



**The Relationship
Between Human Resources and Urban
Competitiveness
A case study of Ningbo city**

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Abstract

Nowadays the competitiveness is a hot subject being studied all over the China. This dissertation is dedicated to analyzing the relationships between human resources and economic development, innovation and technology, and industrial cluster. The main purpose of this dissertation is to find out the extent to which human resource plays an important role in the competitiveness of one city, one economic region, even one state, and also to give some insight in how to accelerate the competitiveness enhancement by adjusting the quantity, quality, collocation, and structure of human resources, and so on.

Literature review was conducted in the context of our theoretical framework discussion. Theories of Porter from USA and theory of competitiveness of Ni Pengfei from China were discussed. Then, a new model was created and, a deductive method was adopted. From different angles, three aspects associated with competitiveness were analyzed respectively. An in-depth case study of the city Ningbo, China was conducted. Our theoretical framework and model were tested in the case study.

We came to conclusion that human resources has significant effect on the economic development, innovation and technology and industrial cluster. It is apparent that human resources is one of the crucial variables prompting competitiveness. Finally, further researches and practical implications of our study were discussed.

Keywords: human resources, urban competitiveness, economic development, innovation and technology, industrial cluster

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Chapter 1 Introduction

In this chapter, the background of the dissertation is introduced. The definitions of urban competitiveness and human resources are also discussed. Further, the problem and purpose, research question and limitation are presented. Finally, the outline is shown.

1.1 Background

Competitions among cities have existed for a long time. In the industrial society, the development and competitive strength of the cities exert significant impact on the development of all related entities of economic behaviors. Urban competitiveness is the comprehensive embodiment of the level of social and economic development in a city. A city with a high urban competitiveness has more opportunities to get more resources and, it can use them in more efficient ways than others. Urban competitiveness can be exhibited in many fields. It consists of many factors including the level of urban economic development, innovation and technology, industrial agglomeration (clusters) and so on.

A city's urban competitiveness is also influenced by many factors, such as infrastructure, the human environment, the public service system, innovation and technology and so on. Among them, human resources plays a very important role with regards to the development of urban competitiveness because human resources is the most important resources for long-term socioeconomic development. Human resources --- the skills and knowledge of habitants --- has also been fundamental to the creation of city's prosperity. The economic importance of human resources will only escalate in the future. Human resources is probably the most important ingredients in the mix of factors that determine an urban region's competitiveness. The ability of an urban region to move up the value chains is closely linked to human

resources capabilities. In undertaking competitiveness assessment, it is important to assess human resources not only in terms of education, training, skills, and work experience, but also in terms of other attributes that are less easily measurable, such as entrepreneurship, creativity and risk tolerance. It must also be recognized that the productive value of individuals is largely determined by external factors. Latent potential of individuals in one institutional or cultural milieu may bloom when they move to another milieu that provides more conducive conditions and opportunities. The influence that human resources exert to urban competitiveness can be sought in many fields that are the embodiments of urban competitiveness.

Our interest in the relationship between urban competitiveness and urban human resources developed during our courses at Kristianstad Business School. The topic is relevant to our works as well. Clarifying the relationship between urban competitiveness and urban human resources will help us get a plain idea about our work after we finish our study in Sweden.

In this dissertation, we will use several theories to demonstrate the embodiments of urban competitiveness. As discussed above, urban economic development, innovation and technology, industrial agglomeration (clusters), are the three significant parts or embodiments of urban competitiveness. So, we will analyze the essential relationship between human resources and urban competitiveness in three parts, namely, the relationship between human resources and urban economic development, the relationship between human resources and innovation and technology, and the relationship between human resources and industrial agglomeration (clusters).

In this dissertation, we use Ningbo city as our case study to illustrate the relationship between human resources and urban economic development, and the relationship between human resources and innovation and technology. We will study the Ningbo garment industry and use it as an example to indicate the relationship between human

resources and industrial agglomeration (clusters). Ningbo, an important city with a population of six million in China, is located in the Yangzi River Delta that is not only one of the largest economic circles in China, but also the sixth largest metropolitan economic circle in the world. And the Ningbo garment cluster, as a traditional industry, is a typical representative of Ningbo industrial clusters.

1.2 Definitions of urban competitiveness and human resources

As Porter (1990) says, “the only meaningful concept of competitiveness at the national level is productivity. The principal goal of a nation is to produce a high and rising standard of living for its citizens. The ability to do so depends on the productivity with which a nation’s labor and capital are employed.” (Porter, 1990). When it comes to cities, urban competitiveness refers to the ability of an urban region to produce and market a set of products (goods and services) that represent good value (not necessarily the lowest price) in relation to comparable products of other urban regions and also the ability to improve itself in appropriate ways. An urban economy, which produces goods and services with high value relative to price, supports the exports of the city. This makes the city more competitive, and also directly raises the quality and standard of life for people living in the urban region. The foundation of urban competitiveness is the ability to get more resources and use them in efficient ways. The urban competitiveness is the prime mover for a city in terms of comprehensive development in all areas.

Human resources is the first and most important resources in society nowadays. As Adam Smith (1776) argues, in his landmark book: *The Wealth of Nations*

“The annual labor of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consist always either in the immediate produce of that labor, or in what purchases with that produce from other nations. What ever be the actual state of skill, dexterity, and judgment with which labor is applied in any nation, the

abundance or scantiness of its annual supply must depend, during the continuance of that state, upon the proportion between the number of those who are annually employed, and that of those who are not so employed. The number of useful and productive laborers, it will hereafter appear, is everywhere in proportion to the quantity of capital stock which is employed in setting them to work, and to the particular way in which so employed.” (Adam Smith, 1776).

According to Adam Smith, human resources is a key factor to measure the ability of a city to create wealth and value. Human resources also broadly refers to the total population of a certain region, or to labor resources, which is the working-age population who has the ability to participate in social realities. On the other hand, human resources is not only the traditional labor resources, but also the reorganization of human physical performance, technical ability and intellectual function during the knowledge economy era. The internal quality of urban human resources is reflected in the levels of education, skill, management and so on.

1.3 Research problem and purpose

Urban competitiveness is the objective response and embodiment of the comprehensive strength of a city. Human resources is the main drivers of social and economic development. This dissertation tries to indicate the relationship between human resources and urban competitiveness in order to express the importance of human resources relative to urban competitiveness through the example of a case study of Ningbo.

1.4 Research Question

- What is urban competitiveness? What factors does urban competitiveness consist of?
- What are human resources? How to evaluate human resources?
- In Ningbo, what is the relationship between human resources and economic

development, innovation and technology, industrial cluster?

1.5 Limitation

We have only used four important factors among so many factors that make up of urban competitiveness since we do not have enough material and data to analyze all factors. Secondly, in the dissertation, we only discuss the relationship between human resources and urban competitiveness, instead of discussing the ways, which we can use to improve human resources and urban competitiveness. Finally, we used secondary data from the annual brochures published by the Statistic Bureau of Ningbo municipal government instead of using first-hand data from direct investigation in the case study.

1.6 Outline

To conclude this chapter we here present the outline of the rest of the dissertation.

Chapter 2 We will present the method chosen. Different research approach and research philosophies will be discussed in this chapter.

Chapter 3 We will present our theoretical framework. The urban competitiveness theory, the human resources and human capital theory, the endogenous growth theory, the theory of innovation of technology, and the cluster theory will be introduced. Then an empirical model is illustrated in this chapter.

Chapter 4 In this chapter we will present the empirical method. The reasons why we use Ningbo as the case study will be discussed. The chapter concludes with a discussion on the reliability and validity of the case study.

Chapter 5 In this chapter we will present the result of a case study of Ningbo. We will

illustrate the relationship between human resources and economic development, the relationship between human resources and innovation and technology, the relationship between urban human resources and industrial clusters.

Chapter 6 In this chapter we will present our conclusions. Suggestions for further research will also be discussed. The chapter concludes with some suggestions to Ningbo Municipal Government.

1.7 Summary

Generally speaking, in the chapter we present the overall introduction of this dissertation. We present the main purpose of this dissertation and why we are interested in the topic. We argue briefly the concepts of human resources and urban competitiveness in a city. The limitation of this dissertation is discussed. Then, we describe the framework of this dissertation.

Chapter 2 Methodology

In this section, the methodology will be discussed, namely the research philosophy, research approach, research strategy and analysis process. Factors relevant to the methods adopted in the dissertation will be presented in the following context in the common order.

2.1 Differing approaches to research

The intention of studying the competitiveness of Ningbo city emerged at the beginning of the international business course, and the idea took form with the development of this course. After having finished a series of courses including a field

trip, the idea of studying this area became more and more clear. Then we searched for a theoretical structure to support our ideas. As the same time, relevant data, mostly secondary data, were collected from the Internet and the literature. Further, an empirical model based on the analysis and the interpretations of the above data was constructed. Finally, the conclusion and the feasible suggestions are presented.

We try to explore the extent to which human resources influences the competitiveness of Ningbo city. It is natural that we state or illustrate the previous theories which mainly explain the function that human resources has played in recent years during the development of urban expansion. Then more secondary data were used to identify the unusual rate of the development of Ningbo, which has partly contributed to the important role that human resources played in the process of the competitiveness enhancement among the cities in China in recent years. When the data are analyzed and some important factors are explained, a more practical revised model is presented. In this dissertation, the deductive approach is adopted.

2.2 Research philosophy

As mentioned above, we intend to evaluate the impact of human resources on competitiveness in a fairly independent way. And we try to interpret and analyze the phenomenon neutrally. So far, among the dominating three kinds of research philosophy, positivism, realism, and interpretivism, the philosophy of positivism is the most fit for our research. We mainly focus on the explanation of positivism.

We adopt the philosophical stance of the natural scientist when we use the principles of positivism. We prefer “working with an observable social reality and that the end product of such research can be law—like generalizations similar to those produced by the physical and natural scientists”(Remenyi, 1998). The researcher in this tradition assumes the role of an objective analyst, coolly making detached interpretations about those data that have been collected in an apparently value-free

manner. There will be an emphasis on a highly structured methodology to facilitate replication (Gill and Johnson, 1997) and on quantifiable observations that lend themselves to statistical analysis. The assumption is that “the researcher is independent of and neither affects nor is affected by the subject of the research” (Remenyi, 1998).

2.3 Research approach

The research project will involve the use of theory. That theory may or may not be made explicit in the design of the research, although it will usually be made explicit in the presentation of the findings and conclusions. The extent to which we are clear about the theory at the beginning of the research raises an important question concerning the design of the research project. The deductive approach means that we develop a theory and hypothesis and design a research strategy to test the hypothesis. While the inductive approach means we could collect data and develop theory as a result of the data analysis (Mark Saunders, Philip Lewis and Adrian Thornhill, 2003). When the research philosophy of positivism is adopted, it is accepted that the deductive approach follows the research philosophy while such labeling is potentially misleading and of no practical value. In this dissertation, the deductive method is adopted, which means we intend to test the theory or to modify the theory.

2.4 Research strategy

There are many research strategies in the research field. Some of these clearly belong to the deductive tradition, others to the inductive approach (Mark Saunders, Philip Lewis and Adrian Thornhill, 2003). As we mentioned above, the deductive approach is employed in the dissertation. According to the general conventions, the case study is usually followed, which is also of true reflection in our dissertation. The reason why we chose the case study as the main research strategy is determined by the following. First, we intend to get an insight by analyzing the general theories, which is realized by taking Ningbo city as a sample. And the second, a simple,

well-constructed case study will enable us to challenge an existing theory and also provide a source of new hypotheses. As the Robson said, the case study, to some extent, is an important strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence. This strategy will be of particular interest to you if you wish to gain a rich understanding of the context of the research and the processes being enacted (Morris and Wood, 1991).

2.5 Data collecting

We planned to use secondary data in our dissertation. The decision about the data collecting method is based on the following factors. First, originated from the context of our dissertation, it is too abstract to conduct a general questionnaire to collect the primary data, although this is often used in the commercial field in daily life interested by the questioned people. Second, in terms of our dissertation, the topic is a so hot that the government departments often undertake surveys and publish official statistics covering social, demographic and economic topics. In the case study of Ningbo city, the relevant data are so conveniently available through authority bulletins or Internet. Third, the time limitation prevents us constructing an enormous questionnaire.

Secondary data include both quantitative and qualitative data, and they can be used in both descriptive and explanatory research. Within business and management research, such data are used mostly in case study and survey-type research. There are three types of data, documentary data, survey-based data, and those compiled from multiple sources.

At the beginning of the dissertation, we have decided to use secondary data. Initially, we asked help from friends and colleagues who work in the similar field or who are interested in this research area. From the book or the annual report delivered from

domestic sources, most of them are the authority bulletins and the collections of the examples of the relevant study, which is more useful when we come to the stage of doing the case study and the empirical analysis. But as whole, we need other classical theory to support our ideas.

The library of the Kristianstad University functioned well during our research, which provided very useful material in shaping the theoretical infrastructure. And the service of the facility is of convenience. Especially, the original work in English version written by the famous authorities, for example Porter, gave us the insight of the research questions. We found that there were many theories, each of which from different point of view can explain the emergence of competitiveness among the worldwide cities. The currently published journals inform us the newest trend of development of the field.

Another sources of the secondary data that should not be omitted, is the Internet. This is widely used in our research. Most of the materials of the case study of Ningbo city, especially the latest information in the relevant aspects came from websites. And also, the papers written by the former classmates provided a good sample for us to learn the structure according to the requirement of western country, which to some extent is different from that in China. In terms of the requirement of structure in western countries, most paper should consist of the following sections, introduction, methodology, theoretical framework, empirical method, results, conclusion and so on.

2.6 Summary

In the chapter, we discuss the methodologies including research philosophy, research approach, research strategy, and the methodology of data collecting. Combined with positivism in research philosophy, the deductive approach is mainly used in this dissertation. To ensure the validity and reliability, most of the second data are collected from the newly published government bulletin and authority website. And

several measurements are taken to ensure the generalisability. We use case study as the research strategy. In the analysis of the study case, both the quantitative and the qualitative method are used.

Chapter 3 Theoretical Framework

In this chapter the theoretical framework is presented. Firstly, we will review Urban Competitiveness theory and the Endogenous Growth theory in detail. Secondly, the theory of innovation and transform of technology will be introduced. Thirdly, the Cluster theory (Diamond theory) will be discussed. Finally, we will set up an empirical model.

3.1 Overview of the urban competitiveness theory

We will discuss the urban competitiveness theory including a brief introduction, and the framework of urban competitiveness. We will also present the embodiment of urban competitiveness. Some factors and terms are introduced that inflect the basic connotation of urban competitiveness.

3.1.1 Introduction.

Porter (1990) in his book, *the competitive advantage of nations*, argues that, “ the competitiveness is productivity.” Iain Begg (2002) argues, “cities that are able to facilitate the achievement by producers of high and rising levels of productivity are national assets.” The Chinese economist Ni Pengfei (2003) points out that a city not only has its goal to develop for interest and profit but also has its urban value system. General speaking, the profit of the city includes overall currency and non-currency profits, and the urban value entity is decided by various factors. On the one hand, Ni

Pengfei (2006) argues that, “ the city is a relatively independent behavioral entity, which tends to develop for interest and profit ... the profiting level of the city is a multi-dimensional composite concept, including the city's profiting composition, profiting scale, profiting growth rate and growth sustainability.” (Ni and Kresl, 2006) On the other hand, Ni Pengfei (2006) argues that, “the urban value income identically equals to industrial value accretion of valuable products...Under conditions of incomplete competition or pursuit of this competition, with various urban resources, environments, locations, urban enterprise scales, technology, management and strategies, the urban enterprises vary in their levels to enhance industrial rents and degrees to lower production and trade costs, leading to various levels and changes of urban value systems.” (Ni, Kresl, 2006) Consequently, there are compelling reasons for investigating the competitive position of cities and for trying to understand how urban competitiveness or performance of cities can be enhanced.

