INSTITUTO
UNIVERSITÁRIO
DE LISBOA

Sustainable Competitive Advantage in Maternal and Child Healthcare Institutions: A Resource-Based Approach

Yuan Haibin

Doctor of Management

Supervisor:

PhD Fernando A. F. Ferreira, Associate Professor,
ISCTE University Institute of Lisbon

September, 2021

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

Sustainable Competitive Advantage in Maternal and Child Healthcare Institutions: A Resource-Based Approach

Yuan Haibin

Doctor of Management

Supervisor:

PhD Fernando A. F. Ferreira, Associate Professor,
ISCTE University Institute of Lisbon

September, 2021

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

Sustainable Competitive Advantage in Maternal and Child Healthcare Institutions: A Resource-Based Approach

Yuan Haibin

Doctor of Management

Jury:

PhD Braulio Alturas, Associate Professor,
ISCTE University Institute of Lisbon
PhD Ricardo Jorge Castro de Correia, Assistant Professor,
University of Madeira
PhD Virginia Trigo, Professor Emeritus,
ISCTE University Institute of Lisbon
PhD Wang Dong, Professor,
Southern Medical University

iscte INSTITUTO UNIVERSITÁRIO DE LISBOA

Sustainable Competitive Advantage in Maternal and Child Healthcare Institutions: A Resource-Based Approach

Yuan Haibin

Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: 袁海斌 Date: 30. sep 2021

Name: Yuan Haibin

作者申明

本人郑重申明：除了论文致谢中明确说明并致以谢意的部分外，所呈交的论文不包含任何他人或作者本人已用于获得任何教育机构的学位和证书而使用过的材料。同时尽我所知，除了文中特别加以标注引用的内容外，本论文不包含任何其他个人或集体已经发表或撰写的成果作品。

作者签名：袁海斌 日期：2021. 9. 30

姓名(拼音)：Yuan Haibin

[This page is deliberately left blank.]

Abstract

The Chinese government has always attached great importance to protect the rights of women and children, and made consistent efforts to promote their all-round and health development. The country's efforts in maternal and child health (MCH) have made significant improvements to the safety of mothers and infants, meeting their diversified health care demands and increasing fairness in medical treatment. While China's medical reform progresses, the fall in birth rate and the growing diversified and multi-level health care service demands of people call for the survival and development of MCH institutions, especially MCH institution at the prefecture level facing more changes and challenges. Thus, MCH institutions need to explore new ways to improve their competitiveness and meet the challenges brought by these new changes.

This research integrates qualitative and quantitative research methods by using scientific methods such as the Delphi Method and the Analytic Hierarchy Process. Through three rounds of expert consultation, we completed the construction of an evaluation index model of the competitive advantage of MCH institutions, and selected 10 MCH institutions to verify the applicability of the model. According to the sensitivity analysis results of the Super Decision software, the model was found to have good stability.

From the evaluation model, it can be seen that human resources have the greatest weight. In practice, it is also found that people are the most controllable core resource, and the one with most potential. Therefore, by focusing on people as the core for MCH success, we have discussed the ways for MCH institutions to acquire and maintain competitive advantages from the three dimensions of discipline leader cultivation, scientific research ability improvement, and construction of a flexible hospital culture.

Keywords: Competitive advantage; Dynamic capabilities; Maternal and child health institutions; Resources

JEL: I10; L12

[This page is deliberately left blank.]

Resumo

O governo chinês sempre atribuiu grande importância à proteção dos direitos das mulheres e das crianças, desenvolvendo esforços consistentes para promover o seu desenvolvimento saudável. Nesse sentido, os esforços do país ao nível da saúde materno-infantil (SMI) trouxeram melhorias significativas para a segurança das mães e dos seus bebés, atendendo às suas necessidades específicas de cuidados de saúde e aumentando a equidade no tratamento médico. À medida que a reforma médica da China avança, a queda na taxa de natalidade e a crescente procura de serviços de saúde diversificados a vários níveis requerem a sobrevivência e o desenvolvimento das organizações de SMI, especialmente a nível municipal, que enfrentam mais mudanças e desafios. Assim, as organizações de SMI necessitam de explorar novas formas de melhorar a sua competitividade e enfrentar os desafios trazidos por essas novas mudanças.

O presente estudo integra métodos de investigação qualitativa e quantitativa, nomeadamente o método Delphi e o Analytic Hierarchy Process. Por meio de três rondas de consulta a especialistas, foi possível desenvolver um índice de avaliação da vantagem competitiva das organizações de SMI, tendo sido selecionadas 10 instituições de SMI para verificar a aplicabilidade prática do sistema de avaliação. De acordo com os resultados da análise de sensibilidade realizada com recurso ao software Super Decisions, o modelo apresentou uma boa coerência interna e estabilidade no cálculo das performances parciais.

Através do modelo de avaliação criado, percebe-se que os recursos humanos têm maior peso nas avaliações feitas. Também se descobriu que as pessoas constituem o recurso central mais controlável e aquele com maior potencial de desenvolvimento. Como tal, ao focarmo-nos nas pessoas como o elemento primário para o sucesso das organizações de SMI, discutimos diferentes formas para que estas organizações possam adquirir e manter vantagens competitivas sustentáveis, nomeadamente a partir da liderança, da melhoria da capacidade de investigação científica e de uma cultura hospitalar flexível.

Palavras-chave: Vantagem competitiva; Capacidades dinâmicas; Instituições de saúde materno-infantil; Recursos;

JEL: I10; L12

[This page is deliberately left blank.]

摘 要

在中国，妇幼保健机构直接服务于妇女和儿童群体。经过 70 余年的建设和发展，其在保障母婴安全、提升出生人口素质、满足妇女儿童多样化健康需求、促进就医公平、提升中国乃至世界人民健康水平方面做出了凸出贡献。然而随着中国医改的深入、人口出生水平的下降以及群众健康需求的多元化，妇幼保健机构，尤其是地市级妇幼保健机构的生存和发展面临更多的变化，妇幼保健机构亟需探求竞争力提升路径，以应对这些新变化所带来的挑战。

本研究主要运用德尔菲法和层次分析法，通过三轮专家咨询，结合层次分析，完成了对妇幼保健机构竞争优势评价指标模型的构建，并选取了 10 家妇幼保健机构对模型的适用性进行了验证。根据 Super-desicion 软件的敏感性分析结果，模型具有很好的稳定性。

从评价模型来看，“人力资源”指标所占权重最大，在实际工作中也发现，人是最可控、最具有潜力的核心资源，因此我们抓住“人”这一核心，从学科带头人培育、科研能力提升和柔性医院文化建设三个维度对妇幼保健机构维持和获取竞争优势的路径进行了探讨。

关键词：竞争优势；动态能力；妇幼保健机构；资源；

JEL: I10; L12

[This page is deliberately left blank.]

Acknowledgements

After three years of study and exploration, under the careful guidance of Professor Fernando Ferreira, my doctoral thesis has finally come to an end. At this moment, thousands of words can only be summed up into much thanks to everyone who gave me helps on many aspects.

First, much thanks to Professor Fernando Ferreira, during the period of my doctoral thesis writing, he put forward strict requirements for me, took many challenges to clarify my thinking and make suggestions for improvements of my study. Thanks to his help, my research horizon has been continuously broadened. His rigorous research attitude and strict research requirements have deeply affected and inspired me. As his doctoral candidate, I feel greatly honored!

In addition, during the three years of my doctoral study, I also received guidance and help from Professor Virginia Trigo, Professor Nelson António, Professor Zhang Zhicheng and Professor Sun Ping. Their research suggestions in the thesis opening and mid-term report helped me further clarify my research ideas.

Last but not least, I would also like to thank all the teachers in the project team, especially Miss Ou Weiyan for her careful help and encouragement, as well as the transition teachers for their help!

Thanks to all of my classmates, grateful to know each other and experienced this journey together, our friendship is everlasting!

[This page is deliberately left blank.]

致　谢

经过三年的学习和探索，在费尔南多教授的悉心指导下，我的博士学位论文终于要划上最后的句号，此时，千言万语只汇聚成两个字—感谢！

首先感谢费尔南多教授，在论文撰写中，您对我严格要求，不厌其烦地为我理清思路、提出改进建议，正因为有您的帮助，我的研究视野得以不断开阔，您严谨的治学态度、严格的治学要求都深深感染和激励着我，作为您的博士研究生，我感到莫大的荣幸！

在博士研究生学习的三年里，我还得到了 Prof. Virginia Trigo、Prof.Nelson António、张持晨教授和孙平教授的指导和帮助，你们在开题及中期报告中为我提出的研究建议，帮助我进一步明确了研究思路！

此外，还要感谢项目组所有的老师，尤其是欧玮艳老师的悉心帮助和鼓励，还有翻译老师的尽心尽力的帮助！

感谢我的同学们，感恩相识，我们友谊长存！

[This page is deliberately left blank.]

Contents

List of Tables

[This page is deliberately left blank.]

List of Figures

[This page is deliberately left blank.]

Chapter 1: Introduction

This chapter focuses on the background and significance of the thesis, describing the research motivation, as well as its purpose, challenges, methods, and main points of innovation.

1.1 Research motivation

The Chinese government has always attached great importance to protect the rights of women and children, and made consistent efforts to promote their all-round and health developmentThe country's efforts in maternel and health (MCH) have made significant improvements to the safety of mothers and infants, meeting their diversified health care demands and increasing fairness in medical treatment. Improving MCH is a central element in healthy policy: MCH institutions directly serve two-thirds of the women and children in China and there is evidently room for increasing this percentage. However, in the constantly changing social environment, many MCH institutions at the level of the prefecture and below are grappling with a growing number of challenges. The main issues are:

1.1.1 Slower growth rate of childbirth compared with general hospitals

This thesis takes Xiangtan City, Hunan Province, as a case. There are 5 public delivery institutions in the urban area of Xiangtan City, of which Xiangtan Central Hospital is the largest. Xiangtan Maternal and Child Health Hospital is the only municipal maternal and child health institution in the city. In 2013, Xiangtan Central Hospital, Xiangtan Maternity and Child Care Hospital and the Second Hospital of Xiangtan ranked top three in terms of the number of births in the city. By 2019, the proportion of births in the central Hospital of Xiangtan increased by 9.5%, while the number of births in the Second Hospital of Xiangtan Maternity and Child Health Hospital and the Second Hospital of Xiangtan only increased by 4.67-4.75% (See Table 1.1 and Figure 1.1 for details).

Table 1.1 Comparison of the number of live births in major institutions in Xiangtan city, Hunan province in 2013 and 2019

	2013		2019		Increse (%)
	Number born alive	ratio (%)	Number born alive	ratio (%)	
Xiangtan City (Urban area)	9038		10081		
Xiangtan Central Hospital	1353	14.97	2467	24.47	9.50
The Second People's Hospital of Xiangtan	592	6.55	181	1.80	-4.75
Xiangtan Maternal & Child Health Hospital	4776	52.84	5797	57.50	4.66

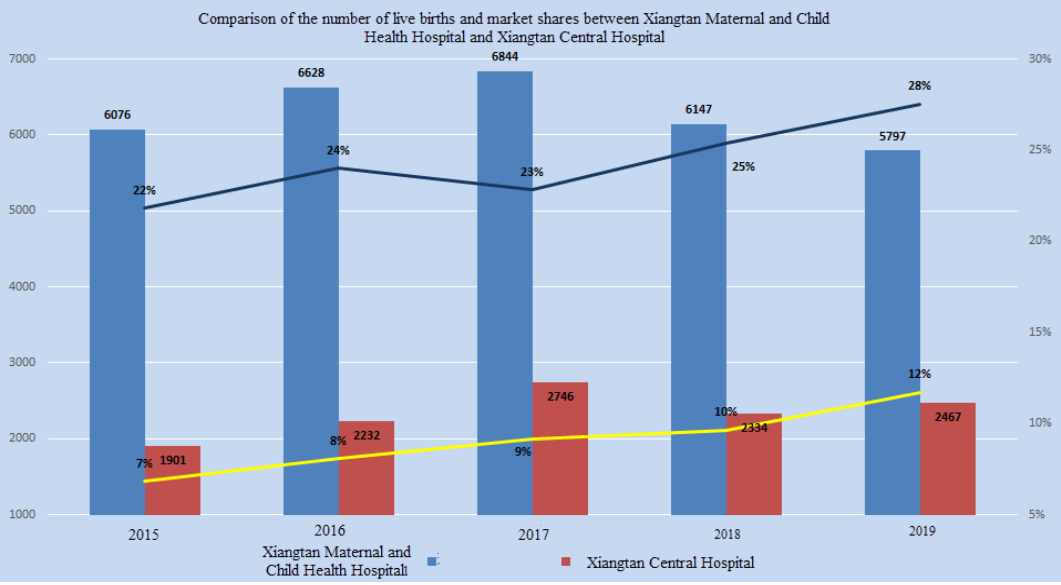

Figure 1.1 Comparison of the number of live births and proportion of births occurring in Xiangtan Maternal and Child Health Hospital and Xiangtan Central Hospita

1.1.2 Poor disciplinary anti-risk capability

The outbreak of the 2019 coronavirus disease (hereinafter abbreviated as COVID-19) at the had an unprecedented impact on the medical and health care industry. In the months of January and February 2020, with the exception of Hubei province, the number of health care consultations across the country decreased by 21.3%, and the number of discharged patients by 17.2%, when compared to the previous year (Center for Health Statistics and Information., 2020). In March 2020, the pandemic started to come under control in China. The number of health care visits increased by 34.4% month-on-month, and the number of hospital discharges rose by 46.9% month-on-month (Center for Health Statistics and Information., 2020). Based on the data, it can be stated that the impact of the COVID-19 outbreak on overall health care work is being reduced as the pandemic gradually fades away.

Unlike general hospitals that came to not be affected by the impact of the pandemic over

time, restoring normal operations, specialized hospitals such as MCH institutions still ^Shanghaisuffered a severe impact from the pandemic: with the implementation of public health measures such as home quarantine, frequent hand washing, and wearing masks, the number of pediatric consultations for infectious diseases and respiratory diseases began to decline sharply. We take the Maternal and Child Health Hospital of Xiangtan City, Hunan Province, as an example. This hospital is a grade-three class-A MCH hospital, and its department of child health care has 10 disciplinary units, which have always been the hospital's core disciplines. However, due to the impact of the COVID-19, the number of outpatient visits in the department of child health care of the hospital in the first quarter decreased by 52.6% compared with the same period the previous year. Even though the pandemic in China has been basically under control since April, the situation of the department in the hospital is still not positive. As of mid-May 2020, the department had only recovered 39% of its medical services, and the number of discharged patients had only recovered by 47% compared with the same period of the previous year. The specific impact that COVID-19 has had on pediatrics highlights the overall impact on MCH institutions and it is fair to say that major public health emergencies have further exposed the vulnerability of these institutions.

1.1.3 Worsening situation for maternal and infant health under the "universal two-child" policy

In November 2013, China began to implement a policy for couples where either the husband or the wife is from an only-child family, allowing them to have two children (the "two-child fertility policy"). This policy was applied across the country from 1 January 2016 onwards. As a result, the number of women of advanced reproductive age in Xiangtan City, Hunan Province, reached 11,000 in 2018 (corresponding to 43.5% of all women – an increase of nearly 10%). While the birth rate in Hunan Province continued to decline after the brief increase in 2017, it must be noted that, after the implementation of the universal two-child policy, the proportion of pregnant women of ages 35 and above increased. The risk of complications during pregnancy and childbirth increases with age, and the tasks managing and treating critically ill pregnant women and newborns also increase in complexity. In other words, the safety of mothers and infants faces greater challenges.

The changes in the public's choice of childbirth institutions, the occurrence of major public health incidents, and the two major adjustments in China's population policy in recent years are all external environmental challenges facing MCH institutions in their survival and

development. This external environment is constantly changing and it is not possible to predict all coming changes. The threefold task of overcoming difficulties in an uncertain environment, forming a sustainable competitive advantage, and achieving sustainable development has become a crucial and urgent problem facing MCH institutions.

1.2 Research questions and objectives

The above landscape provides the starting point of this research. The health care industry has undergone profound changes; demands are diverse and evolving; the environment is complex; and competition is increasing. As such, building a sustainable competitive advantage has become an important but challenging matter for MCH institutions. This research, then, identifies the research question as: "sustainable competitive advantage of MCH institutions: dynamic capability analysis". The cultivation of a competitive advantage by MCH institutions will be analyzed, strategies will be formulation, and implementation paths discussed, with dynamic capabilities as the theoretical basis and through both literature empirical research.

Focusing on the theme of obtaining and maintaining competitive advantages, academia has formed two major theoretical schools: endogenous theory and exogenous theory. Exogenous theory is represented by market structure theory, holding that competitive advantage is determined by external factors such as the market institution to which it belongs and market opportunities. Endogenous theory is represented by resource-based theory and dynamic capability theory. Resource-based theory analyzes the source of competitive advantage from a static perspective, arguing that competitive advantage comes from the valuable, rare, and difficult-to-imitate resources the enterprise possesses. Dynamic capability theory takes the influence of the uncertain external environment into consideration, believing that, in dynamic and complex external environments, enterprises must constantly update existing capabilities, develop new capabilities, and avoid being trapped in the dilemma of "core rigidities".

This research shares the endogenous view of competitive advantage, and holds that competitive advantages ultimately originate from the resources and capabilities possessed by the enterprise. As such, the question studied in this thesis can be divided into three specific sub-questions:

(1) What are the resources or capabilities that constitute the sustainable competitive advantage of MCH institutions?

In order to answer this question, it is necessary to clarify MCH institutions' resources or capabilities with attributes of value, rarity, imitability, and organization (VRIO) through

comparison with general hospitals, and find the basis for building a sustainable competitive advantage.

(2) How should the dynamic capabilities MCH institutions be defined?

The development of a competitive advantage generally goes through three consecutive stages: formation, maintenance, and dissipation. In a rapidly changing environment, competitive advantage can only be maintained until competitors successfully imitate or surpass it (Jiang, 2002). In other words, by answering the first sub-question, we can find the resources or capabilities with VRIO attributes of MCH institutions – however, how can "core rigidities" be overcome to ensure that current resources or capabilities can match the environment in real time? Furthermore, how can the competitive advantage be maintained? To this end, it is necessary to analyze the dynamic capabilities, study their connotation and dimensions, explore their relationship with sustainable competitive advantages, and define the connotation and ways of functioning of the dynamic capabilities of MCH institutions.

(3) How should MCH institutions cultivate dynamic capabilities and build up their sustainable competitive advantages?

This sub-question derives from the affirmative answer to the previous sub-question. If dynamic capabilities are an important source of sustainable competitive advantages of MCH institutions, how can dynamic capabilities be cultivated to obtain sustainable competitive advantages? This is also an important question to answer for the application of theoretical research in practice, and it is also the core of this thesis.

In 2017, China made an improtant decision to implement the "Healthy China" strategy. In line with this decision, in 2019, the Chinese government launched the Health China Intiative (2019-2030), focusing on disease prevention and health promotion. China proposes to carry out 15 special actions which include the action to promote the health of women and children, and promte a shift from treating illness as the central task to focusing on people's health. The marternal and child health promotion action requests the improvements in these aspects: 0-6 years old children health management, comprehensive prevention and treatment of birth defects, maternal and child health care education, the use of traditional Chinese medicine.

Based on the new situation and requirements, this research will focus on the current service capabilities and development status of MCH institutions. On the basis of fully demonstrating the necessity of the development and capacity improvement of MCH institutions, it will introduce dynamic capability theory, aiming to explore and analyze the dimension of MCH institutions sustained competitive advantage, build an evaluation index system based on dynamic capabilities for the cultivation of their competitiveness, and propose the corresponding

strategies. In this thesis, theoretical support and practical exploration can be provided for MCH institutions to improve their service capabilities and develop in a sustainable manner against the backdrop of "Healthy China".

1.3 Research purpose

The topic of how organizations obtain and maintain competitive advantages is central to management research, being initially applied to corporate strategic management. However, with new reforms in public hospitals, medical service organizations have shifted from dominant positions as suppliers to being selected by the market, and the medical service market has changed from a sellers' market to a buyers' market. As a result, MCH institutions' ability to quickly adapt their management strategies is key to determining whether they can gain a firm foothold and steadily develop in the market. It is thus particularly necessary for them to learn from the results of corporate strategic management theory to be able to tackle new challenges.

Dynamic capability theory is mainly adopted in corporate strategic management. As the economy and society constantly develop and change, corporate strategic management is facing new challenges: enterprises want to not only gain a competitive advantage, but they also hope to survive and prosper for a long time. In the long run, the rise and fall of an enterprise does not depend strictly on the success or failure of a specific business area, but on whether it can continue to sustain its development through updating and expanding its business and capabilities (Ma, 2017).

The environment faced by MCH institutions is constantly changing, so they must formulate development strategies that adapt to environmental changes to ensure their own survival and sustainable development. In this regard, there is a coupling interaction between MCH institutions, their strategies, and the environment. MCH institutions require scientific theories as guidance so as to break through their own barriers, form a good interaction with the environment, and eventually achieve sustainable development. From the perspective of their attributes, MCH institutions are similar to other enterprises serving society. The dynamic capabilities of enterprises can help them change their resource allocation and business scope, thus keeping their core competitiveness dynamically compatible with the external environment. Therefore, dynamic capability theory is also applicable for studying and solving the problem encountered by MCH institutions in coping with dynamic and complex environments and achieving sustainable development.

1.3.1 To enrich and improve the relevant theories on hospital strategic management

Western countries began to introduce the concept of corporate strategic management in hospital management in the 1970s. They explored ways to meet patient needs and then adjusted hospital strategies in a targeted manner for a win-win result. China commenced to learn about strategic management theory around the 1980s, and it was introduced into the field of hospital management by a number of scholars and hospital administrators a decade later. With regards to theoretical research, Liu (2008) believes that with the gradual opening of the medical market in China, hospital development will depend more on the role of the market and on hospitals' own strengths. Consequently, hospitals must study the medical market, clarify their position within it, and formulate development strategies, so that they can always maintain strong competitiveness in the open medical market. L. Wang et al. (2010) hold that strategic management presents a long-term, systematic, and overall plan for hospitals' future development, and put forward a number of feasible and directional competitive strategies and measures for hospitals. Meanwhile, in terms of empirical research, Xiao (2018) integrated PEST analysis (Political, Economic, Sociocultural and Technological) and Michael Porter's Five Forces Model into SWOT analysis to explore the feasibility of strategic management theory in hospital management and by taking public grade-three hospitals as the research object. Tang (2019) took public hospital A as an example, employed SWOT analysis to analyze its strengths and weaknesses, opportunities and threats, and discussed the development strategy best suited for it. Based on the strategic management theory of non-profit organizations, Li (2019) utilized the SWOT matrix for strategic matching and explored the strategic model of J Hospital's development with this hospital in Zhenjiang City as the research object.

Overall, the research on the use of strategic management thinking and tools to explore hospitals' development is gradually enriched. It can be said that Chinese hospitals are gradually entering the strategic management stage after they have gone through the stages of activity management and operation management (Quan, 2008). In the activity management stage, the focus of hospitals' development is to meet people's medical and health care needs and solve their problem of "difficulties in receiving medical service". At this stage, hospitals find themselves in a sellers' market where there is weak market awareness and autonomy. When entering the operation and management stage, a buyers' market emerges through reform. Hospitals can obtain a broad growth space, and they also begin to face the development law of the survival of the fittest in the market economy. Currently, with the adjustment of medical insurance payment and the implementation of zero price difference for medicine and

consumables, the medical reform has entered the deep-water zone, and people's demands have changed from a single demand for treatment to various special services such as health care, rehabilitation, prevention, and cosmetology. All of these demands impose greater requirements on hospitals' hardware and software facilities. The environment confronted by hospitals is becoming increasingly more complex. In order to survive and develop, hospitals must use strategic management tools to conduct in-depth and thorough analyses of various elements in the surrounding environment and future development trends. However, if the previous research results of corporate strategic management are directly copied to the medical industry, it is bound to be unacceptable due to the particularity of the industry. Therefore, it is a supplement and improvement of hospital strategic management theories by taking MCH institutions as the research object and using strategic management thinking to construct sustainable competitive advantages for these institutions in an uncertain environment.

1.3.2 To improve the management performance of MCH institutions

The Chinese government has always attached great importance to improving the management performance of medical institutions. As early as 1997, the Decision on Health Care Reform and Development issued by the Central Committee of the Communist Party of China and State Council clearly stated that, through reform and strict management, a responsible, competitive, and dynamic operating mechanism should be established (Central Committee of the Communist Party of China. & The State Council, 1997). In 2017, the General Office of the State Council issued the Guiding Opinions on Establishing a Modern Hospital Management System, which requires to "speed up the structural supply-side reform of the medical services and realize the modernization of the hospital governance system and management capabilities" (The General Office of the State Council, 2017). Currently, the management problems MCH institutions face include: first, the implementation of hospital guidelines, that is, how to effectively "combine health care and clinical practice" to highlight the characteristics of MCH institutions; second, the issue of improving discipline resilience, that is, the subject's anti-risk capability in the face of major public health emergencies; third, the environment adaptation of hospitals to medical reform, medical insurance payment, Internet + medical and other external policies. To obtain sustainable competitive advantages, MCH institutions must employ modern management thinking, improve management practices, and promote strategic changes in operating mechanisms and systems, service models, and competition methods to realize modern, scientific, and systematic management.

1.3.3 To promote the establishment of sustainable competitive advantages in MCH institutions

In recent years, although the development of MCH work has been highly valued and supported by both the government and the public, MCH institutions, compared with general hospitals, are still facing many difficulties in achieving sustainable development, acquiring VRIO resources and building their core competitiveness due to historical and practical reasons. Drawing from the three dimensions of "opportunity perception, grasping and reconstruction" of dynamic capabilities proposed by Teece (2007), the important factors that influence the construction of MCH institutions' sustainable competitive advantages can be analyzed: key managers, resource basis, discipline structure, development environment, hospital culture, and organizational learning. It is necessary to build a sustainable competitive advantage and an index system of MCH institutions; and to put forward a systematic strategy to promote their sustainable development, which will definitely improve the overall service capabilities of MCH institutions and ensure that they can acquire a greater market share. It is of great benefit to promote MCH institutions to better adapt to the needs of economic and social development.

1.4 Research methods

Referring to the mainstream research paradigms and research methods in the field of strategy management, this thesis mainly adopts the literature analysis method, the questionnaire survey method, the in-depth interview method, and the analytic hierarchy process to study the construction path of sustainable competitive advantages of MCH institutions.

1.4.1 Literature analysis method

Through literature analysis, the existing literature is consulted, reviewed, compared, and summarized to determine the research topic and clarify the research background. To obtain relevant theories about competitive advantage at home and abroad, especially resource-based theory, this research took the authoritative database of the Chinese knowledge network and Web of Science as the main source of literature, combined with Baidu, Duxiu and other databases to assist literature collection. It used NoteExpress document management software to classify and manage documents, so as to find gaps in the existing research, put forward the research breakthrough point, and form the theoretical framework in this thesis, based on the review of previous scholars' works.

1.4.2 Questionnaire survey method

In combination with relevant domestic and foreign research and the actual situation of MCH institutions, a questionnaire was designed, mainly including the survey of peer institutions and individual decision makers, so as to obtain the views and suggestions of stakeholders on the service and management of MCH institutions.

1.4.3 In-depth interview method

The content of the interview mainly involves the opinions and expectations of the relevant departments of medical and health industry and MCH institutions on the implementation of the working guidelines, the connotation of management, and the enhancement of the connotation of service in MCH institutions. Expectations and recommendations of all stakeholders on the services of MCH institutions are also included.

1.4.4 Analytic hierarchy process

The opinions, suggestions and opinions from the questionnaire survey and in-depth interview were sorted, to build the capacity evaluation index system of MCH institutions. The proposed items were screened by the Delphi expert consultation method, and the importance of the indicators was scored. Super Decisions software was used to process the zero-labor system to form the final evaluation index system.

1.5 Research approach

The research approach is shown in Figure 1.2.

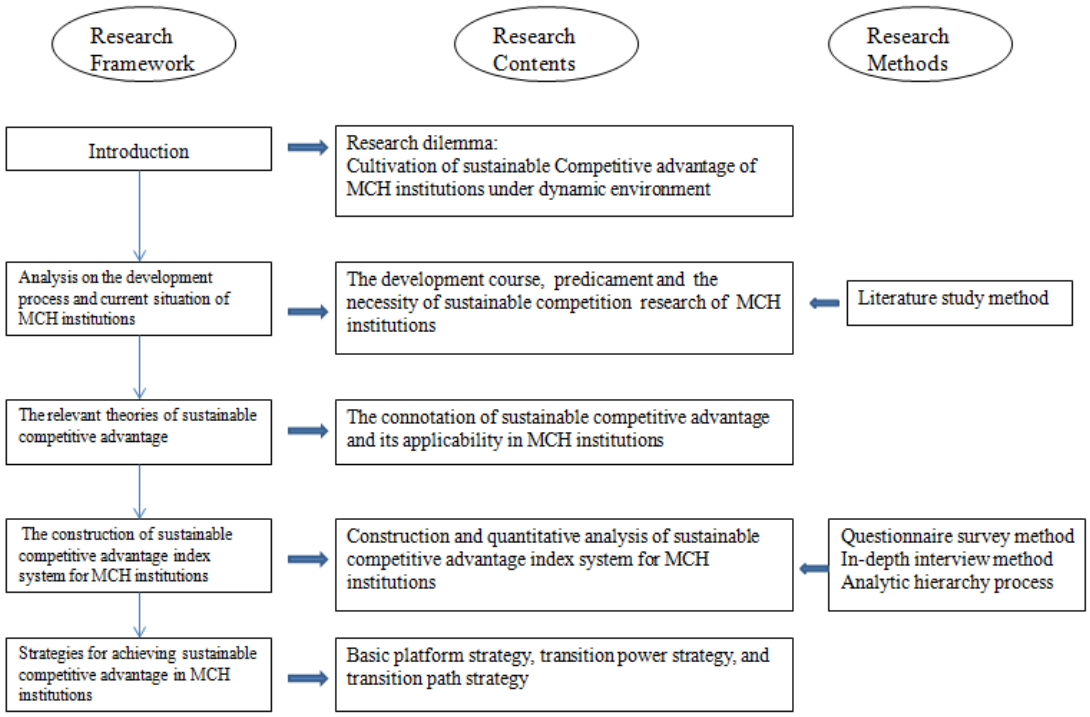

Figure 1.2 Research approach of the thesis

1.6 Innovation points

This research has following two main innovations:

First, the innovative application of resource-based theory to the strategic management research of MCH institutions enriches the application connotation of resource-based theory. Research in China on resource-based theory mostly focuses on theoretical discussions, and there are few practical operations guided by this theory in the management of medical institutions in China, especially in specialized hospitals such as MCH institutions. Although MCH institutions have their special functional orientation, in the uncertain environment, their core rigidity problem is particularly prominent. Therefore, this thesis intends to take a MCH institution at the prefecture level as an example, hoping to help MCH institutions shape their core competitiveness and sustainable competitive advantage through the perspective of dynamic capacity.

Secondly, it constructs a mechanism for MCH institutions to form and maintain sustainable competitive advantages. Expert interviews, questionnaires, analytic hierarchy process, and other methods are used to explore the constituent resources and capabilities of the sustainable competitive advantages of MCH institutions, and a set of indicator system for the cultivation

and evaluation of the competitive advantages of MCH institutions is constructed in order to provide reference ideas for the acquisition and maintenance of the sustainable competitive advantages of MCH institutions.

Chapter 2: Research Background

This chapter mainly presents the development history of maternal and child health work, respectively elaborates the evolution of MCH policy and the supply of MCH service from domestic and international dimensions, discusses the deficiencies of the development of MCH work in China, so as to find the basis for the research on the path to enhance the competitiveness of MCH institutions.

2.1 China's maternal and child health policies and services

2.1.1 Evolution of China's maternal and child health policies

China's maternal and child health policies evolve with China's economic and social development. Their evolution can be divided into the following six stages:

2.1.1.1 Rudiments: 1920-1939

From the 1920s to the 1930s, social thoughts went through drastic changes. On the one hand, with the rise of ideas on the emancipation of women and the intensification of national crises, people began to realize the importance of women's health to the family and to the country, and urged attention to be given to it. For example, Guo (1922) pointed out: "If you want your country to be strong, you must make your descendants strong, and if you want your descendants to be strong, you must make the mothers strong." On the other hand, due to backwards reproductive technology and lack of modern obstetricians, midwives, and specialized women's medical institutions, the maternal mortality rate was as high as 20% (Huang, 2017), and the situation of public maternal and child health was very severe.

From 1927 to 1937, the Nanjing National Government established a health system that required the establishment of midwifery schools and training classes for midwives and nurses, urged local governments to help train new midwives, and actively promoted other health care measures. The government also strengthened health administration (for example, through the establishment of the Central Health Committee, the Central Health Facilities Laboratory, the Central Midwifery Education Committee, and the Nurse Education Committee), and enacted women's health legislation (such as the Midwife Regulations, Rules for Case-filing of

Midwifery School, and Midwife Management Rules). It also established midwifery vocational schools and trained individuals in women's health. With the promotion of the Central Government, provinces, cities, and counties across the country began to build hospitals and public health centers. On this basis, local governments also established special maternity hospitals to take charge of maternity services and childbirth to ensure the health of pregnant women. Among them, the National Central Senior Midwifery Vocational School established in September 1936 is the first and largest special maternity hospital built by the country.

Before the outbreak of the Anti-Japanese War in 1937, the Nanjing National Government had basically established a relatively complete administrative system for women's health. This system contributed to women's health and promoted the development of women's health services. Regrettably, in July 1937, the Anti-Japanese War broke out. After several years of war, economic and social development practically stagnated, and the fledgling maternal and child health system was disrupted.

2.1.1.2 Tortuous start: 1949-1977

At the beginning of the founding of New China, due to the influence of continuous war, health conditions were very poor. In September 1949, the Chinese People's Political Consultative Conference (CPPCC) was held and the Common Program of the CPPCC (People's Political Consultative Conference of the PRC, 1949) was reviewed and approved. This program clearly stated that "attention shall be paid to protecting the health of mothers, infants and children." At the end of October of the same year, the Ministry of Health was established with the Maternal and Child Health Bureau, and local health departments at all levels set up the Maternal and Child Health Office and began to establish a top-down maternal and child health administrative management system. On 20 August 1950, the Ministry of Health held the first National Symposium on Maternal and Child Health. It was determined that the basic tasks of maternal and child health work were to promote the new methods of delivery, train midwives with new methods, and reduce the onset of, and deaths resulting from, puerperal fever and neonatal tetanus (Tao, 2019). At the same time, China formulated regulations such as the Draft of the First Five-Year Plan for Maternal and Child Health of 1953-1957, Trial Guidelines for Maternal and Child Health Care Organizations, and Trial Guidelines for Maternal and Child Health Organizations to gradually standardize maternal and child health work.

2.1.1.3 Recovery: 1978-1989

In 1976, the Cultural Revolution ended, state order returned to normal, and the development of

maternal and child health work was back on track. In 1980, the Ministry of Health of the People's Republic of China (hereinafter referred to as the Ministry of Health) formulated and promulgated the *Regulations on Maternal and Child Health Work (Trial Draft)* (revised in 1986 and abolished in 2013), which first clarified the goals and implementation mechanism of maternal and child health work (Ministry of Health, 1980). In 1982, the Ministry of Health held the National Maternal and Child Health Work Conference, which included perinatal health care, fetal health monitoring, and newborn and infant health management into the scope of maternal and child health work. In 1986, the Ministry of Health promulgated the *Standards for the Establishment of Maternal and Child Health Institutions at All Levels (Trial)* (used until this year), which clearly stipulated the establishment of maternal and child health institutions and the standards for staff and beds (Ministry of Health. & Ministry of Labor and Human Resources, 1986). In order to promote the development of the field of maternal and child health and ensure the supply of professionals for maternal and child health work, the Maternal and Child Health Association of Chinese Medical Association was established, and some colleges and universities also began to set up maternal and child health majors. The implementation of a series of policies and measures standardized the development direction and service standards of maternal and child health care and laid a good foundation for the sustained and steady development of maternal and child health work.

