

**DIGITAL TRANSFORMATION OF TRADITIONAL PHARMACEUTICAL  
ENTERPRISES -- TAKING RENHE'S INVESTMENT  
IN DINGDANG HEALTH AS EXAMPLE**

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## ABSTRACT

The rise of the "Internet Plus" concept has brought enormous possibilities for digital transformation in various industries in recent years. Traditional pharmaceutical enterprises find it increasingly difficult for them to meet the rising healthcare needs of the people in the new era when facing problems such as high costs associated with too many intermediate distributors, low working capital turnover ratio, limited pharmacies in underdeveloped areas, uneven distribution of medical resources, and patients visiting major hospitals for minor conditions. It is possible to sufficiently address these problems with new models, such as pharmaceutical e-commerce and online consultation with the "Internet Plus" traditional pharmaceutical enterprises. This forces traditional pharmaceutical enterprises to seek a certain level of digital transformation.

Combination with e-commerce and that with mobile healthcare are the two main directions of digital transformation of traditional pharmaceutical enterprises with specific options including B2B, B2C, and O2O. This study analyzes the effect of digital transformation efforts of pharmaceutical enterprises with Dingdang Health as the primary example from the perspectives of pharmacies, pharmaceutical enterprises, and consumer experience with the perspective of pharmacies analyzed in terms of operational capability and single store profitability model, the perspective of pharmaceutical enterprises analyzed in terms of financial performance, and the perspective of consumer experience analyzed in terms of third-party review, drug price, online consultation, etc.

The findings show that online pharmacies' operational capability apparently outperforms traditional pharmacies regarding inventory turnover, drug types, service coverage, and average benefits. The single-store profitability model suggests that online

pharmacies also perform much better than traditional pharmacies as the penetration rate of online drug purchases increases. However, the digital transformation has not brought significant decreases in marketing costs as expected though order fulfillment expenses are the largest part of costs of online pharmacies, as shown by the financial data of pharmaceutical enterprises. From the perspective of consumer experience, online pharmacies are more advantageous in terms of third-party review, rating, drug price, online consultation, etc. However, they still cannot completely replace offline pharmacies largely because of the immediacy and professionalism required in pharmaceutical consumption.

**Keywords:** Digitalization; Online pharmacy; Transformation; O2O

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# CHAPTER I

## INTRODUCTION

### 1.1 Background

Every wave of technological advancement brings enormous possibilities for progress and transformation to various industries. Mobile healthcare is becoming popular rapidly as the pharmaceutical industry integrates more diverse digital technologies, such as big data, mobile Internet, and sensors. Driven by the Internet, the digital transformation of the traditional pharmaceutical industry is expected to give rise to brand-new development models and promote the sustainable development of China's pharmaceutical industry. The penetration of smartphones and other mobile terminals and the dramatic advances of mobile Internet driven by 4G, 5G, and other technologies have also created favorable external conditions for the development of mobile pharmaceutical e-commerce. Moreover, the logistics industry's rapid expansion ensures distribution and delivery for mobile pharmaceutical e-commerce. The pharmaceutical industry and mobile Internet can be combined to address the needs of consumers at different levels, such as convenience, safety, cost-effectiveness, and personalization. Customers can access services anytime and anywhere from pharmaceutical enterprises, which can provide more diverse health services to improve customer stickiness.

As for healthcare, China has long been a populous country faced with unbalanced economic development and uneven distribution of medical resources in different regions. The people find it difficult for them to get the proper medical treatment. China's healthcare system provides strong safeguards for treating serious diseases but lacks satisfactory solutions to address minor diseases that do not require treatment in hospital. Such minor

diseases represent a larger base of patients. As a new revolution in the healthcare industry in the past more than ten years, telemedicine has entered a new stage of development due to the explosive growth of the Internet and the penetration of 4G and 5G networks. Telemedicine helps people seek doctors' advice or get all kinds of health-related information anytime and anywhere. Mobile communication technology saves a lot of time, energy, and money, which would be otherwise spent on registering, queuing, and even transportation. It also guides and changes our living and medication habits to prefer "prevention" over "treatment."

As for pharmaceuticals, traditional pharmaceutical enterprises have to face problems, such as fake medicines, high distribution costs, and too many intermediate distributors. Pharmaceutical e-commerce is a new model that can be utilized by pharmaceutical manufacturers, regulatory agencies, research institutes, and vendors to maximize the benefits. Whether in the procurement of raw materials or market research, production planning, or any point in the distribution of the pharmaceutical industry, or the whole process of pharmaceutical consumption, e-commerce helps them achieve better economic benefits and social effects. Statistics show that the Chinese traditional pharmaceutical industry's average annual receivables turnover ratio is only four times, and its average circulation cost rate is 12.6%, with the highest being 30%, showing noticeable gaps from those of its counterpart in the United States. The average annual receivables turnover ratio and average circulation cost rate of the pharmaceutical industry in the United States are 15 times and 2.6%, respectively, by relying on the Internet for pharmaceutical circulation. From these data, it is easy to anticipate that the comprehensive adoption of pharmaceutical e-commerce in China's traditional pharmaceutical industry would naturally

optimize the pharmaceutical circulation in China, improve the circulation efficiency dramatically, and finally promote the rapid development of the pharmaceutical industry in China as a whole.

As for physical examination, the public has become increasingly aware of physical health due to China's fast social and economic development. The focus of healthcare consumption is also changing from disease treatment to disease prevention. Physical examination has become a keyword in the healthcare industry as the new "health management" concept emerges. How to improve the service quality and market share of the physical examination has been directing improvement and optimization of the physical examination segment in the context of booming physical examination services. Traditionally, customers have to receive physical examinations at medical establishments and collect their reports the next day. It is difficult to keep and later retrieve hardcopy reports, which are prone to loss. Customers desire more efficient and convenient services from physical examiners to support access to their physical examination reports anytime, anywhere, as well as personalized and customized services, such as physical examination at home. Such new needs urge physical examination service providers to keep exploring and innovating new offerings, such as Internet-based online systems for inquiries about their physical examination results and online appointment for physical examinations at home, to accommodate the demand in the market.

As for medical insurance, strict examination of medical claims has become a norm to address increasing medical expenses due to the expanding coverage of basic medical insurance, accelerating aging, and changing disease spectrum. Existing measures, such as payment by diagnosis-related group, payment with electronic social security card/medical

insurance electronic certificate, and ex-post review of reimbursement, have failed to effectively control the rapid growth of medical expenses and solve the difficulties and impediments encountered by patients in treatment and claim processes. They even increase the financial burden of patients. Powered by digitalization, biometric technologies, such as facial and fingerprint recognition, as well as emerging information technologies, such as big data and artificial intelligence, are used to identify medical insurance participants, carry out intelligent audits and supervision of medical expenses throughout diagnosis and treatment, enable online payment without physical medical insurance cards, and realize real-time supervision and settlement of reimbursement. These features have further enhanced the service level of medical insurance management, improved the medical experience of patients, enriched the applications of medical insurance, reduced the pressure on insurance participants and hospitals, helped solve problems in medical insurance supervision, ensured the safe operation of medical insurance funds, boosted the ability of medical insurance governance, and realized the co-creation of value in healthcare and medical insurance. Therefore, building a unified online medical insurance settlement system and enabling online payment without physical medical insurance cards are inevitable trends in digitalization.

To sum up, the traditional pharmaceutical industry is facing plenty of opportunities in digital transformation in terms of "healthcare," "pharmaceuticals," "physical examination," and "medical insurance." Currently, healthcare reforms are being deepened while the Internet and other digital technologies are driving the medical reforms technically and changing the practices of the traditional healthcare industry with their own unique logic and business models.

## 1.2 Concept and Methodology

This study first reviews and collates literature related to the digital transformation of traditional pharmaceutical enterprises, analyzes the current conditions of traditional pharmaceutical enterprises, makes hypotheses, and carries out analysis with Renhe's investment in Dingdang Health as the primary example of digital transformation of traditional pharmaceutical enterprises in combination with other relevant data.

First, this study analyzes literature on "Internet Plus," "Internet Plus Pharmacy," and pharmaceutical e-commerce encompassing the theme of "digital transformation of traditional pharmaceutical enterprises." From the literature on pharmaceutical e-commerce, this study identifies several existing models of pharmaceutical e-commerce and examines the O2O model in detail.

Second, in the analysis of the current conditions of traditional pharmaceutical enterprises, this study collates the main problems faced by the traditional pharmaceutical industry from the perspectives of pharmacies, enterprises, and customers, puts forward the hypotheses, and analyzes the main pathways of digital transformation of the traditional pharmaceutical industry at present.

At last, in the case study and comparative study, this dissertation describes the model and layout of Renhe's investment in Dingdang Health for digital transformation and discusses the effect of its digital transformation in detail. Based on the analysis findings, this dissertation gives recommendations for traditional pharmaceutical enterprises to better realize digital transformation.

### **1.3 Purpose and Significance of Study**

Considering the broad penetration and rapid development of the Internet, digitalization is a new requirement for the pharmaceutical industry and an inevitable trend of traditional pharmaceutical enterprises for sustainable development in the era. For the listed pharmaceutical enterprises in China, traditional marketing practices have already lost their advantages in both the pharmaceutical and capital markets. This compels enterprises to seek transformation.

Digital technologies create enormous possibilities for transformation for traditional pharmaceutical enterprises and provide solutions for building the national medical system. On the theme of "digital transformation of traditional pharmaceutical enterprises," this study analyzes the current conditions of China's traditional pharmaceutical industry and carries out an analysis of Renhe's investment in Dingdang Health as the primary example of digital transformation of traditional pharmaceutical enterprises in combination with other relevant data.

In a practical sense, it helps change the marketing practices of traditional enterprises, which are no longer viable in an era with the fast-advancing Internet. Too many pharmaceutical enterprises have replicated traditional marketing practices, which cannot enhance their competitive advantages if no breakthrough is to appear. Internet pharmaceutical sales require enterprises to have Internet thinking in marketing rather than simply presenting products online. Therefore, this demands a significant change in pharmaceutical enterprises relying on traditional marketing practices.

Generally, digitalization of the pharmaceutical industry has the following benefits for the development of China's traditional pharmaceutical industry: reduced costs of

pharmaceutical circulation, improved profitability and management efficiency of enterprises, the satisfaction of more needs of consumers, facilitated supervision by regulatory authorities, and so on. Therefore, studying the digital transformation of traditional pharmaceutical enterprises is of great practical significance.

#### **1.4 Structure of Dissertation**

This dissertation is structured as follows:

The second chapter reviews the literature in China and other countries in connection with the topic of this dissertation and introduces "Internet Plus," "Internet plus Pharmacies," B2B, B2C, O2O, and other models of pharmaceutical e-commerce.