3.1.2 Framework of urban competitiveness

According to the urban competitiveness theory of Ni Pengfei, urban competitiveness can be shown as six elements on account of its goal of interest and profit. It can be expressed by an equation as follows:

$$\text{Urban competitiveness} = \text{Scale} + \text{Quality} + \text{Efficiency} + \text{Growth} + \text{Employment} + \text{Structure}$$

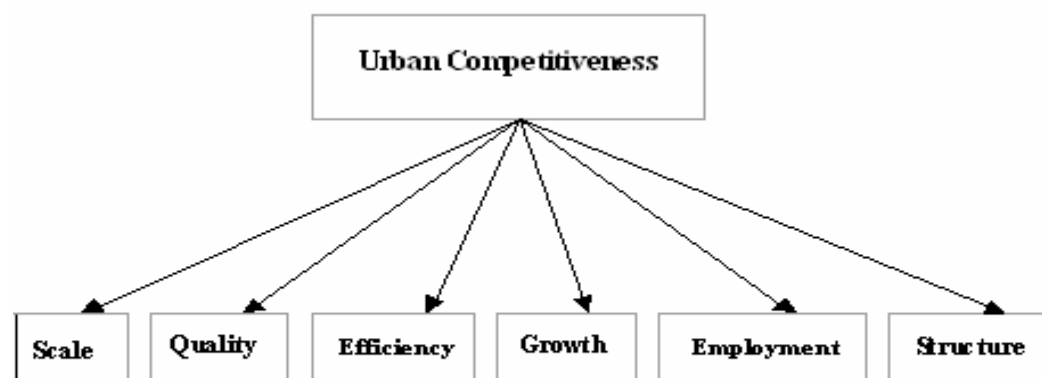


Figure 3.1 Framework 1 of urban competitiveness

Scale refers to a city's occupation of the whole urban product market, reflecting comparative scale of value created by the city.

Quality reflects the intensity and performance of the city. The city with a high index runs a high-quality economy and has strong innovative ability.

Efficiency is the central representation of ratio of output on input in the city's creation of value. The city with a high index has strong ability to integrate and utilize resources as well as to create high added value.

Growth reflects speed and potentiality of the city's value expansion.

Employment reflects the city's ability to adequately utilize human resources and to create employment opportunities, as well as the matching degree between industrial structure and human resources structure.

Structure reflects the characteristics of urban industrial structure. The city with a high index occupies the high-end of industrial value chain and is on a leading position in the competition.

Urban competitiveness can also be divided into 10 parts on account of its value system. It can be expressed by an equation as follows:

Urban competitiveness = Human resources competitiveness + Innovation and technology competitiveness + management of government competitiveness + others (including enterprise management competitiveness, culture competitiveness, location competitiveness, business environment competitiveness and so on)

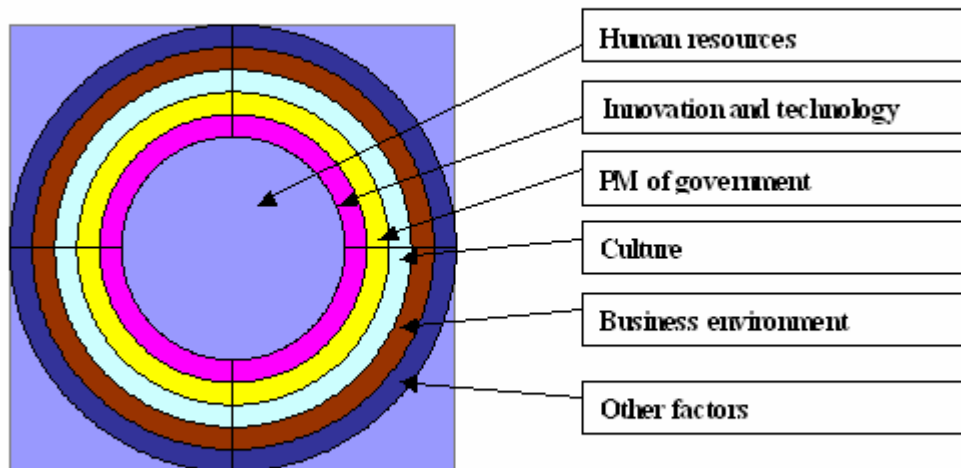


Figure 3.2 Framework 2 of urban competitiveness

Human resource represents the core of competitiveness integrating internal quality of talents and population structure. People are the center and subject of the city, as well as, the subject that creates wealth for the city. Hence, human resources is the core of city competitiveness, deciding the city's development and modernization levels. The internal quality of urban human resources includes their level of education, management, skills and income.

Innovation and technology is the spirit of the city and its competitiveness. The number of international patents and international theses are indices that directly indicate the innovation ability. It not only reflects the development level of innovation and technology, but also the ability to transform innovation and technology into economic growth.

(Other parts and factors are also important in urban competitiveness. However, in this

dissertation, we will only focus on the two parts above to analyze and discuss the relationship between human resources and urban competitiveness.)

Finally, Ni Pengfei (2002) thinks urban competitiveness can be regarded as the sum of all industrial competitiveness in a city. We can describe it as an equation as well.

Urban competitiveness = Urban industrial competitiveness

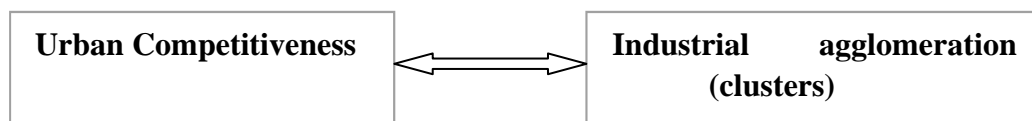


Figure 3.3 Framework 3 of urban competitiveness

Urban industries act as the role of instrument to reach and achieve the goal of creating value and wealth in a city. It also can be divided into several industrial clusters that consists of different industries and public institutions. Porter (1998) argues that, “a cluster is a geographically proximate group of interconnected companies and associated in a particular field, linked by commonalities and complementarities.” Clusters have become a key mode of economic co-ordination and focus on government policies in a city. Industrial clusters, that attract abundant labors and employees, are the fountainheads of urban economic and social development, which results in the increase of urban revenue and income of urban residents. Industrial clusters can facilitate establishment of innovation’s system in order to adjust the structure of industries as well as industrial upgrade. In additional, industrial clusters can help promote energy conservation and decrease economic costs. So, the development level of industrial clusters can reflect urban competitiveness in a city.

3.2 Human resources and human capital theory

We will present human resources and human capital theory, including introduction, and the aspects of the quantity of human resources, the quality of human resources and the collocation of human resources.

3.2.1 Introduction

The human resources of a country or an area depends upon the quantity and variation in the supply of labor. Measures are often generalized across populations. In a narrower sense, human resources refer to the population with fortune genius, or the population quantity that can service as a production factor by economic among gross population. They are not only the traditional labor resources, but also the reorganization of human physical performance, technical ability and intellectual function during the knowledge economy era.

The World Bank confirmed the affiliation between human resources and economic development in its *World Development Report 1990*. The World Bank estimated that 49% of the growth of the developed economies results from the contribution of its human resources. Knowledge enlargement and the popularization of education have contributed to this trend. This contrasts with a figure of 31% for the developing countries.

Human capital is in some sense the value of human knowledge and technical proficiency that a labor force contributes to economic production and activity, which is employed to yield current or future benefits. The knowledge, technical ability and physical performance of a person are not inherent but acquired via some material capital, psychological cost or other such cost. This is the so-called Human Capital Investment. The working capacity of any laborer is gained from this kind of investment.

In Lucas's opinion, the knowledge gained from a scholastic education but divorced

from production, is unclassified human capital which can produce internal effects. These include contributing to the productivity rate of investors themselves. Knowledge gained by learning from actual work is called specialized human capital. This can produce external effects, also called overflow effects, namely contributing to the productivity rate of other factors. External effects are more important than internal ones because they make it possible for the human capital level to be transferred among people. The consequent productivity rate increase not only affects the labor force but also material capital as well. Lucas explains technical advancement with human capital overflow effects, claiming that economic growth is a result of incessant human capital accumulation. He figures that knowledge is a form of human capital while human capital itself is an engine of economic growth.

Human capital is materialized via the value created by effective human work. Thus those without the ability or opportunity to participate in work lose their human capital and are incapable of producing value. For the individual, human capital represents the overall process, from young to old, of investment in knowledge acquisition and the subsequent increase in productive capacity. For society it is related to systems engineering, the provision of education, employment, medical treatment and health care and social insurance as well as board and lodging and economic development. Thus human capital theory becomes the theoretical basis of human resources exploitation.

The conception of human resources as a macroscopic and recapitulative category with a hierarchy which contains not only natural human resources, known as work ability (owned without any form of education and training, also called the ability of engaging simple work), but also the ability and knowledge of the laborer enabling him to engage in complicated work after pre-job training. Human resources are a simple coagulation of all the educational investments (investments of learning obtained during actual work, medical care and migration are included) and refer only to the

ability and knowledge used to engage in complicated work. In a country with ample labor forces such as China, the human resources are abundant while the gross human capital is poor because of the low-level knowledge and ability. Secondly, human resources lays emphasis upon the quantity and health status of laborers while paying little attention to their quality. That is to say, they do nothing but pay attention to the quantity of labor and ignore its heterogeneity. However, human capital lays stress on the heterogeneity of labor, namely labor quality. This characteristic of human capital has vital operational significance because its increment may offer extra labor quantity without increasing labor force quantity. As the world's economy runs to today, human capital has been playing an important role in human resources.

Talent represents that aspect of human capital with better adherence basis as well as being an elite factor of human resources. According to statistical analysis, there is a high correlation between talent and economic development. Examination of the average increment in speed per year from 1978 to 2003, reveals an incremental increase of gross talent of 7.34% while that of the GDP is 9.38% in China. Thus, the elastic coefficient of economic development increment to that of gross talent is 1.28. That is to say every 1% increment of gross talent will bring an increment of 1.28% to economy. (*China Talent Report, 2005*) This analysis suggests that human resources have contributed much to economic development. Moreover, human resources possess special operational significance for China during economic takeoff times.

3.2.2 The Quantity of Human Resources

The guideline for the quantity of a city's human resources is provided by the gross population, number of employed persons and quantity increment of jobholders in the city.

Whether the human resources are abundant or not relates directly to the development of an economy. A certain population is the precondition and base of civilized society

and economic development. However, it doesn't mean simply the bigger the population quantity and scale are the better it will be. It is generally recognized by scholars that the human resources of China have exceeded the requirement of economic development when discussing the relationship between Chinese human resources and economic development. Professor Huanchen Wang has built a matrix relationship for Chinese human resources and their quantitative change and economic surplus via computer analogue simulation. According to his research, only when the relationship between the growth rate of human resources and economic surplus is of positive value, will the supply of human resources produce an economic increment. The optimum point of the growth rate of human resources he calculated to be -0.6%. There is no doubt that China has exceeded this level (Huanchen Wang, 1991). At present, yearly-increase in the population of China is enough to balance out 1/5 or so of the newly-produced GDP during the same period.

The increment of human resources must adapt to the development of city's economy. Overfull jobholders, especially the surplus of low-skilled workers, not only will not boost the development of city economy, but may cause the reverse. However, the shortage of human resources, especially skilled labor and advanced talent, will restrict the extension of industries with high added-value and the continuous promotion of industry structures, and block the development of city economy as a consequence.

3.2.3 The Quality of Human Resources

The quality of human resources refers to its character, including cultural, technical and mental characteristics and such like. The quality of human resources refers to the sum of its physique, intelligence, knowledge and skill. The formation of quality of human resources is impacted by congenial conditions while its advancement is impacted by education. The improvement in the character of human resources in

certain areas has an important effect on the economic development. The contribution made by higher character human resources to economic development derives mainly from increased innovation, ability and productivity. New techniques may be adapted to implement production more quickly and hence enhance productivity and output. The character of human resources could be improved by investing in it. Lucas, the representative figure of new growth theory, thinks that investment in human resources could not only improve our own proceeds, but also increase that of other investing factors by degrees to reinforce the economic increment.

The quality of human capital influences the development of a city's economy by impacting the competitive advantage of its industries. Human resources and investment with high quality could give the city's industries some competitive advantages in resources and products as well as provide the possibility for industrial innovation at the same time. As soon as technical invention and innovation have been industrialized to form new products, city industries can acquire enhanced proceeds by monopolizing the price of products. There are many things that we call consumption that actually belong to the domain of human capital investment, such as education, training, hygiene, migration and so on. Because people wish to improve their physical performance, knowledge and skill, the marginal benefits of effective work will increase by investing in these activities. This brings economic increment and an improvement in the individual's income.

The research conducted by the World Bank also shows that all the countries paying attention to human resources exploitation have a higher economic developing speed than those countries relying only on natural resources exploitation. Lucas points out that the difference between economic development and income level of two countries mainly comes from the human capital they invest in producing products. The country with a high human capital growth rate has a high national economic growth rate, i.e. the higher the human capital level of a country, the faster the human capital

accumulates. Thus the capital revenue will be higher, whereas for those countries with indigenous human capital stock, it is much difficult to accumulate human capital and acquire better capital revenue.

3.2.4 The Collocation of Human Resources

Human resources collocation helps to launch human resources into social production and other activities, for use according to the economic development targets of the society. It is a precondition for the full use of human capital, as well as one important factor of economic development strategy implemented in a country or area. Reasonable, effective and benign human capital collocation promotes economic increment.

Reasonable human capital collocation refers to the highest output rate of human capital investment. It includes the coordination of economic targets and reasonable collocation, productivity and contributes to equality, economic output and social stability, as well as social laboring and housework etc.

Effective human capital collocation refers to the input of human resources and accords with the principle of output more than input. Only if human capital collocation accords with high efficiency principle, is it possible to improve the situation of insufficient use of resources in economic operation and enhance the proceeds of the national economy.

Benign human capital collocation is to invest human capital into different areas, departments or industries to form a benign human capital using structure. Reasonable human capital collocation depends on: 1) adapting to the requirements of economic development level for the whole society; 2) satisfying the needs of the main parts of national economic construction; 3) acquiring better economic proceeds.

3.3 Endogenous growth theory

We will use the endogenous growth theory to explain how human resources and capital function in the growth and development of economics.

3.3.1 A brief introduction of Endogenous growth theory

The endogenous growth theory was originally started by some researchers who were dissatisfied with the neoclassical approach. The main purpose of this new growth theory was to replace the Solow long run steady state of zero per capital growth, and to focus on research and development (R & D) activities, which could introduce new or more matured products that would produce greater profits, and ensure them ahead of any competitors. The theory explained that as new knowledge was translated into goods with practical value (Romer, 1990), with more and more sophisticated products being introduced to a given market, the profits from additional investment in R & D activities should diminish. So Romer's conclusion is that, when the development of new and advanced instructions is equivalent to incurring a fixed cost, the decreasing incentive for continued R&D investment is usually offset by the fact that once the cost of creating a new set of instructions has been incurred, the instructions could be used over and over again without any additional cost. Thus, the profitability of new R & D investments is maintained over time since they result in long-term growth.

3.3.2A outline of Romer's model

Romer's (1986) research started the overall study of the endogenous growth theory, by offering alternative view of long-run prospects for growth. Romer proposed a model in his paper, 'Increasing Returns and Long-Run Growth', in which economic growth is driven by the accumulation of knowledge. His arguments was refined and developed by Lucas (1988). In his paper of 1986, Romer proclaimed, "that long-run growth was driven primarily by the accumulation of knowledge." He pointed out three elements that defined the difference between knowledge and physical capital:

First of all, the development of new knowledge has a positive external effect on the production possibilities of other firms, which cannot be perfectly patented or kept secret. For once one discovers how something can be done, others will try to duplicate it with the hope to reduce costs, whether those who have created the new knowledge or the firms that duplicate it. That is to say, the initial development cost is high, but after it has been paid, the knowledge can be reproduced at very little cost. Take the Internet as a good example, it was first developed for restricted military use. However today it has become a metaphor for the global village with no center, all connected from the superhighways of America to the cyber coffee shops in the shanty townships of the poorer countries.

Secondly, the creation of new knowledge exhibits diminishing returns. That is to say, even though an investor might double his input into research, he could not double the amount of new knowledge produced. That means, though one can buy a factory that produces 10 computers a day, one cannot buy a team of researchers and get 10 developments a year. Therefore, the more money one pours into research, the less one may get back (Romer, 1986).

Lastly, new knowledge is more profitable when it leads to a more efficient production. That means making something which can quickly be put together, and cheap to produce, rather than just simply make something that works. It is a fact that consumers tend to buy the cheaper products with equivalent quality. Obviously, on this point, Romer believed that knowledge production had many side-benefits. However, endogenous growth does not just happen (Romer, 1990).