2.1.1.4 Rapid development: 1990-2000

In the 1990s, women's and children's health received further attention on a global scale. In September 1990, the World Summit for Children was held, during which China signed and pledged the *World Declaration on the Survival, Protection and Development of Children* and the *Plan of Action for Implementing the World Declaration on the Survival, Protection and Development of Children*. In 1992, the Chinese government promulgated the *Outline of the Program for Chinese Children's Development* in the 1990s, which clarified the main goals for the survival, protection and development of children in China in the 1990s. In 1994, China promulgated the *Law of the People's Republic of China on Maternal and Infant Health Care* and implemented it in the following year. This was also the first law on maternal and child health work in China, marking the entry of China's maternal and child health into a process of legal management. In 1995, China formulated and promulgated the outline for the *Development of Chinese Women (1995-2000)*. At that point, the "one law and two outlines" that play a fundamental role in the field of maternal and child health had been formed, and maternal and child health work had been effectively regulated. In a good international and domestic

environment, China on the one hand focused on strengthening preventive health care and rural health, appropriately adjusted its internal investment structure to strive for funding for maternal and child health, and health and epidemic prevention, and earnestly implemented the work policy of "prevention first"; on the other hand, China actively cooperated with international organizations such as the United Nations Children's Emergency Fund (UNICEF) and the World Health Organization (WHO), and participated in global and regional exchanges and research activities, which effectively reduced maternal and child mortality in rural and impoverished areas, and greatly increased the health level of women and children in China.

2.1.1.5 Gradual maturation: 2000-2012

In 2001, China promulgated the *Measures for Implementation of the Law of the People's Republic of China on Maternal and Infant Health Care* (State Council, 2001), which further clarified the guidelines, service content, departments in charge, and rights for maternal and child health. The focus of maternal and child health work also changed from lowering the mortality rate of pregnant women and infants to providing health care at all stages of women's lives. In addition, in 2001 the State Council promulgated the *Outline for the Development of Chinese Women (2001-2010)* and the Outline for the Development of Chinese Children (2001-2010), both renewed in 2010 for another ten years, clarifying the goals, tasks, and related measures for the healthy development of women and children development in each stage of their lives. These documents have become the action plan for guiding, standardizing, and promoting women and children's health work during this period. In 2009, China promulgated the *Opinions of the Chinese Communist Party's Central Committee and State Council on Deepening the Reform of the Medical and Health Care System* (Central Committee of the Communist Party of China. & The State Council, 2009), clarifying that maternal and child health is an important part of the public health service system. There are major programs such as pre-pregnancy and early pregnancy folic acid supplementation, breast and cervical cancer screening, subsidies for childbirth hospitalization for women from rural areas, and maternal and child health services have transitioned from paid to free. With the support of a series of policies, the goals of China's maternal and child health work have become more specific and clearer, and the maternal and child health work system has become more mature and better modeled.

2.1.1.6 Leap and upgrade: 2012 until now

In 2012, the World Health Organization announced the elimination of neonatal tetanus in China, indicating that the quality and accessibility of China's maternal and child health services had

reached a new level. China's maternal and child health efforts begun to change from "preserving survival" to "promoting development". In terms of top-level design, in 2015 the Fifth Plenary Session of the Eighteenth Central Committee of the Communist Party of China proposed to promote the construction of a healthy China in which the improvement of the health of women was taken as one of the important goals; in August 2016, General Secretary of the Chinese Communist Party Xi Jinping attended the National Health and Wellness Conference and delivered an important speech emphasizing the importance of the health of key populations and protecting the health of women and children; on 26 August 2016, the Political Bureau of the Chinese Communist Party Central Committee reviewed and approved the *"Healthy China 2030"* initiative (Central Committee of the Communist Party of China. & The State Council, 2016), further clarifying the goals and measures for maternal and child health, and taking the reduction of maternal mortality and other reproductive health indicators as the main indicators for the construction of a healthy China.

In terms of strategic deployment, China has formulated and implemented a series of medium and long-term development strategies from the strategic perspective of macroeconomic and social development. For example, in the outline of the Thirteenth Five-Year Plan (2016-2020), special arrangements were made to promote the construction of a healthy China, and it was proposed to strengthen maternal and child health care and reproductive services. In November 2015, the *Decision of the Central Committee of the Communist Party of China and the State Council on Winning the Difficult Battle against Poverty* made the protection of the health of women and children in poverty-stricken areas an important part of the implementation of the health and poverty alleviation project to effectively ensure the equality of health services. In September 2016, China formulated and issued *China's National Plan on Implementing the 2030 Agenda for Sustainable Development*, which proposed to further reduce maternal mortality, aimed to include sexual and reproductive health care services, and incorporated reproductive health into national strategies and programs. In October of the same year, the Central Committee of the Communist Party of China and the State Council issued the *"Healthy China 2030"* initiative. This was the first medium and long-term strategic plan proposed at the national level in the health sector since the founding of New China. It requires the construction of a healthy China to be included in the economic and social development plan and incorporates major health indicators such as maternal mortality rate into the assessment indicators of party committees and governments at all levels, which further strengthens the main responsibility of party committees and governments. In January 2017, in order to promote the Thirteenth Five-Year Plan and *"Healthy China 2030"* initiative for the

construction of a Healthy China, the State Council issued the Thirteenth Five-Year Plan for Health to strengthen maternal and child health and reproductive services. In June 2019, the State Council issued the *Opinions on the Implementation of the Healthy China Initiative* and, in July, established the Healthy China Initiative Promotion Committee and released the *"Healthy China Initiative (2019-2030)"*. A series of intensive and important strategic measures have expanded and enriched the connotation of maternal and child health services. By the end of 2019, China's maternal mortality rate had dropped to 17.8 per 100,000 people, and the infant mortality rate had dropped to 5.6‰. The average life expectancy of residents had increased to 77.3 years (Development of Planning and Information, 2020).

2.1.2 Supply of China's maternal and child health services

2.1.2.1 Construction of China's maternal and child health services system

Under the guidance of maternal and child health policies, China's maternal and child health services system has been established gradually. In November 1949, the Ministry of Health of the People's Republic of China was established, with four divisions and bureaus, one of which was the Maternal and Child Health Bureau. At the same time, the local health departments at all levels set up maternal and child health offices (divisions) and, since then, a top-down administrative system for maternal and child health has been formed. In terms of institution building, the Chinese government set up one maternal and child health institution in each province, city, and county. On this basis, in 2002, the National Center for Women and Children's Health, China Centers for Disease Control, a national-level maternal and child health professional institution under the jurisdiction of the China CDC, was established to provide technical guidance on business planning, information exchange, and professional services for maternal and child health across the country. So far, a network of maternal and child health institutions covering the national, provincial, prefecture, and county levels has been established. Maternal and child health institutions at all levels are responsible for grasping the health conditions and influential factors of women and children in their jurisdictions, and actively organizing technical guidance, business training, supervision and assessment in their jurisdictions. They should focus on strengthening the guidance and assessment of primary health institutions, and carry out maternal and child health education in their jurisdictions with appropriate technology development and promotion. They are also responsible for the business guidance of health work in nurseries and kindergartens in their jurisdiction. Among the maternal and child health institutions, the county level ones focus on district management, population

services, and grassroots guidance; the municipal level institutions accept referrals from subordinate institutions and undertake the tasks of maternal and child health technology sub-centers in accordance with the regional health plan; the provincial level institutions are responsible for regional business planning, scientific research training, information analysis and utilization, technology promotion, and guidance, supervision and evaluation for subordinate institutions.

By 2019, China had gradually formed a maternal and child health service network with Chinese characteristics which is globally unique that combines health care and clinical, with maternal and child health institutions as the core, primary medical and health institutions as the foundation, and large and medium-sized general hospitals and specialized hospitals and related scientific research and teaching institutions as support (Gan, 2019). China's MCH care system is shown in figure 2.1:

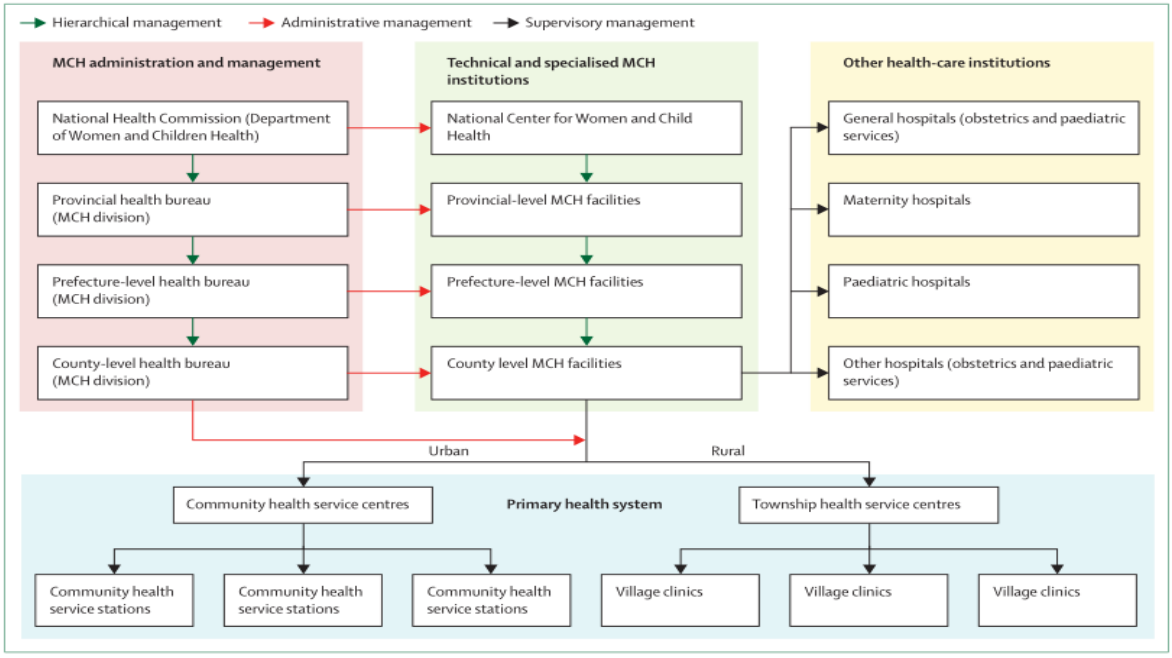

Figure 2.1 China's MCH service system

source: Qiao et al. (2021, p. 7)

2.1.2.2 Development of China's MCH institutions

As the main body of China's maternal and child health system, MCH institutions are unique medical institutions in China. They have made outstanding contributions to improving the health of Chinese women and children. Since 2006, the National Health Commission of the People's Republic of China (formerly the Ministry of Health) has successively issued the *Guiding Opinions on Further Strengthening the Work of Maternal and Child Health* (Ministry Of Health, 2006) and *Administrative Measures for Maternal and Child Health Institutions*

(Ministry Of Health, 2006), which have further clarified that MCH institutions are non-profit public welfare institutions that are organized by the government. They are also professional institutions that provide public health and basic medical services for women and children, and are an important part of the public health service system. MCH institutions adhere to the basis of group health work, meet the needs of the grassroots, give priority to prevention, and provide health education, preventive health care and other public health services for women and children. While carrying out public health duties, MCH institutions also provide basic medical services closely related to the health of women and children. According to *Management Measures of Maternal and Child Health Institutions* (Ministry Of Health, 2006), the main function of MCH institutions is to provide public health services, also including basic medical services: diagnosis and treatment of common diseases in women and children, family planning technical services, prenatal screening, neonatal disease screening and midwifery technical services. Prenatal diagnoses and treatment of obstetric complications and neonatal critical illnesses are also carried out.

MCH institutions in China emerged late but developed rather rapidly. From the perspective of the development process, there are mainly four stages:

(1) Period of quantitative changes: 1950-1959

In 1950, China held the first national symposium on maternal and child health. The tasks of promoting new methods of giving birth, reducing infant mortality, and training existing and new midwives were established, and a three-level administrative system was built. By 1958, the number of maternal and child health institutions in China had increased from 80 to 230, and the number of maternal and child health centers (stations) had increased from 9 to 4,599 (Wu, 2015). This is a period with the most maternal and child health institutions in Chinese history. The services of MCH institutions in this period were mainly public health education and basic services in villages. Health education included information on new methods of delivery, postpartum health, women's health, sexually transmitted diseases, and child health, all aiming at reducing maternal and infant mortality. The service functions of MCH institutions were relatively straightforward.

(2) Period of lag phase: 1960-1979

Unfortunately, in the 1960s and 1970s, due to the influence of the Chinese Cultural Revolution, the construction of maternal and child health institutions was forced to stagnancy, many maternal and child health institutions were canceled or merged. It was not until 1976 when the national order was restored to normal that the work of maternal and child health began to resume.

(3) Period of transformation: 1980-2010

After the reform and opening up in 1978, China formulated the *Maternal and Child Health Work Regulations (Trial Draft)* (Ministry Of Health, 1980), gradually standardizing the development of MCH institutions. During this period, MCH institutions developed from "maternal and child health centers (stations)" to "maternal and child health hospitals". By 2010, maternal and child health hospitals accounted for approximately 70% of MCH institutions in China. In the same period, 8 medical colleges and universities in China established maternal and child health majors and trained a large number of high-level maternal and child health professionals. In the 1990s, the La*w of the People's Republic of China on Maternal and Infant Health Care* and its implementation measures were promulgated and implemented, the guidelines for maternal and child health work were determined, and maternal and child health work was integrated into the scope of legal management through development work. During this period, most MCH institutions in China expanded their business scope, increased their business area, and improved technical equipment. Their overall strength was significantly improved, and they began to cooperate with international organizations to carry out maternal and child health projects. However, MCH institutions in this period were in a period of controversy, exploration, and confusion between health care and clinical care. Individual services and group health care were also developing. The characteristics of maternal and child health care institutions were not yet distinct.

(4) Period of exploration and reform: 2011-2015

Differences in understanding the mandate of "focusing on health care, combining health care with clinical care" found in the *Implementation Measures of the Maternal and Child Health Law* (State Council, 2001) led to unclear positioning and vague functions of MCH institutions: some MCH institutions' appeal of the "clinical-based model for special hospitals" has deviated from the requirements of public health, and their group-oriented and health-centered nature; some MCH institutions' advocate of the "pure health care development model" has deviated from their characteristics as organizations to provide technical guidance and professional service; there are also some MCH institutions where the internal setting of clinical care and health care is not integrated, and the health care features are not prominent. The misunderstanding of the relationship between "health care and clinical care" seriously restricts the development of MCH institutions. In this context, China launched a series of studies in 2010 with the functional positioning of MCH institutions as a key focus.

(5) Period of leaping development: end of 2015 until now

In 2015, China issued the *Guiding Opinions on Standardized Construction and*

Management of Maternal and Child Health Service Institutions (National Health and Family Planning Commission, 2015). The document clearly stipulates the development direction of MCH institutions. First, MCH institutions should adhere to the "four basic principles", that is, adhere to the maternal and child health work guidelines with "health care as the center, protecting reproductive health as the purpose, integrating health care and clinical care, and being oriented towards the grassroots". Second, they should clearly understand the public health aspects of maternal and child health work. Third, they should insist on providing continuous systemic services and management for women and children in accordance with the concept of full life cycle and three-level prevention. Fourth, they should insist on a reasonable layout and planning. Besides the one government-sponsored, standardized maternal and child health service institution in each province, city and county, more institutions should be built and set up according to the size of the population, women and children's health needs, functional tasks, and regional health planning. In the same year, the National Health Commission of the People's Republic of China issued the *Guidelines for the Establishment of Business Departments of Maternal and Child Health Service Institutions at All Levels* (The Office of the National Health and Family Planning Commission, 2015), which began to integrate and regulate business functions. As a result, MCH institutions nationwide initiated a round of "large-ministry system" reforms, and the development of MCH institutions was fast-tracked. Based on a series of documents, MCH institutions at all levels across the country implemented hierarchical top-down management to provide maternal and child health care covering the entire life cycle of women and guided by the health needs of women and children in different periods. In 2018, there were 3080 MCH institutions, 807 maternity hospitals, and 129 children's hospitals in China, which altogether had nearly 640,000 employees. In the same year, outpatient services were provided 400 million times, there were 13.79 million hospitalizations, and the number of beds was 338,000. The number of beds in obstetrics and gynecology and pediatrics in all types of institutions continued to increase (Department of Maternal and Child Health, 2019).

MCH work in China has the following characteristics:

1. Led by the government with the nature of the public welfare. Government-led is the most significant characteristic of the maternal and child health work in China. National public health services, which are not for profit, hold an important position. Under the leadership and support of the government, MCH institutions have a complete system including policies, regulations, and services.

2. Complete organizational structure. The service system is a complete organizational structure with MCH institutions at the core, primary medical institutions as the network base,

and colleges, universities and research institutes as technical support, covering three levels of prevention and implementing hierarchical management (Gan, 2019). 3. Carrying work based on a series of important projects. The key areas in the field of maternal and child health are mainly carried out through major public health service projects, such as the "reduction and elimination" project, the "two cancers" screening project, the Western China rural children nutrition improvement project, and the newborn disease screening project. These, as well as several international cooperation projects, have promoted the universality of maternal and child health work in China.

4. Supported by a strong information system. China has established an information system based on annual reports which include three-network monitoring (The monitoring of Under-five mortality, maternal mortality and birth defects) and resource and operational statuses. The collection, analysis and sharing of big data has provided strong empirical support for the formulation and implementation of relevant policies and for the work of MCH institutions at all levels.

2.2 Maternal and child health policies and services outside China

Unlike China's relatively independent maternal and child health service system, overseas maternal and child health services are not separate from other health services, rather, they are integrated into the medical and health system. N. Yao et al. (2013) outlined the maternal and child health service system of several countries as follows (see Table 2.1).

Table 2.1 Overview of maternal and child health service system in the United States, Australia, Malaysia, and Russia

	Institution setting	Talent training	Funding mechanism	Provisioning
United States	A net-shaped service system based on family doctors and the participation of various hospitals, medical schools, and scientific research institutions	Family doctors: a standardized training system is implemented: undergraduate medical studies + family medicine resident doctor training Specialists: undergraduate education + medical education and graduation clinical internship	Funding is from government funding, insurance companies, social donations and personal payments. Insurance companies are the main source of funds, and the main funds for the poor without medical insurance are mainly supported by government special grants, supplemented	Basic health services and diagnosis and treatment of common diseases: family doctors and community health institutions. Specialist medical services: public hospitals

	Institution setting	Talent training	Funding mechanism	Provisioning
		+ residency practice + specialist training experience	by social donations	
Australia	A hierarchical system including community health service centers, general medicine clinics, state hospitals, national hospitals, and affiliated hospitals of medical universities	General practitioners: undergraduate medical studies + medicine and practical exercises. Specialists: university education + clinical practice	Funding is from government funding, medical insurance and personal payment. All citizens enjoy medical insurance provided by the government	Primary health care services: community health service centers and general medicine clinics. Hospital delivery service and the diagnosis and treatment of some critically ill patients: state hospitals. Grassroots training and guidance and treatment for critically ill patients: national hospitals and affiliated hospitals of medical university.
Malaysia	Three-tier health service network composed of three levels of organizations, including primary health service network, secondary hospitals (regional level), and tertiary hospitals (national level)	General Practitioners: primary medical care is an independent major, and its professional qualifications are recognized after receiving a 4-year master's degree program	Funding is from government funding, social insurance, commercial insurance and personal payment. Government funding accounts for the largest percentage of funding, supplemented by social insurance, commercial insurance, and personal payment of patients	Maternal and child health services: primary institutions such as public health clinics, community health centers and childbirth centers, hospitalization, and rehabilitation; regional hospitals, large general hospitals, and specialist hospitals
Russia	Based on a multi-level administrative system that includes health stations, health centers, joint clinics, hospitals, as well as many specialized joint clinics for obstetrics,	Since 1992, general practice has been regarded as an independent specialty, and a two-year training program has been implemented. Specialists mainly follow the model of 6 years of medical education plus 2	Dual financing channels of budget and insurance. About 75% of the funds are given by local (provincial or state) government budgets, 20% of the funds are covered by compulsory health insurance, and the remaining 5% are	Primary care services: midwives or general practitioners in health centers/clinics. Secondary health care services and medical services: hospitals and specialist clinics. More demanding

	Institution setting	Talent training	Funding mechanism	Provisioning
	gynecology, and pediatrics	years of practice	paid by patients	medical services: state hospitals, federal hospitals, or scientific research institutions

Source: Yao et al. (2013. p. 35)

As can be seen from the above table, although the United States, Australia, and Malaysia do not have independent professional MCH institutions, the maternal and child health services have been fully integrated into the routine work of primary medical and health institutions since the primary medical and health institutions started early and have strong service capabilities. Unlike these countries, at its inception China's maternal and child health service system was based on the Soviet model. China has vigorously developed professional institutions and a three-level maternal and child health professional institution network covering the provincial, municipal, and county levels. They offer most of the maternal and child public health and medical services. MCH services in China are relatively independent, and the service capabilities of primary medical and health institutions are relatively poor.

Based on the analysis of the maternal and child health work in the above four countries, it can be found that they all attach importance to the development of maternal and child health work, and all stakeholders – from government to society – are fully aware of the necessity and importance of strengthening MCH work. Most countries provide women with basic health care and referral services through primary health service institutions, and provide specialized medical services through hospitals, with a clear division of labor. In terms of talent training, these countries have established sound talent training mechanisms. For example, the United States and Australia have established standardized general practitioner training mechanisms to enrich and enhance MCH services. Malaysia and Russia have established related majors. They have strict requirements for obstetrician-gynecologists and pediatricians who provide specialized medical services: in addition to receiving medical undergraduate education and professional training, they are also required to have clinical practice experience. The standardized training mechanism and strict access system have laid a solid guarantee for the quality of MCH care.

While, due to different national conditions and institutional mechanisms, China's MCH services cannot fully imitate models in other countries – they can still benefit from their experience.

2.3 Growth evaluation of MCH institutions in China

2.3.1 Achievements in MCH work

Reviewing the development of MCH health work since the founding of the New China, we find that China has taken a series of steps: the promotion of new delivery methods at the early days of the founding of the People's Republic of China, the dissemination of treatment options for women's diseases in the 1960s, the implementation of family planning in the 1970s, the promotion of perinatal care in the 1980s, the continuous adjustment to guidelines for MCH work, new measures to reduce maternal and infant mortality, the implementation of various major public health projects to protect children's health, the training of MCH specialists, and the improvement of MCH systems. The field continues to improve towards meeting the needs of the population. The Chinese government has, over a long period, assessed the circumstances, and formulated and implemented appropriate maternal and child health management policies, thus ensuring the long-term and steady development of China's MCH services. The core indicators of MCH in China are generally better than the average level of middle and high-income countries, and China is a high-performing country in MCH.

2.3.2 Main problems in MCH institutions

With the development of China's economy, its government and people have deepened their understanding of health. MCH work has gained importance and the demand for MCH services has increased. MCH standards still do not meet all of people's expectations, with the main challenges including:

2.3.2.1 Deviated positioning of some MCH institutions

Although the *Measures for the Implementation of the Law of the People's Republic of China on Maternal and Infant Health Care* document clarifies that the working principle of MCH institutions is "focusing on health care for the purpose of safeguarding reproductive health, implementing the policy of combining health care with clinic treatments, meeting the needs of various groups and the needs of citizens at the grass-roots level, and giving priority to disease prevention", at the specific operational level, some MCH institutions have ignored the basic function of "health care", and the institution's positioning has deviated, which show the characteristics of "emphasizing clinical care and ignoring health care; focusing on paid projects and overlooking unpaid projects".

There are mainly two reasons for this phenomenon. First, there is a lack of government funding. As medical institutions that provide public health services for the society, MCH institutions have an attribute of public welfare, and the government must support MCH work with funds to ensure the supply of public products. In actual operational processes, most MCH institutions adopt a "balance to allocate funds", but government financial subsidies are not in place. With a certain financial input, MCH institutions could provide additional services. Therefore, in order to maintain their survival and development, MCH institutions have to develop clinical services to subsidize public health services. Second, people are not sufficiently motivated to actively seek public health services. For patients, timely clinical diagnoses and treatments matter most as they result in immediate disease alleviation. Their concept of health emphasizes clinical care but disregards health care – and this has become the social reason behind MCH institutions' focus on clinical care.

With these two reasons, the positioning of some MCH institutions has deviated and their health care function has gradually weakened. Health care services for women and children cannot be always guaranteed. Because other medical institutions, supported by complete basic disciplines such as internal medicine and surgery, will also set foot in the service market of MCH institutions, clinical service supply projects are more diverse. As a result, the characteristics of MCH institutions are becoming less obvious, their development prospects more blurred, and their competitiveness diminished.

2.3.2.2 Challenges to the stable development of MCH institutions

Pursuant to the stipulation of the *Ministry of Health's Implementation Plan for the Chinese Women and Children Development Outline (2011-2020)*, there must be one standardized government-sponsored MCH institution in each province, city, and county. There must be departments of obstetrics and gynecology and pediatrics in MCH institutions and general hospitals above the second-grade hospitals due to Chinese standard; facilities, equipment, and staffing in basic medical and health care institutions are expected to meet specific standards (Ministry of Health, 2012). On the one hand, that plan stipulates that each province, city, and county shall set up one MCH institution. Therefore, MCH institutions at all levels have been in a comparatively stable position for a long time due to their different coverage areas. In 2009, China began to implement a new round of medical and health care system reforms (abbreviated as the "new medical reform"). This reform requires that medical and health care institutions should not only effectively reduce residents' burden of medical expenses, but also proactively facilitate access to medical treatment. A basic medical and health care system covering urban

and rural residents should be established to provide people with safe, effective, convenient, and cheap medical and health care services. Under this requirement, it has become a strategic choice for the development of medical institutions to meet people's growing diversified and multi-level health care service demands and to be demand-oriented. In order to provide diversified and multi-level health care services, a sound discipline system and a complete discipline chain are heavily relied upon. MCH institutions are specialized hospitals, with gynecology, obstetrics, and pediatrics as its traditional advantageous disciplines. However, from a longitudinal perspective, the decrease in birth population is for now an irreversible trend due to the birth rate and the declining number of women of childbearing age. In addition, the development of obstetrics is bound to be limited and the clinical discipline of pediatrics focuses mainly on infectious diseases, thus lacking of diversity and being vulnerable in risk-resistance. From a horizontal perspective, the internal health care and clinical referral mechanism of MCH institutions is not perfect, and the discipline chain is not yet complete. These problems require urgent resolution in order to provide people with diversified and multi-level MCH services.

On the other hand, the plan stipulates that MCH institutions and general hospitals above the second grade should set up obstetrics and gynecology and pediatrics departments. In other words, this field, traditionally dominated by MCH institutions, are not exclusive to them. Rather, hospitals above the second grade can all enter the field. Those hospitals, especially large-scale grade-three class-A hospitals with a sound discipline system, can provide more powerful technical support for gynecology, obstetrics, and pediatrics, and carry out multidisciplinary collaborative diagnoses and treatments so as to improve their comprehensive treatment capabilities. This has increased the competitive challenges faced by MCH institutions.

From the above analysis, it becomes clear that it is necessary for MCH institutions to remedy their own shortcomings of imperfect disciplinary system and incomplete discipline chain, so they can develop competitive advantages. In this regard, there is a need for an in-depth discussion on how a sustainable competitive advantage can be built by MCH institutions.

2.4 Synopsis

From the perspect of the development of MCH work, although countries have different medical and health systems, they all attach the same improtance to the health work of women and children. In foreign countries, the treatment and referral services for women and children are mainly provided by primary health care institutions, and MCH work is integrated into the

routine work of primary health care institutions. In China, the work of MCH is mainly undertaken by specialized MCH institutions. In addition to providing professional clinical treatment for women and children, the Chinese government stipulates that such institutions must also perform the functions of public health services such as management of high-risk pregnant women and prevention and treatment of birth defects, which are also not performed by primary health care institutions, large general hospitals and other specialized hospitals.

After more than 70 years of construction and development, China's MCH institutions have been persisting in taking women and children as the center, constantly improving their policies, systems and services, and gradually realizing the purpose of providing health services and protection from the period of fetus to the end of life (Department of Maternal and Child Health, 2019).

Now, with the reform of medical system in China, together with the declining birth rate in China, the external environment facing the development of MCH institutions is changing, so MCH institutions need to face up to the opportunities and risks contained in these changes and explore new ways to enhance their competitiveness.

[This page is deliberately left blank.]

Chapter 3: Literature Review

Sustainable corporate competitive advantage is an important research area in strategic management theory (Porter, 1988). In the ever-changing market environment, obtaining competitive advantage and maintaining it over a long period is an essential capability that enterprises must gain for their survival and continued development. From the existing research on corporate competitive advantage, it can be found that obtaining a competitive advantage is a gradual process that unfolds from the outside to within, that is, from the environment to internal resources and capabilities. It is also a process that unfolds from the static to the dynamic, that is, from core capability to dynamic capabilities. This chapter, then, analyzes and reviews Chinese and other enterprises' competitive advantages and related theories, so as to provide a theoretical framework and basis for the analysis of MCH institutions' source of and access to sustainable competitive advantages.

3.1 Theory of competitive advantage

The concept of "competitive advantage" was first put forward by the British economist Chamberlin in 1939, and then introduced into the strategy field by Ansoff (1965). By 1985, when the book *Competitive Advantage*, written by the "father of competitive strategy", Michael Porter, became a best seller, the concept of "competitive advantage" gradually gained popularity and become one of the central areas of focus in strategic management research.

3.1.1 Connotation

Regarding the meaning of "competitive advantage", there is currently no unified and clear definition. This thesis relies on Yang's (2014) summary of the various interpretations offered by scholars around the world (see Table 3.1 for details).

Table 3.1 Interpretation of competitive advantage by scholars around the world

Year	Scholars	Definitions and Conceptualizations
1939	Chamberlin	Enterprises perform better than their competitors in the market (Chamberlin).
1965	Ansoff	A strong competitive position formed by individual products, a unique asset in the market, and their growth.
1978	Hofer and	The unique market position relative to competitors that enterprises

Year	Scholars	Definitions and Conceptualizations
	Schendel	obtain through resource allocation.
1985	Porter	The unique and superior competitive position of enterprises in comparison with their competitors, which is manifested as above-average market share or profitability.
1991	Barney	If an enterprise can implement a strategy that creates values and cannot be implemented by its existing and potential competitors, it is safe to say that the enterprise enjoys a competitive advantage.
1996	Grant	When there are two or more competitors in the market, and one of them can consistently obtain higher profits than the other competitors, it means that the enterprise has a competitive advantage.
2002	He	Competitive advantage signifies stronger profitability than competitors and the ability to make more profits than the industry average.
2002	Jiang	Enterprises' superior attributes or abilities of achieving market dominance and supernormal profit or their ability of profiting higher than the average of the industry manifested in the process of providing consumers with products or services of a certain value in an effective "contestable market", when compared with other competitors.
2005	L. Jiang et al.	The ability of an enterprise to surpass its competitors. Such ability facilitates the realization the enterprise's major goal, that is, profiting and improving its market share.
2010	Ma	Asymmetry or gap in any dimension, characteristic or level relative to another enterprise or a group of other enterprises, which allows the enterprise to provide customers with higher value than its competitors.
2011	Dong et al.	Corporate competitive advantage refers to the attribute of an enterprise to achieve high performance in market and occupy a leading position, and to maintain this advantage by exploiting its possessed resources and internal cultivation ability.
2013	Meng	Competitive advantage is the state in which enterprises use controlled resources and their own learning abilities to carry out collaborative innovations among organizations to obtain high performance in the market and occupy a leading position, and maintain this advantage by repeating above movements.

Source: Yang (2014. p. 10-11)

Although different scholars have different understandings of "competitive advantage", based on their different research perspectives, there is also consistency behind different statements. First, in terms of attributes, competitive advantage does not exist independently, but it is generated in the process of comparison with competitors. Second, in view of the external performance, competitive advantage is manifested as excess profit. Whether an enterprise can gain excess profit in a certain period is the criterion for determining whether the enterprise has a competitive advantage. Third, from the perspective of internal composition, low cost and differentiation are important means of constructing a competitive advantage.

Based on relevant definitions of competitive advantage, we believe that the term can be understood as the state in which entities, involved in market operation activities and oriented

towards customer needs, provide customers with more profitable products or services relative to their competitors, and thereby achieve a dominant position and excess profits in the market through the integration and deployment of resources and capabilities that they possess in a dynamic and competitive market environment and within a certain period of time and space.

3.1.2 Basic types of competitive advantage

In his book *Competitive Strategy*, Porter (1985) pointed out that overall cost leadership, differentiation, and focus are three generic strategies for enterprises to gain competitive advantage. The details are as follows:

3.1.2.1 Low-cost leadership

Low-cost or overall cost leadership advantage means that the total cost of an enterprise producing certain or similar products is at a lower level in the industry, so it can obtain relatively more benefits than competitors at the same market price level or quickly occupy the market with lower market price (Jiang, 2002). In Porter's (1985) view, economies of scale, learning, capacity utilization patterns, linkage, interrelationships, integration, timing, discretionary policies, geographic location, and institutional factors are the top ten cost drivers that determine the cost behavior of value activities. Cost drivers reinforce and are related to each other in affecting cost.

In market competition, pursuing the lowest cost is an important way for enterprises to maximize profits. Under the premise that value is perceived universally, enterprises that have competitive advantage of low cost can create more profits than competitors. Porter (1985) summarizes two ways for companies to gain competitive advantage: one is to control cost drivers, and the other is to redefine the value chain. Enterprises striving to achieve the cost leadership strategy must develop resources with sustainable cost advantages to ensure that they maintain cost advantages over the long term in a bid to achieve extraordinary performance.

3.1.2.2 Differentiation

In Porter's view, an enterprise that can create a unique product or service for buyers is able to set itself apart from competitors (Porter, 2014, p. 95), so differentiation allows enterprises to charge higher prices for products and attain higher sales at ordinary price levels. During cyclical or seasonal economic downturns, enterprises enjoy a higher level of buyer loyalty, thus achieving earnings higher than that of ordinary days or peak seasons. Differentiation stems from enterprises' value chain, and any activity in the value chain may play a role in the promotion of

differentiated strategy. There are two ways for companies to enhance their differentiation strategies: to make existing value activities more unique, or to rearrange the value chain in a way that helps to enhance uniqueness. Opening up channels of uniqueness, turning differential costs into advantage, changing the rules of creating uniqueness, and restructuring the value chain that maintains the uniqueness of enterprises in new ways are the characteristics of successful implementation of differentiated strategies.

Irrespective of the competitive cost as a variable, enterprises with significant differentiation can attain greater market rights than competitors. Differentiation itself can serve as a barrier to competition and increase the difficulty of competition so as to safeguard a favorable market position and help companies to get more excess profits.

3.1.2.3 Focus

The focus strategy refers to enterprises that focus on specific buyer groups, product categories, or regional markets and adopt the cost leadership strategy or the differentiation strategy to obtain competitive advantage (Porter, 2014). Compared with broadly-targeted competitors, enterprises being more advantageous in serving small-scale or specific strategic target customers can focus on serving specific target groups by meeting their needs, lowering the cost, or adopting both methods to gain competitive advantage.

Being different from the cost leadership strategy and the differentiation strategy, the focus strategy combines segments to achieve specific strategic targets and gain a competitive advantage. If cost leadership and differentiation are competitive strategies that enterprises adopt to focus on the whole industry, focus is a strategy mode that enterprises adopt to concentrate on specific segments.

As for the sustainability of the focus strategy, Porter (2014) holds that it depends mainly on three factors: (1) broadly-targeted competitors—the greater the difference between value chain and service that an enterprise focuses on and the value chain needed in other segments is, the more sustainable the focus strategy will be; (2) imitators—the sustainability of the focus strategy is based on the sustainability of competitive advantage of the enterprise that implements the focus strategy (the structure of particular segments determines how high barriers to entry are); and (3) segment substitution—the sustainability of the focus strategy is determined by the sustainability of the segment, so to ensure the latter is the key to developing the former.

In summary, the essence of the focus strategy is to create value for customers in a specific target market via low costs or differentiation. Since the strategy focuses on specific services

and target groups, even small-scale enterprises can centralize their strength, become “small but excellent”,–“small but special”, and thus obtain higher revenue than the general level and competitive advantage.

3.1.3 Main theories and doctrines on competitive advantage

In strategic management and related literature, there are many theories and doctrines on competitive advantage. The main theories and doctrines about competitive advantage are summarized by Ma (2010) as follows (Table 3.2).