The third chapter presents an analysis of the current conditions and the research hypotheses by analyzing the problems faced by traditional pharmaceutical enterprises in digital transformation from the perspectives of pharmacies, pharmaceutical enterprises, and patients and putting forward three basic hypotheses from these perspectives. The chapter also discusses in detail the digital transformation of traditional pharmaceutical enterprises in combination with e-commerce and mobile healthcare.

By taking Renhe's investment in Dingdang Health as an example, the fourth chapter discusses the models and strategic layouts of digital transformation of pharmaceutical enterprises and studies and summarizes the related empowerment activities of these enterprises for digital transformation.

The fifth chapter focuses on the data verification of the hypotheses made earlier and discusses in detail the effect of digital transformation of traditional pharmaceutical enterprises from the three perspectives of pharmacies, pharmaceutical enterprises, and user

experience, mainly based on the data of Dingdang Health in combination with other relevant data.

The sixth chapter gives the main conclusion of this dissertation by summarizing the analyses and findings earlier and puts forth some recommendations and suggestions for enterprises seeking digital transformation.



## CHAPTER II

### LITERATURE REVIEW

#### **2.1 Literature on "Internet Plus" and "Internet plus Pharmacies"**

There is no agreement on a unified, clear definition of "Internet Plus" among Chinese and foreign scholars. The concept of "Internet Plus" first appeared in China in 2012, when Yu Yang, chairman of Analysys, formally used "Internet Plus" as an umbrella term for the transformation of traditional enterprises. According to Tencent CEO Pony Ma, "'Interne plus' a traditional industry represents a kind of capability, or a kind of external resources and settings to improve the industry." "'Internet Plus' is an upgraded version of the fusion of informatization and industrialization. Beyond industrialization, it makes the Internet the core feature of current informatization and merges it with manufacturing, commerce, finance, and other service industries. This merging is a deep integration representing a whole greater than the sum of its parts. Only innovation can make "+" truly valuable and meaningful," commented Huang Huang, an associate professor at the School of Government, Peking University. In 2015, the State Council released the *Guiding Opinions of the State Council on Actively Promoting "Internet Plus" Initiatives*, which pointed out that "Internet Plus" is to deeply integrate the innovation achievements related to the Internet with various fields of economy and society, drive technological advances, efficiency, and organizational changes, enhance the innovation capability and productivity of the real economy, and develop a new form of economic and social development with the Internet as a basis and innovation element. This also means the fusion of "Internet plus" various fields was to usher in a new wave of scientific and technological revolution and

industrial changes and produce a strategic and all-around impact on China's economic and social development.

Centering on the Internet for development, "Internet Plus" allows more effective use of Internet channels for drugs, improves the efficiency of drug development and application efficiency, and matches the current development pace of pharmaceutical enterprises. However, compared with other traditional industries, the pharmaceutical industry has fallen behind in leveraging the Internet, especially domestic pharmaceutical enterprises, which are slow to accept and apply frontier ideas. Generally, "Internet Plus" refers to the deep integration of the Internet and various traditional industries driven by innovation. For example, a doctor remotely diagnoses patients' conditions and then prescribes some medicines; the patient orders the medicines online anytime, anywhere, and has them delivered to his or her home. This may be a future scenario for pharmaceutical enterprises. Those who establish such business models first will seize a favorable position in the market. "Internet Plus" means faster and easier channels for patients to purchase pharmaceutical products and more innovative development strategies and operations closer to patients' needs for pharmaceutical enterprises.

"Internet plus pharmacies" mainly involves the standardization of online pharmacies, mobile healthcare, wearable devices, etc., and traditional pharmaceutical enterprises participate in or acquire hospitals, pharmacies, and Internet-based enterprises to constantly improve the industrial chain. At the same time, pharmaceutical e-commerce companies with good standing and high performance have also been targets of investors. This means that as part of the concept of "Health China," "Internet plus pharmacies" will

drive the rapid development of pharmaceuticals, healthcare, pharmaceutical e-commerce, and other related fields in the future.

In the initial stage of "Internet plus pharmacies," Bujnowska-Fedak (2015) believes that the Internet has strongly promoted the development of pharmaceutical enterprises. The Internet enables enterprises to interact and communicate with end customers and provide them with the desired information. This drives the development of enterprises. In a study on traditional Chinese medicine (TCM) enterprises, Hong Jiezai (2016) discussed the impact of Internet-based innovations on TCM enterprises, different trading models of "Internet plus TCM," and their effects and results. He believed that "Internet plus TCM" was inevitable for TCM enterprises and suggested the future development direction of "Internet plus TCM" in four perspectives: marketing, products, management, and commerce.

Guo Bingjie et al. (2014) analyzed the status quo and models of pharmaceutical sales on the Internet in China and compared them with those in foreign countries. They found that there are already complete laws, strict market regulations, and comprehensive technical standards in Japan, European Countries, and the United States. Internet pharmaceutical sales are thriving with high output value and benefits in these countries and territories, from which China should learn experiences to boost online pharmaceutical sales in China, considering China's deficiencies in the Internet pharmaceutical industry by contrast. While holding exactly the same view, Wang Xiangnan (2016) divided the strategic Internet transformation of Chinese pharmaceutical enterprises into periods characterized by rapid growth, interwoven favorable and unfavorable conditions, and the coexistence of challenges and opportunities. Meng Lingquan et al. (2013) named several specific

advanced experiences. For example, the United States has complete online pharmacy registration and official certification mechanisms, and the compliance level is high across the whole industry; the United Kingdom has a complete range of procedures in guiding consumption by consumers and sale of prescription drugs; Germany has social insurance coverage of medical expenses; Japan has medical operations and services to address various aspects of needs.

Looking at the booming "Internet plus pharmacies," Xia Xiaoyan (2016) analyzed its future trend from a macro perspective, suggesting that the "Internet Plus" transformation of pharmaceutical enterprises would play an important role in improving the transparency of the pharmaceutical industry, make illegal drugs nowhere to hide through the traceability of drug information, and improve the efficiency of distribution for the public's wellbeing.

However, Guo Yue (2016) and Li Fan et al. (2017) perceived the predicament of pharmaceutical enterprises while most of the scholars above felt optimistic about their "Internet Plus" transformation. Guo Yue (2016) noted that the performance of pharmaceutical enterprises might be affected or even encumbered by problems, such as the lack of innovative thinking, inability to integrate and utilize resources, unclear business strategies and directions, and lack of preliminary research. Li Fan et al. (2017) analyzed the market structure, enterprise behavior, and business performance of China's pharmaceutical circulation industry since 2010 with the SCP (structure-conduct-performance) model. They found that the performance of state-owned pharmaceutical enterprises was generally unsatisfactory though they kept expanding through mergers and acquisitions and pharmacy alliances, and other models kept emerging. They suggested that financing and M&A of enterprises should be encouraged, and supply-side structural

reforms should be carried out throughout the whole pharmaceutical circulation industry. It is important to drive the whole industry business model by relying on the Internet.

Though various problems were anticipated in the development of "Internet plus Pharmacies," Zhan Hongchun (2016) believed that the positive role of "Internet plus Pharmacies" is evident in the long run as the traditional pharmaceutical industry and the Internet industry become increasingly fused.

## **2.2 Pharmaceutical E-Commerce**

B2B and B2C were the two main forms of pharmaceutical e-commerce before 2013. The former takes place between businesses, serving as third-party platforms of pharmaceutical e-commerce. In a simple example, a regulator establishes a platform to facilitate free trading by businesses. The latter occurs between businesses and customers as businesses sell products directly to customers, from producers to end users. Many studies on healthcare O2O and its applications have been made in China along with the rapid development of Internet healthcare and the rise of the O2O model in recent years.

Plentiful academic research findings have been identified in connection with "pharmaceutical e-commerce" in China. Most scholars believe that China's pharmaceutical e-commerce has much room for development. For example, in an article on *China Internet Week*, Lyu Wenlong (2010) pointed out that China's pharmaceutical e-commerce market is a blue ocean with huge potential, considering that the market size of pharmaceutical e-commerce in the United States already amounted to hundreds of billions of US dollars per year. The size of the pharmaceutical B2C segment is still small in China compared with the whole pharmaceutical circulation industry. This directly shows that pharmaceutical e-commerce in China has developed slowly as a whole, and its market size is relatively small

compared with the traditional pharmaceutical circulation industry. As early as 2006, Chen Yuwen noted that the slow development of pharmaceutical e-commerce in China was mainly attributable to the low informatization level of many traditional pharmaceutical enterprises in China, which was an innate deficiency. Wang Guoni (2010) also noted that the delayed release of relevant government policies was also an important reason for the slow development of China's pharmaceutical e-commerce. Especially the obsolete system reflected in the traditional pharmaceutical circulation in China is the key factor impeding the rapid development of pharmaceutical e-commerce. Moreover, consumers lack confidence in online drug purchases due to the contrasting reputations of online pharmacies. All these factors work together to hinder the development of pharmaceutical e-commerce in China.

While identifying problems, scholars have proposed solutions or prospects for future development. For example, Li Jiangning (2006) recommended measures at the regulatory system level of pharmaceutical e-commerce. Most scholars have studied and directly referred to the mature informatization models in developed countries to address problems in the informatization of pharmaceutical enterprises. For example, Meng Lingquan (2006) analyzed the mature development models of pharmaceutical e-commerce in the United States in detail. Learning from and studying the development models of pharmaceutical e-commerce in western developed countries can surely provide information for the development of pharmaceutical e-commerce in China. However, the development of pharmaceutical e-commerce varies in different countries and territories, where people have diverse needs for drugs, and the pharmaceutical industry is in a different stage of informatization.

As for medical applications of O2O, Zhou Yutao (2013) studied how to expand online and offline medical services by leveraging advanced information technology and how to develop the pharmaceutical O2O business in the existing policy system. Ma Zunzhong et al. studied how to combine micro-media platforms with medical services and turn mobile communication terminals into telemedicine terminals by leveraging micro-media (such as Weibo and WeChat) unconstrained by time and space. Yu Guangjun (2015) studied some specific applications, such as the development of WeChat official accounts of medical institutions to connect hospitals with patients and realize functions such as appointment, registration, health consultation, and information inquiry. The services available on WeChat differ depending on each hospital's characteristics and service processes. The applications of the WeChat public platform are becoming increasingly extensive as its interfaces are being improved and many external interfaces are becoming available. Luo Ziran (2015) believed that adding online payment, the most important function of O2O, into medical payment could reduce queuing of patients, save much time in seeking medical service, alleviate the burden on hospitals, and increase the time spent on effective medical service.