3.3.3 Four prominent preconditions

“Endogenous Technological Change,” the model of Endogenous Growth is based on four basic inputs: Firstly, capital, which is measured in units of consumption goods,

must be readily available. Secondly, labor, which is known and measured as skills available from a healthy human body, must also be in its place. Thirdly, human capital, which is defined as activities including formal education and professional training, is a necessity of endogenous growth. Whereas, the latter one is noted by Romer (1990) as being person-specific: If the person who knows how to multiply died, the skills grasped by that only person would be lost from the pool of human capital. Fourthly and lastly, in order to provide efficiency, it is always necessary to include an index of the level of the technology (Romer, 1990).

3.3.4 The development of endogenous growth theory

The key point of Romer's model lies in the expression "An adequate stock of human capital". Romer found out that "what is important for growth is integration not into an economy with a large number of people but rather into one with a large amount of human capital" (Romer, 1990). Thus, to promote growth, economic policies of the leading countries should greatly encourage investment in the field of new researches, and if this is not possible, the governments should at least subsidize the accumulation of total human capital. Romer (1990) also states that today, even a less-developed economy with a very large population could still benefit from economic integration caused by globalization, and the economy which has a large stock of human capital would experience faster growth. Romer also points out that knowledge is a non-rival product—this means that if one knew how to add and another person learnt how to add, they could both add at the same time. On the other hand, a calculator was a rival product, which means two individuals could not use it at the same time. According to Romer's point of view, technological advance comes from things that people do. It is based on the fact that things do not just happen. What Romer means is that technological advances only gain when people start experimenting or looking for market niches. Romer's theory can be used to explain the development and the decline of IBM. IBM emerged because a firm wanted to be competitive; IBM grew and expanded because it needed a new market; IBM then failed because Asian

countries successfully copied cheaper clones, and they managed to produce computers with equivalent computing power at much cheaper costs.

3.4 Theory of innovation and transform of technology

History has shown that innovation and transformation of technology play an important role in the development of society and economy. Inventors who bring important innovation and new technologies to our world are of more importance

3.4.1 Brief introduction

Innovation and technology are the spirit of a modern city and they are the critical components of a city's competitiveness. We can analyze a city's innovation and technology through the following three steps. First, we should look at city's ability to generate innovation and new technology. This is directly related to the human resource and level of technological development of the city. One of the important indices of a city's innovation ability is the number of international patents that are hold by the city's individuals and companies. These indices reflect the abundance of technological resources a city has, and it apparently reflects the level of the innovation and technology developments. The indices also have the advantage that we can use it to quantify otherwise qualitative innovation and technology ability. We will discuss this further in the following chapters. Second, we need to look at how well the city utilizes its innovation and technology ability in its economic production, and further, increases its economic growth. This is usually an important part in a city's development, and it sometimes dictates a city being competitive or not. Finally, after we proved the importance of the city's ability in innovation and technology, and its ability in using them in its economic development, we should look at the environment that nurtures all, from people, technology, and finally, the competitiveness and development of the city. We should realize that relying on any external force to push an innovation and technology transition would be a costly failure. An environment that absorbs and cultivates human resource, and a complete system that rewards innovation and new technology users in economic production, will be proved to be the

most important necessities a city should have to be competitive and to have a fast and long-lasting healthy development.

3.4.2 The role of inventors

Inventors have traditionally been a source of new technologies that have powered the growth of the regional or the national economy. In the late twentieth century, innovation, the process of transforming an idea into a new product or service, appeared to be playing a more vital role than ever before. Innovation, and those who carry it out --- inventors among them --- have thus become the subject of extensive research aimed at achieving greater understanding of technical entrepreneurship. Increasingly, inventors have also been the beneficiaries of the long-lasting growth of the urban city designed to encourage and accelerate the innovation process. More emphasis has been placed in the transformation of the new technology in production line as soon as possible.

3.4.3 Human factors in innovation process research

According the Free Encyclopedia, Robert Solow won the Nobel Prize in 1987. He was awarded this prize because he demonstrated that sustained economic growth requires technological innovation. In his research, he proved that there are essential relationship among factors such as R & D, innovation, technology transfer, and entrepreneurship and so on. Hence, it will lead to desired social outcomes as job creation, economic growth, and enhanced competitiveness (Ellin, 1979; Maidique, 1980; Bruun, 1980; Kurz, 1983; Birley, 1986; Kirzner, 1983; Birch, 1993).

By knowing and appreciating the desirable results of the innovation process, the importance of making it function more effectively is becoming more evident. Meanwhile, there are considerable literatures on human factors as well as concerning on economic growth. The high capacity technological workers play an important role in the innovation process not only they are crucial parts of human resources but also they directly transform the technology innovation into efficiently production.

By applying models and developing categories of new business ventures, analysts of entrepreneurial diversity have found, within the wide variety of firms and entrepreneurs, patterns that have practical applications to the management of technology transfer (Gartner 1989) including the need more effectively to couple creative people such as inventors to that process (Ehretsmann, 1989).

It is important to managers of government innovation programs because it can help direct scarce resources to inventors with the greatest probability of commercial success. It also indicates the types of assistance that will be most instrumental in accelerating some inventors for the motivations that underlie the choices made by inventors in the development of their technologies. Inventor motivations need to be considered in government-sponsored innovation programs because the success of a program requires that there be some degree of overlap between the government's goals and the inventor's own definition of success.

3.5 Cluster's theory and Porter's Diamond

Porter's cluster's theory indicates the relationship between human resources and clusters and points out the fact that human resources has an important role in clusters.

3.5.1 Introduction

In 1990, Michael Porter of the Harvard Business School published the results of an intensive research effort that attempted to determine why some nations succeed and others fail in international competition. In his research, Porter developed his Diamond theory where four broad attributes of a nation shape the environment in which local firms compete, and these attributes promote or impede the creation of competitiveness advantage. Michael Porter popularized the concept of industry clusters in his book "*The Competitive Advantage of Nations (1990)*". Porter also developed the "Diamond of Advantage," in which four factors create a competitive advantage for

firms. The four corners of the diamond include factor conditions, demand conditions, industry strategy/rivalry, and related and supporting industries.

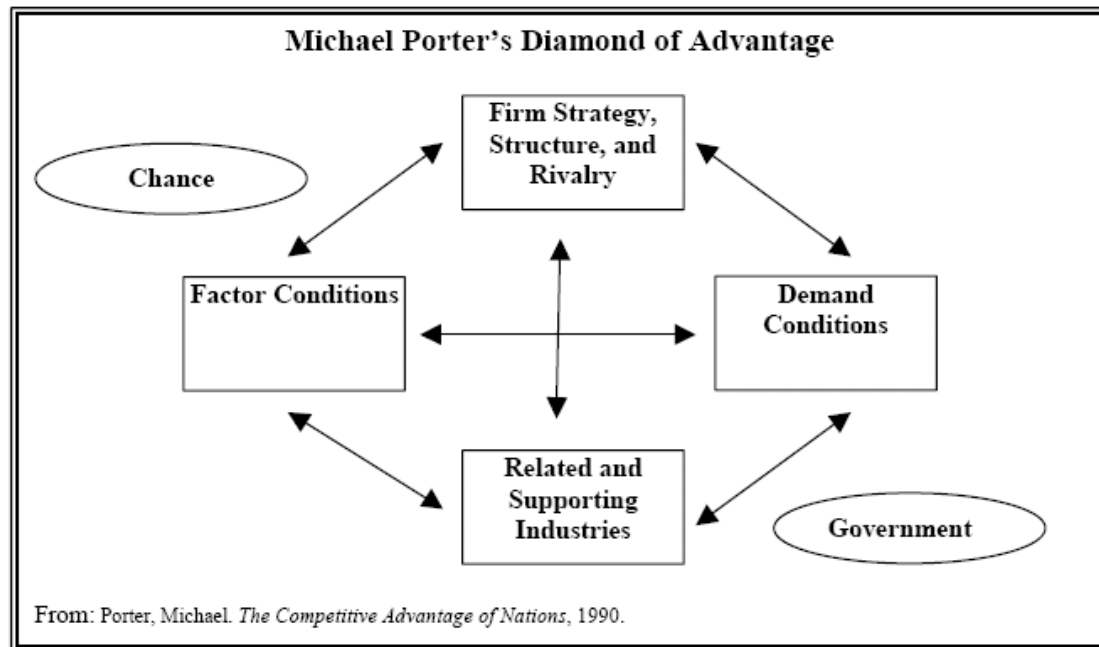


Figure 3.4 Porter's Diamond of Advantage

Factors conditions indicate that the region's position in factors of production, such as skilled labor or infrastructure, necessary to compete in a give industry.

Demand conditions refer to the nature of home demand for the industry's product or service.

Related and supporting industries are the presence or absence in a nation of supplier industries and related industries that are internationally competitive.

Firm strategy, structure, and rivalry means the conditions governing how companies are created, organized, and managed, and the nature of domestic rivalry in a city.

Porter used this diamond to determine which firms and industries had competitive advantages, and his emphasis of the importance of related and supporting industries

encouraged an interest in clusters. While his original thesis was applied to nations as a whole, Porter recognized that the majority of economic activity takes place at the regional level. Thus, his ideas are commonly applied to cities and regions. Michael Porter (1990) argues that competition is a driving force behind cluster development. Clustering is a dynamic process, and as one competitive firm grows, it generates demand for other related industries. As the cluster develops it becomes a mutually reinforcing system where benefits flow backwards and forwards throughout the industries in the cluster. Porter argues that it is the competition between rival firms in the cluster that drives growth because it forces firms to be innovative and to improve and create new technology. This, in turn, leads to new business spin-offs, stimulates R & D, and forces the introduction of new skills and services. Because many of the industries within the cluster employ a similar labor force, the labor force can freely move to other related firms within the cluster, thus transferring knowledge to new firms, and continuing to promote competition and, therefore, growth. This growth can either lead to increasing the vertical integration of the cluster, or it can lead to the horizontal integration of the sector. Increased vertical integration occurs as the division of labor gets more specialized, and new firms are able to fill the new niche markets. Horizontal clustering occurs as the new technology and labor skills are applied to related industries in different sectors. Porter points to Silicon Valley as an example of how competition has spurred the horizontal clustering process.

3.5.2 Human resources in factor conditions

Human resources, as a factor in the Diamond, is the quantity, skills, and cost of personnel (including management), taking into account standard working hours and work ethic. Human resources can be divided into a myriad of categories, such as toolmakers, electrical engineers with PhDs, applications programmers, and so on. It is also the stock of scientific, technical, and market knowledge bearing on goods and services. To some extent, human resources resides in universities, government research institutes, private research facilities, government statistical agencies,

business and scientific literature, market research reports and debates, trade association, and other sources.

3.5.3 Industrial cluster's development

Raymond Vernon initially proposed the product life-cycle theory in the mid-1960s. Vernon (1966) argues that the life cycle of product is divided into three stages including new product period, mature product period, and standard product period. This theory is also used in the term of industrial cluster's development. As Ni Pengfei argues (2004), the cluster's life cycle is divided into three stages, which are birth period, growth and maturity period, and fall and upgrade period. Industry dynamics show the common life-cycle pattern. The number of firms, public institutions and employees initially rises and later falls as an industrial cluster evolves. Consequently, we can draw the trace of cluster's development through the development of firms, public institutions and human resources in an industrial cluster.

3.6 Empirical Model

According to the discussion above, we set up an empirical model that shows the relationships between all factors. We will indicate the relationships between form A and form B in the view of a case study of Ningbo, in order to argue further the relationship between human resources and urban competitiveness.

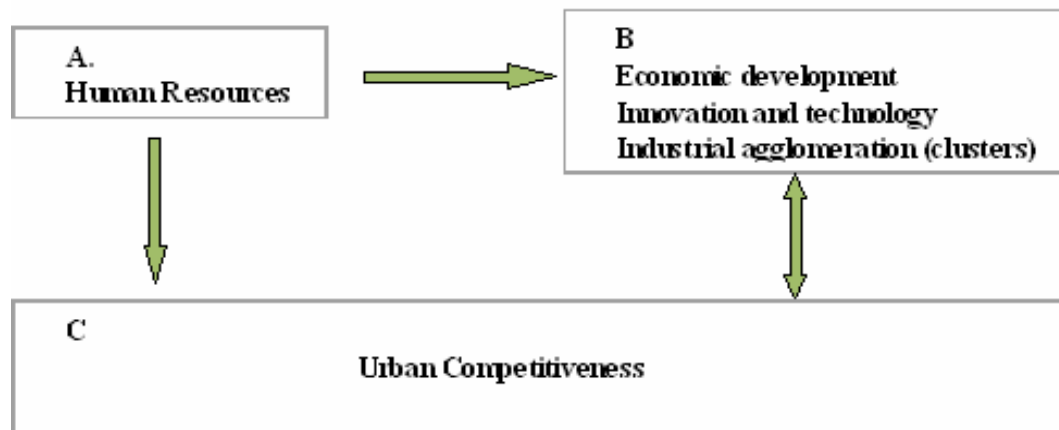


Figure 3.5 An empirical model

3.7 Summary

In this chapter, we discuss the theories that show the basic concept and embodiments of urban competitiveness. We focus on four terms, which are human resources, economic development, innovation and technology, and industrial clusters. Then, we present several theories to indicate the relationships between human resources and economic growth, human resources and innovation and technology, human resources and industrial clusters. Finally, in order to show the emphasis of our study case, we set up an empirical model to illustrate the relationships among urban competitiveness, human resources, economic growth, innovation and technology, and industrial clusters.

Chapter 4 Empirical Method

In this chapter, the case study will be presented. The limitation, validity, reliability and generasbility are also discussed.

4.1 Case study

In this dissertation the research strategy is to use a case study. The case study can be a worthwhile way of exploring existing theory (Saunder et al. 2003), and this strategy is of particular interest because we wish to gain a rich understanding of the context of the research and the process being enacted (Morris and Wood, 1991). Because of such abstract theories mentioned above, we are afraid that it is too difficult to understand without the adoption of a concrete sample. We intend to find out the extent to which the competitiveness of Ningbo city can be explained by those theories. With the help

of the exhibition of a vivid sample, the abstract theories will become more and more simple and clear. In addition, the fast development of the economy and society of Ningbo city also require reasonable theories to guide. Then, with correct guideline, Ningbo city will make a sustainable progress in the following years.

The case study is very helpful to generate answers to the question “why?”, “what?”, and “how?” (Saunders et al. 2003). As government officials, we are encouraged to find the real reason to why Ningbo city developed so fast, what factors contributed the success of Ningbo city, how it could exceed other cities in China and how it can keep the developing trends in the future. We used Ningbo garment cluster as an example to indicate the relationship between human resources and clusters because Ningbo garment cluster is the typical representative of Ningbo industrial clusters.

We intend to analyze three aspects of competitiveness of Ningbo city, economic development, industry clusters and technology innovation. They are the foundational factors of the Ni Pengfei theory and the competitive theory of Porter. We select those three aspects depending on the following reasons. First, according to the literature, those factors are always the main influential indexes. Second, among the other factors such as fundamental conditions and cultural factors, these three factors make up the fundamental structure of the theory of Ni Pengfei, which is the main theoretical basis in this dissertation. Third, the data about these three aspects are easily found in the governmental bulletin and can more easily be accepted by average people.

4.2 Limitations

There are several limitations existing in our research. One is the completeness of the factors we adopt in the dissertation. Due to our limited knowledge, we only selected a familiar area to do research, which may cause the whole dissertation less perfect. We only selected Ningbo city as sample to deduce the theory and to discuss the developing trend in China, which to some extent is less convincing. As far as the data

collection is concerned, the omission of the primary data adversely affects the convincingness of the whole dissertation. The limited time also prevents us from carrying out a deeper analysis in this field.

4.3 Validity

Validity examines the casual relationships between two variables and if the findings are what they appear to be (Saunders et al. 2003). According to Robsson (2002), there are some threats to validity, namely history, testing, instrumentation, maturation and ambiguity about casual direction (Saunders, Lewis and Thornhill, 2003). We take the following methods to avoid the possible threats to the validity as we can. All the secondary data come from governmental sources, which are seen as the most convincing in China. When some data are conflict, we always use the most recently published data. All the theoretical information originates from the most famous people connected with the relevant area, such as Porter from America and Ni Pengfei from China.