Table 3.2 Main theories and doctrines about competitive advantage

	View on Enterprise	Core Concept	Strategy Tasks
Analysis of industry positioning	Portfolio of product marketing activity	Industrial structure Market positioning Bargaining power Barriers to entry and mobility Monopoly profits	Industry positioning Place the enterprises in the most defensible position in an attractive industry
Resource-based view of enterprises	Combination of unique resources and abilities	Unique resources Core competency Dynamic capabilities Knowledge Ricardian rent	Differentiated resources Grab and utilize unique resources and abilities to implement strategies that are difficult for competitors to imitate
Strategic commitment	Designer and implementer of a series of irreversible investment decisions	Commitment (Dedication) The maintenance of strategy Barriers to entry Barriers to mobility Lasting competitive advantage	Choose commitments Through a series of resources investment to establish and strengthen the enterprise’s sustainable market positioning
Schumpeter’s theory of innovation	Implementer of creative destruction	Innovation Creative destruction New combination of resources Entrepreneur Entrepreneurs rent	Innovation Break the existing equilibrium of the market and open up new markets and games where you are in a leading position
Efficiency doctrine	An alternative market operation mechanism that reduces production costs and transaction costs	Transaction cost Operating cost Economization Efficiency rent or quasi rent	Economization of business activities Run the enterprise most efficiently to achieve the highest efficiency of all activities in the overall value chain
Ecosystem	One of the	Evolution	Co-evolution

	View on Enterprise	Core Concept	Strategy Tasks
doctrine	species in the business ecosystem	Co-evolution Environment selection Business ecosystem Dominance (foundation) Species	Pursue the dominant position of the enterprise in the business ecosystem and the healthy evolution of the system itself
Hyper competition doctrine	Vigilant fighter	Hyper competition Competition upgrading New “7S” analysis Short-term advantage	Fight hard Create short-term competitive advantages through constant competitive behavior, thus advancing with the times in the never-ending competition
Co-opetition doctrine	A rational decision-maker seeking to optimize behavioral outcomes	Competition and cooperation Substitution and complement PSTAR of the game Win-win	Co-opetition Pursue the balance between competition and cooperation; change the rules of the game or the game itself to achieve a win-win situation

Source: Ma (2010. p. 181-182)

From Table 3.2, it can be seen that existing doctrines mainly focus on a single factor or level of corporate competitive advantage, such as corporate industrial orientation, resources, and culture, and analyze and demonstrate it as the source of competitive advantage. Nevertheless, competitive advantage will gradually disappear, so it is hard to ensure the maintenance of an enterprise’s competitive advantage by relying on just one competitive advantage. To obtain a lasting competitive advantage, an enterprise must cultivate a dynamic and evolving set of competitive advantages. The set should include various types of competitive advantages and it can, along with the external environment, constantly adjust, integrate, and renew its components, eliminate old advantages, and generate new ones, so as to delay the disappearance of the competitive advantage. Therefore, we believe that the explanation for every single factor of competitive advantage mentioned in the table above should be viewed comprehensively, that is, to admit the rationality of every single factor and regard corporate competitive advantage as a multi-dimensional and dynamic set. The competitive advantage of an enterprise is maintained and sustained just by the interaction of various advantageous factors in the set.

3.1.4 Dynamism of competitive advantage

In the 1990s, management scholars began to change the focus of the research on corporate competitive strategies from a particular environment or factor to the influence of environmental changes on the industry's internal competition and interactions between competitors, that is, to study corporate strategic management from the perspective of dynamic competition.

3.1.4.1 Understanding of the dynamism of competitive advantage

From the static point of view, competitive advantage is developed in a specific environment, reflecting the advantage of an enterprise compared with its competitors under that condition. However, the environment changes continuously, and only by constant innovation and generation of new advantages can an enterprise preserve its advantageous position over a long period. An increasing number of scholars agree that competitive advantage is dynamic, but there are not many studies on the understanding of the dynamism of competitive advantage, which can be summarized as follows:

(1) The formation of dynamic competitive advantage lies in constant innovation on competitive advantage. Jiang (2002) believes that when the environment changes drastically the enterprise should develop new competitive advantages through constant innovation and thus construct a "continuum" of interconnected or successive competitive advantages with a continuous wave-like forward trajectory (Figure 3.1). It is through constantly shifting competitive advantages that an enterprise obtains a sustainable competitive advantage.

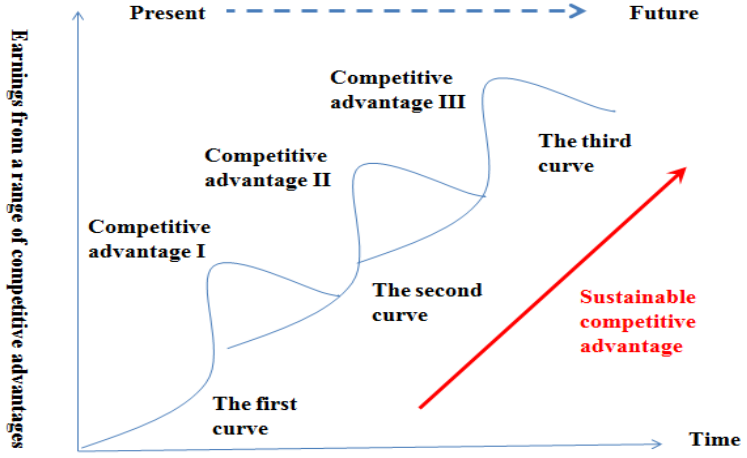

Figure 3.1 The "continuum" of corporate competitive advantage

Source: Jiang (2002, p. 26)

(2) Endogenous competitive resources and capabilities are crucial to maintaining corporate competitive advantage. The generation of competitive advantage is, of course, related to the

environment, but the key to maintaining corporate competitive advantage is an enterprise's endogenous resources and capabilities. Endogenous competitive resources and capabilities mainly refer to competitiveness arising from the movement of the enterprise's internal organization, culture, mechanism, human resources, and other elements. Resources and capabilities can be described by the attributes of Value, Rarity, Imitability, and Organization (VRIO) (Barney, 1986).

(3) The development of a new competitive advantage will be restricted by core rigidity. Generally, when an enterprise moves from one kind of competitive advantage to another, it will be inhibited by the rigidity of its original advantage. The rigidity of the original advantage has four main manifestations. First, behavior and preference habits, that is, over-relying on static benefits resulting from the original competitive advantage and ignoring the prediction of and response to changes of the external environment. Second, significant costs already sunk into a specific asset which offers the existing advantage and the costs of developing a new advantage. Third, the management system and resulting employee benefits developed at the time of the original advantage. Fourth, cognitive path dependence, which means the choice of competitive advantage mode will be affected by the established thinking mode, in the face of changes in the external environment, only the change signals that consistent with exsiting thought patterns would be accepted. Therefore, when an enterprise transforms its competitive advantage, it needs to consider the core rigidity, work to address it, and remove barriers to the development of new competitive advantage.

(4) Competitive advantage is a unity of singularity and clustering. Singularity and clustering of competitive advantage is from the perspective of the number of competitive advantages owned by an enterprise and their relations. An enterprise's prosperity is based on a competitive advantage cluster composed of various related competitive advantages acting in different times and spaces. A typical competitive advantage cluster consists of dominant advantages and supportive advantages and it changes with the environment.

(5) Competitive advantage is relative. Any competitive advantage exists in the comparison with competitors in a certain time and space and there is no absolute competitive advantage divorced from time and space constraints. Y. Zhang and Liu (2018) believe that corporate competitive advantage is under the premise of a certain time and space, which is mainly reflected in the relativity of time, space, and competitive factors.

3.1.4.2 Composition of the dynamism of competitive advantage

The disappearance and maintenance of competitive advantage are two aspects of the dynamism of competitive advantage. The details are as follows:

(1) The disappearance of competitive advantage

Competitive advantage is temporal and spatial. That means enterprises do not have permanent competitive advantages. Jiang (2002) believes that competitive advantages generally go through three consecutive stages of formation, maintenance, and disappearance. When a competitive advantage is formed, the profitability of the enterprise gradually increases. When the competitive advantage is sustained, the profitability of the enterprise remains basically unchanged. When the competitive advantage gradually disappears, the profitability of the enterprise decreases.

In a rapidly changing environment, competitive advantage can be maintained until competitors succeed in either imitating or overtaking that advantage. External factors as well as the enterprise itself can contribute to this. The external factors include imitation by competitors, technological innovation, changes in consumer preferences or markets, and changes in government policies. With regards to the enterprise itself, the disappearance of competitive advantage is mainly caused by a weak foundation of that advantage, poor resistance and response to market threats, and lack of deep insights and adaptability (Jiang, 2002)

(2) The maintenance of competitive advantage

There are two common views regarding the maintenance of corporate competitive advantage in the field of strategic management. One view holds that the maintenance of competitive advantage is the continuation of a competitive advantage in a certain form over a long period of time. In Porter's (1985) view, as long as an enterprise can maintain an operating performance higher than the level of its industry for a long time, it can be said that the enterprise has a sustainable competitive advantage. Barney (1991) believes that only when existing or potential competitors cannot simultaneously implement the same value creation strategy and cannot replicate the benefits brought by this strategy, can we say the enterprise has a sustainable competitive advantage. Hoffman (2000) thinks that sustainable advantage is the lasting benefit that a particular enterprise obtains by implementing a unique value creation strategy which has not been implemented by its current or expected competitors simultaneously, and neither do these competitors have the ability to replicate the benefits brought by the strategy. Xiang (1999) believes that competitive advantage can be a state of brief or long-term existence. A competitive advantage that exists for a long time can be counted as a sustainable competitive advantage.

However, changes in the economic environment, especially in technology and industrial structure, occurring unexpectedly, which are also known as “Schumpeterian shocks”, may limit or remove an enterprise’s competitive advantage in an abnormal period and further result in “creative destruction”(Schumpeter, 2017). The original competitive advantages or disadvantages of the enterprise will be reaffirmed or redefined. Therefore, D'Aveni (1999) argued that sustainable advantage is a collection of short-term advantages rather than the continuation of a specific advantage.

We believe that neither the continuation and maintenance of a given form of competitive advantage over a long period nor the collection of a series of temporary advantages has an impact on the “maintenance” of competitive advantage. In fact, regarding the judgment of the “maintenance” of competitive advantage, X. Li et al. (2005) believe that it must involve two aspects. First, “maintenance” is relative to the imitation and erosion by all competitors. Only when an enterprise’s various competitive advantages cannot be eroded by the imitation of all competitors at present and in the future can it gain a sustainable competitive advantage. Second, “maintenance” refers to a relative amount of time. As long as the enterprise as a whole enjoys a competitive advantage in various environments, it may be considered as having sustainable competitive advantage.

3.2 Sources of competitive advantage

Since the 1980s, the increased competition has made the formation and maintenance of corporate competitive advantage more significant to the survival and development of enterprises. As such, management scholars have become interested in understanding the source of competitive advantage. Competitive advantage theories can be divided into endogenous and exogenous.

3.2.1 Exogenous competitive advantage theory

Under this theory, corporate competitive advantage mainly originates in an enterprise’s external environment. In other words, corporate competitive advantage is mainly determined by competitive relations and opportunities in the external market. The view is represented by the theory of industrial organization and the strategic conflict theory.

3.2.1.1 Theory of industrial organization

The theory of industrial organization attributes the competitive advantage of an enterprise to the industry and competitive position the enterprise is in, emphasizes the role of market forces, and provides an analytical perspective to consider what determines the profitability of an enterprise at the industrial level. Its representatives are the "structure–conduct–performance" analytical framework and the "structure–conduct–effect" paradigm.

The "structure–conduct–performance" analytical framework was developed by Harvard University economists, including Edward Mason and Joe S. Bain. They believed that market structure determines an enterprise's conduct in the market and the latter determines the enterprise's performance in the operation of the market economy. Porter (2014) applied this analytical method to the study of strategic management and proposed the generic mode of industry analysis, namely the "structure–conduct–effect" paradigm. He pointed out that the threat of new entrants, the bargaining power of suppliers, the bargaining power of buyers, the threat of substitutes, and the degree of competition among existing firms constitute the "Five Forces Model" that affects an enterprise's competitiveness in the organizational environment. An enterprise's basic competitive strategy is determined by the enterprise's competitive situation formed by these five forces.

3.2.1.2 Strategic conflict theory

This theory focuses on analyzing the interaction of competitors' strategic conduct. It holds that the environment within the industry is unstable and competitors' strategic conduct will have an impact on an enterprise's market position and competitive advantage. Thus, the theory analyzes enterprises' strategic actions by setting up mathematical models, and then reveals how enterprises affect the market environment by influencing their competitors' conduct. According to the theory, managers' decision-making capability is regarded as a potential source of corporate competitive advantage and to strike first to gain the initiative is the motto of the theory.

3.2.1.3 Review of the exogenous competitive advantage theory

The theory of industrial organization and the strategic conflict theory hold some points in common: both focus on market forces external to enterprises, attribute corporate competitive advantage to factors external to enterprises, and, indeed, explore the influence of the industrial environment on corporate competitive advantage. Nevertheless, a phenomenon often occurs in management practice: in the same industry, some enterprises can gain sizeable profits, while

some go bankrupt, which means that enterprises' external environment is not the only factor that determines corporate competitive advantage. In fact, in addition to environmental factors, different resources, capabilities, development history, cultural deposits, manager decisions, and other internal factors owned by peer enterprises all have an impact on the result of enterprise competition. Therefore, the exogenous competitive advantage theory emphasizes the decisive role of the structure of the external market, ignores the analysis of enterprises' internal characteristics, and appears quite deterministic.

3.2.2 Endogenous competitive advantage theory

Because Porter's competitive strategy theory cannot differentiate competitive advantages under the same outside conditions, scholars began to explore other approaches to obtaining competitive advantage. In the early 1980s, Rumelt (1982) used empirical analysis and pointed out that the main source of an enterprise's excess profits is not external market structure characteristics, but its different internal resources. Therefore, he began to explore internal factors of corporate competitive advantage and, after over 30 years of study, he gradually formed the endogenous competitive advantage theory represented by corporate competence theory.

The endogenous competitive advantage theory focuses on the interior of an enterprise in the exploration of competitive advantage and considers that, compared with the external conditions of an enterprise, the accumulation of internal resources and competence is the key to explaining an enterprise's ability to gain excess profits and maintain its competitive advantage.

This theory has four main component theories: the resource-based theory, the core capability theory, the knowledge-based theory, and the dynamic capabilities theory.

3.2.2.1 Resource-based theory

Resource-based theory (RBT) is the development theory of enterprise competition based on resources. The root of RBT can be traced back to Penrose (1959). In her book *The Theory of the Growth of the Firm*, Penrose (1959) put forward the theory of enterprise resource growth and formulated the analysis paradigm of "enterprise resource-enterprise capability-enterprise growth". The author regards the enterprise as a resource collection which is coordinated and limited by the management framework. The difference between the resources occupied by enterprises as well as limited resource liquidity result in a scarcity of enterprise resources. Certain enterprises can use scarce resources to offer products with lower cost and higher quality

compared to other enterprises, and gain a competitive advantage as a result. Penrose analyzed the growth capability of enterprises through in-depth observation of the enterprises' internal elements, recognized the differences between the productive resource bundles controlled by different enterprises, and studied the competitive significance of inelastic productive resources such as management teams, senior managers, and entrepreneurs' capabilities. Her theory has offered a new perspective to explain the source of enterprises' competitive advantages. Her proposition that the heterogeneity of enterprises comes from the characteristics of their resources has become the cornerstone of RBT.

After Penrose, Wernerfelt (1984), Rumelt (1984), Barney (1986), Dierickx and Cool (1989), and Peteraf (1993) have made their own contributions to RBT.

In 1984, Wernerfelt's (1984) article A Resource-Based View of the Firm was published in the Strategic Management Journal. He put forward the resource-based competition framework, that is, the endogenous view of competitive advantage based on resource positioning strategy, which is different from Porter's "product-market" framework and thus pioneered the RBT of the enterprise. Internal resources are significant for an enterprise to obtain profits and maintain a competitive advantage. The publication of that article is regarded as the formal birth of the resource-based view. Wernerfelt (1984) believes that, compared to the external environment, the internal environment of an enterprise plays a decisive role in creating market advantages. The accumulation of organizational capabilities, resources, and knowledge within the enterprise is the key to obtaining excess profits and competitive advantage. Wernerfelt was the first to propose the concept of "resource position barriers" similar to the "barriers to entry" in industrial economics, shifting the emphasis from the competitive environment of enterprises to the resources that enterprises have already developed for competition, and recognizing that competition between enterprises for obtaining resources and, more broadly, their resource mix, are of great significance to the capability of enterprises to gain advantage. His view had a significant impact on research of strategic management theory in the 1990s.

Different from Wernerfelt's attempt to build a theory based on the origin of resources to explain enterprise performance, Rumelt (1984) explained the reasons for the existence of enterprises from a strategic perspective. He defined the enterprise as a string of productive resources bundles, in which the imitation of resources depends on the extent of protection from the "isolation mechanism", that is, enterprises are homogeneous when they initiate their activity, and then become heterogeneous due to the "isolation mechanism", which is the reason why resources cannot be completely imitated. In the meantime, the value of resources will change according to the environment in which they are applied. On this basis, he also proposed

a series of isolation mechanisms and began to explore the resource attributes that could enhance inimitability.

Barney's greatest contribution to RBT lies in the formal establishment of RBT and in proposing the VRIO framework for enterprise resource analysis. Similarly, to Wernerfelt, Barney believes that it is feasible to develop a theory that explains an enterprise's lasting and outstanding performance based on the attributes of resources it controls. Therefore, he introduced the concept of strategic factor market as a place for enterprises to acquire or cultivate the resources needed to implement their product market strategy. He believes that corporate competitive advantage stems from the strategic resources owned by the enterprise (Barney, 1991). Barney concludes that there are four attributes of strategic resources that can bring competitive advantage to enterprises: (1) value: the resources can help enterprises take advantage of opportunities and deal with threats in the environment, and enhance operating efficiency; (2) rarity: resources are owned by only a few competitors; (3) imitability: enterprises that do not possess certain resources face a cost disadvantage when trying to develop such resources. The factors influencing the resource imitability of enterprises are mainly specific historical conditions, unknown causal relations, social complexity, and patent rights; (4) organization: the utilization of resources is different from the resources themselves. Without a good organization system to make use of valuable, scarce, and difficult-to-imitate resources, the mere possession of such resources cannot bring a competitive advantage to the enterprise. The function of organization is to transform the value of resources into a bridge presenting profits. Barney's research focuses on how to discriminate and decompose the strategic resources that can lead to differences in competitive power from the resources of the organization. Therefore, Barney's analysis is a static stock analysis, that is, "defining the sustainable competitive advantage with the concept of equilibrium". The release of Barney's concept of strategic resources marked the formal establishment of the school of resource-based strategy, and strategic management switched its focus from the traditional analysis of market and external environment to an analysis of the internal capabilities and resources of the organization.

Dierickx and Cool (1989) extended Barney's view. They explored the causes of the economic rent of the resources controlled by enterprises, proposing that resources with such attributes as non-economic time compression, unclear reasons, interrelated asset stocks, or assets' accumulated efficiency, are more unlikely to be dominated by strategic factor market competition compared with other types of resources. However, they based their contributions on a generally accepted premise: that enterprises have heterogeneous resources, and that the

focus should be on what competitive advantages resources bring to enterprises. In doing so, they did not consider the research on the formation mechanism and dynamic development process of resources. Indeed, resources are constantly changing along with the external environment. Organizations must constantly select and integrate the resources they occupy, so as to ensure that the resources and the environment remain dynamic and adaptable. In addition, RBT takes independent resources as the object of analysis. However, in uncertain environments, there is a common complementarity or correlation between resources, which increases the difficulty of analyzing a single resource. Given this, scholars have begun to subdivide "resources" and extract the concept of "capabilities" from it. They regard an organization's unique and inimitable capabilities acquired in a long-term learning process as the source of corporate competitive advantage, and thus produced the "capability-based theory".

3.2.2.2 Core capability theory

(1) Resources and capabilities

From the perspective of RBT, enterprises are the combination of various resources and capabilities. However, in view of the internal logic of resources and capabilities, it is very difficult to draw a clear line between the two. A resource has a "basic" attribute and it is static. In fact, financial capital, physical capital, personal capital, and organizational capital can all be regarded as "resources". Yet capability refers to the property that an enterprise can develop these resources in the implementation of strategy, which means that it is dynamic (Sirmon et al., 2007). In a sense, resources are the basis for the development of enterprise capabilities. The quantity and quality of resources determine the size and level of capabilities. Capability is the way to allocate, develop and use resources for organizational development. Resources and capabilities are the foundation of enterprise strategy as well as the condition of building and maintaining the competitive advantage of enterprises. This research regards resources and capabilities as the source of competitive advantage and does not make strict distinctions between them.

(2) Core capability

The Core capability of the Corporation written by Prahalad and Hamel (1990), which puts forward that the core capability of the corporation is the source of sustainable competitive advantage, marked the beginning of research on core capability theory. Based on the comparative analysis of the significant differences between the development of GTE (an American company) and of NEC (a Japanese company) in the 1980s, the article points out that

the enterprise is essentially a competence system. Prahalad and Hamel believe that the competitive advantage of an enterprise stems from the cost performance of the existing products in the short term but, in the long run, it will depend on the enterprise's competence to build its core competitiveness with lower cost and at a faster pace than its rivals. Therefore, the article defines core competitiveness as the accumulation of knowledge in the organization, particularly the knowledge of how to harmonize different production skills and integrate various technology flows. The article also proposes that a core capability helps the company enter the market, brings perceivable value to customers, and is hard to imitate by competitors.

Since Prahalad and Hamel raised the concept of core capability, researchers from different schools have defined core capability from different angles. As one of the frontier topics in management studies, core capability theory is still developing and improving. J. Chen et al. (1999) summarized existing research as shown in Table 3.3.

Table 3.3 Main theoretical points of enterprise core capability

	Focus	Capability representation or dimension	Advantages	Disadvantages
Integration view Prahalad and Hamel (1990); Kesler et al. (1993)	Integration of different skills and technology flows	Presented in texts, the symbol of organization, such as Sony's microfilming competence	Emphasizes the integration of competence to facilitate good communication within and outside the organization	Poorly broken down; poor hierarchy
Network view Klein et al. (1998)	Skill network	Various skills and networks based on their relationships	Strong decomposability; directly into the skill level; intuitive	The key points are not prominent; insufficient consideration on organizational culture factors
Coordination view Sanchez et al. (1997); Durand (1997)	Coordinated allocation of assets and skills	Excellent assets, cognitive ability, procedures and routines, organizational structure, behavior, and culture	Emphasize coordinated allocation. Therefore, three of the five elements of capability are related to coordinated allocation	Poor hierarchy; too much emphasis on organizational and cultural factors
Combination view Prahalad (1993); Coombs (1996)	Combination of competences	The combination of technology, management process and group learning; the combination of technological competence and	Emphasizes the combination of competences, can be clearly broken down clearly, has certain maneuverability	Poor hierarchy

	Focus	Capability representation or dimension	Advantages	Disadvantages
		organizational competence; the combination of insight/foresight and frontline execution		
Component and architecture view Henderson and Cockburn (1994)	Competence constitution	Component competence and architectural competence	Can be broken down well, has maneuverability, with a systematic view	Poor hierarchy and dynamism
Platform view M. Meyer and Utterback (1992); M. Meyer and Lehnerd (1997)	The impact on product platform	User insight, product technological competence, manufacturing process competence and organizational competence	Connect the market through the product platform; two of the four modules are related to the market	Not comprehensive; less consideration on organizational culture factors
Technological competence view Patel and Pavitt (1997)	Relative technological competence presented by patents	Patent share and revealed technological advantage	Quantitative description through patents	Limitations in using patents as indicators; without considering organizational culture

Source: Chen et al. (1999, p. 14)

As shown above, different researchers have interpreted core capabilities in different ways, indicating the rich connotations associated to the concept.

Core capability theory, combining enterprise system view and enterprise capability view, regards the enterprise as a capability system and core capability is its subsystem. In essence, core capability is a knowledge system and has a hierarchical structure. Gallon et al. (1995) divided the core capability of enterprises into three dimensions, namely, basic competence of functional departments, key competence of business departments, and core capability of enterprise. D. L. Barton proposed four dimensions of core competitiveness, namely, skills and knowledge, technology system, management system, and value system (Cai, 2002). Y. Wang et al. (2000) divide core competence into six levels, namely, business environment, enterprise, discipline, technology, product, and product core subsystem.Cai (2002) believes that the core competence system is divided into coordination competence, integration competence, learning competence, and innovation competence.

The introduction of measurement to carry out quantitative analysis on enterprise

competence is a great contribution to core competence theory. The measurement of enterprise competence by RBT depends on the understanding of resources, and most descriptions are presented qualitatively. The core competence theory has gradually introduced quantitative analysis to assess enterprise competence. According to the summary made by G. Zhang and Liu (2006), M. Meyer and Utterback (1992) adopted a semi-quantitative method to measure enterprise competence, dividing it into four dimensions, namely, product technology, understanding of customer needs, distribution channels, and manufacturing capability. Experts were invited to grade these four dimensions, after which a weighted average is used to evaluate the level of competence. Patel and Pavitt (1997) proposed the patent measurement method, that is, using patent data to calculate Patent Share (PS) and Revealed Technological Advantage (RTA), and measuring competence according to a PS-RTA two-dimensional coordinate diagram. Sveiby proposed a mechanism to monitor the intangible assets of enterprises, and divided the 17 evaluation methods that appeared in 1992-2000 into the direct intellectual capital method, the market capital method, the asset return method, and the balanced scoreboard method, so as to measure the three components of knowledge capital: employee capabilities, internal operating system, and external cooperative relations.

3.2.2.3 Dynamic capabilities theory

As mentioned above, RBT ignores the fact that it is difficult to effectively explain the construction and maintenance of enterprises' competitive advantages in a dynamic environment. The long-term accumulation of core competences can cause corporations to be slower to adapt, leading to the emergence of core rigidity (Barton, 1992). Therefore, some scholars in the competence school of thought began to realize that core competences are not independent from the external environment, and that the maintenance of core competences must be based on coordination and adaptation with the external environment. D. Teece et al. (1997) then proposed the concept of "dynamic capabilities", which has gradually become one of the key topics in the field of strategic management.

(1) Connotation and identification

Although the study of dynamic capabilities has been ongoing for over twenty years, the definitions of dynamic capabilities have not yet been unified. To date, the concept of dynamic capabilities is defined in two major directions. One view is that the dynamic capabilities of enterprises are the capabilities to accomplish abstract organizational and managerial processes, such as the capability to build, adjust, integrate, and reconstruct internal and external resources or capabilities, the capability to perceive and identify opportunities and threats, the capability

to detach and release resources, and the capability to learn (Eisenhardt & Martin, 2000; O'Reilly & Tushman, 2008; D. Teece & Pisano, 1994; C. Wang & Ahmed, 2007); the other view is that dynamic capabilities are the kind of capabilities shown in specific strategic and organizational processes, such as the capability to develop products, form alliances, or make strategic decisions, marketing, research and development (R&D), the capability to create or disrupt markets, to develop new products, processes, and services, to implement new business processes, or to create new customer relationships and change business modes (Drnevich & Kriauciunas, 2011; Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; McKelvie & Davidsson, 2009).

Based on the above, this research chooses the view of D. Teece et al. (1997) as the basis on which to define the concept of dynamic capabilities. That is, dynamic capabilities refer to the capabilities of enterprises to build, integrate and reorganize the internal and external resources by constantly investigating the changes of the environment and exploring business opportunities, so as to improve enterprise competence in market operation and practices, as well as adapt to the dynamic and complex environment with uncertain changes (D. Teece et al., 1997). Dynamic capabilities should have at least two basic criteria. The first concerns the role of capabilities: different from conventional capabilities of enterprises, dynamic capabilities can change conventional capabilities, and then determine the direction and speed of enterprise development. The second is about the process of application: dynamic capabilities are repeatable and stylized, and can be identified as a clear process.

(2) Dimensions

D. Teece and Pisano (1994) are the earliest authors dividing dynamic capabilities into dimensions. In their work *The dynamic capabilities of firms: An introduction*, dynamic capabilities are divided into three dimensions: adaptability, integration capability, and reconfiguration capability. Later, *Dynamic Capabilities and Strategic Management* (D. Teece et al., 1997) further clarified that dynamic capabilities consist of three dimensions: (1) integration capability; (2) configuration capability; and (3) reconfiguration capability. After over 20 years of development, many scholars around the world have carried out dimensional analyses of dynamic capabilities from their respective points of view. There are two main categories to their studies: one is the cognitive perspective centered on enriching and improving the dynamic capabilities system, and the other regards dynamic capabilities as the capabilities of enterprises to complete specific strategies and organizational processes, thereby constructing the dimensions of dynamic capabilities from the perspective of application. The details are shown in Table 3.4.

Table 3.4 Dimensions of dynamic capabilities

Perspective	Author	Dimensions
Cognitive perspective	D. Teece and Pisano (1994)	Adaptability, integration, and reconfiguration
	Teece et al. (1997)	Integration, configuration, and reconfiguration
	Eisenhardt and Martin (2000)	Integration, reconfiguration, acquisition, and release
	Teece (2007)	Opportunity perception, opportunity utilization, and reconfiguration
	C. Wang and Ahmed (2007)	Adaptability, learning, and innovation
	O'Reilly and Tushman (2008)	Opportunity perception, opportunity utilization, and reconfiguration
	Wu (2010)	Integration, learning, and reconfiguration
Application perspective	Geng et al. (2004)	Learning, Internet, technology, and market
	Li (2004)	Insight to the external environment, value chain matching and integration, resource allocation, and integration
	Eisenhardt and Martin (2000)	Product development, alliance, strategic decision-making capability
	Doving and Gooderham (2008)	Human capital and internal development, and alliance
	Danneels (2008)	R&D and new market development
	Drnevich and Kriauciunas (2011)	Develop new products or services, implement new business processes, create new customer relationships, and change business modes

Current research seems to regard dynamic capabilities as the capability of enterprises to complete specific strategies and organizational processes, However, it puts too much emphasis on the individual characteristics of enterprises' dynamic capabilities, ignoring the aspects that dynamics capabilities of different enterprises have in common. Considering the lack of commonality and comparability between studies, this seems to be conducive to deepening the understanding of dynamic capabilities while further enhancing the previous achievements of other scholars. Integrating the viewpoints of various scholars, this research holds that the dimensions of dynamic capabilities are opportunity perception, resource integration, resource reconfiguration, and resource utilization.

Dynamic capability refers to the ability of enterprises to constantly integrate resources, reconfigure, update, and create resources and build capabilities. Its theory emphasizes that enterprises adapt to industry changes in a rapid, accurate and creative way (C. Wang & Ahmed, 2007). Dynamic capability is a high-level capability embedded in the daily organizational process of an enterprise and it acts on basic capabilities. It can promote the improvement of basic capabilities, to upgrade and rebuild the core capability in response to changes and obtain

and maintain competitive advantages (Yang, 2014).

Uner et al. (2020) explained the success of Turkish chain hospitals in cultivating international market opportunities from the perspective of dynamic capability. Mandal (2017) studied the impact of dynamic capabilities on the cooperation with hospital suppliers and hospital supply chain performance. Kumar et al. (2020) explored the mediating role of the quality management capability between the dynamic capabilities of the electronics industry and the performance of new product development. Baden-Fuller and Teece (2020) explored the relationship between market perception, dynamic capability, and competitive dynamics. In China, meanwhile, research on dynamic capabilities has emerged only in the past decade. Most of that research has remained at the theoretical level, discussing the definition of dynamic capability, dividing it into dimensions and analyzing its connection to basic capabilities. It rarely focuses on practical application for the medical field. In the increasingly complex and changing external environment, many problems in competition, management and efficiency faced by medical institutions can be solved with the help of dynamic capabilities. In this regard, this study holds that the concept of dynamic capabilities should be introduced to the field of hospital management and localized empirical studies should be carried out so as to enhance the universality of the theory and solve practical problems of hospital management.

3.2.2.4 Knowledge-based theory (KBT)

RBT proposes that unique resources are the source of enterprises' competitive advantages (Barney, 1991). Grant (1996) expanded RBT and applied knowledge to explain the aspects of internal flexibility, coordination, organizational structure, and enterprise boundary, among others, and thus put forward the knowledge-based theory (KBT). He holds that knowledge is the most important strategic resource in an organization, because an enterprise's knowledge is difficult to imitate by competitors and, more importantly, the knowledge structure which is formed by the current stock of knowledge determines the mode and method of the enterprise to identify opportunities and allocate resources. The existing knowledge base and structure determine whether the internal resources of an enterprise can be effective.

Knowledge is the core of KBT, the key to the competitive advantages of an enterprise that hides behind the enterprise's ability to handle everything. Allee (1997) puts forward the concepts of core knowledge capabilities and core performance capabilities, stating that these two kinds of capabilities are distinct but closely related indicators to identify the advantages held by an enterprise. Core performance capabilities reflect the ability of an enterprise to produce high-quality products and services at high speed and with high efficiency. Core

knowledge capabilities are unique expertise, knowledge, and skills relative to specific businesses. Zollo and Winter (2002) propose that "enterprise competence arises from the co-evolution of the accumulation of implicit experience, the clarification of explicit knowledge and knowledge coding activities". The accumulation of implicit experience refers to the learning process of constantly revising operation practices. The clarification of explicit knowledge means making empirical knowledge clear through collective discussions, task briefings and performance evaluation activities. Knowledge coding activities refer to disseminating useful knowledge within an enterprise through manuals, spreadsheets, and management software. The co-evolution of these three mechanisms is the basis for developing enterprise competence. The evolution of enterprise competence is seen as a dynamic process in which an enterprise continuously generates and revises its operating practices.

According to the definition of KBT, the objective external environment faced by different enterprises is essentially the same but, because of the differences in the knowledge structure and the cognitive ability closely related to the accumulated knowledge, enterprises have different capabilities to find and identify market opportunities and threats, which affect some enterprises' competitive advantage (H. Yao et al., 2018).

3.2.2.5 Review of the endogenous competitive advantage theory

To summarize: endogenous competitive advantage theory aims to explain the acquisition, consolidation, and promotion of corporate competitive advantage from the perspective of input factors. Researchers' diverse interpretations of the concept of input factors leads to four major areas in endogenous competitive advantage theory. These areas are: resource-based theory, core competency theory, knowledge-based theory, and dynamic capability theory. Both the resource-based theory and the core competency theory are based on static analyses of internal variables of enterprises. The former emphasizes input factors, while the latter pays more attention to the connection and application of factors. But the core competency theory does not go beyond the resource-based theory. Rather, it just places more emphasis on the uniqueness, scarcity, and inimitability of capabilities. Knowledge-based theory holds that performance differences are due to the asymmetry of mechanisms of knowledge creation and utilization among different enterprises, from the perspective of knowledge. The dynamic capability theory shifts static analyses to dynamic analyses, transforming capability improvement from one-time acquisitions to continuous acquisitions, which means continuously cultivating, improving, and reconstructing enterprises' heterogeneous capabilities. These four schools of thought in enterprise competence have fundamentally changed the traditional view that relates enterprises

and market mechanisms.

3.3 Application of competitive advantage theory to hospital management

The application of competitive advantage theory to hospital management mainly focuses on the competitive advantages that hospitals will compete for in the future (G. Li & Hu, 2005). This is not unique to hospitals, but applicable to enterprises in all fields. In capital markets, the core competitiveness of a hospital's capital is the most fundamental guarantee for its long-term existence and sustainable development (Tian, 2019). Therefore, if a hospital wants to obtain competitive advantages, it should cultivate its core competitiveness. Reviewing studies on the core competitiveness of hospitals, the following perspectives can be discerned.

3.3.1. Basic research on hospital core competitiveness

Wang (2003) defines the core competitiveness of a hospital as "a combination of a series of skills and knowledge that enables a hospital to achieve sustained competitive advantages in a certain field or some fields, and a unique ability of the hospital which is formed through excellent culture and medical practice". This definition has been applied by many studies related to the core competitiveness of hospitals.

Studies on the characteristics of hospitals' core competitiveness are extended and expand mainly on the basis of the research on the enterprises' core competitiveness and the hospitals' actual situation. For example, Z. Wang et al. (2001) conclude that the characteristics of hospitals' core competitiveness are value-orientation, uniqueness, extensibleness, heterogeneity, and implicitness.Wang (2003) summarizes these as the extent to which the core competitiveness is knowledge-based, value-oriented, unique, and dynamic.

As for research on the constituent elements of hospitals' core competitiveness, Wan (2008) pointed out that it is composed of endogenous variables and exogenous variables. Endogenous variables include core technology, core concepts, core employees, and core products; exogenous variables include core customers and core markets. The integration of endogenous variables and exogenous variables constitutes the core competitiveness of hospitals.

Qiang (2006) believes that resources and competence determine competitiveness. The resources held by hospitals can be divided into three categories. The first is static health resources (or natural capital), including internal institutions, hygiene, funding, health manpower, and conventional equipment. This type of resource input shows a trend of diminishing returns and is easy to imitate. The second is dynamic exogenous health resources

(or alternative capital), including the introduction of new technologies, new medical equipment and their corresponding diagnosis and treatment projects. This kind of resource input mainly brings short-term unstable economic growth, which is also imitable. The last is dynamic endogenous health resources (or intellectual capital), including technological innovation, R&D capabilities and disciplines, and senior medical staff. This type of resource input brings long-term stable economic growth and cannot be easily imitated by competitors. As for competence, Qiang (2006) divides it into comprehensive competitiveness and core competitiveness, and believes that in order to maintain and develop competences over a long period, hospitals must evaluate their comprehensive competitiveness and identify and cultivate their core competitiveness, so as to obtain competitive advantages to win or maintain a top position among the competition. Tian (2019) believes that the most effective and obvious measures for constructing a hospital's core competitiveness are to develop information technologies, build talent teams, and construct the specialty competitiveness of the hospital. Yang (2011) believes that a hospital's competitiveness is decided by capabilities and resources, and ascribes core competitiveness to learning ability, resources, hospital culture, and management capability.

