stability and service quality of these suppliers directly affect Ctrip's business development. Supply chain risk management is another challenge Ctrip must face. Price fluctuations and declining service quality of suppliers, as well as external factors such as policy changes and natural disasters, may impact Ctrip's supply chain. In 2020, Ctrip was faced with the problem of “retail to resale” of suppliers, whereas under the retail model, merchants face consumers directly and take on service and contractual work, under the agency model, suppliers sell their products to Ctrip, which then raises the price of the products to consumers. This shift has caused concern and dissatisfaction among suppliers, who may face reduced revenues and longer billing periods [12].

6. AI-Based Strategy for Ctrip's Future Development

Ctrip's future development strategy under the AI framework will focus on improving arithmetic and memory management capabilities, optimising model versatility, deepening user behaviour analysis to provide personalised services, strengthening supply chain management and optimisation, as well as expanding its markets and diversifying its services.

Facing the challenges of "memory wall" and "arithmetic wall", Ctrip will continue to increase R&D investment to optimise memory usage and arithmetic allocation for model training. The adoption of efficient distributed computing frameworks and heterogeneous computing resources, such as GPUs and FPGAs, will significantly improve computing efficiency. This not only solves the resource

bottleneck problem of large-scale AI model training, but also improves data processing speed and accelerates model iteration. The use of migration learning and domain adaptive technology improves the ability of the model to migrate knowledge between different domains, ensuring the applicability and effectiveness of AI services in various tourism scenarios [5]. In terms of user behavior analysis and personalized services, Ctrip can deeply analyze users' historical data and behavioral trajectories through AI algorithms, identify user preferences and needs, and provide personalized travel recommendations and services. Strengthening supply chain management and optimisation is also key to Ctrip's development, continuing to establish stable partnerships with upstream suppliers such as airlines, hotels and travel agencies to ensure the stability and reliability of the supply chain. At the same time, AI technology is used to achieve real-time monitoring and predictive analysis of supply chain data, predicting and responding to supply chain risks in advance and improving the efficiency of resource utilisation. Use AI to expand into the international market, optimise the services and experience of the international version of Trip.com to meet the needs of global users, and strengthen cooperation with international travel suppliers.

7. Conclusion

Through an in-depth study of Ctrip's innovative strategies in generative AI, content listings, ESG low-carbon hotel standards, Ctrip's development issues under the framework of AI, and future development strategies, this paper argues that Ctrip, through AI technological innovations and strategic adjustments, continues to improve the user experience and promote the progress of the industry, and realises the function of an intelligent travel assistant, which provides the user with a more convenient and personalized travel experience, providing users with valuable travel information references, helping users make quick decisions, and also promoting the sustainable development of the tourism industry. In evaluating Ctrip's innovative strategy, based on Ctrip's AI marketing advantages, his specific data level performance is relatively limited in the collection of this study. Based on the discussion of the current limitations, this study suggests that future researchers can delve into the internal data level of the company to explore how much the development of AI such as this has impacted the company's specific marketing data and revenue data. As AI technology continues to advance and expand its application areas, the global tourism industry recovers and develops, and the market competition will become increasingly fierce, future research could further focus on the innovative application of AI technology in the tourism industry to improve data processing and analysis capabilities, and provide more accurate and effective decision-making support for tourism companies. This will help promote the digital transformation and intelligent upgrading of the tourism industry.

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