There are some problems affecting the validity of this dissertation. One is the incompleteness of the data. For example, we would like to analyze the extent to which the advanced workers affect the transfer of innovation of technology. But the number of workers in recent years is not available, so we have had to leave this section out, which to some extent makes the analysis less perfect. Another problem has to do with the aggregations and definitions. The definitions of data variables may not be the most appropriate for our dissertation because those data only meet the requirements of the original research (Saunders, 2003).

4.4 Reliability

Reliability refers to how well the research leads to the same results on other occasions and if other researchers could reach similar results (Saunders, Lewis and Thornhill, 2003). We write in a way to minimize the threat of unreliability. So, we always intend to use secondary data nearest to the original sources. For example, there are several

sources where the number of skilled workers is available. In most case, those figures are occasionally small differences. although there are small differences existing occasionally. We only use the data from the workforce bureau, which is in charge of the management of the workforce. When data have been complied, more attention is paid to examine how the data were analyzed and how the results were reported (Saunder, 2003).

Some problems of reliability still exist. Because of the limitation of time, we only search for data useful for our dissertation. We do not assess the whole context. Sometimes the data were collected for a particular purpose and more likely to be useful as a source of the writer's perceptions and views than as an objective account of reality (Saunder, 2003). The governmental documents also have this shortcoming.

4.5 Generalisability

Generalisability is sometimes referred to as external validity and whether the findings are applicable to other research settings (Saunder, Lewis and Thornhill, 2003). As mentioned in the introduction above, this dissertation aims to evaluate the extent to which human resources play an important role in the process of the development of cities. The competitiveness of a city or region or even state is discussed all over China and the world. We selected Ningbo as case study to carry out an in-depth analysis. Many researchers intend to answer the question "why?" and "how?" about the development of Ningbo. To some extent our results may be used as guidelines for other regions of China that are puzzled and lost at a cross road, finding no power to promote the local economy and social progress. Also, the theoretical basis constructed is derived mainly from the classic authorities Porter and Ni Pengfei, who are now prevailing in China due to the model they created to evaluate the contribution that the human resources, technology and other factors make to the development of the competitiveness.

4.6 Summary

The case study used in this dissertation will help to understand the abstract theory in a simple way. Ningbo city introduced as a sample will be helpful to make the relationship between human resource and competitiveness clearer. Several measurements have been taken into consideration to make this dissertation more convincing, valid and reliable although there are inevitably some factors effecting the validity and reliability. The results drawn from the analysis will be certainly a guideline for the development of other regions in China.

Chapter 5 A Case Study of Ningbo

In this chapter, we will discuss the relationship between human resources and economic development, innovation and technology, and industrial clusters in case study of Ningbo.

5.1 Relationship between Human Resources and the Economic Development of Ningbo City

We will discuss in depth how economic development is influenced by the quantity and quality, as well as allocation of human resources.

5.1.1 Introduction

We need to confirm some measuring guidelines before investigating the relationship between human resources and economic development in Ningbo.

First of all, we need to confirm the guidelines for measuring its economic development status. A city's economic development status finds expression in two

main aspects – economic strength and economic growth. Economic strength is mainly determined by the gross economy or economic scale. Gross economy reflects a city's actual output and development status and represents the base of sustainable development and general competitiveness. No matter how strong the general competitiveness is, it will be of little account if it lacks the support of gross economy. Judging from general experience, the bigger the gross economy, the city strength it reflects will be more forceful, and greater city competitiveness will obtain under certain circumstances. Economic growth is a complicated dynamic process consisting of a series of factors which integrate into and act upon each other. There are many elements that determine economic growth, the main determinants being capital, the labor force and technical advancement. In addition, institutional, organizational, cultural as well as governmental factors influence economic growth indirectly by changing factor input and production. From the viewpoint of a city, its economic growth is determined by its geography, economic environment and its natural resources. To a large extent, the growth speed of a city decides the level of its competitiveness.

With regard to the above mentioned, we choose GDP and per capita GDP as the guideline for measuring economic development when researching the relationship between human resources and a city's economic development. There is one thing that we must point out and is that there is definitely that the relationship between economic development and the guidelines used is not always a simple, positively correlated one.

Secondly, we need confirm the guideline for human resource measurement. Human resources comprise the principal part of productivity. People mastering certain knowledge and labor skills, is the most positive and active factor among all those influencing productivity and it will become a determining factor in economic development, along with the development of the economic society. Scale, structure, quality, capital input as well as the relation between supply and demand of human

resources in a city act directly upon a city's competitiveness. Therefore, we choose guidelines and data such as gross population, number of Employed Persons, number of university students per thousand of population, the proportion of persons with junior college or above educational background, and the distribution of professional technical manpower in different industries to measure and reflect the relationship between human resources and a city's economic development.

5.1.2 Human Resources Status Quo of Ningbo

According to the *China Education and Human Resources Problem Report* published in Feb. 2003, the population with higher and secondary education in developed and new-style industrialized countries accounts for a higher percentage than in other countries. In the U.S.A. and Korea for instance, the population from ages 25 to 64 with higher and secondary education accounts for a percentage of 87 and 66 respectively, of which the proportion of population with higher education is 35% and 23% respectively. In contrast, in the year of 2000, the population in China from ages 25 to 64 with senior high school education or above accounts for only 18% while that percentage of the population with junior high school education or below is 82%, and about 42% have only elementary level education or below. There are less than 5 in 100 with a junior college education or above.

According to data from the National Population Census 2000, the proportion of the population with senior high school education and technical secondary school education and above, to gross population aged 6 and above in Ningbo is as follows.

Table 5.1 The share of population with educational status above senior high school and technical secondary school among population aging 6 years above in 2000

Education Status	Countrywide	Zhejiang	Ningbo	Hangzhou	Xiamen	Dalian	Shenzhen
Junior College or above(%)	3.88	3.40	3.44	7.20	8.37	8.64	8.06
Senior High School and technical secondary school (%)	11.96	11.46	11.79	13.73	17.64	15.31	22.34
Total	15.84	14.86	15.23	20.93	26.01	23.95	30.4

Source from: Main data gazette of the fifth national population census in 2000

According to Table5.1, the proportion of the population with junior high school education and above, as well as senior high school and technical secondary school education in Ningbo, while higher than that of Zhejiang Province, is under the countrywide average. Compared with Hangzhou, Xiamen, Dalian and Shenzhen, there is an obvious difference with a straggling percentage of 5.7, 10.78, 8.72 and 15.17 respectively. In general, the human resource quality in Ningbo is comparatively low and it is not so easy to recruit advanced talent.

5.1.3 Economic Development Status Quo of Ningbo

During recent years, the national economy of Ningbo has been increasing rapidly and steadily. In the year of 2005, the GDP of Ningbo was RMB 244.64 billion and the gross ranks the 5th among 16 cities of Yangtze Delta. Calculated with reference to comparable prices, there's an increment of 12.5% compared with 2004. Thus, the primary industry have an added-value of RMB 12.884 billion representing an increment of 1.8% while that of the second industry is RMB 135.353 billion or an increment of 11.8%, and that of the third industry is RMB 96.403 billion or an increment of 15.2%. Figure 5.1 shows the statistical data of three industries of Ningbo from 2001 to 2005.

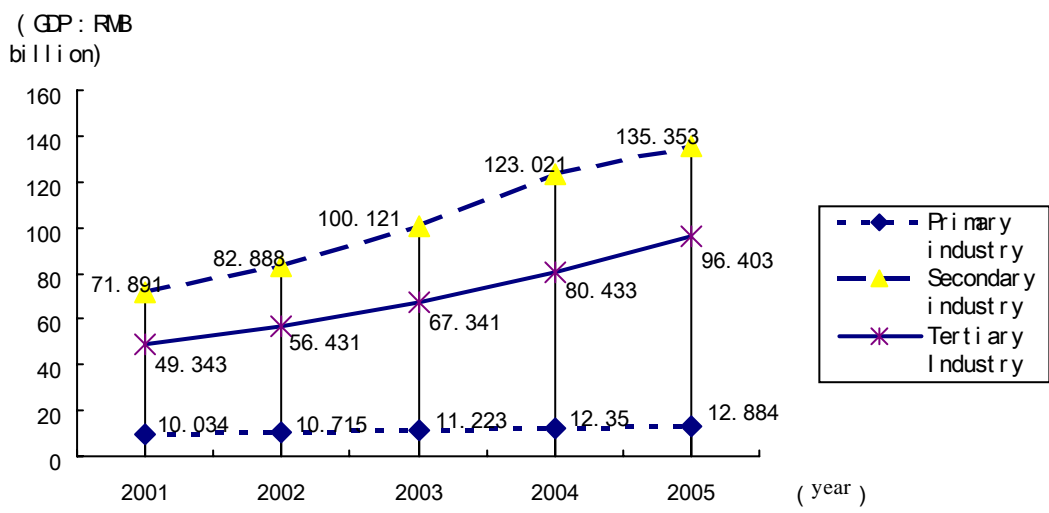


Figure 5.1 Three industries' GDP current chart of Ningbo from year 2001 to 2005 Source from: *Ningbo Statistical Yearbook*

From Figure 5.1 we may see that three industries of Ningbo have increased by various degrees and the economic structure has been optimized gradually during recent years. The Primary industry maintains a steady developing state while its share of the total output value has decreased continuously. The Secondary industry continues to increase rapidly with its share among the three industries slightly improved and it's still the driving force of rapid economic development in Ningbo. The Tertiary Industry has increased powerfully with its proportion of the total unchanged on the whole.

5.1.4 Relationship between the Quantity of Human Resources and Economic Development

Now we will discuss the relationship between the quantity of human resources and economic development in Ningbo by analyzing and researching the relationship between population and Per Capita GDP, the number of Jobholders in the three industries and the GDP of Ningbo from 2001 to 2005.

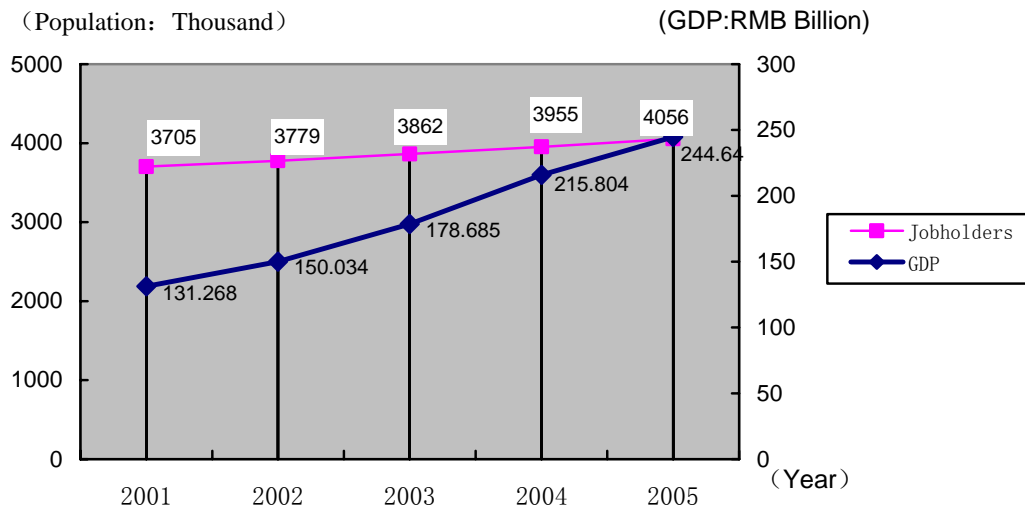


Figure 5.2 Current of Jobholders and GDP from 2001 to 2005

Source from: Ningbo Statistical Yearbook

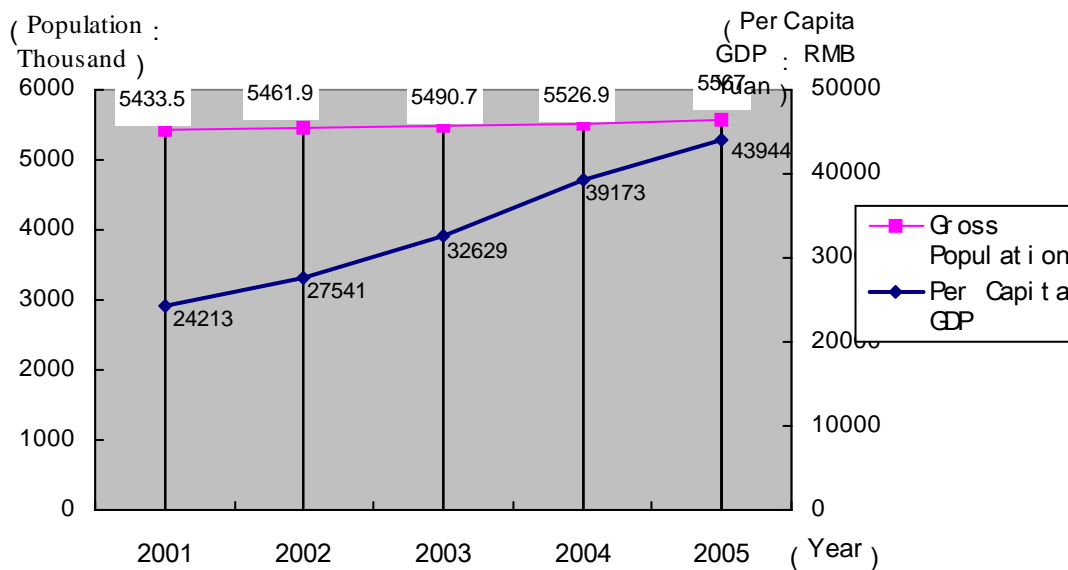


Figure 5.3 Current of Gross Population and Per Capita GDP from 2001 to 2005

Source from: Ningbo Statistical Yearbook

Referring to Figure 5.2 and 5.3 we may see that the increments of gross population and number of Jobholders are far less than that of GDP and per capita GDP from 2001 to 2005.

Table 5.2 Jobholder numbers and GDP currents of three industries 2001—2005

Item		Year 2001	Year 2002	Year 2003	Year 2004	Year 2005
Jobholders (Thousand)	Primary Industry	987	933	881	795	701.7
	Secondary Industry	1897	1944	1984	2014	2044.3
	Tertiary Industry	821	902	997	1146	1310
	Total	3705	3779	3862	3955	4056
GDP (RMB Billion)	Primary Industry	10.034	10.715	11.223	12.35	12.884
	Secondary Industry	71.891	82.888	100.121	123.021	135.353
	Tertiary Industry	49.343	56.431	67.341	80.433	96.403
	Total	131.268	150.034	178.685	215.804	244.64

Source from: Ningbo Statistical Yearbook

According to Table 5.2, from 2001 to 2005, the number of Jobholders in the Primary Industry of Ningbo reduces by 285.3 thousand with a reducing percentage of 28.91 while that of Primary Industry GDP increases 28.5% with a fine situation of economic development. The GDP increment of both the Secondary and Tertiary industries has exceeded that of Jobholders. That is to say, the number of Jobholders in the Primary industry has a negative correlation with GDP while that with the Secondary and Tertiary industries is positive. It is obvious that the fluctuation in the quantity of human resources will not always cause a relative quantity alteration of GDP. Thereby we may arrive at a conclusion – it is not certain that a simple increment in human resources will impulse the economic development of Ningbo within limits.

5.1.5 Relationship between the Quality of Human Resources and Economic Development

Now, we will analyze the relationship between the quality of human resources and economic development in Ningbo with regard to the effects due to the changes in numbers of university students per thousand and the professional technical personnel. We will try to estimate their contribution to the GDP and per capita GDP of Ningbo from 2002 to 2004.