3.3.2 Construction and improvement of the hospital's core competitiveness

Sun Tzu's *The Art of War* states "know yourself and know your enemy, and you will never be defeated". In terms of hospital development from a strategic perspective, "knowing yourself" means a hospital should have a clear understanding of its core competitiveness.

Regarding the construction of hospitals' core competitiveness, existing research mainly focuses on hospital culture, talents, science, and technology. In addition, there are perspectives of research like the learning organization, the blue ocean strategy, the predominance enrichment effect, asymmetric innovation, and the refocusing strategy.

As for the evaluation of a hospital's core competitiveness, Yang (2007) views it as a synthesis of the hospital's capabilities, dividing them into strategic management ability, medical technology innovation ability, medical marketing ability, organizational management ability, medical service ability, learning ability, and cultural construction ability. The author has also summarized 47 specific evaluation indicators according to their development and utilization conditions, the degree of sustainable development and the difficulty of imitation, giving different abilities different weights to show the overall core competitiveness of the hospital through a vector synthesis of the various capabilities. Tan (2011) designs an evaluation index system of the hospital's core competitiveness based on the development and utilization

conditions of the core competitiveness, the degree of sustainable development and the difficulty of imitation with a combination of the Balanced Scorecard (BSC) performance management tool. The author believes that knowledge is the circle formed by core competitiveness. Knowledge in hospitals mainly refers to technological R&D capabilities and their application. As for the formation of core competitiveness, resources are the basis, culture is the driving force, and management is the guarantee. On this basis, the core competitiveness of hospitals can be divided into 4 first-level indicators: technological R&D and application ability, resource utilization ability, hospital culture and management ability, and 18 second-level indicators. They are evaluated with the analytic hierarchy process and fuzzy comprehensive evaluation methods.

3.3.3 Evaluation on the study

Core competitiveness theory is one of the specific applications of competitive advantage theory in the research on hospital management. After the core competitiveness theory was introduced into the field of hospital management, research on the core competitiveness of hospitals became increasingly active. The current consensual view of the research on the core competitiveness of hospitals is that the main elements of the hospital's core competitiveness include human resources, technological innovation, strategic management and operation management, hospital culture, learning ability, and brand appeal. However, current research also has some shortcomings. First, most studies discuss the core competitiveness of hospitals from a single aspect, such as human resources, hospital culture and hospital brand, and focus on the research of the competitiveness of general hospitals. Second, most existing research takes the static development environment as the premise. It is still unknown whether the hospital development strategy prop osed in the static environment can deal with the dynamic and complex competitive environment. Third, the research on the sustainable competitiveness of maternal and child health (MCH) institutions and other special hospitals is relatively fragmented. There is a lack of holistic, three-dimensional, and comprehensive in-depth research, and there are no complete mechanisms or systems of evaluation to measure and promote the sustainable competitiveness of MCH institutions.

3.4 Review of the competitiveness of MCH institutions

At the level of theory, research on the competitiveness of China's MCH institutions mainly focuses on the discussion of strategic choices and the construction of competitiveness. At the

practical level, it mainly concentrates on the construction of evaluation indicators.

3.4.1 Theoretical research

Regarding the selection of strategies, as early as 1992, Wang Fenglan, Director of the Department of Maternal and Child Health of the Ministry of Health, proposed that China's MCH work must adopt a correct development strategy to survive, develop, and succeed (Wang, 1992). For a long time, the development strategy of MCH institutions has been a point of controversy in the development of health care and clinical business. Take Shandong Province as an example. Before the mid-1980s, the MCH institutions at all levels in the province were basically health care providers. After 1986, with the establishment of the national policy of MCH work, which "focuses on prevention and guiding the grassroots, and combines health and clinical work", the development model of MCH institutions at all levels began to diversify. General institutions were predominant for some time but, since 2000, clinics began to gain prominence (Zhen, 2004). In recent years, with improvements to people's conceptions of prevention and health care, the combination of health care and clinical care has gradually become the pattern for MCH institutions. According to Long (2019), the combination of health care and clinical practice in MCH institutions is a process of fully integrating hospital services, technology, and talents. It can integrate hospitals' medical resources and provide patients with more systematic, continuous, efficient, and convenient integrated medical services, thus helping MCH institutions to form their own service characteristics and promote their development.

As for the competitiveness of MCH institutions, L. Zhou et al. (2008) define it as consisting of competitive advantages that are formed through long-term accumulation. They also describe it as a kind of competence to take the initiative in a competitive environment over a long period of time, and as having the characteristics of defensiveness, super-normality, super-value, contingency, and credibility. The ways for MCH institutions to form their core competitiveness are: (1) to build a service promotion strategy by regarding preventive health care services as a bridge and link between doctors and patients; (2) to build a distinctive brand strategy to create distinctive brands by establishing and maintaining patient loyalty and strengthening employee unity; (3) to establish a leading technology strategy by researching and developing professional and key technologies, and absorbing and introducing cutting-edge technologies at home and abroad to develop core technologies; and (4) to develop a business expansion strategy by deepening the profession vertically and extending the service chain horizontally to take the path of differentiated development. Pan (2010) believes that the core competitiveness of MCH

institutions lies in fully promoting the theme of "maternal and child health care", and highlighting, deepening, and optimizing its characteristics, so as to realize a development that is differentiated from that of ordinary medical institutions. To build the core competitiveness of MCH institutions with regional characteristics, municipal level MCH institutions should follow the recommendations of technical guidance and adopt quality management systems for MCH work. County-level MCH institutions should be clear about their duty and service contents, and implement quality management, offer health education, foster team building among their professionals, and digitize their systems. Community health service centers and village or town-level health centers should become the new frontiers of MCH work, by establishing a "two-way referral" mechanism between community health service centers and MCH institutions to improve the accessibility and effectiveness of maternal health care.

In addition to the overall analysis of the composition of the core competitiveness of MCH institutions from the macro level, many scholars have examined core competitiveness at the micro level, in which discipline construction has become the focus of discussion. Tong (2019) believes that discipline construction determines the competitive strength and development potential of MCH institutions. A "family-centered" service concept has been proposed and the discipline system is to be completed by shaping the image of the discipline, strengthening third-party discipline evaluation, and building a comprehensive discipline group covering women health, children's health, women and children emergency, public health, and medical technology. From the perspective of the discipline construction of MCH institutions, Xiong (2008) notes that the performance of functions of MCH institutions must be grounded on a solid disciplinary basis.

3.4.2 Practical research

Many scholars have constructed evaluation indicators of MCH institutions from the aspects of performance and services. For example, Liu (2019) adopts the literature selection method, the expert discussion method, the subjective evaluation method, and the mathematical statistics method to construct a service capacity evaluation index system for MCH institutions in Gansu Province, in China. Shao et al. (2013) take the county-level MCH institutions in the Anhui Province as samples, and use the brainstorming method, the Delphi method, and the coefficient of variation method to construct a total of 41 evaluation indicators in seven aspects for comprehensive evaluation. Luo et al. (2018) combine the technique for order preference by similarity to an ideal solution (TOPSIS) method and the quartile method to conduct a

comprehensive evaluation on the municipal MCH institutions in Sichuan Province. W. Jiang and Xie (2015) conduct a comprehensive evaluation study on the performance of municipal MCH institutions in Hunan Province. He (2014) analyzes the influential factors of children's health care service capabilities of county and district level MCH institutions and constructs evaluation indexes accordingly.

3.4.3 Research summary

By reviewing relevant literature on the construction of the competitiveness of MCH institutions, we find that there are mainly the following problems:

1. Lack of theoretical guidance on strategic management. Existing research is mostly about problem analysis and empirical research, providing practical advice but lacking theoretical support.

2. Lack of in-depth international comparison and exploration. The few existing international studies on MCH services are mostly simple introductions to such services across a number of countries. For example, D. Zhang (1989) presented the MCH work being carried out in Japan and in the Philippines; Gu (2018) analyzed MCH work in Australia; Lu et al. (2000a, 2000b) conducted a brief analysis of the state and development trends of MCH in Australia; Lesser and Fang (1987), Ji and Duan (2000), and the Department for women and children (1998) reviewed MCH work in the United States. There is a lack of international, comprehensive, horizontal comparison and of vertical in-depth discussion. There is also a lack of in-depth research on the improvement of the service system construction of China's MCH institutions by learning from the advanced experience of other countries.

3. Lack of interdisciplinary research perspectives. Most studies are carried out from the perspective of public health, but from the perspective of the management of MCH institutions, in addition to the perspective of public health management, the choice of strategies for MCH institutions or the construction of competitiveness can also be discussed based on the competition theory in strategic management and advantage theory.

3.5 Analytical framework based on the construction of dynamic capabilities

Exploring the sources of competitive advantage is important to strategic management research. From the above review, we believe that the external environment certainly has an impact on corporate competitive advantage, but the ultimate source of competitive advantage lies in an

enterprise's internal characteristics, namely the resources and capabilities held by it. Changes in the external environment will restrict the formation of an enterprise's internal characteristics and thus influence its competitive advantage. Therefore, the enterprise needs to seek the optimal combination of resources and capabilities in the dynamic external environment, constantly adjust and integrate its internal characteristics, and fit them to the external environment, to be able to obtain sustainable competitive advantages.

The acquisition of competitive advantage is the central topic of this study, and environment, resources, and capabilities are all important factors that affect the formation and development of competitive advantage. In this regard, we can construct a realistic model for the cultivation of competitive advantage.

(1) The external environment is an important factor that affects the cultivation of competitive advantage. A challenging and turbulent external environment will restrict the application of the internal resources and capabilities of an enterprise. To obtain a sustainable competitive advantage, an enterprise must fully realize the dynamic complexity of its external environment and strive to match its strategies to the environment.

(2) Competitive advantage results from the mutual matching of the environment, resources, and capabilities. The value of an enterprise's resources and capabilities is realized by exploiting the external environment – resulting in the development of its competitive advantage. The external environment affects the enterprise by forcing the enterprise to match its existing resources and capabilities to the environment. Among them, key resources and capabilities applied to respond to environmental changes become the source of corporate sustainable competitive advantage.

(3) The real-time matching of resources, environment, and capabilities is realized through dynamic capabilities, which are the source of an enterprise's sustainable competitive advantage. The competitiveness of MCH institutions discussed in this study does not refer to "core competence" in the general sense, but to "dynamic capabilities" based on the dynamic environment. "Core competence" is temporal and static. In fact, an enterprise's original core competence may be lost due to actions of competitors, changes in the environment, and the emergence of new technologies. In turn, dynamic capabilities (the capabilities that help the enterprise develop and integrate its internal resources and capabilities) can assist the enterprise in effectively adapting to changes in the external environment and form the basis for sustainable competitive advantage in the dynamic environment.

(4) Dynamic capabilities are critical for MCH institutions to obtain competitive advantage. Although the health care field changes drastically, all medical institutions are in a shared space.

In competition, people tend to notice that, compared to general hospitals, MCH institutions have a different structure of disciplines and scale of assets. However, given that assets are mobile, that the structure of disciplines changes, and that the governance structure can be adjusted through reform, these factors cannot constitute the source of sustainable competitive advantage for hospitals. Only MCH institutions' capabilities to reconstruct internal resources and adapt to the environment obtained through long-term accumulation are the source of sustainable competitive advantage for MCH institutions in the changing external environment. Therefore, MCH institutions must move away from the mindset of relying on the internal resources or the external environment for development, pay attention to the cultivation of dynamic capabilities, and make sure that they always have competitive advantage.

3.6 Synopsis

The construction of sustainable competitive advantage is the core topic of this study. Centered on that topic, this chapter describes the concept of competitive advantage from the aspects of its definition and basic modes. As market competition increases, people realize that competitive advantage, once obtained, cannot last on its own. With changes in the external environment, imitation and technological innovation of new enterprises, changes in consumer preference, and the emergence of new factors, if an enterprise cannot adjust or change its strategy in time, its competitive advantage may disappear. Thus, to maintain competitive advantage, enterprises must explore the source of competitive advantage.

The different assessments of the source of competitive advantage can be grouped under two theories: exogenous and endogenous. The latter pays more attention to the internal aspects of an enterprise and studies the influence of its internal resources and capabilities on maintaining corporate competitive advantage. The resource-based view of the competitive advantage theory is the origin of endogenous theory. As Barney put forward the VRIO attributes of resources, the research on the resources possessed by enterprises has become an area of interest. Different understandings of resources have led to different schools within endogenous theory, such as the core competence theory based on competence, the knowledge-based theory based on knowledge, and the dynamic capabilities theory based on capabilities of adapting to the environment.

On the basis of reviewing the competitive advantage theory, this chapter examines existing research, especially on the study and application of empirical theories in MCH institutions. Compared with general hospitals, MCH hospitals have a lower resistance to discipline risks

with a single kind of patients. In addition, the long-term arguments of development modes also restrict the development. In recent years, and especially following the outbreak of COVID-19, people have focused more on disease prevention and health care. In light of the continuous changes in the external environment, simply studying the development strategy of MCH institutions is not sufficient. It is necessary to cultivate the capabilities of adjusting to changes in the environment, namely dynamic capabilities, under the guidance of strategic management thinking.

Lastly, we constructed a realistic model for the cultivation of competitive advantage. We believe that the development of MCH institutions' sustainable competitive advantage can be analyzed from the combination of environment, resources, capabilities, and dynamic capabilities. The next chapter discusses the resources and capabilities with the VRIO attributes possessed by MCH institutions and the cultivation paths of dynamic capabilities.

[This page is deliberately left blank.]

Chapter 4: Index Construction for MCH Competitive Advantage Evaluation

While the topic of enterprises' competitive advantage receives significant attention in research, few studies examine the competitive advantage of medical institutions, let alone of specialized hospitals such as MCH hospitals or institutions. To study the competitive advantages of MCH institutions from the lens of strategic management, the priority is to determine what the competitive advantages of health care institutions are, which is to say, what indexes can be used to measure their core competitiveness, and what standards should be observed in cultivating their own competitiveness. Therefore, it is necessary to connect the theory of competitive advantage to the development of competitive advantages in MCH institutions by establishing reasonable and effective evaluation criteria and an evaluation index system that will allow MCH institutions to achieve sustainable development in a turbulent market environment and determine, evaluate and develop their own competitive advantages. Therefore, this Chapter draws lessons from existing research on competitiveness evaluation and establishes an evaluation and analysis model of competitive advantage for MCH institutions. The evaluation index system will be constructed based on relevant principles and the resources and capabilities of these institutions, in order to explore some significant strategies for the development of MCH institutions.

4.1 Principles of index construction

Competitive advantage is dynamic, while endogenous competitive resources and capabilities are the key to the sustainability of competitive advantage. The premise of obtaining competitive advantage is to know one's own competitive advantages and correctly evaluate their competitiveness.

MCH institutions are unique in China. They not only perform clinical functions but also provide public health services entrusted to them by the government. Therefore, to determine the evaluation indicators of their competitive advantages, one should not take into account not only their clinical diagnosis and treatment capability, but also the public health services they offer. As for the design of an evaluation index, the following principles should be considered:

4.1.1 Principle of objectivity

Population, policy, and economy are objective realities that cannot be ignored in cultivating the sustainable competitive advantages of MCH institutions. Therefore, the evaluation index system of sustainable competitive advantages for MCH institutions must conform to these realities.

4.1.2 Principle of comprehensiveness

The evaluation of the sustainable competitive advantages of MCH institutions must be systematic and comprehensively reflect the internal resources that constitute the sustainable competitive advantages (Wen et al., 2017). According to the characteristics of MCH institutions, in the process of index construction, we should not only consider the evaluation of their health care, clinical and integrated services, but also disentangle the internal logic between qualitative and quantitative indexes, so as to ensure that the indexes have wide and deep coverage, a strong logic, and a clear hierarchy.

4.1.3 Principle of feasibility

The principle of feasibility is an important guiding principle for evaluating whether an index can be applied to specific practice. The purpose of evaluating the sustainable competitive advantages of MCH institutions is to find ways to cultivate their own sustainable competitive advantages. This requires that, on one hand, the data acquired be scientific and objective and, on the other hand, the constructed evaluation system be easy to understand and operate (Huang, 2003; Hua et al., 2003), so as to ensure that the evaluation indexes can provide not only a reference for the competitiveness evaluation of MCH institutions, but also guidance for their development.

4.1.4 Principle of dynamism

Competitive advantages are dynamic. In other words, the internal and external factors that affect the development of hospitals are under constant evolution (Zhao & Lu, 1998) . As such, the design of the evaluation index must consider existing key indicators, which are highly sensitive to the construction of competitive advantage, and also focus on the future of MCH institutions, so as to look for potential core indicators with development momentum and ensure that potential competitiveness can be predicted on a scientific basis.

4.1.5 Principle of comparability

The principle of comparability is the basis for evaluating whether indexes can reflect different types of competitive advantages and whether they can be compared in pairs in the subsequent analytic hierarchy process (AHP). When constructing the evaluation index system of core competitiveness for enterprises according to the requirements to display specific content and attributes, the indexes selected and utilized should have a stable source of data and be applicable to all evaluation schemes. To ensure the authenticity, objectivity and rationality of the results, the standards of the evaluation indexes must be consistent. The comparability of indexes, in fact, means that the indexes can reflect the common nature of different objects evaluated from a certain aspect (Luce et al., 2012) . Under the premise of homogeneity, the qualitative differences are determined through quantitative comparison, so as to show the differences in evaluation objectives.

4.1.6 Principle of scientific basis

A reasonable selection of indicators, a standardized operation process, and scientific evaluation criteria can facilitate the research work and enable it to more accurately and rationally reflect reality (Liu, 2001). Therefore, when designing the evaluation index system of competitive advantage for MCH institutions, the positioning of MCH institutions should be taken into account to produce indexes that can reflect the competitiveness of general hospitals and construct an overall framework with reliable, independent, and representative indexes.

4.1.7 Principle of observing the characteristics of MCH institutions

Considering the distinctive nature of MCH institutions, and in order to achieve the research purpose and reflect the competitive advantages of MCH institutions, the evaluation model should be built by including indexes that fully reflect the characteristics of MCH institutions. To some extent, this study should distinguish between the operational indicators of MCH institutions and those of general hospitals in order to improve their applicability to MCH institutions and put forward constructive suggestions and opinions, thus showing innovation and practicability.

4.2 Construction of evaluation indexes

Given the lack of relevant research on the evaluation indexes of the sustainable competitive advantage of MCH institutions in China, this study preliminarily established a framework of index systems through in-depth interviews with experts in accordance with the above principles. In addition, experts were invited to evaluate the types of competitive advantages represented by specific indexes based on four dimensions of the resource-based view (RBV), namely, value, rarity, imitability, and organization.

4.2.1 Free list interviews

Through the process of interview experts' selection, determination of interview outline, and analyzing the interview results of experts, the factors that affect the competitiveness of MCH institutions are sorted out, which lays a foundation for the construction of evaluation indicators.

4.2.1.1 Selecting experts for interview

In this study, experts were selected by accidental sampling, a method often used in exploratory research. Accidental sampling, also known as convenience sampling or natural sampling, refers to the selection of samples by researchers according to the actual situation (J. Chen & Fang, 2019). Due to the constructive process-oriented nature of this study, we followed the guidelines provided by Eden and Ackermann (2004), who suggested that six to ten people would be an appropriate number for expert interviews. It is worth mentioning, however, that representativeness is not a major concern in process-oriented research. Indeed, as noted by Bell and Morse, there is "*less emphasis on the output per se and more focus on the process*" (Bell & Morse, 2013) . In order to ensure the comprehensiveness of the subsequent index construction, in this study experts were selected for interview from MCH institutions in Hunan, Guizhou and Guangxi, and all were senior executives in their institutions. We carried out a preliminary selection of 30 experts based on the following criteria:

1.Over 10 years of experience working as a senior executive.

2.Having worked in two or more management departments.

3.Having participated in the performance appraisal of MCH institutions.

The basic information of the 30 experts is shown in Annex A.

Due to the experts' different working schedules, only 23 experts were interviewed, and the other 7 participated in the follow-ups of this study.

4.2.1.2 Determining interview outline

Before the formal interview, we drew up an interview outline based on the actual situation of MCH institutions and literature review. Two senior executives of MCH institutions were invited for a preliminary interview. Afterwards, the outline was revised according to the interview results, at which point the final draft was produced (Annex B).

4.2.1.3 Collecting interview data

It is important to collect the interview data in a timely manner. Any new viewpoint proposed by the interviewees was recorded as a new influencing factor pair. The data of the free interviews was double-typed and collected in time to avoid any deviation. Identical or similar viewpoints referred by different interviewees were classified under the same influencing factor. If only one expert mentioned a certain viewpoint, that viewpoint was not included in the evaluation index system.

4.2.1.4 Analysis of interview data

According to the classification of resources by Barney (1991), and by Barney and Clark (2007), to facilitate subsequent analysis, the influencing factors mentioned by the experts were classified as financial resources, human resources, brand resources, cultural resources, material resources, and organizational resources. The factors of sustainable competitive advantages of MCH institutions identified in the free list interview are shown in Annex C.

4.2.2 Screening of evaluation indexes

The selection criteria of evalution indicators are directly related to the credibility of the final evaluation model. Based on the VRIO framework of Barney & Clark's resource-based theory as screening criteria, this study conducts the second round of expert consultation to re-screen the factors influencing the competitiveness of MCH institutions obtained from free interviews.

4.2.2.1 Ideas of screening

Barney pointed out that to learn the sources of sustainable competitive advantage, it is necessary to establish a theoretical model based on resource heterogeneity and illiquidity. To establish such a model, resources must have four attributes: value, rarity, non-imitability and utilization by an organization. This is the VRIO framework of the RBV (Barney & Clark, 2011), as shown in table 4.1

Table 4.1 The VRIO model

A resource or capability				
Valuable or not?	Rare or not?	Imitation cost high or not?	Utilized by organization or not?	Type of competitive advantage
No	-	-	-	Competitive disadvantage
Yes	No	-	-	Competitive equilibrium
Yes	Yes	No	-	Temporary competitive advantage
Yes	Yes	Yes	No	Unutilized competitive advantage
Yes	Yes	Yes	Yes	Sustainable competitive advantage

Source: Barney and Clark (2011, p. 79)

For MCH institutions, we take their resources or capabilities as sources of competitive advantages so that we can also screen the evaluation factors listed in the free interview by constructing the VRIO analysis framework, where:

1. Value: This refers to whether a resource is helpful for the hospital to develop opportunities or to mitigate threats existing in the environment, indicating that the resource is helpful for the hospital to cultivate and improve its competitiveness.

2. Rarity: This refers to whether a resource is possessed by only a few of its peers and whether the resource or capability is in short supply.

3. Imitability: This refers to whether hospitals without a certain resource face a cost disadvantage when trying to acquire or develop it, in other words, whether there is a high cost (such as time cost, economic cost, or management cost) when attempting to imitate the valuable resources of successful hospitals.

4. Organization: This refers to whether the hospital's policies or activities are organized for the effective use of its valuable, rare, non-imitable resources, that is, whether the hospital converts the value of resources into real profits.

Considering value, rarity, imitability and organizational matters, this thesis constructed a relational framework which contributes to understanding the relationship between the development of resources and capabilities and the competitive potential of hospitals.

There are many factors influencing the competitive advantages obtained from the series of free interviews. In order to ensure the effectiveness of the VRIO expert consultation on the indexes, this study kept the indexes with a frequency of over ten times, and the questionnaire for VRIO expert consultation is designed as shown in Annex D

4.2.2.2 Selection of consulting experts

In order to ensure the representativeness and authority of the evaluation indexes and apply the indexes to the hospital, when selecting consulting experts, we must consider their academic achievements, familiarity with the domain, scope of knowledge, and practical experience in hospital management. In this study, the 30 experts selected from the index construction process were given questionnaires for VRIO consultation.

4.2.2.3 Results of expert consultation

In this round of consultation, a total of 30 questionnaires were distributed and 28 were collected. Of these, 25 were valid, since 3 invalid questionnaires included repeated filling of resource types and missing information. See Annex E for the frequency statistics of expert consultation results.

4.2.2.4 Framework of evaluation index system for sustainable competitive advantages of MCH institutions

Through literature review, free list interviews and VRIO expert consultation, the framework of evaluation index system for sustainable competitive advantages of MCH institutions was finally established.

4.3 Establishment of the evaluation model of sustainable competitive advantages for MCH institutions

As for the evaluation index system of sustainable competitive advantages in MCH institutions, on the one hand, some evaluation indexes are significantly affected by subjective factors, so it is difficult to directly determine their evaluation values through statistical methods; on the other hand, every evaluation index in the same hierarchical structure plays a different role. Therefore, before the application of the evaluation indexes, it is necessary to scientifically quantify them and clarify their weight distribution.

4.3.1 Basic principles of analytic hierarchy process

The analytic hierarchy process (AHP) is a method combining qualitative and quantitative analysis. It was proposed in the 1980s by American operations scholar Tomas Saaty (1980) . This method is characterized by the mathematization of decision-making thoughts through the construction of a hierarchical structure model, which provides a quantifying basis for the

analysis, decision-making, prediction, or control of a problem through mathematics (He, 2018) . AHP is used to solve the multi-criteria decision-making problem in three steps: First, a hierarchical model is established; then, the weights of the indexes of each hierarchical structure are quantified; lastly, a comprehensive ranking of all the indexes is made, so as to determine the best solution to the problem.

4.3.1.1 Establishing a hierarchical structure model

AHP follows the idea of decomposition before synthesis, that is, to solve a problem in decision-making, the first step is to analyze the structure of the elements involved in the problem, and then decompose the problem into different elements according to its nature and the general goal to be achieved. Specifically, the hierarchical structure mainly includes three layers:

(1) The highest layer: objective, which indicates the purpose of the decision or the problem to be solved.

(2) The middle layer: criterion, which is an intermediate link for achieving the goal. This layer can be divided into several sub-criterion layers according to the complexity of the research object.

(3) The lowest layer: plan, referring to a number of specific plans or measures available for achieving the goal.

The elements in these layers are independent of each other, while the elements in the upper layer restrict or dominate the elements in the lower layer. *"In the mathematical theory of hierarchical structure, we discuss the importance intensity of the elements of a certain layer with respect to the elements of its adjacent layer, thus establishing a method to evaluate the influence of this layer on its adjacent layer"* (Saaty, 1980, p. 216).

4.3.1.2 Establishing a pairwise judgment matrix

After the hierarchical structure is established, it is necessary to determine the importance intensity of each element in a certain layer to that in its adjacent layer, which is achieved through pairwise comparison. This method can reduce the difficulty of judgment caused by the discrepancy in the nature of the factors and improve the accuracy of comparison.

The pairwise judgment matrix constructed through AHP is as follows (Table 4.2).

Table 4.2 The pairwise judgment matrix

A	A_1	A_2	…	A_n
A_1	a_{11}	a_{12}	…	a_{1n}
A_2	a_{21}	a_{22}	…	a_{2n}
…	…	…	…	a_{12}
A_n	a_{n1}	a_{n2}	…	a_{nn}

In the judgment matrix:

(1) If aij=1, then Ai is as important as Aj.

(2) If aij > 1, Ai is more important than Aj.

(3) If aij < 1, Aj is more important than Ai.

In addition, the judgment matrix satisfies:

(1) aii=1

(2) aij=1/ aji

(i,j=1,2,3,...,n)

To facilitate the comparison of the elements in the same layer, Saaty (2008) scaled the elements with the numbers 1-9 based on the mathematical derivation of Weber-Fechner's psychophysical logarithmic response function (Table 4.3).

Table 4.3 Basic scale of the absolute numbe

Importance intensity	Definition	Explanation
1	Equally important	Two activities contribute equally to the achievement of the objective.
2	Slightly more important	
3	Moderately important	Experience and judgment are slightly biased toward one activity over another.
4	More than moderately important	
5	Very important	Experience and judgment are strongly inclined to one activity rather than another.
6	More than very important	
7	Great intensity or showing importance	One activity is more popular than another; its advantages have been proved in practice.
8	Overwhelmingly intense	
9	Extremely important	It is the evidence that one activity receives more support than another; and it is the highest level of affirmation
1.1-1.9	When activities are very close, a decimal is added to 1 to properly show their differences.	A better alternative to adding decimals is to compare two similar activities with other very different activities, and to mark the activity as between 1-9 when it is a larger

Importance intensity	Definition	Explanation
		one rather than a smaller one.
The reciprocal of the above values	If activity i has one of the above non-zero numbers when compared with activity j, then j has a reciprocal when compared to i.	A logical assumption

Source: Saaty (2008, p. 257)

4.3.1.3 Calculating the weights of the indexes of a certain layer

After the judgment matrix is obtained by pairwise comparison, it is necessary to deal with the matrix to determine the weight of the elements in a certain layer in terms of their importance over the related elements in the upper layer, and then the importance weight of all elements is calculated. Assuming that the judgment matrix is A=(aij)n*n, the calculation of the judgment matrix is as follows:

(1) Normalizing A elements according to the column sequence:

$$a1)a1)= \quad a_{ij}/\sum_{k=1}^{n} a_{kj} \ (i, j=1, 2, \ldots, n)$$

(2) Adding all the columns of the same row in the normalized matrix:

$$WW= \quad \sum_{j=1}^{n} \bar{a_{ij}} \ (i=1, 2, \ldots, n)$$

(3) Dividing the added vector by n to obtain the weight vector:

$$w_i = \widetilde{w}_i/n$$

(4) Calculating the maximum eigenvalue:

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n} \frac{(Aw)_i}{w_i},$$

among which $(A_w)_i$ represents the ith component of the vector Aw.

4.3.1.4 Consistency test of the judgment matrix of a certain layer

In the process of decision-making and judgment, it is inevitable that the subjective thinking of the decision-makers will be logically inconsistent, which results in the contradiction between the scales of the elements and the deviation of the judgment matrix from consistency. If the judgment matrix is to truly reflect the relationship between the compared objects, the deviation of the judgment matrix must be controlled within a certain range, so the concept of consistency is introduced into AHP, which is used to judge whether the judgment matrix constructed by the decision maker is acceptable or not. Saaty (2008) introduced a consistence ratio (CR) as an index to evaluate consistency.

That is:

$$\mathbf{CR=CI/RI} \quad \mathbf{(4.1)}$$

In this formula, n represents the number of dimensions of the judgment matrix; CI is the consistency index; RI is the average random consistency index of the same dimension; CR is the consistence ratio.

$$\mathbf{C.I.=(\lambda_{max}-n)/(n-1)} \quad \mathbf{(4.2)}$$

R.I. is the random consistency index and its values are as follows (Table 4.4).

Table 4.4 Random consistency index

Dimension	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.52	1.54	1.56	1.58	1.59

Source: Saaty (2008, p. 264)

In terms of the consistence ratio, when CR < 0.10, we believe that the judgment matrix has a satisfactory consistency. If the test result is not qualified, the constructed judgment matrix should be adjusted according to the feedback, and the judgment items in the matrix should be re-determined until all the judgments in the matrix pass the consistency test. Then, the synthetic weight vector W of each judgment group can be calculated.

4.3.1.5 The overall ranking of the hierarchical layers

The overall ranking of the hierarchical layers refers to the calculation of the importance weight of all elements in a certain layer to the upper layer according to the ranking within this layer. The overall ranking of the hierarchy is carried out layer by layer from top to bottom. The principle of the hierarchical ranking is as follows (Table 4.5).

Table 4.5 The principle of the hierarchical ranking

Layer A / Layer B	A_1	A_2	…	A_m	The overall ranking of layer B
	a_1	a_2	…	a_m	
B_1	b_1^1	b_1^2	…	b_1^m	$\sum_{i=1}^{m} a_i b_1^i$
B_2	b_2^1	b_2^2	…	b_2^m	$\sum_{i=1}^{m} a_i b_2^i$
…	…	…	…	…	
B_n	b_n^1	b_n^2	…	b_n^m	$\sum_{i=1}^{m} a_i b_n^i$

In this, $a_1, a_2, \ldots a_n$ are the weights of the first-level indexes $A_1, A_2, \ldots A_m$, and the weights of $B_1, B_2 \ldots B_n$, the corresponding elements of a_1, are b_1^1, $b_2^1 \ldots b_n^1$.

The overall hierarchical ranking satisfies: $\sum_{j=1}^{n}\sum_{i=1}^{m} a_i b_j^i = 1$

4.3.1.6 Consistency test of the overall hierarchical ranking

After the overall hierarchical ranking, it is also necessary to test the consistency of the final weight, and the judgment basis is consistent with the single-layer ranking.

4.3.2 The applicability of AHP in the evaluation of competitive advantages of MCH institutions

In view of its principle, AHP can be applied to the evaluation and decision-making of complex problems with multi-objectives and multi-criteria. Through AHP, the problem can be divided into objective layer, criterion layer and plan layer according to its internal logic. A comparison scale with levels 1-9 is established. Through the comparison of the relative importance, preference, or possibility of two elements (for example, criterion) to another element in the above layer (for example, objectives), the priority of the compared elements is determined. This method can effectively realize the combination of qualitative analysis and quantitative analysis, and it avoids the disadvantage of subjective arbitrariness caused by the traditional method of "distributed weights". Therefore, the analysis results of AHP are more systematic and scientific. MCH institutions are faced with omni-directional and diversified competition. AHP is naturally applicable in determining the key elements from those complex competition elements and building a path to greatly enhance the competitiveness of MCH institutions.

4.3.2.1 Helping to clarify the source of competitive advantages of MCH institutions

AHP is a multi-criteria decision analysis method based on a mathematical algorithm and on cognitive psychology (Marstins et al., 2015). It can help decision makers overcome their cognitive limitations and support them in making complex decisions (Forman & Gass, 2001). AHP is a problem-oriented method, which decomposes a problem into different elements and assembles those elements at different levels according to their relations, so as to form an evaluation model with a hierarchical structure. In each subdivision layer, the elements are quantified according to certain criteria, and the judgment matrix is constructed by pairwise comparison. The overall weight of the index in the criterion is determined by single-layer ranking and total-layer ranking, through which the solution to the problem is finally obtained. As for the competitive advantages of MCH institutions, with the construction of the main indexes that affect the competitive advantages of MCH institutions, the relative importance of the factors to the competitive advantages of MCH institutions can be calculated via AHP, which

can directly show the influencing factors of the competitive advantages. With AHP, hospital managers can analyze the sources of competitive advantages of MCH institutions more clearly and thoroughly, so as to provide a more intuitive theoretical basis for the follow-up decision-making in hospital strategic management.

4.3.2.2 Matching with the development background of MCH institutions

MCH institutions focus on MCH-care services and also perform the function of public health services. They play a very special role in China's health care system. In recent years, under the influence of changing demographics in China, the number of MCH patients in these institutions has been decreasing, and the types of demands are also changing. In addition, as the reform of China's medical and health system proceeds, MCH institutions face more intense competition. Under the background of the interlaced changes brought about by both internal and external circumstances, traditional competitiveness analysis methods either fail to subdivide and quantify the importance of all factors affecting their competitive advantages, or are too complex for decision makers to use. However, AHP addresses both these limitations. It regards complex decision-making problems as a system, clarifies the relationships between the internal components of the system by constructing hierarchical layers, and measures quantitative and non-quantitative factors uniformly using relative scales. On the basis of their subjective knowledge, decision-makers can make a decision-making plan by simply making choices and judgments, which greatly improves the efficiency and scientificity of decision-making.

4.3.3 Steps of applying AHP in the evaluation model of sustainable competitive advantage in MCH institutions

Through carrying out the third round of expert consultation, and using the AHP method, to determine the specific weight of the evaluation index.

4.3.3.1 Consulting experts about the weights of evaluation indexes

Seven experts who participated in free interviews and VRIO judgment were selected for further consultation to determine the weights of different indexes in the evaluation model. This requires the experts to fully understand the indexes that are finally included in the evaluation model, and to have high management expertise and authority in the field as a result of their extensive working experience in MCH institutions. All the questionnaires given out have been collected, and all are valid. The basic information of the seven experts is shown in Annex F.