Based on their actual conditions, some large-scale medical institutions in China have designed and carried out medical O2O services, transformed the traditional consultation processes, and optimized medical service processes. Sun Guoqiang et al. (2015) studied the First Affiliated Hospital, Zhejiang University, the first public hospital in China to open an online hospital, which enables zero-distance expert service for outpatients, 7/24 service, and access to personal health data on the cloud system at any time. Wang Jianlei et al. (2015) discussed the data platform built by Peking Union Medical College

Hospital in collaboration with Internet enterprises, which constructed an architecture of "Internet plus healthcare" and formed an ecosystem of medical and related industries encompassing the hospital. Another hospital they studied was Peking University International Hospital, which realized data integration and service collaboration of HIS, CIS, and HERP in combination with the hospital's information platform. It has designed Internet consultation management programs with online registration on its WeChat service account as a major feature. Chen Xiaopeng et al. (2015) studied the efforts of the 1st Affiliated Hospital of Wenzhou Medical University in transforming its traditional consultation processes. The hospital developed the first "off-hospital healthcare system" in China with various online healthcare functions. The hospital has also established a set of evaluation indicators. The Central Hospital of Wuhan has set up an Internet hospital unit, which has staff on duty from designated departments every day, mainly providing services for returning patients and those with chronic diseases. The hospital is also working with Ali Health in a pilot project of the "Village Taobao Program" to provide the hospital's medical services to the grassroots by connecting the Internet hospital unit with Taobao service stations in rural areas via the Internet. Wang Jianxiu et al. (2015) studied Kangmei Hospital, run by Kangmei Pharmaceutical, which explored the Internet hospital development model by the private hospital "+" large pharmaceutical company based on Kangmei's Mobile Health Care, pharmaceutical e-commerce mall, and chain pharmacies. These exploratory applications have brought convenient medical services and facilitated the healthcare industry's evolution and reform.



## CHAPTER III

### STATUS QUO ANALYSIS AND HYPOTHESES

#### 3.1 Existing Problems with Traditional Pharmaceutical Enterprises

Pharmaceutical enterprises in China are facing various problems, even with continuous growth. They can hardly accommodate the new needs arising from the development of productive forces as the fast development of China's economy and society and the people's living standards imposes high standards and requirements on pharmaceuticals and healthcare. Traditional pharmaceutical enterprises have to seek transformation by constantly identifying their problems with new technologies, especially the emergence of derivative formats brought by "Internet Plus" in the pharmaceutical industry.

**3.1.1 Pharmaceutical enterprises and pharmacies.** First, drugs moved through a hierarchy of distributors from pharmaceutical manufacturers to hospitals or pharmacies in the past. Such a complicated distribution model raised the operating costs of pharmacies and led to difficulties in managing distribution processes and tracking drug flows due to low transparency. Slow capital circulation is another problem common in traditional pharmaceutical circulation.

Second, the limited numbers of offline pharmacies cannot meet the needs of patients in some small cities, rural towns, and other end markets, from which patients often have to buy drugs in larger cities with more supplies after long-time travel. Traditional offline drug retailers face another disadvantage that they cannot provide all the types of drugs of the desired quality. The pharmacies' footprint limits the number of drugs available, so they may not have drugs for treating rare diseases; pharmacies in underdeveloped areas

acquire and replace their stock less frequently than those in more developed areas due to the scattering of patients and poor conditions of transportation.

Third, China's traditional offline retail pharmacies face fierce market competition, lower levels of industrial concentration, and regional characteristics. Dashenlin, LBX Pharmacy, Yifeng Pharmacy, and Yixintang are the top four private chain retail pharmacies with market shares of 3.2%, 3.0%, 2.9%, and 2.8%, respectively, in 2020. Geographically, Dashenlin mainly operates in South China; LBX Pharmacy in Central China and East China; Yifeng Pharmacy in South China and Central China; Yixintang in Southwest China. They have followed similar pathways of expansion by obtaining high market shares in smaller cities and then seeking entry into other places. However, the expansion of offline pharmacies has been held back by factors such as the time required for the induction of new stores, competition and protectionism in new markets, and overvaluation of the target enterprises in the primary market. Few enterprises in the offline pharmacy industry have a presence across the whole country.

**3.1.2 Customers.** China's healthcare resources have kept increasing and improving with a growing number of hospitals and health institutions. However, difficult access to necessary resources and high medical expenses still exist in the healthcare industry, given the large patient population in China.

China's medical resources are insufficient to meet the demand for diagnosis and treatment. The quality of medical services cannot be guaranteed as nearly 100% of sick beds are occupied in class-A tertiary hospitals. High-quality medical resources are unevenly distributed across the country. The following problems mainly plague patients: First, it is difficult to access necessary resources, which are unevenly distributed. As high-

quality medical resources are concentrated in cities, patients are unwilling to visit primary hospitals due to worries about their medical skills. Many patients would prefer secondary and tertiary hospitals to treat common and chronic diseases. Second, patients complain about the healthcare system as they often have, for example, only five minutes to talk to doctors after three hours in queuing in large hospitals. Third, medical expenses are still high though hospitals no longer rely on pharmaceuticals for profits through the deepening of medical reforms. In some cases, patients and their families become poor or return to poverty due to illness, especially in rural areas. Primary hospitals have limited medical skills and equipment for treating severe diseases, though a higher portion of the medical expenses at these hospitals is reimbursed under insurance. Patients have to seek treatment in secondary and tertiary hospitals and bear higher medical expenses.

As for drug purchases, as mentioned earlier, there are limited numbers of offline pharmacies in some small cities, rural towns, and other end markets, where patients cannot find pharmacies nearby. The pharmacies in these areas may not have certain types of drugs with the desired quality, and they acquire and replace their stock less frequently due to their sizes, poor conditions of transportation, and other unfavorable factors. Pharmacies find it difficult to meet customers' needs in terms of quantity, quality, and even pricing of drugs.

**3.1.3 Hypothesis.** The problems discussed above have exposed deficiencies in pharmaceutical companies, pharmacies, and customers' experience, requiring urgent solutions. In the wave of "Internet Plus," the development of different models of pharmaceutical e-commerce through "Internet plus Pharmacies" can effectively solve the problems of uneven distribution of medical resources, reduce tiers of pharmaceutical distributors, improve the operating capability of pharmacies, enhance the profitability of

pharmaceutical enterprises, and effectively meet the needs of customers. The emergence of Internet healthcare can save much time waiting for the diagnosis, treatment, and medical resources through online consultation.

Based on the analysis above, this dissertation puts forward the following hypotheses:

H1: Digital transformation can increase the operational capability and revenues of pharmacies.

H2: Digital transformation can significantly increase the revenues of pharmaceutical enterprises and reduce their costs.

H3: Digital transformation can significantly improve patients' medical experience.

### **3.2 Directions of Digital Transformation of Traditional Pharmaceutical Enterprises**

At present, quite a few listed companies in China are involved in the transformation toward "Internet plus pharmacies," including traditional pharmaceutical enterprises, Internet companies, and even real estate developers. CONBA, Tongrentang, Jiontown, Baiyunshan, and Renhe are the most typical among the traditional pharmaceutical enterprises. Most of them have been progressing smoothly in their efforts seeking transformation toward "Internet plus pharmacies."

Generally, traditional pharmaceutical enterprises follow either of two directions in digital transformation: combining pharmacies with e-commerce or mobile healthcare. These two directions give rise to different business models, so finding a suitable business model and pathway to transformation is the basis of digital transformation and strategic planning for a traditional enterprise.

**3.2.1 Combination of traditional pharmacies with e-commerce.** The combination of traditional pharmacies and e-commerce was a model observed as early as the inception of Internet pharmacies. However, the earliest e-commerce pharmacies did not emerge quickly as the mainstream sales channels in the pharmaceutical industry due to the lack of support from policies and technology, the largely unchanging market environment, constraints from people's consumption habits, and other factors. With the rise of the "Internet Plus" concept, the combination of traditional pharmacies and e-commerce has developed beyond the previous limits and given rise to new business models. Pharmaceutical e-commerce mainly falls into the B and C categories defined by the types of users, mainly with B2B, B2C, and O2O as the three main models. Observations suggest that pharmaceutical e-commerce has penetrated into other forms of transactions, except that patients purchase drugs directly in hospitals. As for the corresponding operation model, the B2B model connects drug suppliers, distributors, and hospitals. On the other hand, drug suppliers and offline pharmacies directly sell pharmaceutical products to users in the B2C model. On the C side, users may also place orders on O2O platforms for pharmaceuticals, including owned platforms (such as Dingdang Kuaiyao) and third-party platforms (such as Meituan and Ele).

#### 1. B2B model of pharmaceutical e-commerce

As the name suggests, the B2B (Business to Business) model of e-commerce takes place between businesses and is a type of wholesale e-commerce. The B2B model serves each B end in the pharmaceutical circulation of the industry chain, involving enterprises engaged in raw material processing, pharmaceutical production, wholesale, and other operations. Compared with the complicated process along the traditional distribution chain

for pharmaceutical products, B2B dramatically reduces the distribution cost and offers technical means for tracking drug flow information. Currently, the typical B2B enterprises include Jiontown, yao.jd.com, and Yaoshibang.

In January 2017, the Chinese government released the *Circular on Implementing the "Two-invoice System" in Drug Procurement by Public Healthcare Institutions (Trial)*, starting implementation of the "two-invoice System." In the "two-invoice system," one invoice is issued when drugs are sold from a pharmaceutical manufacturer to a first-class distributor, and another invoice is issued when the distributor sells the drugs to a hospital. This means a dramatic reduction of intermediate links in the circulation of drugs from pharmaceutical manufacturers to hospitals.

Pharmaceutical B2B platforms fully fit in the reform spirit of the "two-invoice system." With the B2B model, pharmaceutical manufacturers can display all of their products on such platforms, while distributors, hospitals, pharmacies, and other buyers can purchase products on the platforms anytime, whether the government, pharmaceutical enterprises, or third parties own these platforms. It is possible to reduce distribution costs, improve regulation efficiency, and achieve other objectives when transactions are completed online. Slow fund flows often impede the traditional circulation of pharmaceutical products. In the B2B model, however, the more open and transparent data of B2B platform lowers the threshold of cooperation with financial institutions, and the funds of transactions become readily available. To sum up, the "two-invoice system" is mainly intended to reduce the distribution cost by eliminating the intermediate links of pharmaceutical circulation. It also enhances the transparency of information on

pharmaceutical circulation to allow more efficient regulation. The B2B model of pharmaceutical e-commerce fully meets the purpose of the "two-invoice system" reform.