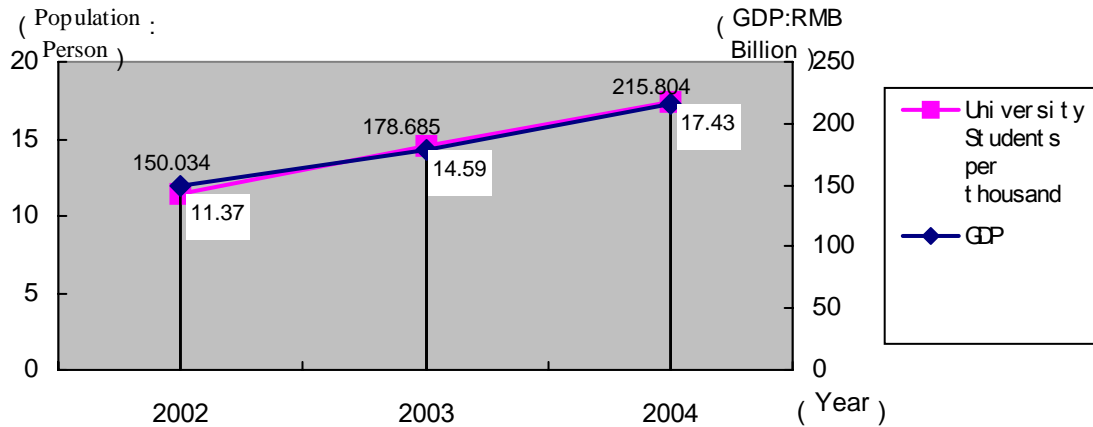


Figure 5.4 Changing Current of GDP Increment and Education Investment from 2002 to 2004 Source from: Ningbo Statistical Yearbook

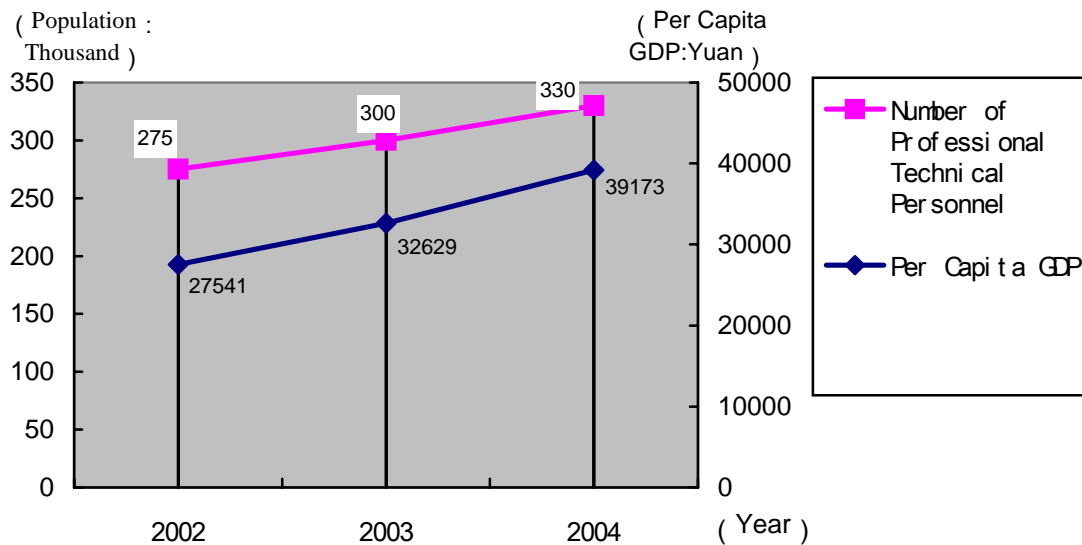


Figure 5.5 Changing Current of Per Capita GDP Increment and Professional Technical Personnel Increment from 2002 to 2004

Source from: Ningbo Talent Development Report 2006, Ningbo Statistical Yearbook

From Figure 5.4 and 5.5 we may see the increment in professional technical personnel and education investment has had a great effect on GDP and per capita GDP for Ningbo and these four factors increase mostly in step. The increment in education investment enhances the quality of the human resources of Ningbo while the

increment in human resources with high performance promotes the economic development of Ningbo. Therefore we may arrive at a conclusion: under the circo of slow increment of jobholders, the reason that GDP still increases rapidly is due to the rapid increase in talent, such as professional technical personnel etc. That is to say, the improvement in human resource quality promotes effectively the economic development of Ningbo.

5.1.6 Relationship between Human Resources Collocation and Economic Development

Human resources collocation must be in accord with the rules of industrial development so that it may promote economic development effectively. Looking at one country or area, its economic development process is no other than the process of its industrial development, namely, a process of industrial structure alteration. This is manifested by the status alteration of the three industries during the process of economic development. If we make a comprehensive survey of the world's economic development, we may see that the three industries structure has a changing current from 1-2-3 to 3-2-1 (Here 1 means Primary Industry, 2 means Secondary Industry, and 3 means Tertiary Industry. 1-2-3 here is a pattern to show that Primary Industry ranks the top, Secondary Industry ranks the second and Tertiary Industry ranks the third in whole industry; in contrast, 3-2-1 here shows Tertiary Industry ranks the top, Secondary Industry ranks the second and Primary Industry ranks the third in whole industry. This pattern is also used in the context). This current mainly appears in aspects such as human resources collocation and GDP structure and so on.

First of all, let's have a look of the changing current of human resources collocation, also called the changing current of three industries labor force proportion. During economic development, the labor force first transfers from the Primary Industry to the Secondary one. When economic development reaches a certain stage, the labor force begins to transfer to the Tertiary industry. The distribution pattern for the labor force

in these industries is such that the labor force engaging the Primary industry will reduce while that in the Secondary and the Tertiary industries will increase. This is not only shown by the time series of one country's economic development. One also draws similar conclusions from comparisons of cross sections of the same point of time of countries at different developmental levels. The higher a country's economic development level, the lower proportion of the total labor force engaged in the Primary industry. Alternatively, the lower a country's economic development level, the greater the proportion of its labor force that is accounted for by its first industry, while that for the Secondary and the Tertiary will be less. Thus the proportion sequence of three industries' labor force will definitely transfer from 1-2-3 to 3-2-1.

Statistical data from the *World Development Report* shows that under the circs of the world's economy increasing commonly from 1960 to 1980, the labor force structure of the three industries in each country at different developmental levels has exhibited a changing current to 3-2-1. This could find expression in the decreasing of the proportion of the labor force in Primary industry, with low-income countries or area having decreasing amplitude of 5%, that of middle-income countries or areas is 19% and developed countries or area is 11%. Of these the decreasing amplitude of middle-income countries or area is particularly obvious. The proportion of labor force in the Tertiary industry has improved with low-income countries or areas having an increment of 1% that of middle-income countries or area is 11% and developed countries and area is 14%. Of these, the last category shows the most obvious proportion increment of labor force. The labor force proportions of the Secondary industry in low-income and middle-income countries or areas both increased, by 4% and 8% respectively. Along with the improvement of economic development level, the proportion of labor force in the Secondary industry in developed countries or areas decreased, and the all-time development of the Tertiary industry significantly attracts the labor force of the Primary and Secondary industries. This transfer forms a pattern of 3-2-1 for the labor force industries distribution.

Then we will see the GDP structure alteration, also known as the proportion alteration current of three industries to GDP. In a general way, during the early days of industrialization, the Primary industry lead by traditional agriculture accounted for the bigger share in GDP because of the lower-level of economic development. Therefore, the GDP pattern appears as 1-2-3 structure for the proportion of the three industries. Along with the improvement in economic development level, the increasing speed of technological enhancement and the promotion of the consumption needs of the society, the share of the Secondary industry, lead by machine manufacturing industry, of GDP went up rapidly. Subsequently the three industries proportions of GDP followed a pattern of 2-1-3 or 2-3-1. After entering the final stage of industrialization, the Tertiary industry is dominated by finance, insurance and medical care, education develops quickly and the three industries proportions of GDP subsequently change to a of 3-2-1 pattern.

The statistical data from the World Development Report shows that the three industries share of GDP in low-income countries and areas has changed to the pattern of 2-1-3 in 1980 from 1-3-2 in 1960 and then 2-3-1 in 1990. The three industries share of GDP in low-income countries and areas has been in a transient state leading to the pattern of 3-2-1 from 1980 to 1990. During the process of economic development, the proportion of the Primary industry of GDP in one country or area will consistently reduce while that of the Tertiary industry will grow and that of the Secondary industry will first go up and then down. This will tend to change the proportion sequence of GDP from 1-2-3 to 3-2-1.

Now we will analyze the changes in human capital collocation and GDP structure of the three industries from aspects such as human resources collocation, proportional contribution of the three industries to GDP and talent resources collocation, according to data for Ningbo in the period 2001 to 2005.

Table 5.3 GDP, Jobholders and Talent Resources Quantity of Three Industries in Ningbo from 2001 to 2005

	Item	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005
Primary Industry	GDP (RMB Billion)	10.034	10.715	11.223	12.35	12.884
	Jobholders (Thousand)	987	933	881	795	701.7
	Talent Resources Quantity (Thousand)	6.1	5.7	5.2	4.9	4.8
Secondary Industry	GDP (RMB Billion)	71.891	82.888	100.121	123.021	135.353
	Jobholders (Thousand)	1897	1944	1984	2014	2044.3
	Talent Resources Quantity (Thousand)	60.1	74.1	88.1	109.3	126.1
Tertiary Industry	GDP (RMB Billion)	49.343	56.431	67.341	80.433	96.403
	Jobholders (Thousand)	821	902	997	1146	1310
	Talent Resources Quantity (Thousand)	258.8	270.2	286.7	325.8	354.1
Total	GDP (RMB Billion)	131.268	150.034	178.685	215.804	244.64
	Jobholders (Thousand)	3705	3779	3862	3955	4056
	Talent Resources Quantity (Thousand)	325	350	380	440	485

Source from: Ningbo Talent Development Report 2006, Ningbo Statistical Yearbook

First we look into the change in human resource collocation, also known as change of labor force proportion of the three industries.

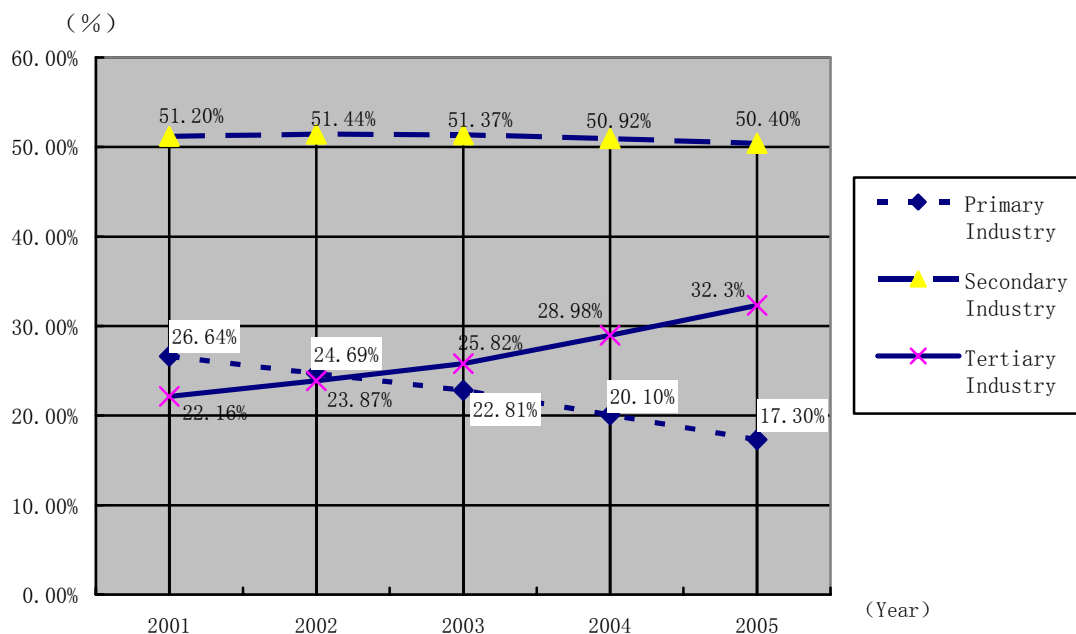


Figure 5.6 Proportion of Jobholders of Three Industries from 2001 to 2005

Source from: *Ningbo Statistical Yearbook*

From Figure 5.6 we may have:

- Primary industry proportion of human resources has reduced 9.34% from 2001 to 2005.
- Secondary industry proportion of human resources has reduced by 0.80% from 2001 to 2005, in which there has been an increment of 0.24% from 2001 to 2002. It then reduced slowly, in the period 2002 to 2005 dropping by 1.04%.
- Tertiary industry proportion of human resources has increased 10.14% from 2001 to 2005.

On the whole, the gross human resources of Ningbo has increased 351 thousand from 2001 to 2005 with an increment percentage of 9.47. The added human resources were absorbed by the Secondary and Tertiary industries. Meanwhile, the human resources of the Primary industry were gradually transferred to the Secondary and Tertiary industries. The Tertiary industry absorbed the newly-added human resources so that its human resources proportion was enhanced. The pattern of human resource

collocation of the three industries changes from 2-1-3 to 2-3-1, which accords with the rule of economic development in the case of Ningbo.

Secondly, let's have a look at the alteration in the GDP proportions of three industries.

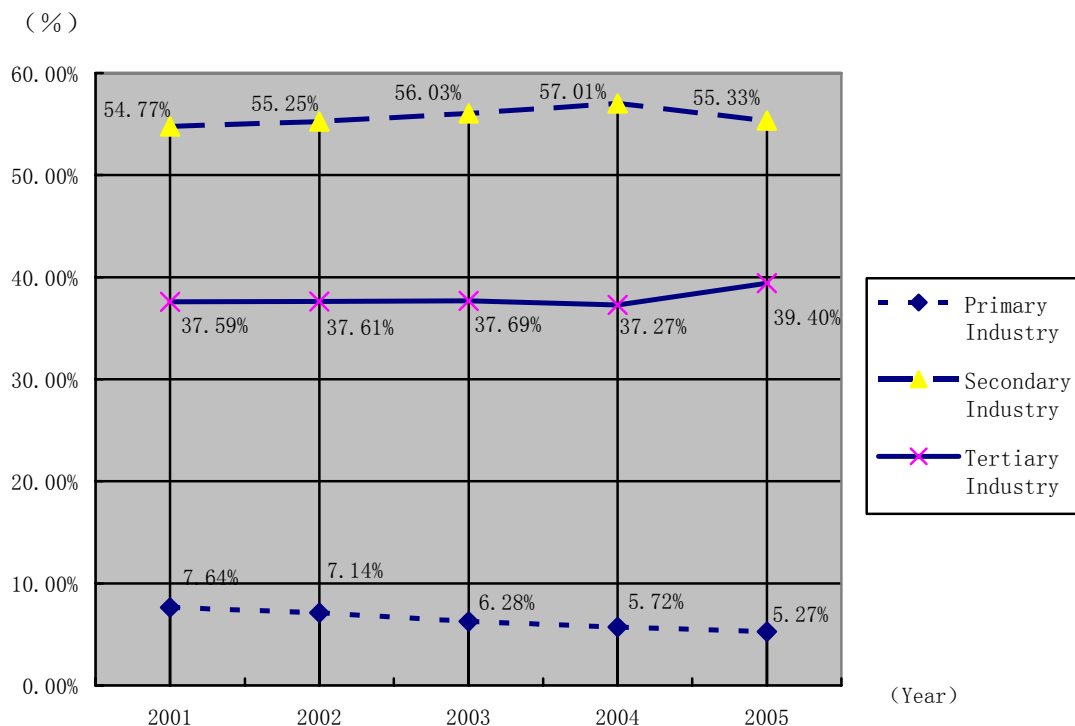


Figure 5.7 GDP Proportions of Three Industries from 2001 to 2005

Source from: Ningbo Statistical Yearbook

According to Figure 5.7:

- GDP proportion of the Primary industry reduced by 2.37% from 2001 to 2005.
- Proportion of GDP for the Secondary industry has increased 0.56% from 2001 to 2005. The increment from 2001 to 2004 was 2.24% and from 2004 to 2005 there was a slight reduction of 1.68%.
- The GDP proportion of the Tertiary industry has increased 1.81% from 2001 to 2005.

On the whole, the GDP proportion pattern for the three industries in Ningbo in the period 2001 to 2005 has been 2-3-1. In this interval the GDP proportion of the

Primary industry showed a trend of reducing gradually, while those of the Secondary and Tertiary industries were steadier and without significant increments.

Now let us look again into the contribution of talent resources to the three industries.