4.3.3.2 Establishing the hierarchical model

In terms of research purpose, this study aims to evaluate the competitiveness of MCH institutions and hopes to put forward constructive suggestions on the resource allocation and development direction of MCH institutions according to the results obtained from the constructed evaluation model. The hierarchical model of evaluation indexes was constructed to make the indexes less difficult for the experts to understand, and experts were asked to use the weight judgment table to make pairwise comparisons of the importance of the indexes included in the evaluation model, so as to obtain the weight value of each indicator. To better illustrate the hierarchy model, the third-level indexes under each secondary indexes are replaced by abbreviations, for example, "CTR_{11}" to "CTR_{16}" stand for the 6 indexes under "Human resource", "CTR_{21}" to "CTR_{29}" stand for the 9 indexes under "Brand resource", "CTR_{31}" to "CTR_{32}" stand for the 2 indexes under "Financial resource" , "CTR_{41}" to "CTR_{42}" stand for the 2 indexes under "Material resource", "CTR_{51}" to "CTR_{59}" stand for the 9 indexes under "Organizational resource", and "CTR_{61}" to "CTR_{65}" stand for the 5 indexes under "Cultural resource".(Figure 4.1)

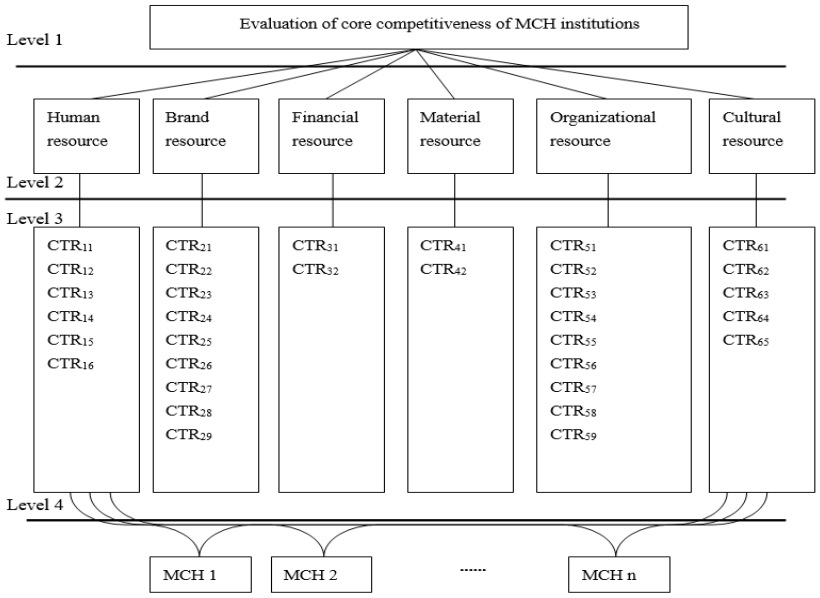

Figure 4.1 The hierarchical model for evaluating the competitive advantages of MHC institution

4.3.3.3 Constructing a pairwise comparison matrix

According to Saaty's explanation of AHP, the experts need to fully understand the meaning of the indexes in the light of their own professional knowledge, make pairwise comparisons of the indexes' importance according to scores for importance ranging from 1 to 9 (which is done in Table 4.3), and finally give scores on the basis of the pairwise comparison matrix.

Taking the second-level index "human resources" as an example, the expert judgment matrix is constructed as shown in Annex G.

Each expert's judgment on the importance of the indexes is different. Therefore, after the seven experts score the importance intensity of the pairwise judgment matrix of the 6 second-level and 33 third-level indexes in the model, it is necessary to integrate the importance intensity of all the indexes. This study considers that the authority of the experts is consistent, and they have the same understanding of the parameters reflected in the indexes. Therefore, the arithmetic average method was used to integrate the final results of importance judgment.

The process of integrating the calculation results of each item in the matrix is as follows:

The arithmetic average score of the pairwise comparisons:

$$\overline{\mathbf{a}} = \frac{\sum_1^7 \mathbf{a}}{\mathbf{7}} \quad \textbf{(4.3)}$$

Taking the second-level indexes "cultural resources" and "human resources" as examples, if the scores made by the seven experts on the importance of the two indexes are $a_1, a_2 \ldots a_7$ in the pairwise comparison matrix, the importance comparison value of "cultural resources" and "human resources" is:

$$\overline{\mathbf{a}} = \frac{\mathbf{a_1+a_2+a_3+a_4+a_5+a_6+a_7}}{\mathbf{7}} \quad \textbf{(4.4)}$$

The arithmetic average calculation was conducted on each second-level and third-level index, through which the common opinions of the seven experts were obtained. Then, the final integrated weight pairwise judgment table was obtained.

4.3.3.4 Weight calculation and consistency test

After obtaining the comprehensive judgment of all the indexes by the seven experts, the relative importance intensity and judgment matrix were calculated. The specific calculation process is as follows:

Take the third-level index in "human resources" as an example.

I. Normalizing the elements in each column of the judgment matrix:

$$\overline{\mathbf{a_{ij}}} = \frac{\mathbf{a_{ij}}}{\sum_1 \mathbf{a_{ij}}} \ \textbf{(i,j=1,2…..,n)} \quad \textbf{(4.5)}$$

n represents the scale of the judgment matrix.

The first column:

$$\overline{a_{11}} = \frac{1}{1+5+\frac{1}{4}+1+\frac{1}{5}+1} = 0.1183$$

$$\overline{a_{21}} = \frac{5}{1+5+\frac{1}{4}+1+\frac{1}{5}+1} = 0.5917$$

$$\overline{a_{31}}=\frac{\frac{1}{4}}{1+5+\frac{1}{4}+1+\frac{1}{5}+1}=0.0296$$

$$\overline{a_{41}}=\frac{1}{1+5+\frac{1}{4}+1+\frac{1}{5}+1}=0.1183$$

$$\overline{a_{51}}=\frac{\frac{1}{5}}{1+5+\frac{1}{4}+1+\frac{1}{5}+1}=0.0237$$

$$\overline{a_{61}}=\frac{1}{1+5+\frac{1}{4}+1+\frac{1}{5}+1}=0.1183$$

The second column:

$$\overline{a_{12}}=\frac{\frac{1}{5}}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.0983$$

$$\overline{a_{22}}=\frac{1}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.4918$$

$$\overline{a_{32}}=\frac{\frac{1}{6}}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.0820$$

$$\overline{a_{42}}=\frac{\frac{1}{4}}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.1229$$

$$\overline{a_{52}}=\frac{\frac{1}{6}}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.0820$$

$$\overline{a_{62}}=\frac{\frac{1}{4}}{\frac{1}{5}+1+\frac{1}{6}+\frac{1}{4}+\frac{1}{6}+\frac{1}{4}}=0.1229$$

The third column:

$$\overline{a_{13}}=\frac{4}{4+6+1+3+1+3}=0.2222$$

$$\overline{a_{23}}=\frac{6}{4+6+1+3+1+3}=0.3333$$

$$\overline{a_{33}}=\frac{1}{4+6+1+3+1+3}=0.0556$$

$$\overline{a_{43}}=\frac{3}{4+6+1+3+1+3}=0.1667$$

$$\overline{a_{53}}=\frac{1}{4+6+1+3+1+3}=0.0556$$

$$\overline{a_{63}}=\frac{3}{4+6+1+3+1+3}=0.1667$$

As the calculation procedures of the fourth, fifth and sixth columns are the same as the above, they are omitted.

After normalization, the judgment matrix is changed into:

$$\bar{a} = \begin{pmatrix} 0.1183 & 0.0984 & 0.2222 & 0.1304 & 0.2632 & 0.1304 \\ 0.5917 & 0.4918 & 0.3333 & 0.5217 & 0.3158 & 0.5217 \\ 0.0296 & 0.0820 & 0.0556 & 0.0434 & 0.0526 & 0.0434 \\ 0.1183 & 0.1229 & 0.1667 & 0.1304 & 0.1579 & 0.1304 \\ 0.0237 & 0.0820 & 0.0556 & 0.0434 & 0.0526 & 0.0434 \\ 0.1189 & 0.1229 & 0.1667 & 0.1304 & 0.1579 & 0.1304 \end{pmatrix}$$

II. Adding the normalized matrix by row:

$$\mathbf{b_i} = \sum_{j=1}^{n} \overline{a_{ij}} \ \mathbf{(i=1,2,\ldots,n)} \qquad \mathbf{(4.6)}$$

I.e.:

$$b_1 = \sum_{j=1}^{2} \overline{a_{1j}} = 0.1183+0.0984+0.2222+0.1304+0.2632+0.1304 = 0.9629$$

$$b_2 = \sum_{j=1}^{2} \overline{a_{2j}} = 0.5917+0.4918+0.3333+0.5217+0.3158+0.5217 = 2.7763$$

$$b_3 = \sum_{j=1}^{2} \overline{a_{1j}} = 0.0296+0.0820+0.0556+0.0434+0.0526+0.0434 = 0.3066$$

$$b_4 = \sum_{j=1}^{2} \overline{a_{1j}} = 0.1183+0.1229+0.1667+0.1304+0.1579+0.1304 = 0.8266$$

$$b_5 = \sum_{j=1}^{2} \overline{a_{1j}} = 0.0237+0.0820+0.0556+0.0434+0.0526+0.0434 = 0.3007$$

$$b_6 = \sum_{j=1}^{2} \overline{a_{1j}} = 0.1183+0.1229+0.1667+0.1304+0.1579+0.1304 = 0.8266$$

III. Normalizing the vector $W=[\mathbf{b_1}, \mathbf{b_2}, \ldots . \mathbf{b_n}]^{\mathbf{T}}$ and calculating the average of each row:

$$\mathbf{W_i} = \frac{b_i}{n} \frac{b_i}{n} \qquad \mathbf{(4.7)}$$

I.e.:

$$W_1 = \frac{b_1}{6} = \frac{0.9629}{6} = 0.1605$$

$$W_2 = \frac{b_2}{6} = \frac{2.7763}{6} = 0.4627$$

$$W_3 = \frac{b_1}{6} = \frac{0.3066}{6} = 0.0511$$

$$W_4 = \frac{b_1}{6} = \frac{0.8266}{6} = 0.1378$$

$$W_5 = \frac{b_1}{6} = \frac{0.3007}{6} = 0.0501$$

$$W_6 = \frac{b_1}{6} = \frac{0.8266}{6} = 0.1378$$

W is the eigenvector that needs to be obtained, and it is the weight value of each element of an index judged by the experts. This study shows the specific principle and calculation steps.

The data are double-typed in Super-decision software. Because the algorithm and the reserved decimal point are different, the results have a small deviation, which can be ignored. The final weight value is based on the result obtained by the software. Take the calculation results of "human resources" by the software as an example (Figure 4.2):

Figure 4.2 The calculation results of "human resources" by Super-decision software

Therefore, for the two third-level indexes in "Human resources", the final weights judged by the experts are as follows (Table 4.6).

Table 4.6 The final judgment weights of human resources

Indexes	Weights
Staff training mechanism	0.156
Regional influence of discipline leaders	0.474
Staff title structure	0.050
Talent development	0.136
Academic structure of staff	0.048
Talent retention rate	0.136

IV. Calculating the judgment matrix's maximum eigenvalue λ_{max}:

$$\lambda_{max} = \frac{1}{n}\sum_{j=1}^{n}\frac{\sum_{i=1}^{n} a_{ij} w_j}{w_j} \tag{4.8}$$

According to the above formula and the relevant data calculated stepwise, the maximum eigenvalue and index value for consistency of the judgment matrix under the category of "human resources" are respectively:

$$\lambda_{max}=6.1789 \quad CI=\frac{\lambda_{max}-n}{n-1}=0.0357 \tag{4.9}$$

V. Consistency test

In this example, CR=CI/RI=0.0284. Therefore, it passes the consistency test, and the final results of the judgment matrix meet the requirements.

In line with the above steps of weight calculation, pairwise comparison was made among the six second-level indexes to obtain the corresponding weights of all the second-level indexes, and the same operation was carried out for the third-level indexes which are subordinate to the second-level indexes. After synthesizing the opinions of the seven experts, the judgment matrix of all indexes passes the consistency test and meets the requirements of judgment. The specific results are as follows (Table 4.7).

Table 4.7 Results of index consistency test

Indexes	λ_{max}	CR
Financial resources	2.0000	0.0000
Material resources	2.0000	0.0000
Human Resources	6.1789	0.0284
Organizational resources	9.3214	0.0275
Cultural resources	5.0812	0.0181
Brand resources	9.7976	0.0683

4.3.3.5 Calculating the comprehensive weight of the index and the total score

As the final judgment of the model is based on the comprehensive weight of the third-level index, the final weight of the third-level index was calculated by the weighted method: $W= W_a*W_b$. Finally, the evaluation index model of the competitiveness of MCH institutions and the weight assignment were obtained (Annex H).

4.3.3.6 Ranking results of 10 MCH institutions

In order to evaluate the applicability of the competitive advantage evaluation system for MCH institutions, it is necessary to conduct an empirical analysis of the model. In this regard, we selected 10 Chinese MCH institutions from the same level by convenience sampling to verify the applicability of the model.

As the data collection and ranking process of the 10 MCH institutions are presented in Chapter 5, this part only presents the overall scores and ranking results of these institutions (Table 4.8).

Table 4.8 Overall scores and rankings of MCH institutions

Hospital	Overall score	Ranking
MCH_1	5.7151	8
MCH_2	6.6846	3
MCH_3	6.1756	5

MCH_4	5.9441	7
MCH_5	5.7038	9
MCH_6	6.0672	6
MCH_7	5.5945	10
MCH_8	6.6407	4
MCH_9	6.8099	2
MCH_{10}	7.6174	1

We can see from Table 4.8 that the best performer in competitiveness is MCH_{10} and the worst is MCH_7.

4.4 Synopsis

This chapter mainly completed the construction of the evaluation index model of the competitive advantage of MCH institutions, and selected 10 MCH institutions to verify the applicability of the model.

The evaluation model was constructed mainly through three rounds of expert consultation. After the process of sorting indexs, confirming framework and calculating index weight, an evalution model of 6 dimensions and 27 specific index was bulid. At the same time, in order to test the applicability of the model we build, 10 domestic MCH hospitals were selected to verify the applicablity of the model.

Chapter 5: Empirical Analysis of Competitive Advantage Evaluation for MCH Institutions

In order to evaluate the applicability of the competitive advantage evaluation system for MCH institutions, it was necessary to conduct an empirical analysis of the model. In this regard, we selected 10 Chinese MCH hospitals by convenience sampling to verify the applicability of the model.

5.1 Data collection

Before officially inviting experts to participate in the study, we divided the 33 indicators listed in the evaluation model into two categories (qualitative and quantitative) and included the indicators into the questionnaire that was distributed to the 10 MCH hospitals. This was important to ensure that experts have an objective and comprehensive understanding of the 10 selected MCH hospitals.

The questionnaires filled out by the 10 MCH hospitals were then submitted to 5 experts for further analysis, according to Eden and Ackermann (2004) the number of experts should vary between 5 and 12 elements. Specifically, the experts were invited to evaluate these 10 hospitals based on the evaluation model. The final scoring result is obtained after averaging the scoring results of each index of the 5 experts.

5.2 Overall weight and ranking

5.2.1 Overall score and ranking of MCH hospitals

According to the scores given by the experts and the weights of various indicators, the weight scores and rankings of the 10 MCH hospitals can be calculated. Table 4.8 in Chapter 4 shows the overall score and ranking of the 10 MCH hospitals in this model.

It can be seen from Table 4.8 that the 10 MCH hospitals are ranked according to their total scores, which are obtained by applying a simple additive aggregation model (Marstins et al., 2015) . The results indicate that, in terms of competitive advantage, MCH_{10} is the best performer, while MCH_7 is the worst performer.

5.2.2 Overall score of 6 indicators

According to the statistical results of the second-round expert consultation (Annex E of Chapter 4), concerning the value, rarity, inimitability, and organizational utilization of the indicators (VRIO analysis), 6 indicators including "network system for maternal and child health care services" (CTR_1), "regional influence of academic leader" (CTR_2), "ability of medical and health care service integration" (CTR_3), "decision making ability of senior management team" (CTR_4), "ability of public health management for women and children" (CTR_5), and "number of characteristic and key subjects" (CTR_6) were selected as "sustainable competitive advantage".

In order to further understand the performance of the 10 hospitals in these 6 indicators in the model, the scores of the 5 experts were adopted again for analysis. Table 5.1 shows the scores of the 10 hospitals in the model on these 6 indicators.

Table 5.1 Performance of 10 MCH hospitals in 6 indicators

	CTR_1	CTR_2	CTR_3	CTR_4	CTR_5	CTR_6
MCH_1	0.4987872	0.944966	0.065059	0.348187	0.243520	0.120990
MCH_1	0.5542080	1.113710	0.074698	0.409632	0.265658	0.258112
MCH_3	0.4987872	1.046213	0.06265	0.368669	0.214003	0.185518
MCH_4	0.5126424	0.911218	0.067469	0.358428	0.228761	0.266178
MCH_5	0.5126424	0.877469	0.072288	0.337946	0.265658	0.217782
MCH_6	0.4849320	0.911218	0.072288	0.368669	0.250900	0.322640
MCH_7	0.4710768	0.877469	0.067469	0.348187	0.228761	0.250046
MCH_8	0.4987872	1.079962	0.084336	0.409632	0.243520	0.298442
MCH_9	0.4710768	1.181208	0.081926	0.368669	0.258279	0.225848
MCH_{10}	0.5680632	1.417450	0.084336	0.450595	0.287797	0.354904

According to the results shown in Table 5.1, the average scores of the 10 hospitals on the 6 indicators in the model can be ranked from high to low as shown below: CTR_2 (1.0360882), CTR_1 (0.5071003), CTR_4 (0.3768614), CTR_6 (0.2500460), CTR_5 (0.2486858), CTR_3 (0.0732518). MCH_{10} ranks first in these 6 indicators. Except for CTR_6, the scores of MCH_7 on the other 5 indicators are all lower than the average.

5.3 Sensitivity analysis of the model

Based on the AHP mathematical formulation presented in Chapter 4, this research built a competitiveness advantage evaluation model for MCH institutions that includes 6 second-level

indicators and 33 third-level indicators. In such a complex evaluation model, the change of a single indicator's weight may have a certain impact on the overall stability of the model and the ranking results of the evaluation targets. Therefore, the next step of the research is to conduct a sensitivity analysis of the overall competitiveness advantage evaluation model constructed for MCH institutions to evaluate the impact of the change of each indicator's standard weight on the model as a whole.

According to the weights obtained in the research, the applied model evaluated and ranked the competitiveness of the 10 MCH hospitals selected in the research. The importance of each MCH hospital in the model's various indicators has been determined, and the following indicators are selected to conduct the sensitivity analysis and present the results, including high-weight second-level indicators such as "human resources" (abbreviated as CTRa in the table) and "organizational resources" (abbreviated as CTRb in the table); third-level indicators "regional influence of academic leader" (abbreviated as CTRc in the table), and "network system for maternal and child health care services" (referred to as CTRd in the table).

5.3.1 Sensitivity analysis of second-level indicators

The values of the index weights in the first column of Table 5.2 and Table 5.3 have no practical significance. They are generated by the software for sensitivity analysis and represent the possible weight fluctuation ranges of the two second-level indicators of "human resources" and "organizational resources". The other columns of the two tables are the scores and priority rankings under different index weight values of the 10 MCH hospitals selected in the sensitivity analysis.

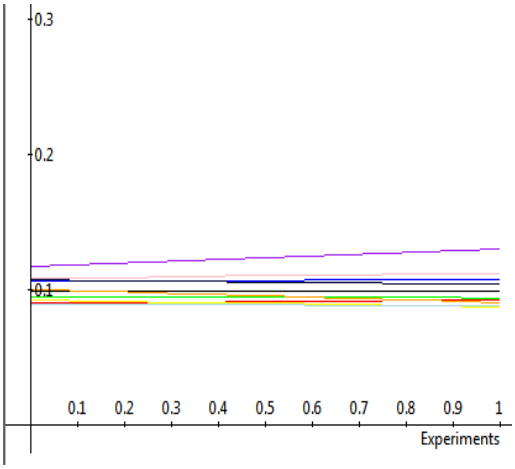

Figure 5.1 Sensitivity analysis of "CTRa"

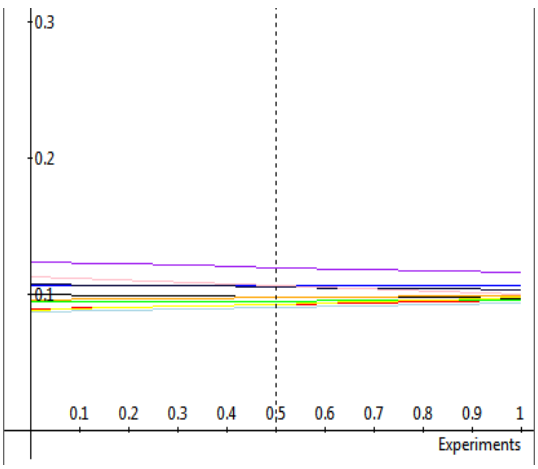

Figure 5.2 Sensitivity analysis of "CTRb"

Table 5.2 Sensitivity analysis of "CTRa"

"CTRa" Weight	Priority ranking									
	MCH_1	MCH_2	MCH_3	MCH_4	MCH_5	MCH_6	MCH_7	MCH_8	MCH_9	MCH_{10}
0.01062	0.090	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.109	0.122
	9	3	5	7	8	6	10	4	2	1
0.04746	0.090	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.109	0.122
	8	3	5	7	9	6	10	4	2	1
0.28162	0.091	0.106	0.098	0.095	0.090	0.096	0.089	0.106	0.109	0.121
	8	3	5	7	9	6	10	4	2	1
0.45001	0.091	0.106	0.098	0.095	0.090	0.096	0.089	0.106	0.109	0.120
	8	4	5	7	9	6	10	3	2	1
0.63945	0.092	0.105	0.098	0.095	0.090	0.096	0.089	0.105	0.109	0.120
	8	4	5	7	9	6	10	3	2	1
0.85782	0.092	0.105	0.098	0.096	0.090	0.096	0.090	0.106	0.108	0.119
	8	4	5	7	10	6	9	3	2	1

Table 5.3 Sensitivity analysis of "CTRd"

"CTRb" Weight	Priority ranking									
	MCH1	MCH2	MCH3	MCH4	MCH5	MCH6	MCH7	MCH8	MCH8	MCH10
0.01326	0.090	0.106	0.098	0.094	0.090	0.096	0.088	0.106	0.109	0.121
	8	3	5	7	9	6	10	4	2	1
0.14218	0.091	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.109	0.121
	8	3	5	7	9	6	10	4	2	1
0.23689	0.091	0.106	0.099	0.095	0.090	0.096	0.088	0.106	0.109	0.121
	8	3	5	7	9	6	10	4	2	1
0.30267	0.091	0.106	0.099	0.095	0.090	0.096	0.088	0.106	0.109	0.120
	8	4	5	7	9	6	10	3	2	1
0.45001	0.092	0.105	0.099	0.095	0.090	0.096	0.087	0.106	0.109	0.120
	8	4	5	7	9	6	10	3	2	1
0.61314	0.092	0.105	0.099	0.096	0.090	0.096	0.087	0.106	0.109	0.119
	8	4	5	7	9	6	10	3	2	1

It can be seen from the results in Table 5.2 that when the weight of the indicator "CTRa" is between 0.04746 and 0.45001, the model does not change the ranking of the 10 MCH hospitals, and the model is stable; when the weight reaches 0.45001, the competitiveness rankings of the ten hospitals change slightly, and the weights remain stable between 0.45001 and 0.85782; when the weight reaches 0.85782, the competitiveness rankings of the 10 hospitals change slightly. In general, the "CTRa" indicator is not sensitive, and has little effect on the model's overall evaluation of the competitiveness of MCH hospitals.

It can be seen from the results in Table 5.3 that when the weights of the indicator "CTRb"

are between 0.01326 and 0.30267, the model does not change the ranking of the 10 MCH hospitals, and the model is stable; when the weight reaches 0.30267, the competitiveness rankings of the 10 hospitals change slightly, but then become stable. In general, the "CTRb" indicator is not sensitive, and has little effect on the model's overall evaluation of the competitiveness of MCH hospitals.

5.3.2 Sensitivity analysis of third-level indicators

The values of the index weights in the first column of Table 5.4 and Table 5.5 have no practical significance. They are generated by the software for sensitivity analysis and represent the possible weight fluctuation ranges of the two third-level indicators of "regional influence of academic leader" and "network system for maternal and child health care services". The other columns of the two tables are the scores and priority rankings under different index weight values of the 10 MCH hospitals selected in the sensitivity analysis.

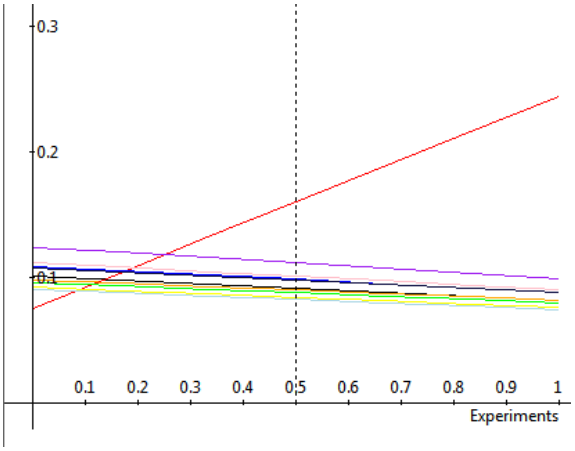

Figure 5.3 Sensitivity analysis of "CTRc"

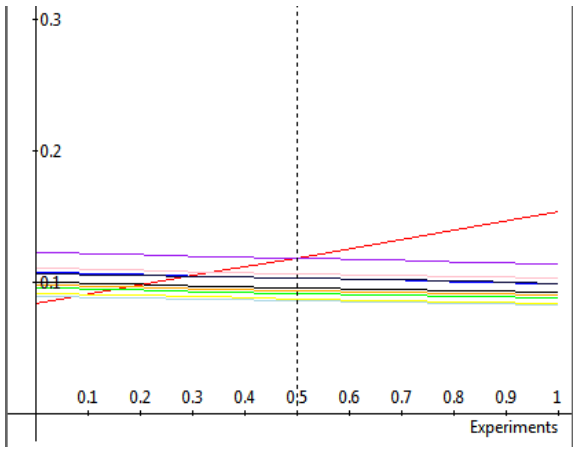

Figure 5.4 Sensitivity analysis of "CTRd"

Table 5.4 Sensitivity analysis of "CTRc"

"CTRc" Weight	Priority ranking									
	MCH 1	MCH 2	MCH 3	MCH 4	MCH 5	MCH 6	MCH 7	MCH 8	MCH 9	MCH10
0.00273	0.075	0.108	0.100	0.095	0.091	0.097	0.090	0.108	0.112	0.125
	10	3	5	7	8	6	9	4	2	1
0.04219	0.082	0.107	0.099	0.095	0.091	0.097	0.089	0.107	0.110	0.123
	10	3	5	7	8	6	9	4	2	1
0.08166	0.088	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.110	0.123
	9	3	5	7	8	6	10	4	2	1
0.08956	0.090	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.110	0.122

"CTRc" Weight	Priority ranking									
	MCH 1	MCH 2	MCH 3	MCH 4	MCH 5	MCH 6	MCH 7	MCH 8	MCH 9	MCH10
	8	3	5	7	9	6	10	4	2	1
0.11850	0.095	0.105	0.098	0.093	0.089	0.096	0.088	0.105	0.109	0.122
	7	3	5	8	9	6	10	4	2	1
0.12376	0.095	0.105	0.098	0.093	0.089	0.095	0.088	0.105	0.109	0.122
	6	3	5	8	9	7	10	4	2	1
0.13954	0.098	0.105	0.098	0.093	0.089	0.095	0.087	0.105	0.109	0.121
	5	3	6	8	9	7	10	4	2	1
0.17375	0.104	0.104	0.097	0.093	0.089	0.095	0.087	0.104	0.107	0.119
	4	3	6	8	9	7	10	5	2	1
0.17638	0.104	0.104	0.097	0.093	0.088	0.095	0.087	0.104	0.108	0.120
	3	4	6	8	9	7	10	5	2	1
0.19217	0.108	0.104	0.096	0.092	0.088	0.094	0.087	0.104	0.108	0.120
	2	4	6	8	9	7	10	5	3	1
0.25794	0.118	0.103	0.095	0.091	0.087	0.093	0.086	0.103	0.106	0.118
	1	4	6	8	9	7	10	5	3	2
0.51872	0.162	0.098	0.090	0.087	0.083	0.089	0.082	0.097	0.100	0.110
	1	4	6	8	9	7	10	5	3	2

Table 5.5 Sensitivity analysis of "CTRd"

"CTRd" Weight	Priority ranking									
	MCH 1	MCH 2	MCH 3	MCH 4	MCH 5	MCH 6	MCH 7	MCH 8	MCH 9	MCH10
0.0027	0.084	0.107	0.099	0.095	0.091	0.097	0.089	0.106	0.110	0.122
	10	3	5	7	8	6	9	4	2	1
0.0448	0.087	0.107	0.099	0.095	0.090	0.097	0.089	0.106	0.110	0.122
	10	3	5	7	8	6	9	4	2	1
0.0737	0.089	0.106	0.099	0.094	0.090	0.096	0.089	0.106	0.109	0.122
	9	3	5	7	8	6	10	4	2	1
0.0948	0.090	0.106	0.099	0.094	0.090	0.096	0.088	0.106	0.109	0.121
	8	3	5	7	9	6	10	4	2	1
0.1500	0.094	0.106	0.098	0.094	0.090	0.096	0.088	0.105	0.109	0.121
	7	3	5	8	9	6	10	4	2	1
0.1763	0.096	0.105	0.098	0.094	0.089	0.096	0.088	0.105	0.109	0.121

"CTRd" Weight	Priority ranking									
	MCH 1	MCH 2	MCH 3	MCH 4	MCH 5	MCH 6	MCH 7	MCH 8	MCH 9	MCH10
	6	3	5	8	9	7	10	4	2	1
0.2053	0.0985	0.1053	0.0986	0.0938	0.0899	0.0957	0.0887	0.1054	0.1082	0.1201
	5	3	6	8	9	7	10	4	2	1
0.2974	0.1044	0.1043	0.0976	0.0939	0.0899	0.0957	0.0877	0.1043	0.1082	0.1201
	4	3	6	9	9	7	10	5	2	1
0.3053	0.1053	0.1043	0.0976	0.0939	0.0889	0.0957	0.0877	0.1043	0.1082	0.1201
	3	4	6	8	9	7	10	5	2	1
0.3477	0.1072	0.1043	0.0976	0.0929	0.0889	0.0947	0.0877	0.1043	0.1072	0.1191
	2	4	6	8	9	7	10	5	3	1
0.4947	0.1181	0.1033	0.0955	0.0911	0.0871	0.0933	0.0861	0.1033	0.1062	0.1181
	1	4	6	8	9	7	10	5	3	2
0.6105	0.1261	0.1023	0.0955	0.0901	0.0861	0.0933	0.0851	0.1023	0.1052	0.1171
	1	5	6	8	9	7	10	4	3	2
0.7104	0.1331	0.1013	0.0945	0.0891	0.0851	0.0923	0.0841	0.1013	0.1052	0.1161
	1	5	6	8	9	7	10	4	3	2

It can be seen from the results in Table 5.4 that when the weight of the indicator "CTRc" is between 0.00273 and 0.08166, the overall ranking of the 10 MCH hospitals by the model remains unchanged. When the weight reaches 0.08166, the ranking of MCH_1 increases, while the ranking of MCH_7 decreases; when its weight reaches 0.08956, the ranking of MCH_1 increases, and the ranking of MCH_5 decreases; when its weight reaches 0.1185, the ranking of MCH_1 increases, and the ranking of MCH_4 decreases. When its weight reaches 0.25794, MCH_1 ranks first, then the increase in the weight of "CTRc" will not affect the overall ranking of the 10 MCH hospitals, and the model tends to be stable. According to the results of the table, it can be seen that when the weight of "CTRc" is between 0.08166 and 0.25794, its impact on the competitiveness ranking of the 10 MCH hospitals is obvious. Once its weight is greater than 0.25794, the model stabilizes. As such, it can be seen that the high-weight indicator, "regional influence of academic leader" is sensitive, and change in its weight has a great impact on the final result of the evaluation model.

The results shown in Table 5.5 indicate that when the weight of the indicator "CTRd" is between 0.00273 and 0.07377, the overall ranking of the 10 MCH hospitals in the model remains unchanged. When the weight reaches 0.07377, the ranking of MCH_1 increases, while the ranking of MCH_7 decreases; when its weight reaches 0.09482, the ranking of MCH_1 increases, and the ranking of MCH_5 decreases; when its weight reaches 0.15007, the ranking of MCH_1 increases, and the ranking of MCH_4 decreases. When its weight reaches 0.49474, tMCH_1

ranks first; when its weight reached 0.6105, MCH_8's ranking increases and MCH_2's ranking declined; afterwards, the increase in the weight of "CTRd" does not affect the overall ranking of the 10 MCH hospitals, and the model stabilizes. According to the results of the table, it can be seen that when the weight of "CTRd" is between 0.07377 and 0.49474, its impact on the competitiveness ranking of the 10 MCH hospitals is relatively obvious. Once its weight is greater than 0.6105, the model stabilizes. As such, it can be seen that the high-weight indicator, "network system for maternal and child health care services" is sensitive, and change in its weight has a great impact on the final result of the evaluation model.

In carrying out this research, sensitivity analysis has been conducted for all indicators in the evaluation model. The results show that the overall sensitivity of the second-level indicators is low. When the weights of the second-level indicators change, their impacts on the final evaluation result of the model are small; the high-weight third-level indicators, such as the "regional influence of academic leader", "network system for maternal and child health care services", and "proportion of funding for science and education" are highly sensitive. Within a certain weight change range, these indicators have a great impact on the final evaluation result of the model. Therefore, it is worth giving some attention to these third-level indicators.

5.4 Robustness analysis of the model

Sensitivity analysis is the analysis of the overall stability of the model under the condition that the weight value of a specific indicator of the evaluation model fluctuates and other indicators remain unchanged, and the discussion of the influence of the specific indicator value's weight change on the evaluation result of the model. Based on the above sensitivity analysis results, it is found that some high-weight third-level indicators are highly sensitive. Therefore, the robustness analysis of the simultaneous change of multiple high-weight indicators within the model's framework is needed to verify the stability and reliability of the model. Table 5.6 uses the third-level indicator of the highest weight "regional influence of academic leader" (hereinafter referred to as CTRc) which is subordinated to the second-level indicator "human resource" as an example for robustness analysis. Other subordinate third-level indicators (staff training mechanism, professional title structure, talent team, educational background structure, talents retention rate) are replaced with "CTR_1", "CTR_2" ... "CTR_5" to present the analysis results:

Table 5.6 Robustness analysis of "CTRc"

"CTRc" Weight	Weight ranking					
	CTR_1	CTR_2	CTR_33	CTR_4	CTR_5	（MCH_1-MCH_{10}）
0.0000	0.2964	0.0944	0.2586	0.0920	0.2586	9,3,7,5,8,6,10,4,2,1
0.0512	0.2812	0.0895	0.2454	0.0873	0.2454	9,3,7,5,8,6,10,4,2,1
0.1069	0.2647	0.0843	0.2310	0.0821	0.2310	9,3,7,5,8,6,10,4,2,1
0.1582	0.2495	0.0795	0.2177	0.0774	0.2177	9,3,7,5,8,6,10,4,2,1
0.2094	0.2343	0.0746	0.2045	0.0727	0.2045	9,3,7,5,8,6,10,4,2,1
0.2564	0.2204	0.0702	0.1923	0.0684	0.1923	9,3,7,5,8,6,10,4,2,1
0.3121	0.2039	0.0649	0.1779	0.0633	0.1779	9,3,6,5,8,7,10,4,2,1
0.3674	0.1875	0.0597	0.1636	0.0582	0.1636	9,3,6,5,8,7,10,4,2,1
0.4103	0.1748	0.0557	0.1525	0.0542	0.1525	9,3,6,5,8,7,10,4,2,1

The first column of Table 5.6 does not have practical significance. They consist of the possible range of values for "regional influence of academic leader", as generated by the software. In this research, the high-weight and sensitive indicators are selected for analysis and explanation to ensure the representativeness and persuasiveness of the result.

It can be seen from Table 5.6 that when the weight adjustment value of the indicator "regional influence of academic leader" changes between 0.0000-0.3121, the weight value of the other five indicators changes according to a certain rule, the sum of the overall third-level indicator weight is 1, and the ranking of the model's evaluation result is stable. When the weight value is greater than 0.3121, the ranking of the model's evaluation result changes slightly, and then tends towards a stable state. It indicates that when the weight of this indicator is changed and the weights of other indicators of the same level change at the same time, the model can still obtain the evaluation results that meet the requirements.

This research has conducted robustness analysis on all indicators, and the results show that the constructed competitive advantage evaluation model for MCH institutions is well suited for evaluating the competitiveness of MCH institutions even when the model is disturbed by changes in the weight judgment, indicating its good applicability.

5.5 Competitiveness evaluation of 10 MCH hospitals

In order to prove that the competitiveness evaluation model of MCH hospitals built in this research is effective in application and can be used to analyze the characteristics and shortcomings of each MCH hospital, this research took ten MCH hospitals as examples for empirical analysis, in which qualitative indicators obtained relevant specific data and quantitative indicators gained information from the self-rating questionnaires for each MCH

hospital. The completed questionnaires were finally submitted to 5 experts for evaluation and scoring, and the average scores were taken as the competitiveness evaluation results of the 10 MCH hospitals. As the data are for empirical study only, the specific names of the hospitals are omitted and replaced by MCH_1 to MCH_{10}.