## 2. B2C model of pharmaceutical e-commerce

The B2C (Business to Customer) model of e-commerce generally refers to the e-commerce activities of enterprises facing individuals. After years of development, B2C e-commerce is characterized by fully two-way information communication, flexible means of transactions, fast logistics and delivery, and low-cost and high-benefit operations. The B2C model of pharmaceutical e-commerce provides users with online channels for drug purchases and features more categories of drugs at lower prices. The B2C model may work on owned platforms and third-party platforms. For example, jkcsjd.com, 111.com.cn, and liangxinyao.com are owned platforms, while jd.com and yao.tmall.com are typical third-party platforms.

Compared with offline operations, B2C pharmaceutical e-commerce platforms enjoy obvious advantages in terms of the categories available. For a chain of traditional retail pharmacies, a key store usually has more than 3,000 SKUs (Stock Keeping Units), while a regular store has about 2,000 SKUs. In contrast, the liangxinyao.com platform had 33 million SKUs of medical and health products and over 46,000 SKUs for its own business as of March 2021. Jd.com had 40 million SKUs of medical and health products in June 2021.

## 3. O2O model of pharmaceutical e-commerce

Technically, the O2O (Online to Offline) model of e-commerce is an extension of the B2C model. Based on B2C, O2O is a model guiding users from online channels to offline stores via the Internet by allowing the placing of orders online and experience with

offline pharmacies. Compared with B2C, the consumers of pharmaceutical O2O have clearer purposes. O2O focuses on products meeting the "urgent, night, private, lazy, and special" needs of consumers. Specifically, pharmaceuticals for "urgent" needs include drugs for treating diarrhea, summer heat, traumatic injury, gauze, iodine, etc. Pharmaceuticals for needs "at night" are those possibly required by consumers at night and delivered to their doorstep 24 hours a day. Pharmaceuticals for "private" needs include those for improving male functions, gynecological drugs, contraceptives, pregnancy test sticks, sex toys, etc. Pharmaceuticals for "lazy" needs are part of the lazy economy for people unless to leave their homes or offices. Pharmaceuticals for "special" needs include those for which customers must consult pharmacists, such as drugs for treating colds, gastrointestinal conditions, and chronic diseases.

O2O meets the demand for instant delivery while ensuring the quality of drugs. Currently, in China, the O2O model of pharmaceutical e-commerce is mainly used as marketing channels for pharmaceutical enterprises and pharmacies to increase their contact with consumers or as e-commerce platforms that divert patients from hospitals or provide contactless diagnosis and treatment services. Consumers consult pharmacists, select drugs, decide to purchase online, and then choose whether to collect the drugs themselves or wait for delivery according to their needs. The platforms arrange the nearest pharmacies for them to collect the drugs or for delivery by professional third-party logistics providers. Currently, typical O2O platforms include JD Yaojisong, Dingdang Kuaiyao, JD Daojia, and Meituan.

In addition, the DTP (Direct to Patient) model has been emerging. In this model, pharmacies directly deliver drugs to customers' doorstep according to prescriptions,



provide consultation, and track patients' improvement in conditions after patients obtain prescriptions in hospitals.

The models of pharmaceutical e-commerce described above are widely used in the current sales and development of Internet pharmacies. Due to the different properties of these platforms, they have different profitability models, types of customers, and types of consumers. It helps enterprises find a pharmaceutical e-commerce model best suitable for their development by comparing different models and related websites, APPs, and enterprises.

**3.2.2 Combination of traditional pharmacies and mobile healthcare.** Currently, healthcare reforms are being deepened while Internet technologies are driving the medical reforms technically and changing the practices of the healthcare industry with their own unique logic and business models. Building a mobile healthcare service platform means creating a new mobile healthcare model. A mature mobile healthcare service platform should integrate advantageous resources, such as doctors, hospital registration, consultation, payment, remote monitoring, big data of health, terminals, and wearable devices, to realize complementary online and offline advantages and their seamless integration. Mobile healthcare platforms must effectively clarify and classify users' needs and provide comprehensive services, such as healthy food, characteristic shopping, intelligent life, early care, medical care, culture, tourism, daily diagnosis and treatment, and psychological rehabilitation.

The most prominent characteristic of mobile healthcare is telemedicine or online diagnosis and treatment. As a new revolution in the healthcare industry in the last more than ten years, online diagnosis and treatment have entered a new stage of development

due to the explosive growth of the Internet, the penetration of 4G, and the commercialization of 5G networks. Online diagnosis and treatment help people seek doctors' advice or get all kinds of health-related information anytime and anywhere. Mobile communication technologies save a lot of time, energy, and money that would otherwise be consumed for registering, queuing, and even transportation. It also guides and changes our living and medication habits to prefer "prevention" over "treatment."

## **CHAPTER IV**

### **PRACTICES OF TRADITIONAL ENTERPRISES FOR DIGITAL TRANSFORMATION**

This chapter discusses the practices of traditional enterprises for digital transformation by taking Dingdang Health as an example. Dingdang Health is closely related to Renhe, one of the large listed traditional pharmaceutical enterprises in China with clear objectives and strategic plans for digital transformation, and has attained some achievements.

Renhe Group, founded in 2001, has become a leading OTC enterprise in China after 17 years of development. As a well-known trademark in China, Renhe has many well-known brands such as "Renhe Kelike," "Youkadan" and "Fuyanjie." Leveraging its traditional resources, Renhe Group strives to move closer to the Internet and transform into a digital pharmaceutical company.

#### **4.1 Upstream Resources -- Heli Internet of Things (M2F)**

As a pharmaceutical manufacturer, Renhe produces a limited number of products, which are insufficient to meet the drug demand of users, while Dingdang Kuaiyao offers thousands of drugs. Renhe needs other pharmaceutical companies to join the supply chain and integrate their drugs to ensure the availability of product resources. M2F is an innovative business model developed by Renhe for Internet pharmacies. On January 12, 2015, Renhe founded Heli Wulian and the "Heli Internet of Things" in collaboration with more than 200 pharmaceutical industrial enterprises. The platform is intended to harmonize the procurement by the participating enterprises of raw materials, packaging materials, and production equipment, reduce industrial costs, remove obstacles on the upstream-downstream price industry chain, and lower product prices. This model is called M2F.

The "Heli Internet of Things" created by Renhe follows the trend of shifting from the Internet to the Internet of Things and represents a novel Internet thinking about the pharmaceutical industry. The Internet of Things platform is mainly intended to integrate the resources of the stakeholders, optimize the relationship between supply and production, and become a B2B platform for suppliers of raw materials, auxiliary materials, packaging materials, and pharmaceutical products in China. The establishment of the Internet of Things platform is deemed a great leap to the Pharmaceutical Industry 4.0. Enterprises analyze and share big data on the Heli Internet of Things platform. The Internet of Things reduces the cost of many links. First, centralized procurement reduces the cost of raw, auxiliary, and packaging materials and then the prices of drugs. Second, enterprises can deliver products directly to end users. The Internet of Things reduces many intermediate links and offers the most favorable prices to consumers. The most crucial characteristic is standardized and unified procurement, which ensures that all members in the alliance have access to the same high-quality raw materials and provide products with consistent quality.

In addition, the development of such Industrial Internet alliances will also improve the general quality management level of alliance members, enhance the efficiency of fund use within the alliance and reduce the cost of fund use, and thus support the transformation and upgrading of China's pharmaceutical manufacturing industry as a whole.

#### **4.2 Commercial Circulation – Dingdang Pharmaceutical's B2B Model**

Dingdang Pharmaceutical adopt the B2B model. While the "Heli Internet of Things" concentrates pharmaceutical companies' products on the Internet, Dingdang Pharmaceutical has established a platform for the procurement and supply by offline physical pharmacies, thus integrating upstream and downstream resources and facilitating

intermediate commercial circulation. Many profits are devoured by too many intermediate links in the commercial circulation of the traditional pharmaceutical industry, which is in chaotic conditions. The quality of drugs is also a major concern in the lengthy process of circulation and allocation. Relevant surveys show that consumers are the most worried about whether drugs have deteriorated and whether they are counterfeit upon delivery rather than the time when they are delivered. Therefore, specialized pharmaceutical logistics is also one of the keys to the development of pharmaceutical e-commerce. Acquisition of strategic target enterprises can help Renhe optimize its resource allocation.

#### **4.3 User Side -- B2C Platform Cooperation and Dingdang Kuaiyao O2O**

On the user side, Renhe tries to expand the industrial chain horizontally through cooperation with B2C platforms, such as Taobao, Tmall, and JD.COM, while leveraging the complementary advantages of other network platforms efficiently. On the other hand, Renhe works hard to build its own O2O platform -- Dingdang Kuaiyao -- to solve the "last mile" issue.

The Dingdang Kuaiyao O2O platform carries out business via its own pharmacies or cooperation with other pharmacies. Users browse drug information on the Dingdang Kuaiyao APP, where professional pharmacists provide them with the necessary advice. Users then place orders following the instructions, and then cooperative physical pharmacies deliver the ordered drugs. Dingdang Kuaiyao now operates in 14 cities, including Beijing, Guangzhou, and Hangzhou, with 304 owned Smart Pharmacies. Dingdang Kuaiyao's fast-growing O2O business has benefited from its advantages in the following five aspects:

The first is related to the superior traditional offline resources. Dingdang Kuaiyao has been able to expand rapidly because of the strong support from Renhe Group's industrial and commercial system. Dingdang Kuaiyao did not start from scratch as other startups usually do since Renhe Group already has strong resources in terms of the supply chain, sales end, and terminal pharmacies. Dingdang Kuaiyao provides systematic training to pharmacies' delivery personnel and establishes assessment criteria to ensure the service quality of cooperative pharmacies. For pharmacies, the cooperation with Dingdang Kuaiyao does not drive away existing offline customers but increases sources of foot traffic.

The second is related to the Internet thinking. The pharmaceutical O2O business requires three types of employees familiar with the pharmaceutical industry, the Internet, and operations. Key members of Dingdang Kuaiyao's workforce have Internet experience from working with Amazon, JD.COM, VIPS, VANCL, and Lefeng, as well as a pharmaceutical industry background. It has a team with a complete range of skills.

The third is related to online and offline collaboration. The most important requirement to realize O2O is the connection between online and offline information, which poses an enormous challenge to the company's technical and financial strength. Dingdang Kuaiyao has installed an ERP system in all cooperative pharmacies to effectively monitor and track data to meet this requirement. Renhe Group has also acquired 50 pharmacies to coordinate the cooperation. Dingdang Kuaiyao prefers pharmacies that meet its requirements for "electronic fences" in cooperation to improve online and offline collaboration to a certain extent.

The fourth is related to innovation ability: Dingdang Kuaiyao is the only pharmaceutical O2O company that promises "free drug delivery in 28 minutes" as it

requires its offline employees to follow standard operating procedures. It divides the drug delivery process into 32 procedures and optimizes them all.