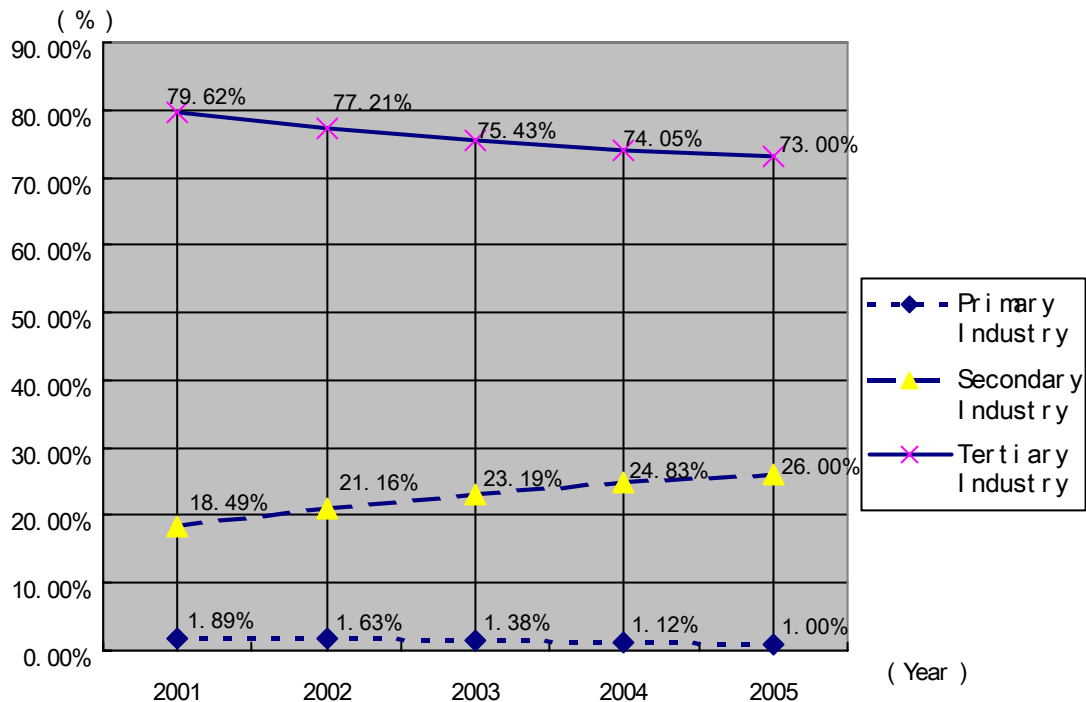


Figure 5.8 Proportion of Talent Resources of Three Industries from 2001 to 2005

Source from: *Ningbo Talent Development Report 2006*

According to Figure 5.8:

- The Primary industry accounts for the least proportion of talent resources of the three industries, and shows a slow reduction of 0.89% from 2001 to 2005.
- The Secondary industry proportion of talent resources has increased, and has an increment of 7.51% in all from 2001 to 2005.
- The Tertiary industry accounts for the largest share of talent resource proportion. However, it reduced from 2001 to 2005 by 6.62%.

On the whole, the talent resources of Ningbo have increased by 160 thousand persons

with an increment of 49.23% from 2001 to 2005. The contribution of the human resources of the Primary industry reduced gradually year by year regardless of its quantity or proportion. The newly-added talent resources and those transferred from the Primary industry have been absorbed by the Secondary industry to greatly improve its talent resource proportion. The pattern of talent resources collocation in the three industries is 3-2-1.

Finally, we will research the altered situation in talent resources and GDP of the three industries in Ningbo using the year 2001 as a cardinal number. The details are showed in Table 5.4.

Table 5.4 Growth rate of GDP and Talent resources of three Industries from 2002 to 2005

	Year 2002		Year 2003		Year 2004		Year 2005	
	Talent resources (%)	GDP (%)	Talent resources (%)	GDP (%)	Talent resources (%)	GDP (%)	Talent resources (%)	GDP (%)
Primary Industry	-6.56	6.79	-14.75	11.85	-19.67	23.08	-21.31	28.40
Secondary Industry	23.29	15.30	46.59	39.27	81.86	71.12	109.82	88.28
Tertiary Industry	4.40	14.36	10.78	36.48	25.89	63.01	36.82	95.37

Source from: Ningbo Talent Development Report 2006, Ningbo Statistical Yearbook

According to Table 5.4, we may see that the Secondary industry has the highest increment of GDP and talent resources among the three industries in Ningbo from 2002 to 2005. It is observed that the Secondary industry has in a leading position in the aspects of contribution to national economic development and attracting and concentrating talents. This is in agreement with Ningbo's status as an important industrialized port city on the Yangtze Delta. The rate of increase in GDP of the Tertiary industry has been far beyond that of the talent resources with an increment of 95.37% while that of talent resources was 36.82%. The GDP increment was 2.59

times that of talent resources. That is to say, every percentage increment in talent resources for the Tertiary industry will bring a relative GDP increment of 2.59%. Thus, the talent resources of the Tertiary industry have played a more important role than those of the Primary and Secondary industries. In this way, the human resource collocation and economic development drive each other in Ningbo. The economic development and economic structure of Ningbo has adjusted to cause a flow of human resources and talent resources to the three industries which results in the optimization of human resource and talent resource collocation in Ningbo. This optimization in turn drives a deeper development of the economy of Ningbo.

5.1.7 Conclusion

From the analysis and research above, we know that a pure increment of human resource quantity will not with certainly promote the economic development of Ningbo. The enhancement of human resource quality acts differently on the development of the various industries. Only if there is a balance between the quantity, quality and collocation of human resources can the economic development of Ningbo be promoted to the greatest extent. The triangle is the most stable structure in geometry. There also exists such a balance and relationship between the quantity, quality and collocation of human resources, the balancing axes (CG of this triangle) being economic development (shown as in Figure 5.9). The target of this balance relationship is to maintain a healthy, continuous and rapid development of the economy. The balance between the quantity, quality and collocation of human resources is not hard and fast but a dynamic balance which determines the direction and speed of economic development in Ningbo and acts on this city's Competitiveness.

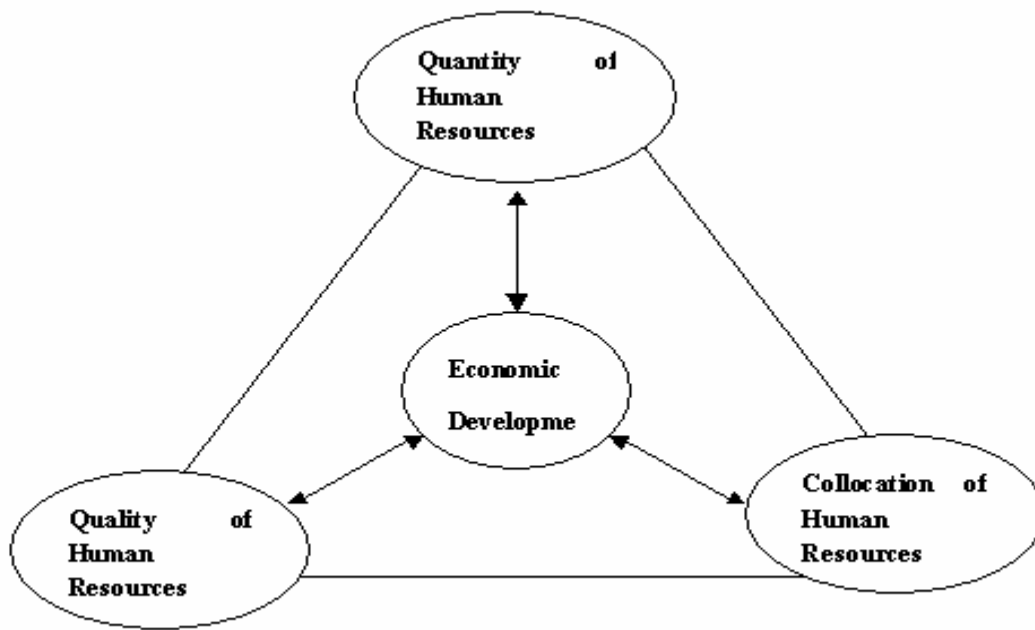


Figure 5.9 the model of Human Resources and Economic Development

5.2 Human Resource’s Influence on Technology and Their Relationship

Technological capability is a city's abilities in technology innovation and transformation of technology findings, and its level of technology development.

5.2.1 Influence of technology on a city's competitiveness

Technology advances bring along the adjustment on its industry's structure and product's structure, drive modernization of the whole production process, and increase a region's economy strength. Technological findings, once transformed into production, will become real productivity, which will further generate new economic development feature, accelerating the development of the economy. Technology has very important effect on reconstruction of the traditional industry. The power of new technology lies in upgrading traditional industries by adopting new technology, and also, in driving industrialization through using information technology. In addition, new and high technology revenue that is created by new technologies themselves, is

an important part of a city's core competitiveness.

5.2.2 Main Achievements in Human Resource Cultivation

Within 5 years that started from 2001, human resource cultivation in Ningbo gained remarkable achievements. Macro-scaled human resource cultivation advanced to a new era. The size, quality and configuration of its human resource have been improved remarkably. In 2001, the city had about 325 thousand talented professionals. This number has increased to around 485 thousand in the end of 2005, with an average annual increase of 9.94%. The quality and configuration of its human resource were improved greatly: number of high degree holders, who have master or doctor degrees, has increased from 1,950 in 2001 to 6,500 in 2005; number of professionals with advanced titles has increased from 9,100 in 2001 to 17,000 in 2005. The proportion of high degree holders and advance title professionals in the whole work force has increased from 0.6% and 2.8% in 2001 to 1.34% and 3.5% in 2005.

There were 255,000 specialty technicians in 2001. This number has increased to 360,000 in the end of 2005, with an annual increase of 9.28%. In 2005, there were around 64.7 specialty technicians per 1000 people. In 2001, ratio between specialty technicians with advanced, middle and junior titles is 1:7.4:19.7. This ratio was changed to 1:9.4:13.7 in the end of 2005 as a result of big increases in advanced and middle title technicians.

Table 5.5 Changes in the scale of human resource and the number of specialty technicians in Ningbo within last 5 years

Year	GDP (Million Yuan)	Population (Thousands)	Talented Professionals (Thousands)	Talented professionals per 1000 people	Specialty Technicians (Thousands)	Specialty Technicians per 1000 people
2001	131,268	5,433.5	325	59.8	255	46.9
2002	150,034	5,461.9	350	64.1	275	50.3
2003	178,685	5,490.7	380	69.2	300	54.6
2004	215,804	5,526.9	440	79.6	330	59.7
2005	244,640	5,567.0	485	87.1	360	64.7

Source from: Statistics Bureau of Ningbo City and Human Affair Bureau of Ningbo City.

Table 5.6 Changes in number of people with degrees of 3-year-college or higher in Ningbo within 5 years

Year	Doctors	Masters	Bachelor (Thousands)	3-year-college (Thousands)	Total(Thous ands)
2001	250	1700	45	216	262.95
2002	320	2200	60	230	292.52
2003	400	3100	70	250	323.50
2004	560	4350	80	264	348.91
2005	700	5800	93	282	381.50

Source from: Human Affair Bureau of Ningbo City.

Table 5.7 Changes in number and ratios in specialty technicians in Ningbo with 5 years (Unit: Thousands of people)

Year	Specialty Technicians	Advanced Title	Middle Title	Junior Title	Ratio
2001	25.5	0.9	6.7	17.9	1:7.4:19.7
2002	27.5	1.1	7.6	18.8	1:7.0:17:0
2003	30.0	1.3	8.7	20.0	1:6.7:15.4
2004	33.0	1.5	9.8	21.7	1:6.5:14.5
2005	36.0	1.7	11.0	23.3	1:9.4:13.7

Source from: Human Affair Bureau of Ningbo City.

In 2001, the city had 370 advanced title experts, including 6 fellows of the National Innovation and technology Society. In 2005, number of advanced title experts has increased to 495, including 11 National Innovation and technology Society fellows.

5.2.3 Technology Improvement

The city has seen great technology improvement during the last years. In the end of 2005, there were 137 city-level or above enterprise engineering and technology centers, including 3 national and 66 provincial. The city has built city-level and above key laboratories, including 1 National Education Ministry key laboratory, 1 National Technology Ministry and Province Ministry cooperative national key laboratory cultivation base, and 4 provincial laboratories. Number of accredited patents has increased from 2,148 in 2001 to 3,985 in 2005, with an annual average increase rate of 16.7%, within which, number of invention patents has increased from 34 in 2001 to 157 in 2005, an annual average increase of 46.4%. During the tenth 5-year Plan, number of accredited patents has reached 15,886, which was 2.4 times of those in the previous 15 years. Within them, 95% of the patents are owned by the enterprises, and above 16.97% of the middle size enterprises have patents, with patent implement rate

of 55% and above. Number of patents that were authorized in the city was in the top tier among its peer cities for 5 years starting from 2001 to 2005. Number of patent applications and number of patent authorizations per thousand populaces were 9.6 and 6.6 in 2001. These numbers have increased to 16 and 8.2 in 2005. Among 16 cities in the Yangzi Delta, Ningbo is the top number 2 and top number 1 in number of patent applications and number of patent authorizations per thousand populace.

Table 5.8 Change in number of patent authorizations in 5 years

Year	Number of patent authorizations	Number of talents (Thousands)	Number of patent authorizations per thousand talents
2001	2148	325	6.6
2002	2780	350	7.9
2003	3414	380	8.9
2004	3559	440	8.0
2005	3985	485	8.2

Source from: Technology Bureau and Human Affair Bureau of Ningbo

5.2.4 High-tech Industry

Hi-tech industry is the main foundation and embodiment of the transformation of technology findings. The city of Ningbo, through a whole-scale implementation of means of expediting the development of high and new technology industry, expediting the development of higher education and attracting high quality talents, accelerated effectively the development of the high-tech industry. The growth rate of the city's high-tech products production has been healthy all along. The city's middle size corporations' high-tech products production has increased from 43 Billion Yuan in 2001 to 152.6 Billion Yuan in 2005, with an annual growth rate of 36.6%. Number of high-tech corporations has increased from 120 in 2000 to 294 in 2005, with an annual

growth rate of 29%. Number of national-class high-tech corporations has increased from 23 in 2001 to 66 in 2005. 8 high-tech corporations have enlisted in stock exchanges in Mainland China and Hong Kong successfully. Weight of the high-tech production in gross production has increased from 26% in 2001 to 32.2% in 2005. Within 5 years, the whole city has developed 3,926 new products, including 110 items enlisted in the national new product development plan. Up to 2005, the city is producing 1,520 new high-tech products, which is more than 2 times of that in 2001.

Table 5.9 Weight of high-tech production from the middle size corporations in the industry gross production in Ningbo within 5 years

Year	2001	2002	2003	2004	2005
High-tech products production(Billion Yuan)	42.4	60.8	88.7	112.5	152.6
Industrial gross production (Billion Yuan)	163.0	200.0	263.0	381.5	473.9
Weight of the high-tech production (%)	26.0	30.4	33.7	29.5	32.2

Source from: Technology Bureau of Ningbo

5.2.5 Conclusion

Technological capability is the main constitutional pier of a city's competitiveness. Technological capability can be embodied in technological development and transformation of technology findings, which is, for here, directly embodied in the growth in number of patent authorizations and high-tech industry development. Starting from 2001 to 2005, total number of talented professionals in Ningbo has increased from 325 thousands to 485 thousands. More and more increase of the human resource base is the foundation of the high quality human resource growth, thus the labor quality has improved remarkably. Therefore, ratio of high and median degree talents to low degree talents has improved from 1:7.4:19.7 in 2001 to 1:9.4:13.7. At the same time, in terms of technology development, number of patents per thousand people has increased from 6.6 in 2001 to 8.2 in 2005. In the year of 2003,

this number was 8.9. An important reason for this was that Ningbo established high-tech zone in that year, which put special effort in accelerating Ningbo's technology advance. The development of the high-tech industry is an important embodiment of the transformation of the technology findings. High-tech products production has increased from 42.4 billion Yuan in 2001 to 152.6 billion Yuan in 2005, with its weight in the industrial gross production increasing from 26% to 32.2% in 2005. This has been more and more important in economic development in Ningbo. Yet, all these achievements have close relationship with the increase of the technological human resources and improvement of the quality of the technology professionals.