It is important to note that the model built in this research is intended to evaluate competitiveness and thus all the hospitals that use this model for evaluation refer to the same standards. The evaluation results are used only to compare the competitiveness between hospitals, that is, no matter what the evaluation results are, differences in the final evaluation scores, such as differences in the scores of third-level indicators, the overall scores of second-level indicators, or the total scores calculated from the model, indicate different competitiveness of hospitals. In order to improve the comparability and credibility of the competitiveness evaluation results of the empirical study, the ten MCH hospitals selected for this research are all prefecture-level.

5.5.1 Ranking in the financial resources dimension

According to the expert's scoring results of the third-level indicators of "proportion of funding for science and education" and "proportion of income from medical services" classified in the second-level indicator "financial resources", the average-score matrix of the ten hospitals is as follows.

$$\mathbf{S_1}=\begin{bmatrix} 3.40 & 6.00 & 6.40 & 5.00 & 4.20 & 4.20 & 3.60 & 6.20 & 7.80 & 4.60 \\ 5.60 & 5.60 & 4.80 & 8.00 & 8.00 & 4.40 & 7.00 & 5.60 & 7.20 & 7.20 \end{bmatrix} \quad \textbf{(5.1)}$$

The weight of each third-level indicator gathered from the previous hierarchical analysis is as follows.

$$\mathbf{W_1 = [0.0640, 0.0320]} \quad \textbf{(5.2)}$$

According to the final score matrix $b_1\, b_1 = W_1\, W_1 * S_1\, S_1$ of the ten hospitals in this dimension, the results are as follows.

$$\mathbf{b_1}=\begin{bmatrix} 0.2177 & 0.3842 & 0.4098 & 0.3202 & 0.2689 & 0.2689 & 0.2305 & 0.3970 & 0.4994 & 0.2945 \\ 0.1790 & 0.1790 & 0.1535 & 0.2557 & 0.2557 & 0.1407 & 0.2238 & 0.1790 & 0.2302 & 0.2302 \end{bmatrix} \quad \textbf{(5.3)}$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals in the financial resources dimension, which are shown as follows.

$$\mathbf{d_1 = [0.3967, 0.5632, 0.5633, 0.5759, 0.5247, 0.4096, 0.4543, 0.5760, 0.7296, 0.5247]} \quad \textbf{(5.4)}$$

Therefore, the ranking of the ten MCH hospitals in the financial resources dimension after synthesizing the experts' scores is shown as follows**.**

$$\mathbf{R_{1} = [10, 5, 4, 3, 7, 9, 8, 2, 1, 6]}$$

5.5.2 Ranking in the human resources dimension

According to the experts' scoring results of the third-level indicators of "professional title structure", "educational background structure", "talent team", "talents retention rate", "regional influence of academic leaders" and "staff training mechanism" categorized in the second-level indicator of "human resources", the average-score matrix of the ten hospitals is displayed as follows.

$$S_2 = \begin{bmatrix} 5.80 & 7.80 & 7.80 & 6.80 & 6.20 & 7.60 & 7.40 & 5.60 & 6.20 & 5.20 \\ 5.80 & 6.80 & 6.20 & 6.00 & 5.00 & 6.60 & 5.20 & 6.60 & 8.00 & 8.40 \\ 4.80 & 5.60 & 5.40 & 5.20 & 4.80 & 4.80 & 4.80 & 5.60 & 6.20 & 7.80 \\ 6.00 & 6.20 & 5.80 & 6.00 & 5.20 & 5.40 & 5.60 & 6.20 & 6.60 & 7.40 \\ 5.60 & 6.60 & 6.20 & 5.40 & 5.20 & 5.40 & 5.20 & 6.40 & 7.00 & 8.40 \\ 6.00 & 7.00 & 5.40 & 6.40 & 5.80 & 5.40 & 5.40 & 7.00 & 6.80 & 7.60 \end{bmatrix} \quad (5.5)$$

The weight of each third-level indicator gathered from the previous hierarchical analysis is as follows.

$$W_2 = [0.0178, 0.0171, 0.0484, 0.0484, 0.1687, 0.0555] \quad (5.6)$$

According to the final score matrix $b_2\, b_2 = W_2\, W_2 * S_2\, S_2$ of the ten hospitals in this dimension, the results are as follows.

$$b_2 = \begin{bmatrix} 0.1032 & 0.1388 & 0.1388 & 0.1210 & 0.1104 & 0.1353 & 0.1317 & 0.0997 & 0.1104 & 0.0926 \\ 0.0991 & 0.1162 & 0.1059 & 0.1025 & 0.0854 & 0.1128 & 0.0889 & 0.1128 & 0.1367 & 0.1435 \\ 0.2324 & 0.2711 & 0.2614 & 0.2518 & 0.2324 & 0.2324 & 0.2324 & 0.2711 & 0.3002 & 0.3776 \\ 0.2905 & 0.3002 & 0.2808 & 0.2905 & 0.2518 & 0.2614 & 0.2711 & 0.3002 & 0.3195 & 0.3583 \\ 0.9450 & 1.1137 & 1.0462 & 0.9112 & 0.8775 & 0.9112 & 0.8775 & 1.0800 & 1.1812 & 1.4174 \\ 0.3332 & 0.3888 & 0.2999 & 0.3554 & 0.3221 & 0.2999 & 0.2999 & 0.3888 & 0.3776 & 0.4221 \end{bmatrix} \quad (5.7)$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals in the human resources dimension, which are shown as follows.

$$d_2 = [2.0034, 2.3288, 2.1332, 2.0325, 1.8795, 1.9530, 1.9015, 2.2525, 2.4256, 2.8115] \quad (5.8)$$

Therefore, the ranking of the ten MCH hospitals in the human resources dimension after synthesizing the experts' comments on scores is shown as follows.

$$R_2 = [7, 3, 5, 6, 10, 8, 9, 4, 2, 1]$$

5.5.3 Ranking in the material resources dimension

According to the experts' scoring results of the third-level indicators of "business occupancy area" and "featured equipment for women and children" classified in the second-level indicator of "material resources", the average-score matrix of the ten hospitals is shown as follows.

$$S_3 = \begin{bmatrix} 5.74 & 7.00 & 4.24 & 4.24 & 3.58 & 7.32 & 4.24 & 4.28 & 5.74 & 8.80 \\ 6.40 & 6.80 & 6.40 & 5.20 & 4.80 & 6.20 & 5.40 & 6.40 & 6.80 & 8.20 \end{bmatrix} \quad (5.9)$$

The weight of each third-level indicator gathered from the previous hierarchical analysis is as follows.

$$W_3 = [0.0186, 0.0374] \quad (5.10)$$

According to the final score matrix b_3 b3=W_3 W3*S_3 S3 of the ten hospitals in this dimension, the results are as follows.

$$b_3 = \begin{bmatrix} 0.1070 & 0.1305 & 0.0791 & 0.0791 & 0.0668 & 0.1365 & 0.0791 & 0.0798 & 0.1070 & 0.1641 \\ 0.2391 & 0.2540 & 0.2391 & 0.1942 & 0.1793 & 0.2316 & 0.2017 & 0.2391 & 0.2540 & 0.3063 \end{bmatrix} \quad (5.11)$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals in the material resources dimension, which are shown as follows.

$$d_3 = [0.3461, 0.3845, 0.3181, 0.2733, 0.2460, 0.3681, 0.2808, 0.3189, 0.3610, 0.4704] \quad (5.12)$$

Therefore, the ranking of the ten MCH hospitals in the material resources dimension after synthesizing the experts' comments on scores is shown as follows.

$$R_{3=}[5, 2, 7, 9, 10, 3, 8, 6, 4, 1]$$

5.5.4 Ranking in the cultural resources dimension

According to the experts' scoring resultsof the third-level indicators of "employees' satisfaction", "understanding of maternal and child health care policy", "long-term planning", "employees' cohesion" and "employees' cultural identity" classified in the second-level indicator of "cultural resources", the average-score matrix of the ten hospitals is indicated as follows.

$$S_4 = \begin{bmatrix} 5.60 & 7.40 & 6.80 & 7.40 & 9.00 & 8.00 & 8.00 & 8.00 & 7.00 & 5.60 \\ 7.20 & 8.20 & 7.40 & 7.80 & 6.60 & 7.60 & 7.20 & 8.00 & 8.00 & 8.00 \\ 5.60 & 7.20 & 6.60 & 5.60 & 5.80 & 7.00 & 5.60 & 7.20 & 7.00 & 7.80 \\ 6.40 & 6.40 & 7.20 & 6.80 & 7.60 & 6.80 & 6.00 & 7.40 & 6.80 & 6.60 \\ 7.60 & 7.60 & 7.80 & 7.00 & 7.60 & 7.40 & 6.00 & 7.20 & 7.40 & 7.00 \end{bmatrix} \quad (5.13)$$

The weight of each third-level indicator gathered from the previous hierarchical analysis is as follows.

$$W_4 = [0.0050, 0.0180, 0.0143, 0.0116, 0.0071] \quad (5.14)$$

According to the final score matrix b_4 b_4=W_4 W_4 * S_4 S_4 of the ten hospitals in this dimension, the results are as follows.

$$b_4 = \begin{bmatrix} 0.0279 & 0.0369 & 0.0339 & 0.0369 & 0.0449 & 0.0399 & 0.0399 & 0.0399 & 0.0349 & 0.0279 \\ 0.1298 & 0.1479 & 0.1334 & 0.1406 & 0.1190 & 0.1370 & 0.1298 & 0.1443 & 0.1443 & 0.1443 \\ 0.0803 & 0.1032 & 0.0946 & 0.0803 & 0.0831 & 0.1004 & 0.0803 & 0.1032 & 0.1004 & 0.1118 \\ 0.0742 & 0.0742 & 0.0835 & 0.0788 & 0.0881 & 0.0788 & 0.0696 & 0.0858 & 0.0788 & 0.0765 \\ 0.0536 & 0.0536 & 0.0550 & 0.0494 & 0.0536 & 0.0522 & 0.0423 & 0.0508 & 0.0522 & 0.0494 \end{bmatrix} \quad (5.15)$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals in the cultural resources dimension, which are shown as follows.

$$d_4 = [0.3658, 0.4158, 0.4004, 0.3860, 0.3887, 0.4083, 0.3619, 0.4239, 0.4105, 0.4099] \quad (5.16)$$

Therefore, the ranking of the ten MCH hospitals in the cultural resources dimension after synthesizing the experts' comments on scores is represented as follows.

$$R_{4=}[9, 2, 6, 8, 7, 5, 10, 1, 3, 4]$$

5.5.5 Ranking in the organizational resources dimension

According to the experts' scoring results of the third-level indicators of "network system for maternal and child health care", "ability of public health management for women and children", "decision making ability of senior management team", "performance incentive mechanism", "ability to respond to market change", "utilization rate of information resources", "emphasis placed by employees on health care business", "integrated health care service capacity" and "subjects structure" classified in the second-level indicator of "organizational resources", the average-score matrix of the ten hospitals is shown as follows.

$$S_{5=}\begin{bmatrix} 7.20 & 8.00 & 7.20 & 7.40 & 7.40 & 7.00 & 6.80 & 7.20 & 6.80 & 8.20 \\ 6.60 & 7.20 & 5.80 & 6.20 & 7.20 & 6.80 & 6.20 & 6.60 & 7.00 & 7.80 \\ 6.80 & 8.00 & 7.20 & 7.00 & 6.60 & 7.20 & 6.80 & 8.00 & 7.20 & 8.80 \\ 6.20 & 6.20 & 6.20 & 5.60 & 5.60 & 6.40 & 6.40 & 6.60 & 6.60 & 7.20 \\ 4.80 & 6.20 & 5.40 & 5.40 & 6.20 & 5.80 & 5.40 & 6.00 & 6.40 & 6.60 \\ 6.40 & 6.00 & 6.00 & 6.40 & 6.00 & 6.00 & 5.00 & 6.20 & 6.00 & 6.20 \\ 6.60 & 7.20 & 6.40 & 7.20 & 8.00 & 7.20 & 6.60 & 7.20 & 7.20 & 6.60 \\ 5.40 & 6.20 & 5.20 & 5.60 & 6.00 & 6.00 & 5.60 & 7.00 & 6.80 & 7.00 \\ 5.60 & 6.00 & 6.40 & 5.20 & 4.80 & 6.20 & 5.40 & 6.40 & 6.80 & 8.20 \end{bmatrix} \quad (5.17)$$

The weight of each third-level indicator gathered from the previous hierarchical analysis is as follows.

$$W_5 = [0.0693, 0.0369, 0.0512, 0.0264, 0.0148, 0.0070, 0.0080, 0.0120, 0.0254, 0.0374] \quad (5.18)$$

According to the final score matrix $b_5 b_5 = W_5 W_5 * S_5 S_5$ of the ten hospitals in this dimension, the results are as follows.

$$b_5=\begin{bmatrix} 0.4988 & 0.5542 & 0.4988 & 0.5126 & 0.5126 & 0.4849 & 0.4711 & 0.4988 & 0.4711 & 0.5681 \\ 0.2435 & 0.2657 & 0.2140 & 0.2288 & 0.2657 & 0.2509 & 0.2288 & 0.2435 & 0.2683 & 0.2878 \\ 0.3482 & 0.4096 & 0.3687 & 0.3584 & 0.3379 & 0.3687 & 0.3482 & 0.4096 & 0.3687 & 0.4506 \\ 0.1634 & 0.1634 & 0.1634 & 0.1476 & 0.1476 & 0.1687 & 0.1687 & 0.1739 & 0.1739 & 0.1898 \\ 0.0711 & 0.0918 & 0.0800 & 0.0800 & 0.0918 & 0.0859 & 0.0800 & 0.0889 & 0.0948 & 0.0977 \\ 0.0450 & 0.0422 & 0.0422 & 0.0450 & 0.0422 & 0.0422 & 0.0351 & 0.0436 & 0.0422 & 0.0436 \\ 0.0530 & 0.0578 & 0.0514 & 0.0578 & 0.0643 & 0.0578 & 0.0530 & 0.0578 & 0.0578 & 0.0530 \\ 0.0651 & 0.0747 & 0.0626 & 0.0675 & 0.0723 & 0.0723 & 0.0675 & 0.0843 & 0.0819 & 0.0843 \\ 0.1420 & 0.1521 & 0.1622 & 0.1318 & 0.1217 & 0.1521 & 0.1318 & 0.1572 & 0.1470 & 0.1876 \end{bmatrix} \quad (5.19)$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals on the organizational resources dimension, which are shown as follows.

$$d_5 = [1.6300, 1.8115, 1.6433, 1.6295, 1.6560, 1.6835, 1.5841, 1.7577, 1.6957, 1.9625] \quad (5.20)$$

Therefore, the ranking of the ten MCH hospitals in the organizational resources dimension after synthesizing the experts' comments on scores is displayed as follows.

$$R_{5=}[8, 2, 7, 9, 6, 5, 10, 3, 4, 1]$$

5.5.6 Ranking in the brand resources dimension

According to the experts' scoring results of the third-level indicators of "patient satisfaction", "number of characteristic and key subjects", "ability to treat difficult and critical diseases", "social influence of senior management team", "industrial recognition", "patient loyalty", "brand promotion ability", "discipline service chain in a life cycle" and "social influence" classified in the second-level indicator of "brand resources", the average-score matrix of the ten hospitals is represented as follows.

$$S_{6=}\begin{bmatrix} 8.40 & 7.80 & 6.00 & 7.00 & 8.60 & 7.00 & 7.00 & 8.60 & 7.80 & 7.00 \\ 3.00 & 6.40 & 4.60 & 6.60 & 5.40 & 8.00 & 6.20 & 7.40 & 5.60 & 8.80 \\ 5.20 & 4.26 & 6.08 & 4.02 & 4.36 & 6.40 & 4.12 & 5.92 & 6.86 & 6.28 \\ 5.60 & 7.20 & 5.80 & 5.60 & 5.40 & 6.00 & 600 & 7.00 & 6.80 & 8.20 \\ 6.20 & 7.80 & 6.80 & 5.60 & 5.60 & 6.20 & 5.60 & 7.80 & 6.60 & 8.40 \\ 5.40 & 6.20 & 6.60 & 5.80 & 6.40 & 6.40 & 5.40 & 7.20 & 6.60 & 7.20 \\ 6.40 & 6.40 & 6.20 & 5.80 & 5.40 & 5.40 & 5.80 & 7.20 & 6.20 & 7.60 \\ 5.60 & 6.60 & 6.80 & 6.00 & 5.00 & 6.80 & 5.20 & 6.80 & 6.60 & 8.60 \\ 5.80 & 7.00 & 6.80 & 5.80 & 5.40 & 6.40 & 5.40 & 7.00 & 6.00 & 7.80 \end{bmatrix} \quad (5.21)$$

The weight of each third-level indicator collected from the previous hierarchical analysis is as follows.

$$W_6 = [0.0115, 0.0403, 0.0379, 0.0089, 0.0276, 0.0122, 0.0068, 0.0131, 0.0266] \quad (5.22)$$

According to the final score matrix $b_6\, b_6 = W_6\, W_6 * S_6\, S_6$ of the ten hospitals in this dimension, the results are as follows.

$$b_6 = \begin{bmatrix} 0.0963 & 0.0895 & 0.0688 & 0.0803 & 0.0986 & 0.0803 & 0.0803 & 0.0986 & 0.0895 & 0.0803 \\ 0.1210 & 0.2581 & 0.1855 & 0.2662 & 0.2178 & 0.3226 & 0.2500 & 0.2984 & 0.2258 & 0.3549 \\ 0.1972 & 0.1616 & 0.2306 & 0.1525 & 0.1654 & 0.2427 & 0.1563 & 0.2245 & 0.2602 & 0.2382 \\ 0.0497 & 0.0639 & 0.0515 & 0.0497 & 0.0480 & 0.0533 & 0.0533 & 0.0622 & 0.0604 & 0.0728 \\ 0.1709 & 0.2150 & 0.1874 & 0.1544 & 0.1544 & 0.1709 & 0.1544 & 0.2150 & 0.1819 & 0.2315 \\ 0.0659 & 0.0757 & 0.0806 & 0.0708 & 0.0781 & 0.0781 & 0.0659 & 0.0879 & 0.0806 & 0.0879 \\ 0.0438 & 0.0438 & 0.0424 & 0.0397 & 0.0370 & 0.0370 & 0.0397 & 0.0493 & 0.0424 & 0.0520 \\ 0.0736 & 0.0867 & 0.0893 & 0.0788 & 0.0657 & 0.0893 & 0.0683 & 0.0893 & 0.0867 & 0.1130 \\ 0.1545 & 0.1865 & 0.1812 & 0.1545 & 0.1439 & 0.1705 & 0.1439 & 0.1865 & 0.1598 & 0.2078 \end{bmatrix} \quad (5.23)$$

The data in each column of the matrix are summed to obtain the final evaluation scores of the ten hospitals in the brand resources dimension, which are presented as follows.

$$d_6 = [0.9730, 1.1808, 1.1174, 1.0469, 1.0087, 1.2448, 1.0120, 1.3118, 1.1873, 1.4384] \quad (5.24)$$

Therefore, the ranking of the ten MCH hospitals in the brand resources dimension after synthesizing the experts' comments on scores is given as follows.

$$R_{6=}[10, 5, 6, 7, 9, 3, 8, 2, 4, 1]$$

5.5.7 Overall evaluation

The sum of the score results of six second-level indicators of resources is calculated as follows.

$$d = d_1 + d_2 + d_3 + d_4 + d_5 + d_6 =$$

[5.7151, 6.6846, 6.1756, 5.9441, 5.7038, 6.0672, 5.5945, 6.6407, 6.8099, 7.6174] **(5.25)**

$$\boldsymbol{R = [8, 3, 5, 7, 9, 6, 10, 4, 2, 1]}$$

The overall ranking of the competitiveness of the ten MCH hospitals is presented as follows, in descending order: MCH_{10}, MCH_9, MCH_2, MCH_8, MCH_3, MCH_6, MCH_4, MCH_1, MCH_5, MCH_7.

5.6 Analysis and interpretation

The following analysis is based on the competitiveness evaluation results and the overall evaluation results of the ten MCH hospitals in terms of the second-level indicators, and the relevant quantitative data and qualitative scores provided by the ten MCH hospitals, as shown below.

In the financial resources dimension, MCH_9 ranks first while MCH_1 ranks last. According to the collected data and relevant information, MCH_9 invests 2.01% of its funding in science and education, which is the highest among the ten MCH institutions, and 37.62% of its income comes from medical services, which is at the upper middle level among the ten MCH institutions. However, MCH_1 has only 0.03% of its funding invested in science and education, which is the lowest among the ten MCH institutions. In general, the proportion of funding for science and education in the MCH institutions with high competitiveness scores in the financial resources dimension is in the front rank. There are no significant differences in the proportion of income from medical services among the MCH institutions, which falls between 22.58% and 37.62%, except for that of MCH_4 and of MCH_5 (both beyond 50%). This indicates that the proportion of funding for science and education has a great influence on the competitiveness of MCH institutions in the financial resources dimension. Therefore, in order to improve their overall competitiveness, from the perspective of financial resources allocation, MCH hospitals should moderately increase the proportion of funding for science and education, strengthen scientific research, and improve the quality of teaching demonstration sites so as to obtain stronger competitive advantages.

In the human resources dimension, MCH_{10} is in first place while MCH_5 is last. According to the collected data and relevant information, there is no significant difference in the quantitative indicator “professional title structure”. The proportion of senior professional technicians in the ten MCH hospitals ranges from 11.5% to 20.8%, and that of intermediate professional staff is between 24.2% and 38.1%. With regard to the “educational background structure”, the proportion of staff with a doctoral degree in the first-placed MCH_{10} is 1.01%,

the highest among the ten, while that in the second-placed MCH_9 is 0.82%. Meanwhile, the proportion of staff with a master's degree in MCH_{10} and MCH_9 also ranks first and second respectively. Both the proportion of staff with a doctoral degree and that with a master's degree in the last-placed MCH_5 rank at the bottom of the ten. The proportion of staff with a bachelor's degree in the ten hospitals is between 60.2% and 89.0%, which has a relatively small influence on the final competitiveness evaluation ranking of the ten hospitals in terms of human resources.

As for qualitative indicators, according to the results of the self-rating questionnaire of the ten hospitals, the sum of the four qualitative indicators categorized in human resources in MCH_1-MCH_{10} is [23,25,24,22,19,21,20,26,27,32] respectively, which is consistent with their final ranking in the human resources dimension. "Regional influence of academic leaders" has a relatively high weight in the evaluation model and this indicator in MCH_{10} ranks first with 9 points among the indicators for self-evaluation. According to the field investigation, MCH_{10} has high-quality academic leaders and talent teams while MCH_7 and MCH_5 rank 9 and 10 respectively due to the lack of academic leaders. Therefore, in order to improve the competitiveness of MCH hospitals in the human resources dimension for greater competitive advantages in general, hospitals should develop scientific management methods, accelerate the reform of human resources to optimize the structure of professional title and educational background of the staff, and bolster the introduction and training of talents by focusing on the introduction of strong talent as academic leaders of disciplines and departments so as to promote the professional development of hospitals. However, it should be noted that the competitiveness of hospitals cannot be improved by blindly introducing talents. Hospitals should identify the positions in shortage, determine the number of staff needed, and consider the needs of development so as to prevent a lack of human resources. It is also important to establish a sound system of talent training to foster a healthy environment for nurturing, welcoming and employing talents. These measures can guarantee the medical quality and management levels of hospitals and promote the sustainable development of hospitals, giving MCH hospitals sustainable competitive advantages.

MCH_{10} comes first while MCH_1 ranks last in the brand resources dimension. According to collected data and relevant information, MCH_{10} has two characteristic subjects, ten key provincial subjects and five key municipal-level subjects, thus generally showing relatively strong competitiveness in the qualitative indicator "number of characteristic and key subjects". On the contrary, MCH_1 is short of characteristic and key subjects, thus ranking last. It is worth noting that although MCH_7 has 11 characteristic subjects, it is not dominant in the ranking because both characteristic and key subjects are taken into account in the final evaluation by

experts considering the debatable definition of the characteristic subjects. It is difficult to directly compare competitiveness via data in terms of "ability to treat difficult and critical diseases" because of the different statistical calibers of data and diverse characteristics of people seeking medical treatment caused by the geographic location of each MCH hospital. Therefore, if this indicator is used to measure the competitiveness in the brand resources dimension of MCH hospitals, it is important to adopt data that have a common statistical caliber and improve the information management of each hospital to obtain more reliable and comparable data by accurately profiling the features of people seeking medical treatment.

In the material resources dimension, MCH_{10} is in first place, while MCH_5 is in last. Given the collected data and relevant information, MCH_{10} far exceeds the other nine MCH hospitals in the qualitative indicator "business occupancy area". Except for the case that the competitiveness ranking of MCH_2 and MCH_6 is contrary to their ranking of the business occupancy area, the ranking of competitiveness is consistent with that of business occupancy area in the remaining hospitals. Considering that it is not easy to obtain the specific number of "featured equipment for women and children" and it is impossible to measure this indicator via the specific number of the equipment and the proportion of overall equipment, this indicator is measured by the qualitative method of self-evaluation by hospitals. In this way, MCH_{10} has the highest score while MCH_5 has the lowest, which is consistent with the evaluation of their competitiveness in the material resources dimension. In view of the final results, the business occupancy area can better reflect the competitiveness of MCH hospitals in the material resources dimension, but it does not mean that the area should be expanded without limit. Hospitals should conduct market research in the local region and the area should be expanded in line with the ability of MCH hospitals to receive patients for treatment, the quality of medical treatment and the number of patients. In addition, "featured equipment for women and children" is not an indicator for unchecked growth, and the facilities, both hardware and software, should be improved to help sustain the good competitiveness of MCH hospitals and adapt to the development of the market.

MCH_8 ranks first while MCH_7 ranks last in the cultural resources dimension. In the light of collected data and relevant information, the quantitative indicator "employees' satisfaction" in the ten hospitals is between 79.33 and 98.01, and the ranking of this indicator has little relationship with the overall competitiveness in the cultural resources dimension. In terms of the qualitative indicators, the total self-evaluation scores of the indicators in the ten hospitals are [28, 29, 29, 26, 26, 30, 24, 29, 29, 28] respectively. Except for MCH_7 ranking last in both the total self-evaluation scores and the competitiveness in the cultural resources dimension, the

ranking of total self-evaluation scores in the remaining hospitals has a relatively small correlation with that of their competitiveness in cultural resources. In order to enhance the competitive advantage of cultural resources in MCH hospitals, it is vital to improve employees' satisfaction and sense of happiness and strengthen their cohesion and cultural identity to promote employee loyalty. Meanwhile, hospitals can promote cultural peripheral products to enrich the cultural diversity of hospitals and increase employees' understanding of the future development and long-term planning of hospitals. Since MCH hospitals are medical institutions with special functions, the overall objectives are *"putting health care at the center, fostering the purpose of promoting reproductive health, and integrating health care, clinical treatment, and prevention, with an orientation to the public and the grassroots"*. In addition, the sample size in this research is small, and the ten MCH hospitals included in the empirical study vary in their overall scales. The cultural diversity of smaller hospitals may be less than that of larger hospitals. Given the above situations, the correlation between the competitiveness in the cultural resources dimension and the scores given on the basis of the evaluation model established in this research needs to be further investigated.

MCH_{10} is in the first place while MCH_5 ranks last in the organizational resources dimension. According to relevant collected information, the definition of organizational resources is ambiguous, as it is comprised of qualitative indicators for hospital self-evaluation. The total self-evaluation scores of the nine indicators subordinated to the organizational resources dimension from MCH_1 to MCH_{10} are [55, 58, 55, 52, 54, 56, 50, 58, 54, 64], respectively. MCH_{10} has the highest score and MCH_7 has the lowest score in self-evaluation, both of which are consistent with the ranking of their competitiveness in the organizational resources dimension. The scores given by the other MCH hospitals are generally correlated with the final ranking of their competitiveness in organizational resources. Overall, except for MCH_5 which has a self-evaluation score of less than 5 in the organizational resources dimension, all other hospitals have a score between 5 and 8. As for MCH_1 and MCH_3 which share the same evaluation score (55 points), in accordance with the evaluation results of experts based on the information collected, MCH_3 has higher scores than MCH_1 in terms of "ability of public health management for women and children", "subjects structure" and "network system for maternal and child health care" which have relatively high weights. Therefore, MCH_3 ranks ahead of MCH1 in terms of the final competitiveness in organizational resources. With regard to MCH_5 and MCH_9 which share the same evaluation score (54 points), MCH_9 has higher scores than MCH_5 in terms of the three above-mentioned indicators with relatively high weights. In this way, although organizational resources are difficult to evaluate directly, in order to boost

the competitiveness of MCH hospitals in the organizational resources dimension, hospitals should lay stress on improving the ability of public health management for women and children, facilitate the establishment of a network system for maternal and child health care, and continuously improve the quality of maternal and child health care. Meanwhile, hospitals should also optimize the structure of the subjects, and support or open up new subjects conforming to the specific situation of the market on the premise of reinforcing traditional advantageous subjects, thus enhancing the ability to respond to market change and finally improving the overall competitiveness of MCH hospitals. When encountering market changes in special circumstances and times, hospitals can sustain their stable development.

According to the above analysis results, and taking MCH_1 as an example, the evaluation of its competitiveness is at the bottom in "human resource", "material resource", "organizational resource" and "brand resource", which lead to the result that MCH_1 has the least competitiveness in all these 10 MCH institutions. In order to improve the situation and enhance its competitiveness, more attention should be paid to improving these four dimensions.

5.7 Synopsis

This chapter mainly presents the practical application results of the MCH competitiveness evaluation model, scores and ranks the competitiveness of then domestic MCH institutions and carries out sensitivity and robustness analysis of the model according to the scores.

According to the score and ranking of ten MCH hospitals, the competitiveness of ten hospitals was ranked and analyzed from six resource dimensions, and the competitiveness differences among them were obtained, also, priliminary suggestions on which specific competitiveness indicators should be strengthened to enhance the overall core competitiveness of hospitals have been given out.

[This page is deliberately left blank.]

Chapter 6: People Orientation – Improvement Path of Sustainable Competitive Advantage for MCH Institutions

The acquisition of competitive advantage is the core issue of this study. According to RBT, the key to interpreting the surplus profit obtained by an enterprise and maintaining competitive advantages is the internal accumulation of organizational capabilities, resources, and knowledge (Wernerfelt, 1984) . As shown in the models built in the previous research, the weight of "human resources" is higher than any other indicators in the model. In fact, "people" are crucial to creating organizational value, because the implementation of any organizational strategy depends on the support and participation of employees. Besides, the organization's unique culture will necessarily permeate into the process of obtaining and training human resources. Therefore, MCH institutions must acquire the key resource "people" to build and maintain sustainable competitive advantages.

6.1 Human resources management – the true source of hospitals' sustainable competitive advantage

6.1.1 Human resource management and organizational competitive advantage

RBT suggests that an organization's competitive advantage is derived from the valuable, scarce, and inimitable resources it possesses (Barney & Clark., 2007) , which indicates that instead of human resources (HR), human resources management (HRM) is the fundamental source of an organization's competitive advantage.

6.1.1.1 Value of HRM

The value of HRM is realized through managing human resources. Although HR plays an important role in the building and maintenance of an organization's competitive advantages, it does not mean that competitive advantage can necessarily be obtained as long as the HR are highly valuable. This is because the value of HR is implicit and requires effective HRM activities to be transformed into an organization's explicit competitive advantage. Therefore, even with similar HR allocations, organizations can have entirely different performances. To gain and maintain competitive advantage, organizations need to focus more on the entire

process chain of HR placement, development, and optimization.

6.1.1.2 Scarcity of HR

The scarcity of human resources, as shown by the fact that outstanding talents are always at the top of the pyramid in the market with insufficient overall numbers, leads to fierce competition among organizations to acquire these talents. But this problem is not insurmountable. In fact, in regard to the acquisition of top talents, organizational cultivation is also an important path, beyond introduction. In the process of nurturing the existing HR of an organization, the capability of HRM, namely, the ability of the organization to identify and develop emerging talent, is crucial. As the capability of HRM depends on elements such as the organization's strategy, management, and culture, which are the products of the organization's long-term development instead of market purchase, HRM is much more important and scarcer than HR itself in this sense.

6.1.1.3 Uniqueness of HRM

Brian and Barry (1996) believe that HRM can hardly be imitated. Firstly, the mechanisms in which HR produces value are unclear and can hardly be imitated by hiring executives. Secondly, HR systems are path-dependent and cannot be acquired through simple market purchases. In practice, HR development becomes intertwined with, rather than completely separated from, the strategy, structure, and culture unique to the organization. Since each organization has its own unique development strategy, organizational culture, and system structure, simply doing a rough imitation of HR will fail as an approach, as resources will not mesh well with the organization. Only by building an HRM system that is truly geared to the strategic goals of the organization's development, fits with the organization's culture, and integrates with the organization's own structure, can HR actually play its role and acquire a competitive advantage for the organization.

6.1.2 Strategic human resource management (SHRM)

6.1.2.1 Connotation of SHRM

SHRM is derived from the RBT. Devanna et al. (1981) were the first to introduce a strategic perspective on HRM and to divide HRM into three levels: strategic, managerial, and operational level. Wright and McMahan view SHRM as the planned and strategic HR deployment and management actions that an enterprise can take to achieve its goals (Wright & McMahan, 1992). Zhu sees SHRM as systematic management embedded in an enterprise organization, which

continuously transforms intellectual capital-based knowledge resources into core competence through an effective knowledge pipeline (Zhu, 2007). Peng considers HR as the source of core competence of an organization, and SHRM as the process of building organizational competitive advantage and supporting enterprises to achieve strategic goals through activities related to HRM with strategic significance based on the needs of organizational strategic development and individual career development (Peng, 2014).

6.1.2.2 Main characteristics of SHRM

As indicated by the connotation of SHRM, when compared with traditional HRM models, SHRM places more emphasis on the entire process chain of HR investment, development, placement, utilization, and administration, and on matching HRM with organizational strategy to ensure that the organization obtains a competitive advantage.

(1) People – core of SHRM

According to SHRM theory, people are the most important resource for organizations to gain competitive advantage and the most valuable human capital (Gong, 2009). One reason is that all activities of an organization cannot be carried out without the participation of people. Besides, the ultimate purpose of all activities of an organization is to meet the needs of people and realize the value of people. In this sense, "people" is no longer merely a factor of production for the organization, but a resource that can bring benefits and vitality to the organization, and a driving force of organizational development.

(2) Strategic significance– foundation of SHRM

Traditional HRM emphasizes the arrangement and deployment of specific people and materials, and centers on materials. SHRM, however, suggests that HRM should be viewed and implemented from a strategic perspective and should be fully integrated with an enterprise's strategy and strategic needs (Schuler, 1992). Therefore, the "strategic significance" of SHRM can also be understood as the "integration" with organizational strategy, meaning that the core function of HRM is to integrate into an organization's strategy formation and strategy implementation processes, and to be involved in and implement the organization's strategy. This indicates that not only should the HRM of the organization match the development strategy of the organization, but the elements within the HRM system should also fit in with the HRM strategy of the organization.

(3) Organizational performance – ultimate goal of SHRM

According to the definition of SHRM given by Wright and McMahan (1992), the focus of SHRM is on the acquisition of organizational performance and competitive advantage.

Currently, the theoretical discussion on the relationship between organizational performance and HRM mainly centers on best practice theory, contingency theory, structural morphology, and resource theory (J. Yang & Yang, 2020). Many scholars have verified through empirical studies that matching HRM with organizational strategy has a significant positive impact on organizational performance (Arthur, 1994; Bartlett & Ghoshal, 2002; Ding, 2009; Y. Li & Yuan, 2013; S. Liu et al., 2008; Sun, 2012).

6.1.2.3 Foundation of achieving hospital development strategy

HR are the most dynamic resources in hospital development, but even superior human resources cannot achieve the established development strategy of the hospital without effective HRM. Therefore, hospitals must attach great importance to the strategic significance of HRM, prioritize the selection, cultivation, retention, use, and management of talents, respect talents, and provide them with adequate development platforms so as to provide support to their initiatives and improve the overall development of the hospital.

6.1.2.4 Key to promoting hospital operational performance

As the most important factor in the development of a hospital, people are involved in the formulation of hospital strategies and the implementation of strategic deployment. Only by fully stimulating the potential of HR and enhancing the motivation of talents can the operational performance of the hospital be truly improved.

6.2 Competitive advantage acquisition path of MCH institutions based on HRM

6.2.1 Academic leaders – key resource to acquiring hospital competitive advantage

SHRM highlights the importance of HRM activities in organizational performance. In the evaluation model of sustainable competitive advantage for MCH institutions constructed previously, “regional influence of academic leaders” has the highest weight among HR indicators. The validation model of the 10 MCH institutions also that the competitiveness ranking of MCH institutions is positively correlated with the score for “regional influence of academic leaders”.