#### **4.4 Empowerment for Online Diagnosis and Treatment**

By following the trend of Internet hospitals, Renhe provides users with online diagnosis and treatment services on the Dingdang Kuaiyao APP, thus closing the loop of diagnosis and treatment - drug sales - health management.

Renhe has a medical team that integrates its own Hainan Internet Hospital and third-party Internet hospitals to provide users with instructions on drug use, online consultation on common diseases and chronic diseases, and renewal of prescriptions 24 hours a day. Via the Dingdang Kuaiyao APP, users are quickly matched with specialized doctors according to their needs and receive medical advice in voice or video in addition to text communication. In diagnosis and treatment, some users are directly converted into OTC drug buyers. Moreover, patients can obtain prescriptions from online medical consultation services and then directly purchase prescription drugs for common diseases, such as colds, fever, coughing, skin diseases, gastrointestinal diseases, chronic diseases, gynecological diseases, andrology diseases, and children's diseases, online. After diagnosis, treatment, and drug purchases, the patients' health records in the database support follow-up visits and drug purchases, thus empowering the closed loop of diagnosis and treatment - drug sales - health management.

#### **4.5 Empowerment with Technology**

Renhe has established a proprietary technology platform and supported its operation and innovation with various technology systems. The key technologies applied are named below.

Intelligent site selection: Based on big data and its electronic fence system, Renhe is able to select sites of smart pharmacies with relatively low rent and dense user groups to minimize the overlap between the coverage of smart pharmacies and maximize coverage of the whole smart pharmacy network.

Intelligent operation: Based on data analysis and operation, the platform automatically completes picking, packaging, and allocation for drug orders to enable intelligent drug picking, selection, and delivery and detailed prediction of sales orders, thus promoting the continuous improvement of the operating efficiency and business performance of pharmacies.

Intelligent delivery: Dingdang Health's intelligent delivery system provides intelligent solutions for path planning and delivery personnel scheduling by analyzing the logistics progress and local traffic conditions in real-time, thus improving distribution efficiency. In the intelligent delivery system, the order allocation subsystem allocates orders to balance the cost and time required for delivery by analyzing order quantities and the manpower available while considering weather conditions and other complex factors to ensure on-time delivery while minimizing the cost of delivery. The path planning subsystem collects information on possible delivery routes and traffic on these routes to minimize the time of delivery. The quality control subsystem monitors the delivery team in real-time to avoid missed delivery and other problems. The cost optimization subsystem collects and analyzes the delivery cost information and optimizes the delivery system from the financial point of view to minimize the cost while the quality of delivery service is guaranteed.



Smart marketing: Dingdang Health assigns multi-dimensional tags for users based on big data and artificial intelligence technology and maintains user health records. It applies deep learning of artificial intelligence and natural language processing to conduct text analysis and semantic matching for customer needs and medical corpus and construct knowledge maps. It enables accurate marketing and personalized recommendations for different users according to their purchase history, search records, treatment course with drugs, and the number of follow-up visits to improve the efficient operation of Dingdang's Smart Pharmacies.

#### **4.6 Summary of Chapter**

The practices of Renhe's investment in Dingdang Health are summarized below. First, on the product side, it has consolidated pharmaceutical companies' resources with the M2F model and formed procurement alliances, industrial alliances, and information alliances to reduce procurement costs, share information, and thus lower the prices of drugs. Second, it connects upstream products and downstream ends in pharmaceutical circulation with the B2B model and has built a supporting pharmaceutical logistics supply system suitable for modern pharmaceutical e-commerce. Third, on the customer side, on the one hand, it cooperates with B2C platforms, horizontally expands the industrial chain, and develops together with other network platforms efficiently; on the other hand, it connects pharmacies and customers via Dingdang Kuaiyao and has formed an integrated online and offline service system for pharmaceutical O2O, and improves the availability of essential drugs and customer loyalty. Fourth, it has set up a healthcare team, provides online consultation, and realizes the closed-loop of consultation - drug sales - health management. Fifth, it has kept investing in research and development based on technologies, such as big

data and artificial intelligence, to support digital empowerment for its various business lines. To sum up, Renhe's efforts for transformation toward Internet pharmacies have focused on forming a complete pharmaceutical industry chain structure and a complete "big health" layout in a holistic manner rather than seeking superiority in specific fields.

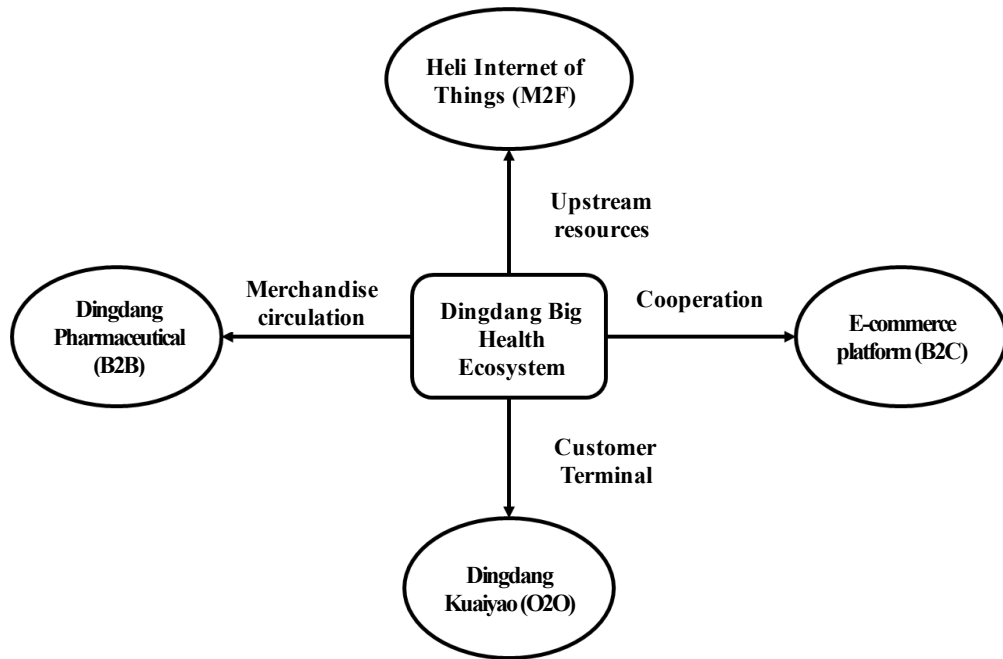


Figure 4-1 Dingdang Health's Business Layout

## CHAPTER V

### REALIZATION OF EFFECT OF DIGITAL TRANSFORMATION

#### 5.1 Pharmacies

**5.1.1 Operational capability of pharmacies.** As for pharmacies, Dingdang Health has become the largest player in China's O2O digital pharmacy market, with a share of 8.5%. As of March 2021, Dingdang Health had over 28.7 million customers on its platform. This dissertation compares some operational data of Smart Pharmacies run by Dingdang Health with those of traditional pharmacies to verify hypothesis H1.

Customers can purchase and collect over-the-counter drugs, prescription drugs, and other medical products in a quick, timely, and convenient manner at the Smart Pharmacies of Dingdang Health. As of June 2021, Dingdang Health had 302 self-operated Smart Pharmacies in 14 Chinese cities. Besides offline retail, these Smart Pharmacies also serve as front-line warehouses of O2O by delivering products customers order online. Now they can deliver orders within 28 minutes 7/24. In the three years from 2018 to 2020, the company received 14.1 million, 26.4 million, and 40.5 million sales orders from direct online sales and offline channels, and the proportion of direct online sales orders increased continuously, accounting for 87.7%, 90.8%, and 92.9% respectively in the three years.

Compared with traditional pharmacies, Dingdang Health's Smart Pharmacies model innovation has many operational advantages. Below are Dingdang Health's Smart Pharmacies compared with the four leading traditional listed pharmaceutical enterprises, i.e., Yifeng Pharmacy, LBX Pharmacy, Yixintang, and Dashenlin regarding inventory turnover, average profits per store, service coverage, and customer experience. In fact, these four listed pharmacy enterprises already have carried out digital transformation with

B2C and O2O e-commerce based on offline store networks, but revenues from e-commerce account for at most 5% of their total revenues. Therefore, they are still considered to be traditional pharmaceutical enterprises in this dissertation.

*Table 5-1 Comparison of Certain Operating Data between Dingdang Health and Traditional Pharmacies*

As of December 2021	Yifeng Pharmacy	LBX Pharmacy	Yixintang	Dashe nlin	Average	Dingdang Health	
Inventory turnover rate	4.08	4.34	3.85	3.79	4.20	6.02	
Operating revenues (RMB 100 million)	130.9	139.2	126.2	145.2	135.4	22.3	
Number of directly-operated stores	5,356	4,892	7,205	5,705	-	302	
Average profits (RMB 10,000/store)	244.4	284.5	175.2	254.5	239.7	738.4	
Service coverage	300-500 m				-	3-5 km	
Management model	Chain				-	Information management	
Delivery method	Collection at an offline store				-	Instant delivery	
Business hours	Partial day				-	7/24	
Presence in provinces/municipalities	Nine provinces/municipalities, mainly in South China and Central China		More than 130 prefecture-level cities in 22 provinces	10 provinces, including Yunnan and Sichuan, mainly in Southwest China	10 provinces, mainly in South China	-	Directly operated O2O Dingdang Kuaiyao stores cover 14 cities

*Table 5-1 Comparison of Certain Operating Data between Dingdang Health and Traditional Pharmacies (Continue)*

As of December 2021	Yifeng Pharmacy	LBX Pharmacy	Yixintang	Dashe nlin	Average	Dingdang Health
Types of drugs	Offline pharmacy size < 100 m <sup>2</sup> , drug types < 3,000; Offline pharmacy size of 100-300 m <sup>2</sup> , drug types < 3,600; Offline pharmacy size > 300 m <sup>2</sup> , drug types ≈ 4,500.				-	5,000 SKUs in average

Inventory turnover rate: Dingdang Health's Smart Pharmacies noticeably outperform offline pharmacies in inventory management. The inventory turnover rate of Dingdang Health's Smart Pharmacies was 6.02 in 2020, while offline pharmacies' average inventory turnover rate was 4.02 in the same period.

Average profits per store: The average profits per store of the four traditional pharmacy enterprises are between RMB 1.5-3 million. The average profits per store of the four traditional pharmacy enterprises are about RMB 2.4 million. At the same time, those of Dingdang Health's Smart Pharmacies are RMB 7.384 million, three times those of offline pharmacies. This divide tends to widen as online purchases of drugs become more popular, considering the fact that the penetration rate of online purchases is now less than 5% in China's pharmaceutical market, and traditional offline pharmacies still dominate the market.