5.3 Human resources and Ningbo's industrial Clusters

In this section, the relationship between human resources and industrial Clusters in Ningbo will be discussed.

5.3.1 Introduction

Ningbo is not only an important port city but also an important industrial and manufacturing base in China. According to "Annual Report on Urban Competitiveness---Industrial Cluster: the Engine of Chinese Economy" (Chinese Social Science Academic Press, 2005), it is shown that there are 19 mature industrial clusters with high competitiveness, of which 8 industrial clusters are the top 10 in China (Mainland). Among them, Ningbo garment cluster ranks the third in Chinese garment clusters. It is the highest rank in all Ningbo industrial clusters. Ningbo garment cluster is the typical representative of Ningbo industrial clusters. In this section, we will focus on Ningbo garment cluster to discuss the relationship between human resources and industrial clusters.

5.3.2 Overview introduction of Ningbo's Garment Cluster

The garment sector is an important part of Ningbo's manufacturing industry. As the one of oldest traditional industrial sectors, the garment sector becomes the pillar industry of Ningbo's economy. So far, more than 2000 firms are engaged in this industry, of which 20 firms are large-sized and 450 firms are medium-sized. In 2005, Ningbo's garment industry with 63.3 billion RMB (approximately \$ 8.01 billion) produced over 1.5 billion suits, accounting for about 13% of the whole country's total capacity in terms of garment making, and it also attracts over 300 thousand employees. The statistics indicate that the Ningbo garment industry contributes greatly to Ningbo's economy. It takes about 10% in percentage of Ningbo's total secondary industrial products. By now, 11 garment enterprises in Ningbo are cited as the top China's best garment enterprise. A large number of brands appear in the Ningbo garment sector, of which 12 are state-level brands. No other city has more state-level garment brands than Ningbo. Many garment enterprises from Ningbo's are well known in China as are their brands, such as Firs, Youngor, Romon, Yixiu, Peiluocheng, and so on.

Ningbo garment industry has undergone remarkable expansion and modernization efforts via its privatization and marketization during 1990s. Meanwhile, the related industry, supporting and service industries such as garment designing, garment exhibition, education in terms of garment, have also developed well in Ningbo, and they promote garment industry upgrading. With the establishment of garment industrial association, many garment R&D institutions, garment colleges and universities with garment majors, garment industrial parks, Ningbo garment industry finally develops itself as an industrial cluster that has the second largest scale garment exhibition fair in China. The competitiveness of Ningbo garment cluster increased rapidly because of its aggregative effect. For instance, the biggest garment industrial park of Ningbo, about 60 garment enterprises, 3% in units of total enterprises, produce over 60% of total Ningbo garment products. Figure 5.10 shows the structure

of Ningbo garment cluster as follows.

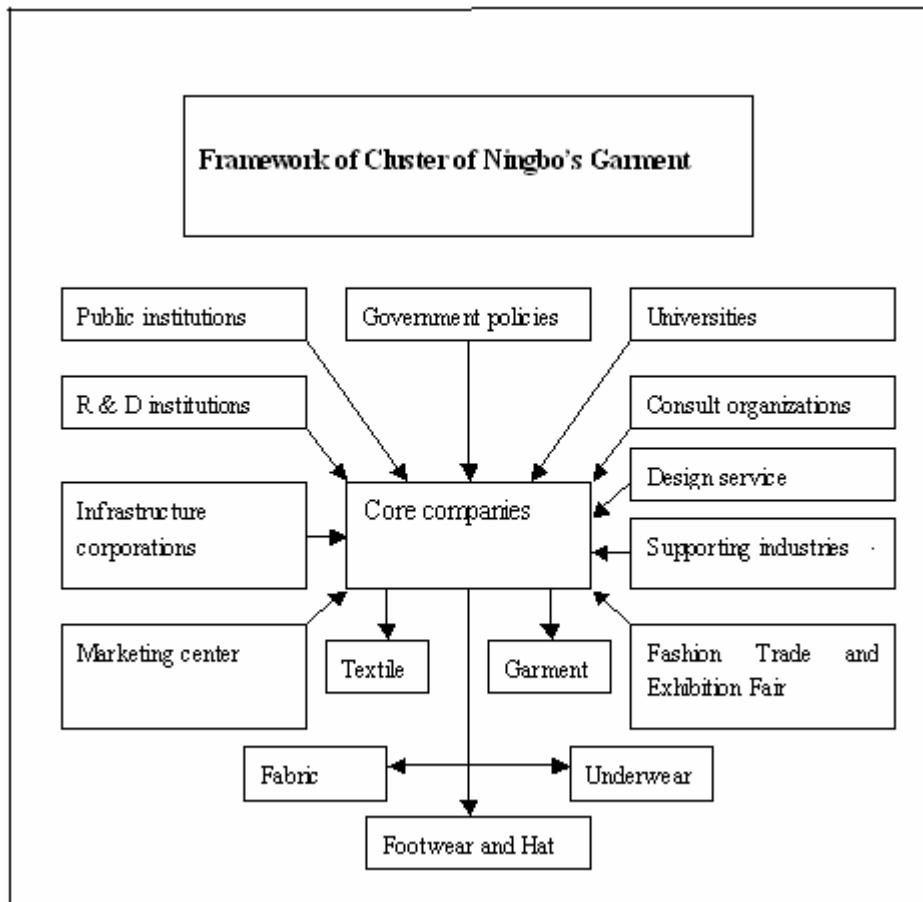


Figure 5.10 Framework of Ningbo’s Garment Cluster

5.3.3 The development process of Ningbo garment cluster

In early 1900s, Ningbo began its garment producing, which is famous as “Hong Brand” tailors in China. Ningbo sewed the first suit of western-style clothes and “sun yat sen's uniform” in 1920s. During this time, a book named “Sewing guide of western-style clothes” was published in Ningbo, which was the first book about sewing western-style clothes in China. In 1980s, with the implementation of the policy of reform and opening to the outside world, Ningbo garment industry bloomed same as other traditional industries. In 1990s, the Ningbo garment industry expended investment in technological transformation and industry upgrading. Advanced technology and large-scale mechanization were widely adopted in Ningbo garment industry. The Ningbo garment industry, with several flagship enterprises, started to act

bellwether in Chinese garment industry on account of its rapid development.

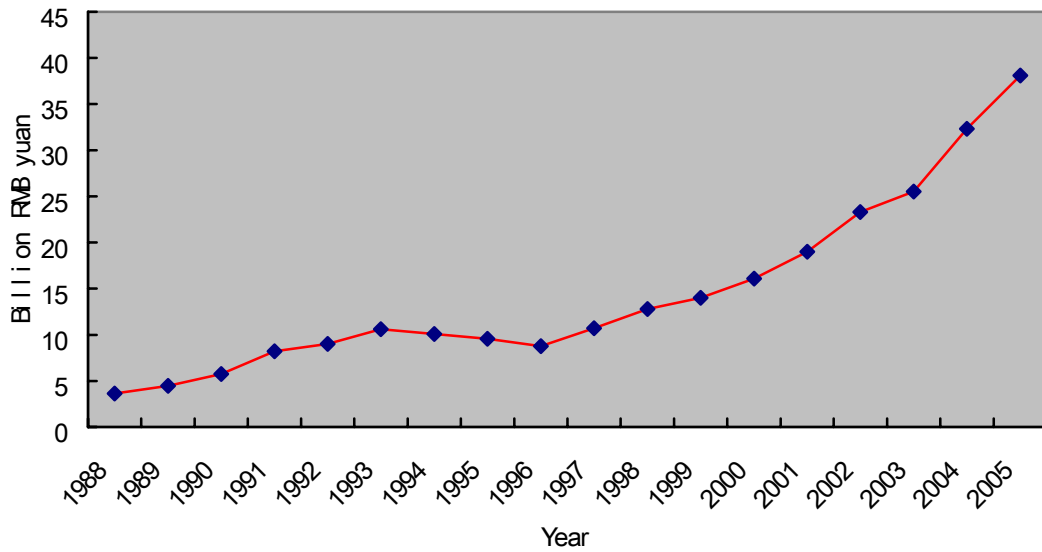


Figure 5.11 the development of turnover of Ningbo garment cluster

Source from: Ningbo Garment Association

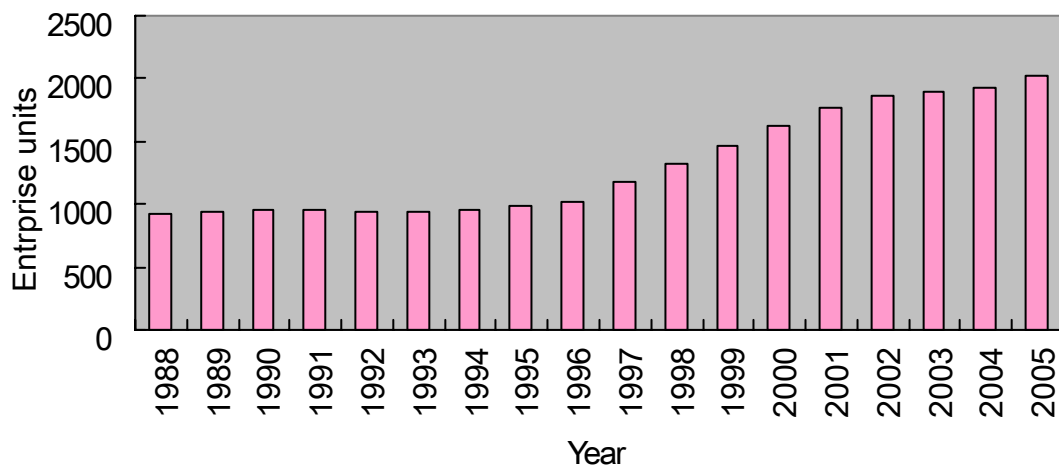


Figure 5.12 the units of enterprises in Ningbo garment cluster

Source from: Ningbo Garment Association

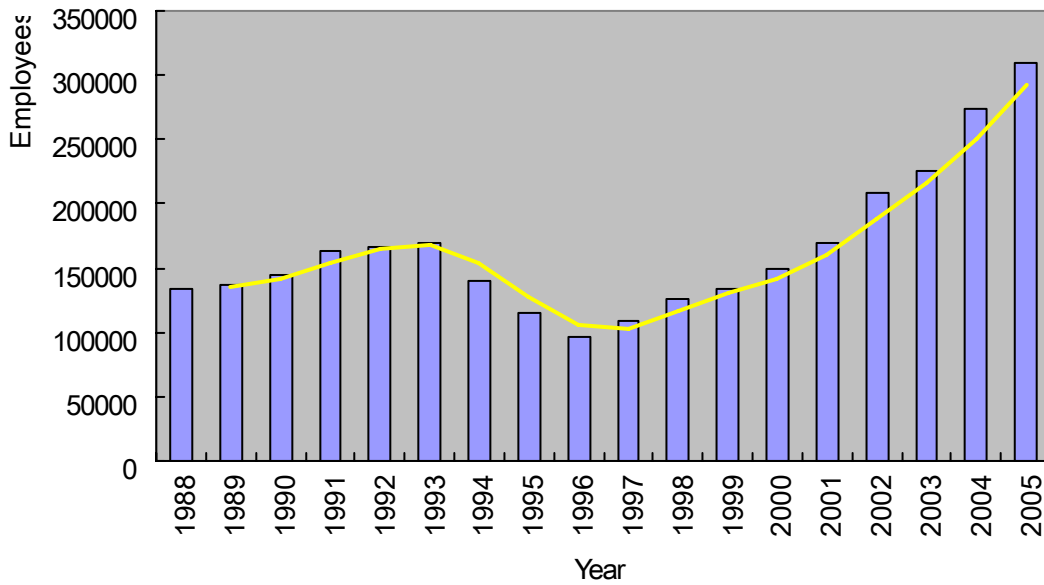


Figure 5.13 Employees in Ningbo garment cluster

Source from: Ningbo Garment Association

According to the statistics above, the development process for the Ningbo garment cluster over the past 20 years can be divided into three stages. The first stage, before 1993, was a low-technology stage. In this stage, the Ningbo garment industry, as a traditional industry, mainly used simple equipment and low technology machines. The second stage, from 1994 to 1998, was the declining and adjusting stage. In this stage, the Ningbo garment industry began an adjustment of its industrial structure. A large investment in technological transformation and industrial upgrading was launched by the Ningbo garment industry. The third stage, from 1999 to now, showed rapid increases and is a mature stage. In this stage, supporting industries and service organizations were increasingly brought into full play. The Ningbo garment cluster, as an integrative industry, developed rapidly.

Table 5.10 three stages of Ningbo garment development

	Low-technology stage	Declining and adjusting stage	Rapid increase and mature stage
Period	Before 1993	1994-1998	1999-now

5.3.4 The importance of human resources in Ningbo garment cluster

During the development process of the Ningbo garment cluster, human resources acted its important role as the prime engine in this cluster. The development of human resources draws the same trace as Ningbo garment cluster development. Ningbo garment cluster always attracts the largest number of employees in all of Ningbo’s industries. The abundant labor is a key base of development of Ningbo's industry. On the other hand, the quality of human resources in the Ningbo garment cluster was also an essential element to help the Ningbo garment industry to upgrade and adjust its structure. In other words, the change of human resources reflects the development process of cluster in the Ningbo garment industry as well.

In the first stage, the quantity of human resources with skill and experienced labor provides a good foundation for the development of the Ningbo garment cluster. It is easy for garment firms to get skilled and experienced employees in Ningbo. In this period, the technological level of garment industry was not so high, and the equipments and machines were simple. The proficiency in using machines and equipments determines whether the garment industry is productive or not. Ningbo garment industry had first mover advantage and owned abundant labors good at garment making. There were many mechanics in the Ningbo garment industry who could keep the machines in a high efficiency. Meanwhile, a lot of veteran mechanics from Shanghai, called “Sunday employee”, were invited to Ningbo, and they conducted and trained local workers. (Shanghai is close to Ningbo, and it is the

biggest garment-manufacturing base in China). At the same time, compared with the other cities around Ningbo, the cost and wage per employee was a bit lower.

Table 5.11 Comparison on wage between Ningbo and neighbor cities

RMB Yuan			
	Ningbo	Shanghai	Hangzhou
Average Wage a year	3030	3485	3302

Source from: Ningbo Statistic Bureau (1992).

In the second stage, with the impact of economic globalization and marketization, the Ningbo garment industry, as a low-technology industry, was no longer fully line with the development and requirements of the situation. The Ningbo garment industry entered into a declining and adjusting stage. Under a series of challenges as well as development opportunities, many firms began reorganization and technological transformation. Lots of entrepreneurs came to the fore. A great deal of employees had to learn new knowledge to catch up with the requirement of their positions. Many workers lost their jobs and retrained. Universities and colleges, as well as vocational colleges and technical secondary school, started to set up involved majors related to garment industry one after another in Ningbo. Firms set about recruiting new employees with the ability to adapt to new production conditions. A mass of personnel, who are good at garment designing, foreign trade, management, financing and accounting, marketing and so on, are brought into the Ningbo garment cluster. The quality of human resources in the Ningbo garment cluster stepped up. Ningbo garment cluster began to adopt a leading position on account of its high competitiveness in China.

Statistic indicates that most of current firms in the Ningbo garment cluster were

established after 1993. In this stage, with the reorganization and industry upgrading, the Ningbo garment industry entered into a new development and creative phase. Ningbo has conducted the “Ningbo Garment Exhibition Fair” annually beginning from 1997, and this is a remarkable sign indicating the Ningbo's garment cluster's success in transforming and restructuring. The changes of human resources, especially in terms of change of quality and structure of human resources, are the key point and prime mover for the significant and tremendous development of the Ningbo garment cluster.

When it comes to the third stage, it is a rapid increase and mature stage of development for the Ningbo garment cluster. In the view of the cluster Diamond, the four parts of the cluster diamond (factor conditions, demand conditions, firm strategy, structure and rivalry, related and supporting industries), interact each other in the Ningbo garment cluster. The Ningbo garment developed rapidly. From 1999 to 2005, the turnovers of Ningbo garment cluster increased by 172.14% while GDP of Ningbo increases 135%.