As for the development of specific disciplines, academic leaders have a dual identity. While academic leaders are the authorities in their field, making outstanding contributions in both the theoretical and technical dimensions of their fields, they are also the designers of the

construction of their discipline and the concrete executors of hospital strategy. This means that academic leaders are at the core of discipline construction and the key to discipline development. The modeling evaluation of the competency traits of academic leaders from the competency perspective is one of the current focuses in research. Wang et al. (2008), for example, used a combination of job analysis, behavioral event interview and expert group interview methods to construct a competency model of clinical medicine academic leaders. Detsky (2011) gave suggestions on how to become a qualified discipline leader from six dimensions: vision, management style, knowledge, interpersonal skills, organizational orientation, and personal development. Xu (2019) examined five dimensions: personal quality, academic achievement and influence, clinical skills and safety, research performance and foresight, and discipline construction and development, as well as established an academic leader competency evaluation system using the Delphi method and the analytic hierarchy process (AHP). G. Zhou et al. (2020) constructed a competency model for academic leaders of clinical medicine discipline in eastern China and concluded that it can be evaluated from comprehensive management ability, personality characteristics, macroscopic decision-making ability, and skills and character. The competency perspective focuses on the evaluation of the personal quality of academic leaders. However, from the perspective of hospital development strategy, in addition to the quality of the academic leaders themselves, it is also necessary to rationalize relevant mechanisms to stimulate the endogenous motivation of the resource of academic leaders with maximum effects.

6.2.1.1 Clarifying the academic attribute of academic leaders

In practice, an academic leader is usually the head of the department, an entity with both academic and administrative attributes, the thinking patterns within which can be somewhat conflicting. Firstly, the academic leader has to assume the responsibility of leading the discipline construction, guide the team to integrate relevant resources, reasonably plan and efficiently achieve the goal of discipline construction, and help the discipline maintain or obtain regional competitive advantage. From this standpoint, the academic leader must take the initiative to innovate the construction direction and work development path of the discipline and carry out work by relying on the strength of the team, so as to enhance professional authority. This requires the academic leader to plan the work of the discipline with active thinking. Secondly, as the head of the department, the academic leader is the specific executor of the hospital's development strategic goals, meaning his/her main responsibility is to firmly implement the superior's decisions and requirements. This role emphasizes the administrative

ability of the academic leader. In this sense, the academic leader constructs the discipline with the thinking pattern of passive implementation.

However, at present, in hiring academic leaders, hospitals do not fully recognize the conflicts in their dual roles. Instead, they see some types of positive correlation between the academic research ability and the department management ability of the academic leaders, thus blurring the boundary between academic research ability and department management ability in the selection of academic leaders. As a result, academic leaders also undertake a lot of administrative affairs voluntarily or involuntarily, which inevitably diverts their energy from discipline construction. Therefore, the premise of fully utilizing the resources of academic leaders is to free them from trivial chores and clarify their academic attributes, so that they can devote themselves to the planning of discipline construction with more time and energy.

6.2.1.2 Enhancing the academic leadership of academic leaders

(1) Leadership and academic leadership

An academic leader is the department leader of the hospital's discipline unit. Regardless of his/her professional capabilities, the role of the academic leader in promoting the research environment of the team and advancing the development of the hospital's discipline depends on his/her leadership capability. According to Sui (2017), leadership contains two aspects: first, the organizational leadership of decision-makers and leaders on the organization and its members, including the influence generated by leadership elements such as the organization's philosophy, decision making, structure, system, resources, and culture; second, individual leadership, which is the leadership generated by an individual leader. As indicated by the connotation of leadership, its core is influence, which is of great significance to the efficient use of organizational resources and the successful achievement of organizational goals.

Academic leadership, the studies of which are concentrated in universities, is a concept that derives from leadership. Many scholars have provided definitions for academic leadership. Wang (2015) believes that academic leadership is a kind of influence that leads and guides multiple subjects of the university to form a common academic vision through participation, interaction, and coupling, and drives the university to achieve this common academic vision. Lu (2016) believes that academic leadership includes two forces: first, the radiation, attraction and driving force from university academic organizations to their members in the process of operation, and second, the collective force with excellent individuals' guidance and mutual promotion of professional groups, which is generated by individual university teacher and group university teachers in the process of academic career fulfillment. Within the hospital, the

clinical research level of a department determines its voice in the discipline, for which reason carrying out clinical research becomes an important way to enhance the competitiveness of the discipline. As a pioneer of the discipline's research, the academic leader is the specific bearer of the discipline's academic leadership. Therefore, the author believes that academic leadership consists of the professional influence of the academic leader, that is, the ability of the academic leader to use his/her personal traits and legitimate authority to organize and use resources to exert influence on the discipline and on its members, thus promoting the achievement of the strategic goals of the discipline's development.

The academic leadership of academic leaders is manifested in both internal and external aspects. The external aspect refers to the ability of the academic leader to obtain external resources in compliance with the law, while the internal aspect mainly refers to the ability of resource coordination. Specifically, the academic leader should not only be highly professional, which is the foundation for the academic leader to exert professional influence and the basis to establish professional authority, but also mobilize other people and stakeholders in the discipline to participate in the research and realize the potential of a team to promote professional development, given that it is unsustainable for academic influence to depend solely on the academic leader.

(2) Improvement path of academic leadership

Identifying discipline development strategy and positioning. As the "torchbearer" of discipline development, the academic leader should not only fully understand the strategic goals of the hospital development to ensure that the discipline development strategy matches with the overall development strategy of the hospital, but also recognize the status quo and future development direction of the discipline, as well as seek out the focus and breakthrough of the discipline's development, so as to obtain or guarantee the discipline's competitive advantage.

Focusing on promoting comprehensive quality. In practice, the academic leader has both an academic and an administrative identity. As the leader of discipline development, the academic leader must put scientific research in the first place, expand his/her academic vision, and ensure that he/she is always at the forefront of academic research – a necessary quality and a fundamental way to enhance academic discourse power and leadership. As the administrative manager of the department, the academic leader must play a role in acting as a driver. In addition, he/she must enhance team management ability, clarify the division of labor, boost team communication, and establish mutual trust within the team to strengthen team cohesion and cultivate a strong research team.

Attaching importance to value leadership and astral shaping. In the short term, team

members' recognition of the discipline leader stems from his/her academic expertise. However, in the long term, value leadership and spiritual shaping of the discipline leader are at the root of the team's recognition. The academic leader must strengthen his/her personal morality, improve his/her personal charisma, and explore the intrinsic value of the discipline with the starting point of meeting the health needs of the public.

Strengthening their ability to manage academic affairs. As the leader of the discipline's development, the academic leader is most familiar with the status quo and trends of the discipline. He/she should be fully authorized and encouraged to join relevant academic committees, and be supported in his/her participation in the management of academic affairs, to stimulate his/her initiative and creativity.

6.2.1.3 Improving cultivation, incentive, and evaluation mechanisms for academic leaders

(1) Improving cultivation system

MCH institutions have a health care culture that is different from that of general hospitals. As most academic leaders have been immersed in the culture of clinical medicine for many years, they do not have a deep understanding of the various dimensions of health care work. As such, they might fail to acclimatize themselves to the organizational culture or exhibit their professional strengths. Therefore, it is more economical and convenient to select and continuously cultivate leaders from within MCH institutions than to bring in leaders from the outside.

Cultivating academic leaders based on specialty disciplines. MCH institutions mainly serve women and children, and their traditional competent disciplines are gynecology, obstetrics, and pediatrics. Related to these disciplines, secondary disciplines with both health care and clinical characteristics are the specialty disciplines of MCH institutions derived from the whole life cycle services and characteristics of health care. MCH institutions can maximize their platform advantages and the role of discipline resources in talent training, and cultivate academic leaders based on their specialized disciplines in a targeted manner.

Cultivating academic leaders based on major projects. Compared with general hospitals, MCH institutions are relatively weak in terms of research and laboratory facilities. However, they have a public health function, as one of their responsibilities is to guide and participate in relevant government-led MCH public health projects – a function not covered by general hospitals. Given that such projects are one of the government's areas of focus, and one of the public's concerns, MCH institutions can rely on these major projects and encourage youth to

apply to join them and expand and improve their research skills.

Cultivating academic leaders through providing learning and academic exchange opportunities. There is a saying in China: “to use stones from another mountain to polish one’s jade”. By exploring diversified exchange and cultivation mechanisms, MCH institutions can create rich learning and academic exchange opportunities for talents, and promote their development through the following channels: send talents out to expand their horizons through academic exchanges, visits for further learning and management training, organize high-level consultations within the hospital or invite authoritative experts to lecture at the hospital, and establish academic workstations to allow talents to enjoy the dividends brought about by academic exchanges without needing to leave the institution.

(2) Improving competition mechanism

An important means of cultivating academic leaders is to create an atmosphere of healthy competition within the hospital so that talents can learn from each other and complement each other in the competition (Sheng, 2014).

Recruiting talents through competition. Guided by the need of discipline construction, MCH institutions can set up posts according to their needs, recruit talents through competition, and develop a flexible hiring mechanism, to fully mobilize the enthusiasm and creativity of their staff.

Trial implementation of the post-target-responsibility system. The post-target-responsibility system refers to the practice of specifying post responsibilities and power according to the nature and characteristics of specific posts, and establishing a set of corresponding assessment, reward, and punishment standards. MCH institutions can clearly define post responsibilities and targets, specify duties through quantifiable indexes, carry out index-oriented and fair assessments and evaluation of the work, and rapidly adjust the posts of those who lack competence, so that the truly excellent talents can stand out, and a selective and orderly mechanism for the talent development can be established.

(3) Improving incentive mechanism

Combining astral and material incentives. According to Maslow’s hierarchy of needs, the physiological needs are the foundation while the self-actualization needs are the ultimate goal. This means that people need to pursue not only material things such as water, food, and sleep to meet their basic physiological needs, but also spiritual things to realize their personal ideal ambitions. In practice, MCH institutions should focus on the guidance role of material incentives, optimizing the performance distribution by piloting incentives for talents with high education and talents in key positions, and exploring the annual salary system to meet the

material needs of backbone talents and guide them to combine their personal goals with organizational performance and contribution.

Granting some freedom of action. Some freedom of action promotes initiative and demonstrates the hospital's trust and support. This enables young talent to feel recognized in their work's importance, improving their efficiency.

Focusing on fairness and impartiality. The formulation of incentive programs must adhere to the principles of fairness and objectivity, and prevent egalitarianism and partiality, so that a fair and just incentives atmosphere can be created.

(4) Improving evaluation mechanism

Establishing a scientific competency assessment model. A scientific competency evaluation model can be used as an important basis for the selection and training of academic leaders. By quantifying the qualities that academic leaders should possess, the model can accurately identify the core competency an academic leader should possess and provide an objective perspective and the direction of efforts for academic leaders who are also responsible for hospital management.

Matching talents with the posts. The use of talents should emphasize appropriateness. Only by placing the right person in the right position to maximize their strengths and avoid shortcomings can we realize the full potential of human resources. MCH institutions should determine the appropriate candidates as per work demands, and reduce the error of job placement, to fully mobilize the enthusiasm, initiative, and creativity of talents.

6.2.2 Scientific research capability: an important support for hospitals' sustainable competitive advantage

As China's medical reform progresses, competition among hospitals is becoming increasingly intense. This competition, which on the surface appears to be a competition in medical services, actually resides at the level of research and innovation of hospitals. MCH institutions are crucial to the provision of professional clinical and health care services for women and children, and the scientific research capability and level of MCH institutions and their professionals are the core driving force that supports and promotes the quality and level of MCH work in China. At a time when health needs are constantly diversifying, MCH institutions must continuously improve their scientific research capabilities and levels so as to effectively perform their function of providing clinical health care services for women and children throughout their life cycle.

6.2.2.1 Analysis of factors restricting the improvement of scientific research capabilities of MCH institutions

(1) Long-term insufficient attention to scientific research funding

As early as in 2008, China's National Center for Women and Children's Health carried out a survey on the current status of scientific research projects and output of MCH institutions at all levels in China. It found that the total amount of scientific research funds in MCH institutions at all levels in China did not exceed 1% of the total business revenue, indicating that MCH institutions at all levels were insufficient in research funding (Q. Yang. et al., 2011) . Unfortunately, this situation has not improved over time. More than ten years later, among the ten MCH institutions surveyed in this thesis, the one with the highest score on the indicator of "percentage of funding for science and education" only had a rate of 2.01%, indicating that, for a long time, MCH institutions have not focused enough on investing in science and education.

(2) Long-term unbalanced distribution of high-quality professionals

According to a survey conducted by Q. Yang et al. (2011), the distribution of high-quality professionals in China's MCH institutions is uneven, which is reflected in the fact that the higher the level of the institutions is, the higher the proportion of well-educated personnel is. In 2008, the proportion of health technicians with a bachelor's degree or above in China's provincial-level institutions was 48.3%, of which 12.2% were health technicians with a master's degree or above. Health technicians with a bachelor's degree or above in prefecture-level institutions accounted for 38.1%, and county-level institutions were dominated by people graduating from higher vocational colleges, accounting for 82.6%. In 2017, an analysis report on the resources and operation of MCH institutions in Hunan Province also showed that, among the 137 institutions, the proportion of health technicians with a bachelor's degree or above in provincial institutions accounted for 82.6%, of which technicians with a master's degree or above accounted for 30.5%. However, health technicians with a bachelor's degree or above in prefecture institutions accounted 70.8%, and county-level institutions mainly had staff graduating from higher vocational colleges, accounting for 65.5%. Highly educated personnel are the main force in scientific research, and the long-term uneven distribution of high-quality professionals restricts MCH institutions from carrying out high-level scientific research.

6.2.2.2 Ways to improve scientific research capabilities of MCH institutions

There is a consensus among hospitals that scientific research capability is an important means of improving their competitiveness. The Massachusetts General Hospital, the Johns Hopkins Hospital, and the Mayo Clinic, which are typical research-oriented hospitals, have been

adhering to bridging the gap between basic and clinical research and clinical practice to continuously improve the philosophy of diagnosing and treating diseases (Sun et al., 2015) . In China, the Ruijin Hospital, which is affiliated with the Shanghai Jiao Tong University School of Medicine, first proposed the concept of "research-oriented hospital". In 2011, the construction of research-oriented hospitals was jointly identified by multiple departments in China as a major national strategy to guide the future development of hospitals (D. Zhang et al., 2019) . Being at the foundation of China's MCH work, MCH institutions need to attach importance to scientific research (Ling et al., 2018).

(1) Basing scientific research work on the public's health needs

Meeting the public's health needs is the ultimate goal of scientific research. Before starting this research, the hospital's research planning department and related researchers should first understand the national and local policies on scientific research projects and the health needs of the public, so as to carry out their work according to specific aims and demands. If conditions permit, institutions should strive to obtain higher-level scientific research projects, improve the quality and technical level of these projects, and use them to drive the overall improvement of hospitals' scientific research level.

(2) Establishing a scientific research capability evaluation system

Objective, comprehensive, and scientific research capability indicators play an important role in promoting the development of scientific research in hospitals and improving the quality of clinical research methods. Their importance is mainly manifested in the following aspects. Firstly, the evaluation results can visually tell the strength of the hospital's scientific research level; secondly, the indicators can clarify the advantages and main problems in the process of the hospital's research work, help the hospital to objectively recognize the current situation, and in a timely manner identify problems and improve them; thirdly, the research personnel as the main body of research can use the evaluation system as a guide to clarify work objectives, improve working methods, increase work enthusiasm, and thus promote the overall improvement of the research level of the hospital. Regarding the evaluation system, Wei et al. (2014) constructed the evaluation indicators for the scientific capabilities of hospitals in Sichuan Province from the three levels of scientific and technological input, scientific research management and activities, and scientific and technological output. Fan et al. (2015) constructed a scientific research capability evaluation indicator system for hospitals affiliated with medical schools from three dimensions: structure, process, and results. MCH institutions can combine their own actual conditions to construct a set of scientific, objective, and comprehensive evaluation indicators for scientific research capabilities, so as to clarify the

guiding goals for the improvement of scientific research work.

(3) Cultivating high-level scientific research personnel

As the main protagonists of research work, scientific researchers play a decisive role in the scientific research work. In addition to the academic influence of discipline leaders discussed above, the research ability of scientific researchers as well as the stability and rationality of the research team structure also directly determine the overall level of scientific research in the hospital. Many scholars have conducted research on the competency of scientific research personnel. For example, Liao et al. (2013) constructed a research ability evaluation system for MCH personnel by taking the Sichuan Provincial Maternal and Child Health Care Hospital as the model, covering four first-level indicators of technological innovation, knowledge innovation, academic exchanges and scientific and educational tasks. Wang et al. (2019) constructed clinical doctors' scientific research ability evaluation indicators from four aspects: basic scientific research ability, academic influence, degree of engagement in scientific research, and scientific research team building. In view of the general shortage of highly educated personnel in MCH institutions, it is recommended to focus on the introduction and training of highly educated personnel so as to cultivate a stable team of scientific research personnel.

(4) Encouraging interdisciplinary and multi-institutional collaborative research

Research innovation is not the same as working behind closed doors. The work of maternal and child health care is based on the concept of whole life cycle services, covering both clinical and health care. With the ever-increasing merging of health care and cliniccal treatment, interdisciplinarity has increased. In the development of scientific research projects, it is necessary to adapt to the situation, promote interdisciplinary fusion, strengthen cooperation with research institutes, public health institutions and general hospitals in scientific research projects, share the wisdom of experts, keep up-to-date with cutting-edge scientific research development and improve the overall scientific research strength of the hospital.

(5) Ensuring the funding of scientific research

Introducing professional talents to enhance scientific research strength, forging a stable team of high-level scientific research personnel, and stimulating the scientific research vitality of hospitals are all inseparable from the requirement of funding. A survey by R. Li et al. (2019) found that the number of scientific research projects and papers is positively correlated with hospitals' funding of scientific research. Scientific research funding is a highly sensitive indicator, and there is a widespread problem of insufficient scientific research funding. Therefore, MCH institutions should supplement research funding as well as provide special funding support for talent team construction and the selection, introduction, training, and

motivation of high-level health professionals, so as to make up for the limitations caused by insufficient funding and promote the overall optimization and quality improvement of the human resources in MCH institutions.

(6) Carrying out scientific research performance analysis

Scientific research emphasizes efficiency, aiming to obtain the most outputs with the least inputs. The performance analysis on the input and output of research funding can guide the rational allocation of limited human, financial, and material resources to obtain the most benefits from research outputs. Such an analysis can also evaluate scientific research investment, fund management, and scientific research output, discover deficiencies in scientific research work, and provide a reference for hospital managers to optimize incentives and formulate and adjust scientific research goals at different stages. The scale of scientific research projects, the structure of funding sources, the influence of papers, and the cultivation of talents can be used as key indicators for scientific research performance evaluation. Hospitals can establish a complete scientific research performance evaluation system to evaluate benefits of scientific research investment scientifically and objectively and improve the benefits of scientific research investment.

(7) Focusing on the transformation of scientific research results

High-level scientific research results should be transformed into high-quality practical applications. For this, it is important to identify the public's needs. Researcher and users should agree on the goals of research. For MCH institutions, the best path to transform scientific research results into clinical use is to start scientific research in areas close to the health needs of women and children. Besides, the transformation mechanism of scientific research achievements should be improved. Hospital science and education management departments play a vital role in this aspect with the following tasks. Firstly, they need to take the initiative to provide services, coordinate with other departments, and build a multi-channel scientific achievements transformation platform. Secondly, they should improve performance incentive measures, incorporate the application of scientific research results into evaluation indicators, and guide and support the transformation of scientific research results into clinical practice. Thirdly, they can also help establish awareness of intellectual property protection, increase the protection of intellectual property rights, and protect the legitimate rights and interests of scientific researchers.

6.2.3 Flexible culture: an important link connecting the key points of competitive advantages

Management is based on culture. As a social function, management must not only assume social responsibility, but also be rooted in culture (Peter, 2012). People are the core factor of management and the key resource that constitutes the competitive advantage of an organization. It is essential to establish a hospital culture with employees as the main body, let hospital employees feel that they are protagonists in a number of activities, and encourage them to work consciously in pursuit of self-realization, so as to gather a strong momentum for the development of the hospital.

6.2.3.1 People as the core of flexible culture construction

While a rigid culture emphasizes restrictions and the management of employees through rules and regulations, a flexible culture incorporates employees' values into the hospital's value system and emphasizes self-management through shared beliefs and values. The reason for which a flexible culture is an important link connecting the key points of competitive advantages is that it focuses on people and stresses the creation of a unified value culture to influence people's psychology and thus achieve the desired purpose of management.

People are the core of hospital management activities. People are the carrier of cultural construction and the main body of human resource management. The hospital brand must be promoted by people and organizational management activities are also carried out with people as the core. Therefore, the importance of people in hospital management is self-evident. From the perspective of stimulating people's creativity, flexible culture pays great attention to the importance of people, and closely combines the development of hospitals with personal growth, improves employees' skills, stimulates organizational vitality, and enhances hospital competitiveness through the construction of common values, behavior modes, and action consciousness.

6.2.3.2 Ways to promote a flexible hospital culture

(1) Building a hospital vision system to create a development community

The essence of team cohesion is the high degree of unity reached between the staff's personal vision and the hospital's development vision. If the staff's personal vision and the hospital's development vision are seen as two independent structures, a cohesion can only be formed when these two are nested and fused in an orderly manner to form a whole. In other words, when the staff's development vision is consistent with the hospital's development

vision, the staff will believe that their vision can be realized through the development of the hospital, and thus they will have the desire to develop together with the hospital. Meanwhile, the actualization of hospital's development goals will become easier because of the cohesion of staff's personal vision. The hospital vision system from top to bottom contains four levels: hospital development vision, hospital development planning, department development planning, and staff personal development planning. Hospital managers should understand the hospital's vision and consult the department and staff on the formulation of the hospital's development plan. In addition, managers need to provide each employee with the opportunity to design their own careers, as well as strive to integrate their personal development plans and the overall development goals of the hospital as a whole, so as to create a development community and form a momentum for hospital development.

(2) Cultivating learning organizations

A flexible culture emphasizes and encourages learning. With regard to learning, Peter introduced the concept of learning organization, defining it as a constantly innovative and progressive organization in which everyone is able to push the limits of their abilities, create their truly desired results, cultivate new, forward-looking and open-minded ways of thinking, and fully realize their common ambitions (Peter, 1997). By continuously learning and absorbing new knowledge and information, a learning organization is able to keep track of environmental dynamics and disciplinary frontiers in real time, thereby increasing its ability to adapt to the environment. As knowledge-intensive organizations, hospitals' need for knowledge is more urgent especially when taking into account the development of disciplines and the improvement of scientific research capabilities. In practice, many scholars have explored the construction of learning hospitals based on the "five disciplines" learning organization model proposed by Peter (1997), and verified the positive role of learning organizations in enhancing the competitiveness of hospitals (Ding et al., 2006; W. Liu et al., 2010; Yi et al., 2008; Zhu et al., 2013;). MCH institutions should pay attention to shaping a learning-centered hospital culture, making efforts in improving system thinking abilities, continuing education, team learning and system building, supporting the sharing of learnings across departments, guiding staff to learn from advanced practices, encouraging them to think innovatively, cultivating their long-term strategic vision, and truly transforming the hospital's learning power and innovation into competitiveness.

6.3 Synopsis

Human resources are the core resources that constitute an organization's competitive

advantage. Combining the research results of Chapter 4 and Chapter 5, human resources are selected as a starting point to discuss the ways to enhance the competitive advantages of MCH institutions from the three aspects of discipline leaders, scientific research capabilities, and flexible culture. It is believed that, for MCH institutions, discipline leaders are key resources. Excellent discipline leaders can effectively plan and lead discipline development direction, identify successful experience, and apply it to broader areas. And as an important support for hospitals' sustainable competitive advantages, strong scientific research ability with efficient transformation level will inevitably promote the improvement of the work quality of MCH institutions. Both scientific research breakthroughs and discipline leader cultivation are inseparable from people's subjective motivation, in which flexible culture becomes a key link connecting these resources.

[This page is deliberately left blank.]

Chapter 7: Conclusion and Prospect

The ultimate goal of this thesis is to identify the internal resources and capabilities that can form the competitive advantages of MCH institutions, make full use of and mobilize these resources, and transform them into competitiveness. As public health institutions, MCH institutions must reflect their own characteristics in the selection of specific evaluation indicators, which differ from those of general hospitals and specialized hospitals.

7.1 Main results

On the basis of an extensive literature review, this research follows the principles of objectivity, comprehensiveness, feasibility, dynamism, comparability, scientificity, and maintaining characteristics of MCH institutions. It integrates qualitative and quantitative research methods by using scientific methods such as the Delphi Method and the Analytic Hierarchy Process. In this way, the research makes non-quantifiable indexes concrete and clear, avoids subjective judgments, and establishes the evaluation system of sustainable competitive advantages of MCH institutions with a clear structure and reasonable weights. Ten MCH institutions in China were selected to verify the model. According to the sensitivity analysis results of the Super-decision software, the model was found to have good stability.

The evaluation model divides the internal resources and capabilities that constitute the competitive advantage of MCH institutions into six secondary indicators (human resources, material resources, organizational resources, cultural resources, financial resources, and brand resources) and 33 tertiary indicators, which can comprehensively reflect internal resources and capabilities of MCH institutions in acquiring and maintaining competitive advantages. It assists MCH institutions to make a comprehensive and objective understanding of their strengths and weaknesses in obtaining and maintaining competitive advantages from different dimensions, and provides a strong basis for making strategic decisions for hospitals to promote their steady development and continuous improvement of competitiveness.

From the evaluation model, it can be seen that human resources have the greatest weight. In practice, it is also found that people are the most controllable core resource, and the one with most potential. Therefore, by focusing on people as the core, we have discussed the ways for MCH institutions to acquire and maintain competitive advantages from the three dimensions of

discipline leader cultivation, scientific research ability improvement, and construction of a flexible hospital culture. It is believed that the competition of hospitals is ultimately the competition of discipline connotation. The cultivation of discipline leaders is the most direct way to enhance the internal construction and social influence of hospital disciplines. It is also the key to gaining competitive advantages. The cultivation of discipline leaders serves hospitals' scientific research capability – an important support for their sustainable competitive advantage. Clarifying scientific research needs, building a research team, securing research funds, scientifically evaluating research capabilities, and focusing on the transformation of research results are all important means to improve the research capabilities of hospitals.

MCH institutions have a different health care culture from general hospitals. The question of whether professionals can recognize and consciously involve themselves in the hospital culture and maximize their enthusiasm to promote hospital development, requires the hospital culture itself to play a part.

7.2 Research innovation

7.2.1 Innovative research perspective

Under the increasingly complex social environment, especially affected by the COVID-19 pandemic, the question of how hospitals survive and develop has become a major issue for hospital managers. Many scholars have started to analyze and evaluate hospital competitiveness, trying to find theoretical support and feasible paths for the improvement of hospital competitiveness, and there have been some useful explorations and attempts. There are differences between MCH institutions and general hospitals in terms of service targets and institutional functions, and research results that are based mainly on general hospitals are be fully applicable to MCH institutions. In China, with ongoing changes to fertility and its conceptions, the public's understanding of health has improved, and health needs have gained greater importance through the implementation of the "Healthy China" strategy. Against this backdrop, the development of MCH institutions is faced with both opportunities and challenges. Research using related theoretical results of strategic management can provide some directions for thinking about the development of MCH institutions, but there is no systematic discussion on this aspect in China. This research fills the gap in the field of management of MCH institutions by systematically applying strategic management theories to the evaluation of MCH institutions' competitiveness and the construction of competitive advantages.

7.2.2 Scientific research methods

In the selection of approaches to construct evaluation indicator system, the combination of the Delphi Method and the Analytic Hierarchy Process is widely used. The former can gather expert opinions broadly to ensure the comprehensiveness of the indicator selection, while the latter is systematic and concise and can minimize the influence of subjective factors of experts. The combination of the two methods is equal to the combination of qualitative and quantitative research. This research adopts the two research methods, strictly selects experts, and uses professional software (Super-decision) to conduct a scientific statistical analysis of the opinions of experts to ensure the scientific and objective selection of indicators.

7.2.3 Operational research results

The evaluation indicators of competitive advantage of MCH institutions constructed in this research reflect the internal resources and capabilities of which competitive advantages are composed in a more comprehensive way. The selection of indicators closely conforms to the actual management of MCH institutions to be comprehensive, easy to understand, and feasible, thus ensuring the operability of the model. The model provides a comprehensive overview of the internal resources and capabilities that constitute the competitive advantages of MCH institutions. The comparison indicator system can objectively evaluate the status quo of hospital competitiveness, find breakthrough points for subsequent improvement, and provide hospital managers and decision makers with a reference for decision-making.

7.3 Research limitations and prospects

7.3.1 Research limitations

1. Limited theoretical and practical references. The literature related to and research results of strategic management are mostly concentrated in the field of enterprises. The theory of strategic management has not been introduced in the field of health care for a long time, so there is still a lack of systematic and mature theoretical and practical research that fully integrates the characteristics of the health care field. Therefore, the literature support available in theory and practice is limited. In the research process, although the theoretical and practical results of enterprise strategic management can be used for reference, creatively transformed, and applied to the research of MCH institutions to construct operational implementation models and obtain

certain research results, it must also be recognized that there are still certain differences between enterprise management and hospital management. Therefore, the theoretical system and operational model of strategic management research in MCH institutions still needs further breakthroughs and improvements in accordance with the actual situation of hospitals.

2. Limitations in the selection of consulting experts. In the process of constructing the evaluation model, in order to ensure the accuracy of the model, the inclusion criteria of experts are strictly screened, and three rounds of questionnaire surveys are designed to avoid the error of results caused by the subjective judgment of experts as much as possible. In general, considering the operability of the indicator system, the selected experts are mainly management experts who come from the front line of actual medical and health care work and have many years of practical hospital management experience. However, since most of the experts in hospital management in China are clinical professionals, their theoretical knowledge of systematic and professional management varies. In academia, there are few experts who specialize in health management research and have an in-depth understanding of the management of MCH institutions, which leads to certain limitations in the selection of consulting experts in this research.

7.3.2 Research prospects

This thesis focuses on the analysis and discussion of the internal resources and capabilities that constitute the competitive advantages of MCH institutions. However, development must result from the interaction of internal and external factors. While the resources and capabilities possessed by an organization are necessary for its survival, the organization itself is often unable to create relevant resources. Therefore, resources and capabilities also depend on the interaction of other factors contained in the external environment to use advantages. The analysis of external environmental factors facing the development of MCH institutions has not been sufficiently discussed in this thesis. Moreover, this thesis only discusses the key factors behind the construction of the competitive advantage of MCH institutions from the perspective of human resources. However, in addition to human resources, the understanding and application of MCH guidelines, the shaping and enhancement of hospital brand influence, and the ability to manage maternal and child public health are also important to the construction of competitive advantages of MCH institutions. These should be further strengthened and deepened in future research.

Bibliography

Allee, V. (1997). The knowledge evolution: expanding organizational intelligence. *Boston Butterworth Heinemann, 51*(11), 71-74.

Ansoff, H. (1965). *Corporate strategy: an analytic approach to business policy for growth and expansion*. McGraw-Hill Companies.

Arthur, J. B. (1994). Effects of human resource systems on manufacturing performance and turnover. *The Academy of Management Journal*, *37*(3), 670-687.

Baden-Fuller, C., & Teece, D. J. (2020). Market sensing, dynamic capability, and competitive dynamics. *Industrial Marketing Management*, *89*, 105-106.

Barney, J. (1986). Types of competition and the theory of strategy: toward an integrative framework. *The Academy of Management Review*, *11*(4), 791-800.

Barney, J. (1986). Organizational culture: can it be a source of sustained competitive advantage? *The Academy of Management Review*, *11*(3), 656-665.

Barney, J. (1991). Firm resource and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Barney, J., & Clark., D. (2007). *Resource-based theory: creating and sustaining competitive advantage*. Oxford University Press.

Barney, J., & Clark, D. (2011). *Resource-based theory: creating and sustaining competive advantage*. Shanghai People's Publishing House.

Bartlett, C., & Ghoshal, S. (2002). Building competitive advantage through people. *MIT Sloan Management Review, 43*(2), 33-41.

Barton, D. (1992). Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Journal*, *13*, 111-125.

Bell, S., & Morse, S. (2013). Groups and facilitators within problem structuring processes. *Journal of the Operational Research Society*, *64*(7), 959-972.

Brian, B., & Barry, G. (1996). The impact of human resource mnanagement on organizational performance: progress and prospects. *The Academy of Management Journal*, *39*(4), 779-801.

Cai, S. (2002). 企业核心竞争力的本质探析 [A probe into enterprises' core competence]. *Contemporary Finance and Economics*, (10), 58-60.

Chamberlin, E. (1939). The theory of monopolistic competition: a re-orientation of the theory of value. *Journal of Economic Studies*, *13*(5), 27–44.

Chen, J., Wang, Y., & Xu, Q. (1999). 国外核心能力研究述评 [Review on foreign core competence research]. *Science Research Management*, *20*(5), 13-20.

Chen, J., & Fang, X. (2019). *社会调查方法* [*Methods of social investigation*]. University of Science and Technology of China Press.

Coombs, R. (1996). Core competencies and the strategic management of R&D. *R&D Management*, *26*(4), 345-355.

Danneels, E. (2008). Organizational antecedents of second-order competences. *Strategic Management Journal*, *29*(5), 519-543.

D'Aveni, R. (1999). Strategic supremacy through disruption and dominance. *MIT Sloan Management Review*, *3*(40), 127-135.

Department For Women and Children. (1998). A review of maternal and child health surveys in the United States. *Maternal and Child Health Care in China*, *13*(1), 57-60.

Detsky, A. (2011). How to be a good academic leader. *Journal of General Internal Medicine*,

26 (1), 88-90.
Devanna, M. A., Fombrun, C., & Tichy, N. (1981). Human resources management: a strategic perspective. *Organizational Dynamics*, *9*(3), 51-67.
Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science*, *46*(87), 1-10.
Ding, G., Pei, Z., & Zhang, H. (2006). 构建学习型组织 促进医院可持续发展 [Constructing learning organization to promote sustainable development of hospital]. *Modern Hospital Management*, (03), 48-50.
Ding, Y. (2009). *Organizational performance based on flexible management of human resources in empirical research* [Master's thesis]. Hunan University of Science and Technology.
Dong, B., Ge, B., & Wang, K. (2011). Resource integration processes, dynamic capabilities and competitive advantages: mechanisms and paths. *Management World*, (03), 92-101.
Doving, E., & Gooderham, P. (2008). Dynamic capabilities as antecedents of the scope of related diversification: the case of small firm accountancy practices. *Strategic Management Journal*, *29*(8), 841-857.
Drnevich, P., & Kriauciunas, A. (2011). Clarifying the conditions and limits of the contributions of ordinary and dynamic capabilities to relative firm performance. *Strategic Management Journal*, *32*(2), 254-279.
Durand, T. (Ed.). (1997). *Strategizing for innovation: competence analysis in assessing strategic change*. John Wiley.
Eden, C., & Ackermann, F. (2004). Cognitive mapping expert views for policy analysis in the public sector. *European Journal of Operational Research*, *152*(3), 615-630.
Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: what are they? *Strategic Management Journal*, *21*(11), 1105-1121.
Fan, H., Li, J., Dai, Z., Zhou, Q., & Huang, W. (2015). 医学院校附属医院科研能力评估指标体系构建 [Establishment of research ability index system for assessing the affiliated hospitals of medical university]. *Chinese Hospital Management*, *35*(11), 53-55.
Forman, E., & Gass, S. (2001). The analytic hierarchy process: an exposition. *Operration Research*, *49*(4), 469-486.
Gallon, M., Stillman, H., & Coates, D. (1995). Putting core competency thinking into practice. *Research - Technology Management*, *38*(3), 20-28.
Geng, S., Li, J., & Guo, W. (2004). Cluster sustainable competitive advantage acquisition: theory and method of dynamic capability. *Research and Development Management*, *16*(3), 75-79.
Gong, Y. (2009). 战略人力资源管理:理论视角的探析 [Strategic human resource management: Analysis from theoretical perspective]. *Economic Research Guide*, (19), 106-109.
Grant, R. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*(S2), 109-122.
Gu, L. (2018). 澳大利亚妇幼保健现状分析 [An analysis of the current situation of maternal and child health care in Australia]. *Journal of Qiqihar Medical University*, 39(5), 576-577.
Guo, R. (1922). *Health advice for women*. The Commercial Press.
He, D. (2018). *管理运筹学方法* [*Operations research in management*]. Wuhan University Press.
He, Z. (2014). *Research on the influencing factors and evaluation index framework of children's health service capacity in county and district maternal and child health institutions in China* [Master's Thesis]. Chinese Center for Disease Control and Prevention.
Helfat, C., & Peteraf, M. (2003). The dynamic resource-based view: capability lifecycles.