Types of drugs: An offline pharmacy smaller than 100 square meters usually sells 3,000 drugs, and an offline pharmacy larger than 300 square meters usually sells about 4,500 drugs. Powered by technology, a Dingdang Smart Pharmacy can quickly adjust the types of drugs available. Dingdang Health's Smart Pharmacies offer products and select SKUs based on customers' needs. According to the input from customers, they also

dynamically change the proportions of categories and continuously optimize the SKUs available in each store. At present, a Jingdang Smart Pharmacy has about 5,000 SKUs on average, which cover nearly all types of products required by consumers while keeping the inventory moving rapidly.

**Service coverage:** Traditional offline pharmacies usually serve the communities with radii of about 300-500 meters centering on them. Dingdang Health's Smart Pharmacies can serve the communities with radii of about 3,000-5,000 meters through O2O remote delivery. The service coverage of Dingdang Health's Smart Pharmacies is 36 times larger than that of offline pharmacies. Moreover, Dingdang Health's Smart Pharmacies are less affected by location. Most traditional pharmacies are located at sites with heavy traffic or pedestrian flows, such as those close to hospitals, urban centers, and business districts. This means higher rent for the properties where the pharmacies operate. Dingdang Health's Smart Pharmacies are usually located at sites that enable the highest efficiency and broadest coverage. They mainly operate online, so they are less affected by location and enjoy lower rent.

**Delivery efficiency:** O2O operation and the five intelligent systems (electronic fence, intelligent dispatching, intelligent picking, route planning, and heat sand table) supported by science and technology serve as the key to Dingdang Health's delivery to the doorstep in 28 minutes. First, delivery personnel usually come from other locations, collect goods at the stores, and bring them to the customers. By contrast, Dingdang Health's self-operated pharmacies have dedicated delivery personnel who directly take the goods from the stores to the customers' homes, halving their travel distance. Second, Dingdang Health's Smart Pharmacies are appropriately located with the electronic fence technology of

Dingdang Kuaiyao after trial runs and stress tests based on the urban road network, traffic conditions, and consumers covered by stores. The service coverage of a store expands from a radius of about 500 meters to about five kilometers. They cover customers more accurately, contact and reach them seamlessly, and ensure on-time delivery.

Third, Dingdang Health minimizes the time for delivery with the whole delivery system powered by the latest technologies. By monitoring the big data, they have comprehensively optimized 32 order taking, picking, invoicing, and delivery processes for offline pharmacies. Advanced technological systems, such as the "intelligent route planning system," "intelligent picking system," and "intelligent dispatching system," have remarkably streamlined the whole process from goods dispatching to picking and delivery.

For example, the mobile picking system enables storage space management with mobile phones connecting the online order processing system and receiving goods information from offline pharmacies. The time of picking goods required for each order is less than one minute, with digital systems matching storage spaces with information about the desired goods, thus considerably improving the employees' working efficiency. The intelligent route planning system shortens the travel time of delivery personnel by seven minutes per order. The intelligent dispatching system has dramatically improved delivery efficiency and performance, keeping customer satisfaction with service. Along with the application of unmanned vehicle technology, the combination of manned and unmanned delivery is expected to supplement manual delivery and improve delivery efficiency in the future.

**5.1.2 Single-store profitability model.** The single-store profitability is simulated with a model analysis method to validate hypothesis H1 again.

Compared with the penetration rates of online drug purchases of up to 30% in developed countries, the penetration rate is less than 5% in China. China's online drug sales were RMB 39 billion, while the total drug sales were RMB 1.63 trillion in 2019. The penetration rate of online drug purchases was only 2.4% in the year.

However, online pharmacies are not expected to completely replace offline pharmacies due to the immediacy and professionalism required in pharmaceutical consumption. From the discussions above, this dissertation proposes the following conjecture: In the future, O2O will keep competing for consumers with offline stores by leveraging advantages in prices, options, and services; revenues of purely offline pharmacies will decrease due to the competition, but the rental, labor, and other fixed costs still exist; small and medium-sized pharmacies will be crowded out faster if they cannot keep the bottom line positive. The profitability of pharmacies will further rise in the future as the foot traffic and sales increase due to the lower density and broader coverage of pharmacies while the general costs of online operation remain relatively stable. The return on investment will increase, and the business model will enter a virtuous circle.

To verify the above conjecture, a single-store profitability model of offline pharmacies and one for online pharmacies have been constructed based on the statistics given in the two sections above for comparative analysis. The key assumptions are stated below.

Assumption 1: The stores are subject to the same conditions, with revenues, rent, and other costs remaining unchanged or growing at the same fixed rate of GDP.



Assumption 2: 65% of revenues are costs, and the gross profit margin is 35%. Of the revenues (100%), 30% are fixed costs, including rent, labor, marketing, and operating costs, which do not change with the sales revenues.

Assumption 3: The penetration rate of online drug purchases will continue to increase in China's pharmaceutical market, reaching the level of 30% in developed countries in an ideal case. The gross profit margin drops to 25% due to fiercer competition.

Stage 1: When the penetration rate of online drug purchases is 0, 65 out of the offline pharmacy's revenues 100 are the cost of goods, and the gross profit is 35; after the fixed cost 30 is deducted, the net profit is 5, and the net profit margin is 5%. Assume that the penetration rate of online drug purchases will increase in the future with the increase in the senior population. When the penetration rate of online drug purchases reaches 20%, the revenues of the purely offline pharmacy will be eroded by the online one and become 80; the gross profit margin remains unchanged at 35%, and then the gross profit becomes 28. If the fixed cost remains at 30, the gross profit cannot cover the fixed cost. The offline pharmacy starts to make a loss with profits eroded by the online pharmacy.

Stage 2: Assume that the remaining pharmacies start to take orders online, and their revenues become 120. If the gross profit margin remains unchanged at 35%, the gross profit becomes 42. After deducting the fixed cost 30 and 10% as the online order fulfillment fee, the remaining net profit is 10, and the net profit margin is 8.33%.

Stage 3: Assume that the pharmacies' density is halved and each pharmacy's service coverage is doubled. The revenues of each store are doubled. Assuming that the penetration rate of online drug purchases reaches 30%, the same as that in developed countries, the revenues of each store become 260. If the gross profit margin changes to 25% due to fiercer

competition, the gross profit becomes 65. After the deduction of the fixed cost 30 and 10% as the online order fulfillment fee, the net profit reaches 29, and the net profit margin reaches 11.2%.

From the analysis with the single-store profitability model above, offline pharmacies start to make losses when the penetration rate of online drug purchases reaches 20%, while the profit of pharmacies after O2O transformation gradually increases with the increasing penetration rate and finally realizes a virtuous circle.

## **5.2 Pharmaceutical Enterprises**

Financial data of pharmaceutical enterprises are compared to verify hypothesis H2. Compared with traditional pharmaceutical enterprises, pharmaceutical enterprises that carry out digital transformation and set up digital pharmacies will see rising profitability as the penetration rate of online drug sales increases. Below are the four leading listed traditional pharmaceutical enterprises, Yifeng Pharmacy, LBX Pharmacy, Yixintang, and Dashenlin, compared with Dingdang Health for analysis in terms of revenue growth rate, gross profit margin, and current-period expense rate, and other financial data. JDH.COM, whose main business line is B2C pharmaceutical e-commerce, is also added for data comparison.

*Table 5-2 Comparison of Financial Data between Dingdang Health and Traditional Pharmaceutical Enterprises*

As of December 2021	Yifeng Pharmacy	LBX Pharmacy	Yixintang	Dashenli	Average	Dingdang Health	JDH.C OM
Compound growth rate of revenues in the last three years	37.9%	21.4%	17.4%	28.3%	26.3%	95.2%	54.2%
Gross profit margin	38.0%	32.1%	35.8%	38.5%	36.1%	34.4%	25.4%
Order fulfillment expense rate	-	-	-	-	-	11.7%	10.8%
Sales expense rate	24.6%	20.3%	24.1%	23.8%	23.2%	19.8%	7.4%
Management fee rate	4.2%	4.7%	4.0%	4.8%	4.4%	5.4%	2.7%
R&D expense rate	0.1%	0%	0%	0%	0%	3.7%	3.1%

The compound growth rates in the last three years show that the operating revenues of Dingdang Health have increased rapidly from 2018 to now due to the increasingly improved environment for Internet healthcare and the development of digital bid health industries driven by COVID-19. The compound growth rate of Dingdang Health's revenues reached 95% from 2018 to 2020, with its revenue reaching RMB 2.229 billion in 2020. By contrast, the average growth rate of the four traditional pharmaceutical enterprises' revenues from pharmacies was only 26.3%.

As for gross profit margin, Dingdang Health's gross profit margin dropped slightly to 41.1%, 36.8%, and 34.4%, respectively, in the years from 2018 to 2020 due to raised costs caused by continuous business expansion, expansion of the network of Smart Pharmacies, increase in sales of prescription drugs, and more favorable discount policies for customers. Its gross profit margin was close to the average of the four leading traditional pharmaceutical enterprises from offline pharmacies, which was 36.1%. Its gross profit margin was better than that of B2C-based JDH.COM, which was 25.4%.

As for the sales expense ratio, the sales expense ratio of Dingdang Health kept decreasing in the last three years, being 24.1%, 21.8%, and 19.8%, respectively. Its sales expense ratio was still close to the average of the four leading traditional pharmaceutical enterprises in offline pharmacies, which was 23.8%. Its sales expense ratio was much inferior to that of B2C-based JDH.COM, which was 7.4%. The performance of JDH.COM was attributable to its advantages in owned warehousing and logistics and traffic diversion via JD.COM, which alleviated its pressure for attracting traffic in sales and marketing. The sales expenses of Dingdang Health are expected to decrease and reach a level comparable to those of JDH.COM as Dingdang Health's model becomes established together with higher brand awareness.

By comparing the profit structure of online retail pharmacies such as Dingdang Health and JDH.COM with offline pharmacies of traditional pharmaceutical enterprises, it is possible to see that order fulfillment expenses are at 10% and the largest part of costs of online pharmacies as the business model becomes mature and the sales expenses decrease. Warehousing, logistics, and labor costs are unavoidable, accounting for more than 70% of the order fulfillment expenses. In an ideal case, reducing sales expenses is the most

significant advantage of online pharmacies over offline pharmacies. Because they are not required to pay rent and maintain a large staff, the sales expense rate of online pharmacies is about 15% lower than offline pharmacies. The management and R&D expenses differ little between online pharmacies and offline pharmacies.