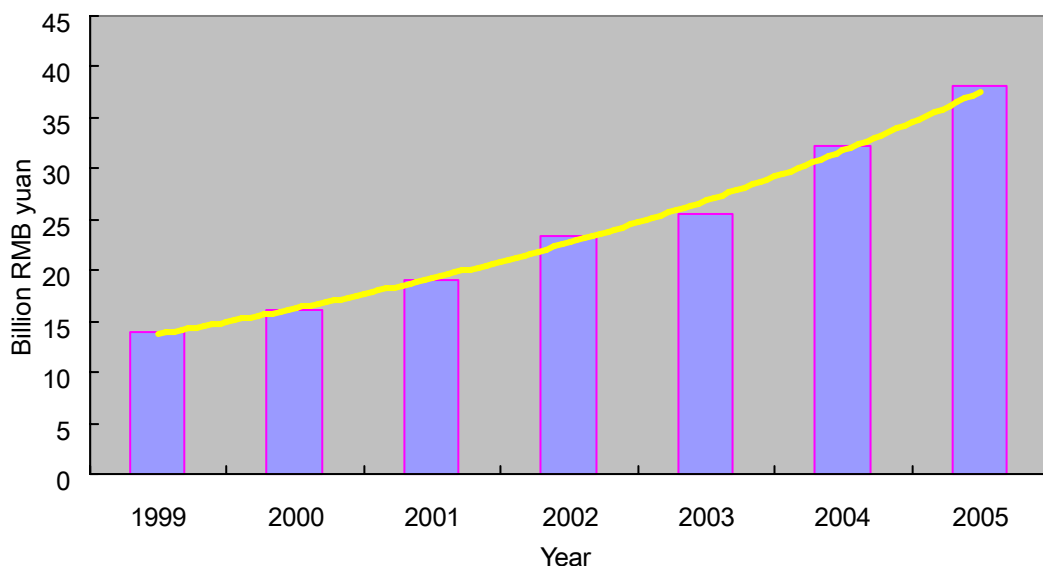


Figure 5.14 turnovers of Ningbo cluster during 1999-2005

Source from: Ningbo Garment Association.

In this stage, human resources in the Ningbo garment cluster developed fast. From 1999 to 2005, in the Ningbo garment cluster, total employees increased 131% while professional people increased 250%.

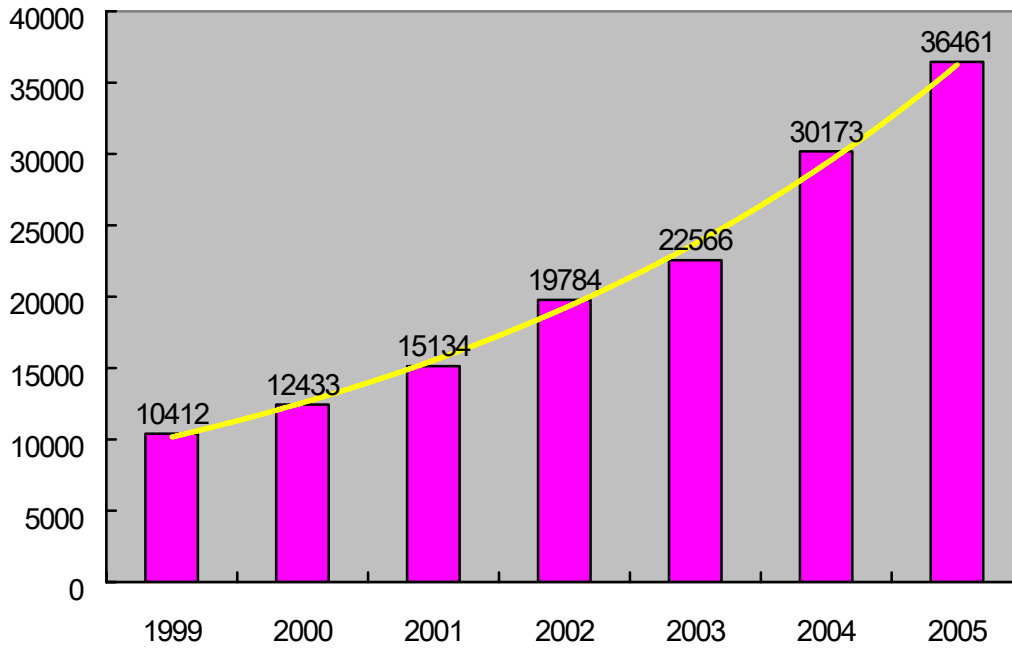


Figure 5.15 Professional people in Ningbo Garment Cluster 1999-2005

Source from: Ningbo Garment Association.

Ningbo garment cluster attracts talented people and experts from other cities and recruits new young people who major in the garment industry. Table 5.12 shows the number of student who major in the garment industry in Ningbo.

Table 5.12 The number of recruited students majoring in garment industry over past five years in Ningbo

Name of school	Education level	The number of recruited students					In sum	
		2000	2001	2002	2003	2004		
Ningbo University	Level 1	24	17	19	22	12	94	5486
Ningbo Advanced	Level 2		80	80			160	
Zhejiang Vocational College of textile	Level 2	96	279	455	297	209	1336	
Ningbo Vocational college of garment	Level 2	310	717	772	1097	1094	3990	
All kinds of vocational high school and technical	Level 3	1050	1120	1056	1516	1500	6242	

Source from: Ningbo Recruit Office of Advanced Education and Ningbo Education Bureau

To sum up, with the development of human resources, the Ningbo garment cluster rose and developed continuously in the past 18 years. Figure 5.16 shows the development of efficiency in the Ningbo garment cluster.

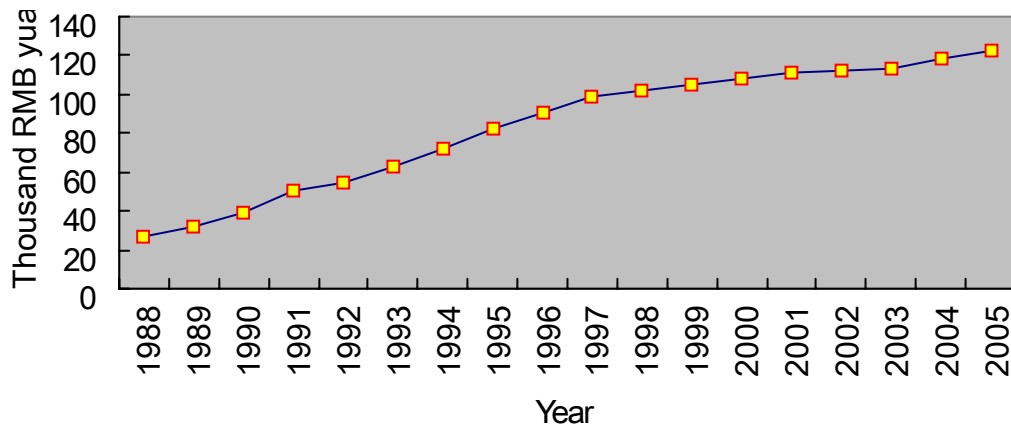


Figure 5.16 Average turnover per employee in Ningbo garment cluster

Source from: Ningbo Garment Association

5.3.5 Conclusion.

From 1988 to 2005, the Ningbo garment industry has made overall remarkable achievements and progresses in industrial development and upgrading through three stages. This can be shown in terms of total scale, industrial structure, technological level, efficiency and productivity of labor, and so on. The foundation and formation of an industrial cluster especially promotes the development of overall industry. The competitiveness of Ningbo garment cluster reached a new high level that resulted in obtaining a leading position in China's garment industry. In the development process of the Ningbo garment cluster, human resources acted an important role that ensured the growth of the Ningbo garment cluster. The development of the Ningbo garment cluster required the support of human resources as well as promoting their development. During the past 20 years, the quantity and quality of human resources increased in the Ningbo garment cluster. Comparison of the developmental process between human resource and the garment cluster as a whole indicates that human resources were the prime driver and motivator in the Ningbo garment cluster.

Through the analysis of a typical representative in all of Ningbo clusters, we can find human resources is a key point to accelerate the formation of clusters, to promote

industrial development and upgrade as well. Human resources is the basic and essential factor in a cluster. Industrial clusters have no opportunity for success in development if they can't get supports from the development of human resources.

5.4 Summary

In this chapter, we focus on analyzing the relationship between human resources and economic development, innovation and technology, and industrial clusters through the case study of Ningbo. According to the research, we found that, firstly, the dynamic force of the economic development was human resources including the quantity, quality and collocation of human resources. Secondly, all achievements in innovation and technology have a close relationship with the increase of the technological human resources and improvement of the quality of the technological professionals. Finally, human resources is a key point to accelerate the formation of clusters, to promote industrial development and also to upgrade. Human resources is the basic and essential factor in the Ningbo garment cluster. Industrial clusters have no opportunity of success in development if they can't get supports from the development of human resources.

Chapter 6 Conclusion

In this chapter, the conclusion of the dissertation is presented. The summary of the dissertation is given. The methodology is discussed and criticized. The further study, practical and theoretical implications, and suggestion are also presented.

6.1 Summary of the dissertation

Urban competitiveness is not only the comprehensive embodiment of the ability of a city to create and produce wealth and value, but also the comprehensive embodiment of the level and mode in use of social resources. Human resources is not only the

fabricant of wealth and values, but also the first and most important resources in a certain region nowadays. The purpose of this dissertation is to indicate the relationship between human resources of a city and its competitiveness through a case study of Ningbo city, an important port city in China. Human resources is a key point to influence urban competitiveness. To some extent, human resources determines urban competitiveness of a city.

Combined with positivism in research philosophy, the deductive approach is mainly used in this dissertation. To ensure the validity and reliability, most of the second data are collected from the newly published government bulletin and authority website. And several measurements are taken to ensure the generalisability. We use case study as the research strategy. In the analysis of the study case, both the quantitative and the qualitative method are used.

When it comes to review of literature, the urban competitiveness theory was presented firstly. We mainly consulted the theory developed by Ni Pengfei. According to the urban competitiveness theory, urban competitiveness embodies many kinds of factors and element, including economic development, innovation and technology, and industrial clusters. Then, human resources and human capital theory was presented to point out the essential items of human resources. Three items, the quantity, quality and collection of human resources, were thought over when we evaluated human resources. Furthermore, Endogenous growth theory, the theory of innovation and transform of technology and Porter's Diamond were discussed to indicate the relationship between human resources and economic development, innovation and technology, and industrial clusters. Finally, an empirical model was set up to illustrate the relationships among all factors above.

In empirical method, the reasons why we use such case study and focus on three aspects of competitiveness were listed. Ningbo is an important port city in China, and

Ningbo garment cluster, as a traditional industry, is the typical representative of Ningbo industrial clusters. The limitations, validity, reliability and generalisability of empirical method were also discussed in the dissertation.

In the case study of Ningbo, the relationship between human resources and economic development was discussed firstly. According to the analysis and research, we found that a pure increment of human resource quantity will not with certainty promote the economic development of Ningbo. The enhancement of human resource quality and the development of collocation of human resources act differently on the development of the various industries. Only if there is a balance between the quantity, quality and collocation of human resources can the economic development of Ningbo be promoted to the greatest extent. There also exist such a balance and relationships between the quantity, quality and collocation of human resources. The balance between the quantity, quality and collocation of human resources is not hard and fast but a dynamic balance, which determines the direction and speed of economic development in Ningbo.

In the aspect of human resource's influence on innovation and technology and their relationship, we found that the capability of innovation and technology can be embodied in technology development and transformation of technology findings, which is directly embodied in the growth of number of patent authorizations and high-tech industry development. More and more increase of the human resource base is the foundation of the high quality human resource growth, thus the labor quality has improved remarkably in Ningbo. At the same time, in terms of innovation and technology development, number of patents and the products of the high-tech industry have increased. In Ningbo, all these achievements in innovation and technology have close relationship with the increase of the technological human resources and improvement of the quality of the technology professionals.

Through the analysis of the development of garment cluster, a typical representative in all of Ningbo clusters, we found that human resources was a key point to accelerate the formation of clusters, to promote industrial development and upgrade as well. Human resources is the basic and essential factor in Ningbo garment cluster. Thus, industrial clusters have no opportunity of success in development if they can't get support from the development of human resources.

6.2 Methodological Criticism

Our search was based on the relationship between human resources and three other factors. As mentioned above, these three factors are the fundamental factors contained both in advantage theory of Porter and Ni Pengfei's theory. There are far more than three factors involved in Ni Pengfei's theory when he began to evaluate the competitiveness of a city. Without the backup of analysis of the other relevant factors, our research looks pale although the whole analytical process is logical without question. The dissertation would have been more realistic if more factors were considered.

Another problem occurred in our research is the choice of variables. Only the quantity, quality and collocation of human resources are in involvement when the relationship between human resources and economic development are to be proved. We are ambitious to cover all aspects of human resources by these limited variables when the economic development is analyzed. The same is true of content concerning the innovation & technology and industrial clusters are involved. Actually, how to measure the variables of human resources is still an open problem even among the researchers specialized in the relevant area.

The third problem is related to the data. We used secondary data from multiple governmental sources, Internet, relevant associations. The paper would have been

more convincing if all the data came from a single source.

6.3 Further research

It is acceptable that in our research only three crucial variables were analyzed. Further research based on the other variables could be carried out in order to get a more convincing result and to have more practical implications. For example, the factor of culture should be taken into consideration in the next step because the cultural variable also plays an important role prompting the competitiveness of cities as mentioned in some of literatures.

In terms of case study, only Ningbo city was studied in detail. Maybe Ningbo only represents one situation in which human resource is crucial for the development of economy and society. In the future, more samples, including not only cities in China but also from overseas should be taken into consideration in order to get more precise evaluation about their mutual relationships. And more comparisons could be made according the differences in size, population, GDP of cities.

6.4 Practical and Theoretical Implications

The significance of this article lies in that through investigation into the effects made by the human resources to the urban competitiveness of Ningbo city, it not only provides the theoretical research of China human resources and urban competitiveness with a new viewpoint, but also comes up with a practical foundation for Ningbo and other Chinese cities to improve urban competitiveness via enhancing the quality and optimizing the collocation of human resources, especially via increasing the quantity as well as improving the quality of talent resources. Above all, it is an aid for Ningbo, a city with great economic importance to realize the shortage of vital talents especially those with high-level and advanced-skills, which is the main confinement factor of economic development and urban competitiveness improvements. It is also an aid in pointing out the direction for the talent development stratagem of Ningbo for

the future consequently.

6.5 Suggestions to the Government of Ningbo Municipality

From now on, as a relatively developed port city of China, Ningbo will turn its steps rapidly from a path mainly forced by resources and capitals to a developing stage mainly driven by skill, knowledge and talents. This will require Ningbo to advance its independence and innovation abilities and constantly strengthen its talents support. According to the reality that Ningbo is lack of vital, innovative and top-notch talents currently, as well as with full consideration of this city's economic structure and industry characteristics, we suggest that Ningbo should get done with its human resources tasks especially the development, introduce and utilization of talents resources from several aspects as follows.

First of all, establish a developing mechanism for innovative vital talents. There are six kinds of innovative vital talents including technological innovation talents, international commercial talents, enterpriser talents, high-skilled talents, modern service industries talents as well as human culture and society science talents being the emphases of next talent development of Ningbo. On the basis of engineering, orientation, cooperation and projects cultivations, it is necessary for Ningbo to create a batch of professional talents training bases and vocational education and training bases to develop and cultivate these talents.

Secondly, strengthen the market distribution mechanism for human resources. Consummate the serving and guiding functions of talents, labor force and graduate employment markets, introduce vital talents that Ningbo currently lacks, utilizing the market mechanism optimizing the collocation of talents resources, and urge these vital talent resources to key fields, pillar industries and superior enterprises.

Finally, build an assurance mechanism of talents' business establishment. The purpose

of developing, cultivating and introducing talents is to utilize them well. To realize this goal, it is necessary not only to provide them with a business establishment platform, but to emphasize scientific research, give crucial subsidization to their training projects, make key improvement to their working conditions, and also to optimize service circumstances, establish and strengthen talents service systems, offer the best services to those vital, innovative and top-notch talents on aspects such as house property purchase, medical care, children education, and social security and so on, so as to make Ningbo a city that can attract, retain and utilize talents well.

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