Strategic Management Journal, *24*(10), 997-1010.
Henderson, R., & Cockburn, I. (1994b). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, *15*(S1), 63-84.
Hofer, C., & Schendel, D. (1978). *Strategy formulation: analytical concepts*. West Publishing.
Hoffman, N. (2000). An Examination of the"Sustainable Competitive Advantage" Concept: past, present, and future. *Academy of Marketing Science Review*, *2000*(4), 1-16.
Hua, H., Qi, G., & Li, Y. (2003). 科研选题的步骤和原则 [Procedures and principles for selecting topics for scientific research]. *Journal of Zhengzhou Institute of Aeronautical Industry Management (Social Science Edition)*, (04), 59-60.
Huang, C. (2017). *Research on women's health policy of Nanjing national government (1927-1937)* [Master's Thesis]. Hunan Normal University
Huang, Y. (2003). Significance and basic principles of scientific research topic selection. *Journal of Anhui Education Institute*, (03), 127-128.
Ji, H., & Duan, M. (2000). 美国妇幼卫生工作现状与启示 [The status quo and enlightenment of maternal and child health work in the United States]. *Maternal and Child Health Care in China*, 15(6), 389-391.
Jiang, L., Xie, W., & Lan, H. (2005). 企业竞争优势理论综述 [The theoretical review of competitive advantage in enterprise]. *Soft Science*, *19*(4), 14-18.
Jiang, W., & Xie, D. (2015). 湖南省市级妇幼保健机构绩效综合评价研究 [A study on comprehensive performance evaluation of municipal maternal and child health institutions in Hunan Province]. *Maternal and Child Health Care in China*, *30*(33), 5731-5734.
Jiang, X. (2002). *持续竞争优势* [*Advantages of sustainable competition*]. Fudan University Press.
Kesler, M., Kolstad, D., & Clarke, W. (1993). Third generation R&D: the key to leveraging core competencies. *The Columbia Journal of World Business*, *28*(3), 33-44.
Klein, J., Gee, D., & Jones, H. (1998). Analysing clusters of skills in R&D: core competencies, metaphors, visualization, and the role of IT. *R and D Management*, *28*(1), 37-42.
Kumar, P., Ramanan, T. R., & Keelath, M. S. (2020). The mediating role of quality management capability on the dynamic capability - new product development performance relationship: An empirical study among new product development units in the electronics sector. *The Quality Management Journal*, *27*(2), 80-94.
Lesser, J., & Fang, Y. (1987). Origin and development of maternal and child health in the United States (continued). *Foreign Medicine (Social Medicine)*, (02), 97-101.
Li, G., & Hu, S. (2005). 试论医院核心竞争力研究框架 [On the research framework of hospital core competence]. *Chinese Hospital Management*, *25*(7), 26-28.
Li, R., Zhao, X., Liu, Y., & Wang, J. (2019). 转化医学视角下某省级医院科研投入产出分析 [Research on input-output analysis of a provincial hospital from the perspective of translational medicine]. *Soft Science of Health*, *33*(08), 23-25.
Li, X. (2004). 企业家战略：培育创新能力的企业内部战略 [Entrepreneur strategy: An internal strategy that fosters innovation]. *Nankai Management Review*, *7*(4), 15-20.
Li, X., Cao, Z., & Wang, Y. (2005). *竞争层次论: 在不同层次上赢得竞争优势* [*Hierarchy of ccompetition: winning competitive advantage at different levels*]. Inner Mongolia University Press.
Li, Y., & Yuan, L. (2013). 战略人力资源管理对企业绩效的影响研究 [Study on the impact of strategic human resource management on firm performance]. *Statistical Research*, *30*(10), 92-96.
Li, Z. (2019). *J hospital's development strategy selection and countermeasures* [Master's thesis]. Jiangsu University.
Liao, H., Yu, J., Qian, P., He, J., & Liang, J. (2013). 妇幼保健人员科研能力评价体系的建

立与实践 [Establishment and practice of the evaluation system on research ability of staff of the maternal-child health]. *Chinese Journal of Medical and Science Research Management*, 26(06), 421-423.

Ling, F., Ding, X., Tang, Y., & Chen, D. (2018). 在县级妇幼保健机构中开展科研创新工作的实践与思考 [Practice and thinking of scientific research innovation in county level maternal and child health care institutions]. *Chinese Journal of Women and Children Health*, *9*(01), 76-78.

Liu, F. (2001). 医院科研选题应注意的几个问题 [Problems that should be paid attention to in selecting topics of hospital scientific research]. *Armed Police Medical*, (05), 307-308.

Liu, S., Zhou, Q., Huang, T., & Liu, X. (2008). 企业战略、人力资源管理系统与企业绩效的关系研究 [The effects of business strategy and HRM strategy on organizational performance]. *Chinese Journal of Management Science*, *16*(3), 181-191.

Liu, W., Wang, Y., & Liu, Z. (2010). 基于圣吉模型的医院学习型组织构建实践研究 [The Practical study of establishing research-oriented organizations in hospitals based on senge model]. *Chinese Hospital Management*, *30*(3), 41-43.

Liu, X. (2019). *Research on the evaluation of service capacity of maternal and child health care institutions in genus province* [Master's Thesis]. Lanzhou University.

Liu, Y. (2008). 实施医院战略管理是构建核心竞争力的关键 [Implementing hospital strategic management is the key to building core competitiveness]. *China Health Service Management*, (02), 91-92.

Long, Q. (2019). 妇幼保健院保健与临床相结合工作探讨 [Discussion on the combination of health care and clinic in maternal and child health care hospital]. *World's Latest Medical Information Digest*, *19*(23), 212-214.

Lu, J., Qiu, Y., Hu, X., & Ye, W. (2000a). 澳大利亚妇幼卫生现状与发展趋势：澳大利亚妇幼卫生考察报告（1） [Current situation and development trend of maternal and child health in Australia: a survey report on maternal and child health in Australia (1)]. *Maternal and Child Health Care in China*, *15*(7), 458-460.

Lu, J., Qiu, Y., Hu, X., & Ye, W. (2000b). 澳大利亚妇幼卫生现状与发展趋势：澳大利亚妇幼卫生考察报告（2） [Current situation and development trend of maternal and child health in Australia: a survey report on maternal and child health in Australia (2)]. *Maternal and Child Health Care in China*, *15*(7), 518-519.

Lu, Y. (2016). 学术领导力:重构现代大学治理体系的逻辑起点 [Academic leadership: A logical starting point for the reconstruction of modern university governance system]. *Higher Education Exploration*, (06), 34-38.

Luce, B., Drummond, M., Dubois, R., Neumann, P., Jönsson, B., Siebert, U., & Schwartz, J. (2012). Principles for planning and conducting comparative effectiveness research. *Journal of Comparative Effectiveness Research*, *1*(5), 431-440.

Luo, M., Wu, F., Su, B., Zhao, Z., He, L., & Liu, W. (2018). 基于 TOPSIS 法的四川省市级妇幼保健机构综合评价 [Comprehensive evaluation of maternal and child health care institutions in Sichuan Province based on TOPSIS method]. *Maternal and Child Health Care in China*, *33*(12), 2643-2646.

Ma, H. (2010). *竞争优势：解剖与集合（修订版）*[*Competitive advantage: anatomy and assembly (revised edition)*]. Peking University Press.

Ma, H. (2017). 动态能力是与非 [Rightness and wrongness of dynamic capabilitie]. *Tsinghua Bussiness Review*, (12), 68-74.

Mandal, S. (2017). The influence of dynamic capabilities on hospital-supplier collaboration and hospital supply chain performance. *International Journal of Operations & Production Management*, *37*(5), 664-684.

Marstins, V., Filipe, M., Ferreira, F., Jalali, M., & Antonio, N. (2015). For sale… But for how long? A methodological proposal for estimenting time-on-the market. *International Journal of Strategic Property Management*, *19*(4), 309-324.

McKelvie, A., & Davidsson, P. (2009). From resource base to dynamic capabilities: an investigation of new firms. *Briticsh Journal of Management*, *20*, S63-S80.

Meng, X. (2013). *Research on the relationship among leadership behavior of entrepreneurs, organizational learning capability and competitive advantage of new venture* [Doctoral dissertation]. Jilin University.

Meyer, M., & Lehnerd, A. (1997). *The power of product platforms: building value and cost leadership*. The Free Press.

Meyer, M., & Utterback, J. (1992). The product family and the dynamics of core capability. *Sloan Management Review*, *34*(3), 29-47.

O'Reilly, I., & Tushman, M. (2008). Ambidexterity as a dynamic capability: resolving the innovator's dilemma. *Research in Organizational Behavior*, *28*(1), 185-206.

Pan, L. (2010). 浅谈妇幼保健机构发展方向的核心竞争力建设 [On the core competitiveness construction of the development direction of maternal and child health institutions]. *Primary Health Care in China*, *24*(01), 49-50.

Patel, P., & Pavitt, K. (1997). The technological competencies of the world' s largest firms: complex and path-dependent, but not much variety. *Research Policy*, *26*(2), 141-156.

Peng, J. (2014). *战略人力资源管理理论、实践与前沿* [*The theory, practice and frontier of strategic human resource management*]. The Chinese People's University Press.

Penrose, E. (1959). *The theory of the growth of the firm*. Shanghai Sanlian Bookstore.

Peter, D. (2012). *Management: tasks, responsibilities, and practices*. Huaxia Publishing House.

Peter, M. S. (1997). *Fifth Discipline: the art and practice of learning organization*. Shanghai Sanlian Bookstore.

Peteraf, M. (1993). The cornerstones of competitive advantage: a resource‐based view. *Strategic Management Journal*, *14*(3), 179-191.

Porter, M. (1988). *Competitive advantage*. China Financial and Economic Press.

Porter, M. (2014). *Competitive advantage*. China CITIC Press.

Prahalad, C. (1993). The role of core competencies in the corporation. *Research-Technology Management*, (11), 40-47.

Prahalad, C., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, *68*(03), 275-292.

Qiao, J., Wang, Y., Li, X., Jiang, F., Zhang, Y., Ma, J., Song, Y., Ma, J., Fu, W., Zhu, Z., Zhang, J., Qian, X., Wang, L., Wu, J., Chang, H., Leung, P., Mao, M., Ma, D., Guo, Y., …, & Hesketh, T. (2021). A Lancet commission on 70 years of women's reproductive, maternal, newborn, child, and adolescent health in China. *The Lancet*, *397*(10293), 2497-2536.

Qiang, H. (2006). 基于资源和能力的医院竞争力 [Hospital competitiveness based on resources and capabilities]. *The Chinese Hospital*, *10*(1), 74-77.

Quan, X. (2008). *Research on strategic management of urban hospital* [Doctoral dissertation]. Huazhong Unversity of Science and Technology.

Rumelt, R. (1982). Diversification strategy and profitability. *Strategic Management Journal*, *3*(4), 359-369.

Rumelt, R. (1984). *Toward a strategic view of the firm*. Prentice Hall.

Saaty, T. (1980). The analytic hierarchy process: planning, priority setting, resource allocation. *McGraw-Hill*, *9*(1-3), 216-217.

Saaty, T. (2008). Relative measurement and its generalization in decision making: why pairwise comparisons are central in mathematics for the measurement of intangible factors-the analytic hierarchy/network process. *Real Academia de Ciencias*, *102*(2), 251-318.

Sanchez, R., Heene, A., & Thomas, H. (1997). Dynamics of competence-based competition:

theory and practice in the new strategic management. *Long Range Planning*, *30*(1), 141.
Schuler, R. S. (1992). Strategic human resources management: linking the people with the strategic needs of the business. *Organizational dynamics*, *21*(1), 18-32.
Schumpeter, J. (2017). *资本主义、社会主义与民主* [*Capitalism, socialism and democracy*]. Jiangsu People's Publishing House.
Shao, Z., Fu, S., Chen, J., Yang, Y., Wang, Y., Sun, Y., Ding, J., & Wu, H. (2013). 县区级妇幼保健机构综合评价体系及评价模型研究 [Research on comprehensive evaluation system and evaluation model of maternal and child health care institutions at county level]. *Chinese Journal of Maternal and Child Health*, *4*(06), 17-19.
Sheng, L. (2014). *规矩与方圆：商业银行经营管理方略* [*Les and circumstances: business management strategy of commercial banks*]. Shanghai People's Publishing House.
Sirmon, D., Hitt, M., & Ireland, R. (2007). Managing firm resources in dynamic environments to create value: looking inside the black box. *Academy of management review*, *32*(1), 273-292.
Sui, Y. (2017). *大学理论* [*The theory of the university*]. People's Education Press.
Sun, S. (2012). *Research on the influence of strategic human resource management on organization effectiveness-Based on competing values framework perspective* [Doctoral dissertation]. University of Shandong.
Sun, Y., He, X., Wen, S., Liu, H., & Li, A. (2015). 以研究型医师和研究型科室为路径建设研究型医院的思考 [Developing the research oriented physician and research oriented clinical department: A method to developing research oriented hospital]. *Hospital Administration Journal of China People's Liberation Army*, *22*(10), 901-904.
Tan, X. (2011). *Research on the evaluation system of hospital core competence based on BSC method* [Master's thesis]. Shandong Normal University.
Tang, H. (2019). *Research on strategic management of public hospitals* [Master's thesis]. Anhui University of Finance and Economics.
Tao, Y. (2019). 迎接我国妇幼保健事业的又一个春天—专访中国妇幼保健中心副主任金曦 [To Welcome another spring in my country's maternal and child health care industry: an interview with Jin Xi, deputy director of China Maternal and Child Health Center]. *Population and Health*, (08), 26-29.
Teece, D. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350.
Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. In M. H. Zack (Ed.), *Knowledge and strategy* (*pp. 77-115*). Butterworth-Heinemann.
Teece, D., & Pisano, G. (1994). The dynamic capabilities of firms: an introduction. *Industrial and Corporate Change*, *3*(3), 537-556.
Tian, Y. (2019). 医院核心竞争力建设路径与分析研究 [Analysis and research on the construction path of hospital core competitiveness]. *World's Latest Medical Information Digest*, *19*(88), 237-239.
Tong, X. (2019). 以强化学科建设为动力推进妇幼保健院建设 [To strengthen the discipline construction as a driving force to promote the construction of maternal and child health hospital]. *China Health Industry*, *16*(03), 192-195.
Uner, M. M., Cetin, B., & Cavusgil, S. T. (2020). On the internationalization of Turkish hospital chains: A dynamic capabilities perspective. *International Business Review*, *29*(3), 5-6.
Wan, L. (2008). 医院核心竞争力的要素构成和实践—访东方肝胆医院副院长连斌 [Elements of hospital core competitiveness and practice: interview with Lianbin, vice president of oriental hepatobiliary hospital]. *China's Medical Frontier*, (07), 74-76.
Wang, C., & Ahmed, P. (2007). Dynamic capabilities: a review and research agenda. *International Journal of Management Reviews*, *9*(1), 31-51.

Wang, F. (1992). 关于我国妇幼卫生发展战略的研究 [Research on the development strategy of maternal and child health in China]. *Maternal and Child Health Care in China, 7*(1), 2-4.

Wang, L. (2015). 基于大学章程建设的学术领导力研究 [Research on academic leadership based on the construction of university charter]. *Educational Review*, (02), 9-11.

Wang, L., Wu, W., & Zhang, X. (2010). 新医改下公立医院战略管理探讨 [Discussion on the strategic management of public hospitals under the new medical reform]. *Medicine and Society*, *23*(6), 48-50.

Wang, M., Li, Q., Luo, Z., Xi, B., & Xu, Q. (2019). 临床医生科研能力评价体系研究 [Research on the evaluation system of clinician's scientific research ability]. *Health Vocational Education*, *37*(07), 146-149.

Wang, X. (2003). 什么是医院核心竞争力 [What is the core competitiveness of hospital]. *Journal of People's Liberation Army Hospital Management*, *10*(3), 264-267.

Wang, Y., Chen, J., & Xu, Q. (2000). 企业核心能力—理论溯源与逻辑结构 [Core competence of corporation: theory sources and logical structure]. *Journal of Management Science*, *3*(3), 24-32.

Wang, Z., Su, J., Luo, Z., & Shi, K. (2008). 临床医学学科带头人胜任特征模型构建—量化与质化结合的方法 [Competency modeling for academic leaders in hospital - an integrated approach]. *Management Review*, *23*(5), 70-77.

Wang, Z., Zhang, W., Zhao, K., & Yang, Y. (2001). 医院核心竞争能力研究 [Research on hospital core competitiveness]. *Hospital Management in China*, *21*(11), 10-11.

Wei, W., Gan, H., Li, X., Zhong, S., & Cao, Q. (2014). 四川省医院科研能力评价指标体系的构建 [Construction of scientific research ability assessment index systems for hospitals in Sichuan Province]. *Chinese Journal of Medical Library and Information*, *23*(07), 21-25.

Wen, H., Ren, X., Wang, X., & Zeng, X. (2017). Topic selection principles and topics for clinical research. *Chinese Journal of Evidence-Based Cardiovascular Medicine*, *9*(03), 257-260.

Wernerfelt, B. (1984). A resource‐based view of the firm. *Strategic Management Journal*, (307), 1-30.

Wright, P., & McMahan, G. (1992). Theoretical perspectives for strategic human resource management. *Journal of Management*, *18*(2), 295-320.

Wu, L. Y. (2010). Applicability of the resource-based and dynamic capability views under environmental volatility. *Journal of Business Reseach*, *63*(1), 27-31.

Wu, S. (Ed.). (2015). *中国儿科医学史* [*History of Chinese paediatric medicine*]. China Medical Science and Technology Press.

Xiang, B. (1999). 企业战略管理若干问题试析 [A tentative analysis of some problems in enterprise strategic management]. *Nankai Business Review*, (4), 58-61.

Xiao, Y. (2018). *Research on the strategic management of public third-grade class-A general hospitals under the backgroud of new medical reform* [Master's thesis]. Guangxi Medical University.

Xiong, Q. (2008). 关于妇幼保健院学科建设的思考 [On the subject construction of maternal and child health care hospital]. *Maternal and Child Health Care in China*, *23*(8), 1030.

Xu, M. (2019). 临床学科带头人胜任力评价体系的建立及应用 [Establishment and application of index weights of competency evaluation system based on clinical subject leaders]. *Medical Education Management*, *5*(03), 282-286.

Yang, B. (2014). *Statistical model for the relationship among knowledge, ability, strategy of start-ups and their competitive advantages* [Doctoral dissertation]. College of Economics

and Business Administration of Chongqing University.

Yang, C. (2011). *Study on the analysis and comprehensive evaluation system of hospital core competence* [Doctoral Dissertation]. Central Sounth University.

Yang, J., & Yang, H. (2020). 人力资源管理与组织绩效关系的实践—国外四大理论的阐释 [Practice approaches between human resource management and organizational performance: explanation of four foreign theories]. *Journal of Capital University of Economics and Business*, *22*(01), 103-112.

Yang, L. (2007). *Research on analysis model of core competence of Chinese hospitals* [Doctoral Dissertation]. Third Military Medical University.

Yang, Q., Huang, A., Jin, X., Luo, R., Wang, J., & Pan, X. (2011). 2008年度全国妇幼保健机构科研现状分析 [Analysis of situation about the scientific research and scientific and technological achievement of womenl and child healthren health institution in 2008]. *Chinese Journal of Women and Child Health*, *2*(01), 33-36.

Yao, H., Sun, F., & Chen, J. (2018). 知识结构、环境波动对突破式创新的影响—知识动态能力的中介作用 [The influence of knowledge structure and environment fluctuation on breakthrough innovation - the mediating effect of knowledge dynamic ability]. *Scientific and Technological Progress and Countermeasures*, *35*(10), 1-8.

Yao, N., Wang, F., Liu, X., & Cai, J. (2013). 国外妇幼卫生服务体系的现状与启示 [The status quo and enlightenment of foreign maternal and child health service system]. *Primary Health Care in China*, *27*(06), 34-36.

Yi, L., Yang, Y., Shen, H., & Hu, M. (2008). 以学习力提升竞争力 探索医院永续发展之路—无锡市第二人民医院构建学习型组织的实践与探索 [To promote competitive ability by keeping learning to explore a sustainable development way for hospitsalis: probe into the practice of setting up a learning organization in the second people's hospital in Wuxi]. *Chinese Hospital Management*, *25*(7), 12-14.

Zhang, D. (1989). 日本、菲律宾妇幼工作简介 [Introduction to women and Children in Japan and the Philippines]. *Maternal and Child Health Care in China*, (06), 40-41.

Zhang, D., Zhang, K., Jiang, Y., & Ye, S. (2019). 研究型医院构建过程中科研人才队伍建设的探索与思考 [Exploration and thinking of the construction of scientific research talents team in the construction process of research-oriented hospital]. *Health Administration of Jiangsu Province*, *30*(12), 1527-1530.

Zhang, G., & Liu, D. (2006). 企业能力、理论与实证研究理论综述 [Enterprise competence: literature review of theoretical and empirical studies]. *Economic Review*, (06), 147-151.

Zhang, Y., & Liu, J. (2018). *经济全球化背景下市场营销管理的理论与运用* [*The theory and application of marketing management under the background of economic globalization*]. Northeast Normal University Press.

Zhao, P., & Lu, Y. (1998). 科研选题的基本思想 [The basic thought of scientific research topic selection]. *Science Research Management*, *19*(5), 67-72.

Zhen, S. (2004). 关于妇幼保健机构发展模式和发展方向的思考 [Reflections on the development model and direction of maternal and child health care institutions]. *Maternal and Child Health Care in China*, (08), 6-7.

Zhou, G., Zhong, Y., Zhen, W., He, J., & Jiang, W. (2020). 我国东部地区临床医学学科带头人胜任力模型构建 [Construction of competency models for clinical medical discipline leaders in eastern China]. *Chinese Health Resources*, *23*(05), 499-503.

Zhou, L., Yang, Z., Zhou, C., & Xu, W. (2008). 论妇幼保健机构的核心竞争力 [On the core competitiveness of maternal and child health care institutions]. *Maternal and Child Health Care in China*, *23*(5), 588-590.

Zhu, J., Feng, S., & Wan, X. (2013). 坚持系统化标准化创建学习型组织，推进医院跨越式

发展 [Adhere to the systematic standardization to create a learning organization and promote the leap - forward development of hospitals]. *Medical Innovation in China*, *10*(33), 144-146.

Zhu, W. (2007). 战略人力资源管理与企业竞争优势—基于资源基础理论的考察 [Strategic human resource management and company competitive advantage - Exploring resource-based view]. *Science of science and management of science and technology*, (12), 119-126.

Zollo, M., & Winter, S. (2002). Deliberate learning and the evolution of dynamic dapabilities. *Organization Science*, *13*(3), 339-351.

[This page is deliberately left blank.]

Webliography

Center for Health Statistics and Information. (2020, April 17). *Number of medical and health institutions in China by the end of march 2020*. National Health Commission of the People's Republic of China. Retrieved June 8, 2020, from http://www.nhc.gov.cn/mohwsbwstjxxzx/s7967/202005/c8bfaf0912034eb3b10e54e288bf488a.shtml

Center for Health Statistics and Information. (2020, April 17). *Medical services in China from january to february 2020.* National Health Commission of the People's Republic of China. Retrieved June 8, 2020, from http://www.nhc.gov.cn/mohwsbwstjxxzx/s7967/202004/544bd45854a542e086d0bfced19131bc.shtml

Central Committee of the Communist Party of China, & The State Council. (2009, April 8). *Opinions of the central committee of the communist party of china and the state council on deepening the reform of the medical and health system*. The Xinhua News Agncy. Retrieved June 2, 2020, from http://www.gov.cn/test/2009-04/08/content_1280069.htm

Central Committee of the Communist Party of China., & The State Council. (2016, October 25). *Planning outline of "Healthy China 2030"*. The Xinhua News Agncy. Retrieved July 8, 2020, from http://www.gov.cn/zhengce/2016-10/25/content_5124174.htm

Department of Maternal and Child Health. (2019, May 27). *Chinese maternal and child health development report (2019)*. National Health Commission of the People's Republic of China. Retrieved July 3, 2019 from http://www.nhc.gov.cn/fys/s7901/201905/bbd8e2134a7e47958c5c9ef032e1dfa2.shtml

Development of Planning and Information. (2020, February 28). *Statistical bulletin of the People's Republic of China (2019)*. National Bureau of Statistics. Retrieved July 13, 2020, from http://www.nhc.gov.cn/guihuaxxs/s10748/202006/ebfe31f24cc145b198dd730603ec4442.shtml

Gan, B. (2019, May 28). *"High Performance" in maternal and child health in China*. People.cn. Retrieved July 13, 2020, from http://health.people.com.cn/n1/2019/0528/c14739-31106487.html

Ministry of Health. (1980, June 15). *The maternal and child health work regulations (Trial Draft).* WWW.LAWXP.com. Retrieved June 25, 2019 from https://www.lawxp.com/Statute/s1061048.html

People's Political Consultative Conference of the PRC. (1949, September 29). *Common program of the Chinese people's political consultative conference.* China Business News network. Retrieved June 30, 2019, from https://wenku.baidu.com/view/843ec2e8551810a6f5248636.html

[This page is deliberately left blank.]

Other References

Central Committee of the Communist Party of China, & The State Council. (1997). *Decision on the health reform and development, PRC* (Report No.3).

Ministry of Health. (2006). *Guidelines on further strengthening maternal and child health Work, PRC* (Report No.495).

Ministry of Health. (2006). *Measures for the administration of maternal and child health institutions, PRC* (Report No.489).

Ministry of Health. (2012). *Notice of the Ministry of Health on Issuance the Implementation Plan for the Chinese Women and Children Development Outline (2011-2020), PRC* (Report No.12).

Ministry of Health, & Ministry of Labor and Human Resources. (1986). *Compilation standards for maternal and child health at all levels (Trial Implementation), PRC* (Report No.2)

National Health and Family Planning Commission. (2015). *Guiding opinions of the national health and family planning commission on the standardized and management of maternal and child health service Institutions, PRC* (Report No.54).

State Council. (2001). *Implementation measures of the maternal and child health law, PRC* (Report No.308).

The General Office of the State Council. (2017). *Guiding opinions of the general office of the state council on the establishment of a modern hospital management system, PRC* (Report No.67).

The Office of the National Health and Family Planning Commission. (2015). N*otice on issuance the guidelines for the establishment of business departments of maternal and child health service institutions at all levels, PRC* (Report No.59).

[This page is deliberately left blank.]

Annex A

Basic information of the selected experts

Basic information	Group	Number
Age (years)	≤40	3
	41~50	17
	＞50	10
Gender	Male	11
	Female	19
Working year (years)	10~15	3
	16~20	3
	21~25	8
	＞25	16
Title	Physician	5
	Associate professor	17
	Professor	8

[This page is deliberately left blank.]

Annex B

Outline of interview on the sustainable competitive advantage of maternal and child health care institutions

Interview content

1. Compared to other medical facilities, what unique resources or capabilities do you think a MCH facility owns?(The resources or capabilities that could be adjusted)

2. Among the resources and capacities you have listed, which do you think could be used as an index to evaluate the competitive advantage of MCH institutions?

3. What internal resources and capabilities do you think need to be strengthen for MCH institutions to cope with environmental changes and maintain competitive advantages?

4. What do you think is more important in evaluating the competitiveness of hospitals, the overall comprehensive strength or the strengh of one certain special unit ?

5. What are your suggestions on improving the competitiveness of maternal and child health institutions?

[This page is deliberately left blank.]

Annex C

Results of Free Interview

Category	Serial numbe	Indicator	Frequency
Human Resources	1	Talent team	20
	2	Professional title structure	13
	3	Educational background structure	11
	4	Regional Influence of academic leader	11
	5	Staff training mechanism	10
	6	Talents retention rate	10
	7	Proportion of core talents	7
	8	Personality charm of academic leader	6
	9	Coverage of continuing education and training	3
Material Resources	1	Featured equipment for woman and children	14
	2	Business occupancy area	11
	3	Diagnosing and treating environment	7
	4	Equipment renewal rate	3
	5	Intelligent diagnosis and treatment	3
Financial Resources	1	Proportion of funding for science and education	11
	2	Proportion of income from medical services	8
	3	Medical expenditure per patient	8
	4	The ratio of the debt to total assets	7
	5	Fixed-assets management	6
	6	Revenue growth rate	5
	7	Medical costs of per 100 RMB medical income	4
	8	Per capita income	3
	9	Cash flow	3
	10	Full cost accounting	3
	11	Ratio of personnel expenses	3
	12	Equipment benefit	3
Brand Resources	1	Social influence	20
	2	Industrial recognition	19
	3	Brand promotion ability	18
	4	Number of characteristic subjects	15
	5	Patient loyalty	15
	6	Patient Satisfactiom	13
	7	Number of Key subjects	13

	8	Subject chain of full life cycle	10
	9	Ability to treat difficult and critical diseases	14
	10	Social influence of senior management team	10
	11	Brand building capability	9
	12	Number of annual scientific research achievements	9
	13	Applementation rate of scientific research achievements	7
	14	Patient recognition	4
	15	Service brand	3
	16	Scientific research team	3
Organizatio n Resources	1	Utilization rate of information resources	15
	2	The emphasis degree of the employees on health care	15
	3	Network system for maternal and child health care services	13
	4	Construction of information platform	13
	5	Decision making ability of senior management team	12
	6	Employees' execution	12
	7	Ability of public health management for women and children	15
	8	The ability to response to market change	11
	9	Subjects structure	10
	10	Performance incentive mechanism	10
	11	Health care and clinical referral mechanisms	8
	12	Management team specialization	8
	13	Matching degree for satff and their work	6
	14	System construction and implementation	6
	15	Supervision and assessment mechanism	6
	16	Organizational structure	6
	17	Multidisciplinary collaboration mechanism	5
Cultural Resources	1	Employees' cultural identity	16
	2	Understanding of maternal and child health care policy	16
	3	Long-term planning	15
	4	Employees' satisfaction	11
	5	Employees' cohesion	11
	6	Investment ratio of cultural development	8
	7	Employees' engagement	6
	8	Characteristic culture of women and children	6
	9	Culture system	5
	10	Construction of medical ethics	5
	11	Employees' innovation consciousness	4

Annex D

The VRIO expert consultation questionnair

tegory	Serial number	Indicator	VRIO Model				
			Is it valuable?	Is it rare?	Is it difficult to immitate?	Is the orgnization organized around it?	Type of Competitive Advantage
Brand Resources	1	Ability to treat difficult and critical diseases					
	2	Brand promotion ability					
	3	Industrial recognition					
	4	Number of characteristic and key subjects					
	5	Patient loyalty					
	6	Patient Satisfactiom					
	7	Social influence					
	8	Social influence of senior management team					
	9	Subject chain of full life cycle					

Cultural Resources	1	Employees' cohesion					
	2	Employees' cultural identity					
	3	Employees' satisfaction					
	4	Long-term planning					
	5	Understanding of maternal and child health care policy					
Financial Resources	1	Proportion of funding for science and education					
	2	Proportion of income from medical services					
Human Resources	1	Educational background structure					
	2	Professional title structure					
	3	Regional Influence of academic leader					
	4	Staff training mechanism					
	5	Talent team					
	6	Talents retention rate					
Material Resources	1	Business occupancy area					
	2	Featured equipment for woman and children					
Organization Resources	1	Ability of public health management for women and children					
	2	Construction of information platform					
	3	Decision making ability of senior management team					
	4	Employees' execution					
	5	Health care and clinical referral mechanisms					

	6	Network system for maternal and child health care services					
	7	Performance incentive mechanism					
	8	Subjects structure					
	9	The ability to response to market change					
	10	The emphasis degree of the employees on health care business					
	11	Utilization rate of information resources					

[This page is deliberately left blank.]

Annex E

Expert consultation questionnaire results for VRIO

Category	Serial number	Indicator	Frequency of VRIO Model judgment			
			Competitive Equality	Temporary Competitive Advantage	Unused Competitive Advantage	Long-term Competitive Advantage
Brand Resources	1	Ability to treat difficult and critical diseases	4	4	8	9
	2	Brand promotion ability	16	3	0	6
	3	Industrial recognition	6	7	3	9
	4	Number of characteristic and key subjects	4	5	5	11
	5	Patient loyalty	13	1	9	2
	6	Patient Satisfactiom	13	5	4	3
	7	Social influence	11	7	2	5
	8	Social influence of senior management team	3	7	7	8
	9	Subject chain of full life cycle	10	6	2	7
Cultural Resources	1	Employees' cohesion	12	10	1	2
	2	Employees' cultural identity	15	2	6	2
	3	Employees' satisfaction	17	4	3	1

	4	Long-term planning	9	8	4	4
	5	Understanding of maternal and child health care policy	13	4	1	7
Financial Resources	1	Proportion of funding for science and education	20	4	0	1
	2	Proportion of income from medical services	14	8	1	2
Human Resources	1	Educational background structure	16	7	1	1
	2	Professional title structure	20	5	0	0
	3	Regional Influence of academic leader	3	2	10	10
	4	Staff training mechanism	14	5	5	1
	5	Talent team	7	5	6	7
	6	Talents retention rate	15	6	3	1
Material Resources	1	Business occupancy area	22	2	0	1
	2	Featured equipment for woman and children	10	9	1	5
Organization Resources	1	Ability of public health management for women and children	6	2	7	10
	2	Decision making ability of senior management team	5	9	1	10
	3	Health care and clinical referral mechanisms	8	3	3	11
	4	Network system for maternal and child health care services	5	2	2	16
	5	Performance incentive mechanism	10	7	4	4
	6	Subjects structure	11	5	4	5
	7	The ability to response to market change	13	7	5	0
	8	The emphasis degree of the employees on health care business	15	4	2	4
	9	Utilization rate of information resources	13	8	2	2

Annex F

Information of consulting experts for index weight evaluation

Basic information	Group	Number
Age (years old)	≤40	0
	41~50	4
	＞50	3
Gender	Male	5
	Female	2
Years of working	≤15	0
	16~20	1
	21~25	1
	＞25	5
Position titles	Deputy senior title	6
	Senior title	1

[This page is deliberately left blank.]

Annex G

The expert judgment matrix of human resources

	Staff training mechanism	Regional influence of discipline leaders	Staff title structure	Talent development	Academic structure of staff	Talent retention rate
Staff training mechanism	1	1/5	4	1	5	1
Regional influence of discipline leaders	5	1	6	4	6	4
Staff title structure	1/4	1/6	1	1/3	1	1/3
Talent development	1	1/4	3	1	3	1
Academic structure of staff	1/5	1/6	1	1/3	1	1/3
Talent retention rate	1	1/4	3	1	3	1

[This page is deliberately left blank.]

Annex H

Indexes of sustainable competitive advantages and weight assignment in MCH institutions

Second-level index	Weight	No.	Third-level index	Weight	Comprehensive weight
Financial resources	0.096	1	Proportion of funds for scientific research and education	0.667	0.064032
		2	Proportion of income from medical services	0.333	0.031968
Human resources	0.356	1	Talent development	0.136	0.048416
		2	Talent retention rate	0.136	0.048416
		3	Regional influence of discipline leaders	0.474	0.168744
		4	Staff title structure	0.050	0.017800
		5	Academic structure of staff	0.048	0.017088
		6	Staff training mechanism	0.156	0.055536
Brand resources	0.185	1	Social influence of senior management team	0.048	0.008880
		2	Intra-industry recognition	0.149	0.027565
		3	Patient satisfaction	0.062	0.011470
		4	Patient loyalty	0.066	0.012210
		5	Brand promotion ability	0.037	0.006845
		6	Discipline service chain in a life cycle	0.071	0.013135

		7	Number of characteristic disciplines and key specialties	0.218	0.040330
		8	Hospital’s social influence	0.144	0.026640
		9	Ability to treat difficult and severe cases	0.205	0.037925
Cultural resources	0.056	1	Understanding of MCH policies	0.322	0.018032
		2	Hospital’s long-term planning	0.256	0.014336
		3	Employee cohesion	0.207	0.011592
		4	Cultural identity of the staff	0.126	0.007056
		5	Staff satisfaction	0.089	0.004984
Material resources	0.056	1	Special diagnosis and treatment equipment for MCH	0.667	0.037352
		2	Business area	0.333	0.018648
Organizational resources	0.251	1	MCH networks	0.276	0.069276
		2	The capability of public health management	0.147	0.036897
		3	Decision-making ability of the senior management	0.204	0.051204
		4	Performance incentive mechanism	0.105	0.026355
		5	Market resilience	0.059	0.014809
		6	Utilization of information resources	0.028	0.007028
		7	Discipline structure	0.101	0.025351
		8	Importance attached to health care by the medical staff	0.032	0.008032
		9	Integrated health care service capacity	0.048	0.012048