### **5.3 Customer Experience**

**5.3.1 Analysis of third-party reviews.** The advantages of digital transformation are examined from the perspective of customer experience with pharmacies in Dapujiao Sub-district and Lianyang Community in Shanghai and the Smart Pharmacies of Dingdang Health in the city to verify hypothesis H3.

Dapujiao Sub-district has a dense and aging population, with 8,783 people over 65 years old, accounting for 14.9% of the total population. There are 14 pharmacies, including six TCM pharmacies, in the sub-district, and only two of them have launched O2O services with slow digital transformation. The concentration of pharmacies is high here, with a pharmacy every 0.11 square kilometers.

By contrast, Lianyang Community has a young and highly internationalized population, with 18,541 people over 65 years old, accounting for 8.38% of the total population. There are six pharmacies, including one TCM pharmacy, in the community, and four of them have launched O2O services with relatively fast digital transformation. The concentration of pharmacies is low here, with a pharmacy every 0.88 square kilometers.

In this dissertation, five pharmacies were selected from each of Dapujiao Sub-district and Lianyang Community for comparison. Ratings and reviews given by customers were collected from Dianping, Ele, and Amap in in-store and O2O scenarios to discuss the

effect of the digital transformation of pharmacies on patients' experience of seeking medical treatment and purchasing drugs. Unfavorable reviews are shown in gray.

*Table 5-3 O2O Business Development of Pharmacies in Dapujiao Community*

	Dingdang Shanghai Pharmacy (Yongchun)	Dingdang Shanghai Pharmacy (Luwan)	Nepstar Drugstore (Xujiahui)	GuoDa Drugstore (Taikang)	Leiyunshang (Luwan)
With O2O business or not	No	No	Yes	Yes	No
Online SKUs	-	-	About 3,000	About 2000	
Rating on in-store experience	4.5 Amap 4.6 Dianping	4.5 Dianping	2.0 Amap 3.0 Dianping	2.0 Amap 3.0 Dianping	3.7 Dianping
Reviews of in-store experience	The prices are high; the service attitude should be improved; the types of products are limited A state-run pharmacy with professional sales representatives	More expensive than buying online Many medicines, good service attitude, and a clean store	No real discounts	A few drugs are expensive; the service attitudes should be improved A full range of products, reasonable prices, 24- hour open, patient and professional	30-50% more expensive than other stores Zealous service; most precious Chinese medicines can be found here
Rating on delivery	4.9 Ele 4.9 Meituan	4.9 Ele 4.9 Meituan	4.8 Ele 4.8 Meituan	4.8 Ele 4.8 Meituan	-

Table 5-3 O2O Business Development of Pharmacies in Dapujiao Community(Continue)

	Dingdang Shanghai Pharmacy (Yongchun)	Dingdang Shanghai Pharmacy (Luwan)	Nepstar Drugstore (Xujiahui)	GuoDa Drugstore (Taikang)	Leiyunshan g (Luwan)
Review on Meituan	-	-	The doctor is enthusiastic; the store usually sends some considerate tips; the service is excellent; the delivery is fast; the products are genuine; the service attitude is good; the prices are nice	Fast delivery, perfect attitude of the delivery guy, and excellent service	-
Review on Ele	-	-	The delivered drugs are wrong Good quality and low price, fast delivery; exquisite packaging The ointment has no package; some items are missing; the thermomete r is defective	Fast delivery, guaranteed quality, satisfactory service, careful packaging, and nice prices The drugs were needed urgently, but the delivery was slow (arrived in 40 minutes)	-

Table 5-4 O2O Business Development of Pharmacies in Lianyang Community

	GuoDa Drugstore (Guangchang )	Nepstar Drugstore (Yingchun Road)	Yifeng Pharmacy (Taikang)	No. 1 Pharmacy (Dingxiang Road)	Yifeng Pharmacy (Luoshan Road)
With O2O business or not	Yes	Yes	Yes	Yes	No
Online SKUs	About 2,000	About 3,000	About 3,000	About 2,000	-
Rating on in- store experien ce	2.96 Dianping	2.00 Amap 2.97 Dianping	2.8 Dianping	4.34 Dianping	3.46 Dianping
Reviews of in- store experien ce	The service attitude should be improved; the types of products are limited; expensive drugs are recommende d; the frequency of chronic disease management is low; member discounts are not available	Empty shelves; common drugs not available; prices more expensive than those online; abundant health preservatio n products; no payment with medical insurance cards Diverse promotional activities	The service attitude should be improved; strong sales recommendati ons; Good experience; payment with medical insurance cards; free use of umbrella	High discounts in this newly opened store, considerate high- quality service, dazzling varieties, complete types of products, and professiona l pharmacists	The drugs are expensive, and the doctors' professionalis m should be improved; The drugs are pretty cheap; the service is good; the sales representative is very professional
Rating on delivery	4.8 Ele	4.9 Ele 4.8 Meituan	4.8 Ele 4.8 Meituan	4.8 Ele	-



Table 5-4 O2O Business Development of Pharmacies in Lianyang Community (Continue)

	GuoDa Drugstore (Guangchang )	Nepstar Drugstore (Yingchun Road)	Yifeng Pharmacy (Taikang)	No. 1 Pharmacy (Dingxiang Road)	Yifeng Pharmacy (Luoshan Road)
Review on Meituan	The agent's attitude is perfect in Meituan's telephone consultation service; on-time delivery; there is a problem with the shelf life	The service is considerate and fast; the price is low; the types of drugs are complete; the delivery is fast; the service attitude is good	Pharmacists responded quickly; fast delivery, low prices, privacy packaging	The packing is perfect, and the delivery is very fast	-
Review on Ele	Preferential prices, good quality, careful packaging, and timely delivery	Timely delivery, reasonable prices, tight packaging, considerate service, and convenient and fast experience	The types of drugs are complete; it is easy to place orders; the delivery is fast and safe; the quality is good; the delivery guy's attitude is friendly; there is a problem with the packaging caused during the delivery process	Fast delivery, high cost-effectiveness; nice drugs; plentiful items	-

Reviews on in-store and delivery experience: Consumers coming to offline pharmacies are mainly concerned about the prices (including special offers, member discounts, etc.) and types of drugs, service attitude, and professionalism (including recommendations on drugs, etc.), and so on and prefer stores that sell drugs of good quality

at low prices with different types available, accept payment with medical insurance cards, and have common and urgent-use drugs. They usually dislike promotional recommendations on drugs. Besides the above factors, consumers are also concerned about the immediacy of delivery and packaging when ordering drugs on online platforms.

Ratings on in-store and delivery experience: Consumers usually give low ratings for ordinary offline pharmacies, ranging from 2 to 4 points. Ratings higher than 4 points are rare. Ordinary pharmacies with online O2O services receive higher ratings, 4.9 points on average, and more favorable reviews.

That is, the O2O model is obviously superior to in-store consumption in terms of experience and cost-effectiveness. Most ratings on in-store experience are about 3 points, while the average rating on O2O experience is 4.9 points. Consumers give more unfavorable reviews on in-store experience than on the O2O model, indicating unsatisfactory experience in stores. The immediacy of drugs means that offline pharmacies are irreplaceable, but offline pharmacies face many problems, such as the unavailability of certain drugs, high drug prices, limited business hours, and poor service attitude of pharmacists. The O2O model offers drugs at prices lower than offline prices, but the price differences are insignificant. Delivery is generally free in the market nurturing stage, so the O2O model is obviously cost-effective.

By taking into account the population structure and distribution of the two communities in the comparison of the tables above, it is easy to find that the level of aging is directly proportional to the density of pharmacies and inversely proportional to the level of pharmaceutical O2O development. However, offline pharmacies will not be replaced

entirely by online pharmacies mainly due to the immediacy and professionalism required in pharmaceutical consumption.

**5.3.2 Drug price analysis.** Drug prices in some pharmacies in the two communities selected above and those of Dingdang Healthy Smart Pharmacies are compared. The drugs chosen for comparison are Lianhua Qingwen Capsules, Mayinglong Diosmin Tablets, and BYHEALTH Protein Powder, which are a common OTC drug, a prescription drug, and a dietary supplement, respectively.

*Table 5-5 Price Comparison of Lianhua Qingwen Capsules (OTC)*

	Store	Ele	Meituan	JDH.COM
Nepstar Drugstore (Xujiahui)	RMB 28.8 / 48 capsules; RMB 42.9 / 72 capsules	RMB 28.8 / 48 capsules; RMB 42 / 72 capsules	RMB 28 / 48 capsules; RMB 42.8 / 72 capsules	RMB 29.8 / 48 capsules; RMB 42 / 72 capsules
GuoDa Drugstore (Taikang)	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules	-
GuoDa Drugstore (Guangchang)	RMB 29.5 / 48 capsules	RMB 29.5 / 48 capsules	RMB 29.5 / 48 capsules	-
Nepstar Drugstore (Yingchun Road)	RMB 42.6 / 72 capsules	RMB 28.8 / 48 capsules; RMB 42 / 72 capsules	RMB 28 / 48 capsules; RMB 42.8 / 72 capsules	RMB 29.8 / 48 capsules; RMB 42 / 72 capsules
Yifeng Pharmacy (Damuzhi)	RMB 29.2 / 48 capsules	RMB 29.2 / 48 capsules	RMB 29.2 / 48 capsules	RMB 28.8 / 48 capsules
No. 1 Pharmacy (Dingxiang Road)	RMB 21.9 / 36 capsules	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules	RMB 21.9 / 36 capsules; RMB 29.5 / 48 capsules
Dingdang Health	RMB 28.8 / 48 capsules			

Table 5-6 Price Comparison of Mayinglong Diosmin Tablets (Prescription Drug)

	Store	Ele	Meituan	JDH.COM
Nepstar Drugstore (Xujiahui)	-	RMB 57.5 / 36 tablets	RMB 54 / 36 tablets	RMB 49 / 36 tablets
GuoDa Drugstore (Taikang)	RMB 57.5 / 36 tablets	RMB 57.5 / 36 tablets	RMB 57.5 / 36 tablets	-
GuoDa Drugstore (Guangchang)	-	-	RMB 57.5 / 36 tablets	-
Nepstar Drugstore (Yingchun Road)	RMB 57.5 / 36 tablets	RMB 57.5 / 36 tablets	RMB 54 / 36 tablets	RMB 49 / 36 tablets
Yifeng Pharmacy (Damuzhi)	RMB 51.5 / 36 tablets	RMB 54.1 / 36 tablets	RMB 54.1 / 36 tablets	RMB 51.5 / 36 tablets
No. 1 Pharmacy (Dingxiang Road)	-	-	-	-
Dingdang Health	RMB 57.5 / 36 tablets			

Table 5-7 Price Comparison of BYHEALTH Protein Powder 450g (Dietary Supplement)

	Store	Ele	Meituan	JDH.COM
Nepstar Drugstore (Xujiahui)	RMB 428 / can	RMB 428 / can; RMB 342 / can during promotion	RMB 390 / can; RMB 198 / can during promotion	RMB 398 / can
GuoDa Drugstore (Taikang)	RMB 428 / can	RMB 428 / can	RMB 398 / can; RMB 278.6 / can during promotion	-
GuoDa Drugstore (Guangchang)	RMB 428 / can	RMB 428 / can	RMB 428 / can	-
Nepstar Drugstore (Yingchun Road)	RMB 384 / can	RMB 428 / can	RMB 390 / can; RMB 258 / can during promotion	RMB 398 / can

Table 5-7 Price Comparison of BYHEALTH Protein Powder 450g (Dietary Supplement)  
(Continue)

	Store	Ele	Meituan	JDH.COM
Yifeng Pharmacy (Damuzhi)	RMB 428 / can; RMB 328 / can during promotion	RMB 428 / can	RMB 428 / can; RMB 192 / can during promotion	RMB 438 / can; RMB 368 / can during promotion
No. 1 Pharmacy (Dingxiang Road)	RMB 428 / can; Buy two get one free	-	-	-
Dingdang Health	RMB 428 / can; RMB 229 / can during promotion			

Table 5-8 Comparison of Delivery Fees of Different Platforms

	Ele	Meituan	JDH.COM
Nepstar Drugstore (Xujiahui)	Delivery fee of RMB 7; free delivery for orders over RMB 19	Delivery fee of RMB 5; free delivery for orders over RMB 16	Delivery fee of RMB 4; free delivery for orders over RMB 30
GuoDa Drugstore (Taikang)	Delivery fee of RMB 7; free delivery for orders over RMB 20	Delivery fee of RMB 5; free delivery for orders over RMB 20	-
GuoDa Drugstore (Guangchang)	Delivery fee of RMB 7; free delivery for orders over RMB 20	Delivery fee of RMB 5; free delivery for orders over RMB 20	-
Nepstar Drugstore (Yingchun Road)	Delivery fee of RMB 7; free delivery for orders over RMB 20	Delivery fee of RMB 5; free delivery for orders over RMB 20	Delivery fee of RMB 4; free delivery for orders over RMB 34
Yifeng Pharmacy (Damuzhi)	Delivery fee of RMB 7; free delivery for orders over RMB 20	Delivery fee of RMB 5; free delivery for orders over RMB 20	Delivery fee of RMB 4; free delivery for orders over RMB 40
No. 1 Pharmacy (Dingxiang Road)	Delivery fee of RMB 7; free delivery for orders over RMB 20	Delivery fee of RMB 5; free delivery for orders over RMB 20	Delivery fee of RMB 4; free delivery for orders over RMB 40
Dingdang Health	Free delivery during the day and RMB 8 delivery fee at night; free delivery for orders over RMB 28		

In general, the prices on Dingdang Health and other O2O platforms are relatively low, but the price differences are insignificant, especially between OTC and prescription drugs. The discounts for the non-pharmaceutical protein powder are relatively high, and its prices differ insignificantly among pharmacies and third-party platforms.

In terms of O2O delivery fees, Meituan Takeaway and Ele have more cooperative stores and offer lower prices and more favorable delivery fees. At present, the delivery fee indicated by Meituan is RMB 5 per order and is wholly exempted during the promotion period; the delivery fee indicated by Ele is RMB 7 per order and is wholly exempted during the promotion period. JDH.COM charge a low delivery fee, but the minimal amount of order entitled to free delivery is higher than that of Ele and Meituan Takeaway. Dingdang Health delivers orders for free during the day but charges RMB 8 for delivery at night. It also delivers orders over RMB 28 for free.

From consumers' point of view, the economy of scale and network effect on the Internet can improve the convenience of drug purchase and the types of drugs being offered, and O2O helps break spatial limits. The categories of drugs in offline pharmacies are limited. Consumers may search for products on different O2O platforms and place orders on online platforms of nearby pharmacies, so the prices are more transparent on O2O platforms. The pharmaceutical O2O market is still in the consumer education stage due to limitations on online sales of prescription drugs and payment with medical insurance cards though the major e-commerce platforms launched the pharmaceutical O2O business quite early. They are trying to attract customers by allowing free delivery for low order amounts, low delivery fees or free delivery, and various coupons. In terms of price, online pharmacies have pricing advantages by offering discounts and promotional activities for

dietary supplements with ample funds from investors in the early stage; in the mid and long terms, online pharmacies can still offer discounts for drugs when the broader service coverage brings more customers per store and higher sales revenues as the costs are low due to the online asset-light strategy.

**5.3.3 Online consultation analysis.** The advent of online consultation has changed the traditional way of medical consultation and improved the state of some existing problems for patients, hospitals, and doctors. Below are some examples:

First, patients need not visit hospitals as they can consult doctors via the Internet anytime and anywhere. Patients save time without queuing for registration at hospitals and can collect reports more easily and quickly after consultation at hospitals. Online consultation makes medical services easier to access.

Second, online consultation copes with the unbalanced distribution of medical resources. High-quality medical resources are available all over the country, where there is Internet access. Doctors can share cases, exchange ideas, cooperate in surgeries, and improve their skills via the Internet. Patients in remote areas can also access high-quality medical services via the Internet.

Third, doctors can answer questions from patients whenever they have time in work or life, so patients save waiting time and have plenty of time to talk with doctors.

According to the data on online consultation of Dingdang Health, for example, Dingdang Health is committed to providing customers with solutions of comprehensive medical products and services and helping patients in health management for chronic diseases to further supplement the service cycle. As of June 2021, Dingdang Health has established a medical team including 16 full-time and 58 part-time doctors and more than

800 external doctors through cooperation with third-party medical institutions, in addition to 397 pharmacists and other medical professionals. The medical team provided 100,000, 2.2 million, and 4.4 million online consultation sessions from 2018 to 2020, respectively, with a compound growth rate of 528.9%. Moreover, the services have effectively enhanced the customer conversion rate of health services. The proportion of customers who purchased products and services to customers who received prescriptions from online consultation was 51.4%, 69.9%, and 68.8% in the three years, respectively. This line of business is well coordinated with drug sales.



## CHAPTER VII

### CONCLUSION AND RECOMMENDATIONS

The transformation toward Internet pharmacies has become an inevitable trend for traditional pharmaceutical enterprises as China's pharmaceutical industry faces industrial restructuring driven by "Internet Plus." Problems have been observed from the perspectives of traditional pharmacies, enterprises, and customer experience. These problems can be solved with new modes, such as pharmaceutical e-commerce and mobile healthcare, emerging in the "Internet Plus" wave and forcing traditional pharmaceutical enterprises to seek digital transformation.

Renhe's investment in Dingdang Health has created a complete pharmaceutical industry chain structure instead of focusing on certain limited aspects. As for upstream resources, it has consolidated the resources of pharmaceutical companies with the M2F model and formed procurement alliances, industrial alliances, and information alliances to reduce procurement costs and share information. In pharmaceutical circulation, it connects upstream products and downstream ends with the B2B model and has built a supporting pharmaceutical logistics supply system suitable for developing modern pharmaceutical e-commerce. As for customer experience, on the one hand, it cooperates with B2C platforms, horizontally expands the industrial chain, and develops together with other network platforms efficiently; on the other hand, it connects pharmacies and customers through Dingdang Kuaiyao and has formed an integrated online and offline service system for pharmaceutical O2O, and improves the availability of essential drugs and customer loyalty. In terms of products and empowerment, it has set up a healthcare team, provides online consultation, and realizes a closed loop of consultation - drug sales - health

management. In the whole digital transformation process, it has kept investing in research and development based on technologies, such as big data and artificial intelligence, to support digital empowerment for its various business lines.

The realization of the effect of digital transformation by traditional pharmaceutical enterprises has been discussed. First, as for online pharmacies, the Smart Pharmacies outperform traditional pharmacies in the inventory turnover rate, average profits per store, service coverage, types of drugs, and delivery efficiency. With the single-store profit model, this study finds that the profits of traditional pharmacies are gradually eroded, and finally, they cannot maintain the bottom line along with the increase in online drug purchases. However, the profitability of digital pharmacies represented by Dingdang Smart Pharmacies keeps improving. Second, as for pharmaceutical enterprises, the overall profitability of Dingdang Health has not shown an obvious advantage over that of traditional pharmaceutical enterprises as the penetration rate of online drug purchases is still low in China's pharmaceutical market, and Dingdang Health is only trying to seize the market and establishing channels at present. Its sales costs have yet to decrease to the expected low level, and there are considerable order fulfillment expenses, as shown in financial data. Third, as for customer experience, consumers give more unfavorable reviews on in-store experience than on the O2O model, indicating unsatisfactory experience in stores. Offline pharmacies face many problems, such as the unavailability of certain drugs, high drug prices, limited business hours, and poor service attitude of pharmacists, while online pharmacies have improved results in all these aspects. Moreover, the O2O model offers drugs at lower prices than offline pharmacies, but the price differences are insignificant. Delivery is generally free in the market nurturing stage, so the

O2O model is obviously cost-effective. Generally, online pharmacies are more advantageous than offline pharmacies regarding third-party review, rating, drug price, online consultation, etc.. However, they still cannot completely replace offline pharmacies mainly because of the immediacy and professionalism required in pharmaceutical consumption.

Pharmaceutical enterprises are facing various obstacles and problems in their efforts seeking transformation and upgrading toward "Internet plus" models, such as insufficient consolidation of the industry chain, ambiguity in relevant policies, unrealized potential reform bonuses, supporting services pending improvement, lack of specific measures to offer easy-to-access benefits to the public, and lack of professionals with comprehensive skills. By studying the current trends of development, Renhe has ascertained that "Internet plus pharmacies" are the direction of policies for strategic transformation and upgrading and clearly understood the strategic missions and objectives of "Internet plus pharmacies" in the development of the pharmaceutical industry and medical reforms in China.

Along with deepening the industrial transformation in the direction of "Internet plus pharmacies," traditional pharmaceutical enterprises will gradually complete their strategic transformation and upgrading by establishing an Internet ecosystem of big health covering the whole industrial chain. Traditional pharmaceutical enterprises have just begun their transformation journey of "Internet plus." A new round of pharmaceutical industry reforms is expected as further relevant policies are being released. While drawing lessons from the practices of Renhe in digital transformation, other traditional pharmaceutical enterprises should decide on their own pathways and models in seeking transformation depending on

their respective conditions and realize the "soft landing" of traditional lines of business in the "Internet plus" waves.

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