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- A Comparative Analysis of Selected Implementation Models -

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Clustering in the field of vocational education or: How to judge the efficiency of clusters

Preface by Volker Bank, professor of vocationomics at Chemnitz University of Technology

The fact that some sectors of the labour market in China are overheated gives reason to reflect thoroughly on how to give remedy to this problem. The overheated sectors are those which require specialised labour force, whereas there is some oversupply to other sectors. This mostly is the part of the labour market where holders of university degrees offer their manpower. A reasonable approach would lie in a better education for unskilled workers, and in a more purposive education for current university students.

Knowing since 1964 some of the effects of a non-homogeneous factor 'labour' by the works of Gary S. Becker, there is a matching problem between different levels of qualifications which command the structures of the labour markets. While the theoretical view on the allocation problem of labour was reduced to only two labour markets ('low' vs. 'high' qualification), the reality is still much more complex than this.

National and international policies (as enacted by the Organization for Economic Co-Operation and Development OECD) suggest that there is no over-education, and that the higher the formal qualification to be held by the people at the supply side of the labour markets, the more the national wealth achieves. The allocation – or matching – problem appears to be solved by simply furnishing new labour at the highest level of qualification possible. The idea behind it is intriguingly simple: While it is not viable to make people work at a (substantially) higher level of work than they are proficient of, it should be viable to make work anybody at a lower level.

The Chinese labour market shows: it is not as simple as that. For whatever reason – most probably because of the old Confucian idea of

deeply engaged life-long-learning – there is a comparably high quota of university alumni who correspond to too few skilled workers in the labour market. The masses of alumni of the universities do not find any adequate employment despite their participation in university studies, which actually should promise good earnings and a decent status at the labour market to them.

It appears to be very reasonable not to address this obvious problem by the regulation of university access but by looking out for attractive alternatives instead. As Zhiqun Zhao described in 2011, there have been many different approaches tried out to give a better reputation and a better organisation to vocational education already. There is another approach, which can be described at the level of macro-didactics, and this approach is the one making use of the combined forces and capacities of different providers in the field of vocational education. This is the fundamental idea of organising in different regions or in different local areas different clusters in this field.

Huojin Xiong tries to deal with these clusters which can be most divergent in different cases. In order to give theoretical support to a policy that wishes to enhance clustering in the field of vocational education, an analytical tool is required. Besides the fact that the practical examples are only counting a few up to now, the differences between the different models are such that one has to talk about singularities. Singularities, however, are not suitable empirical references which can enhance the scientific search for recognition.

Xiong tackles this problem by choosing a comparative approach. The criteria of comparison are thoroughly developed by making use of a wide theoretical framework that ranges from Becker's already mentioned theory of human capital to the theory of Bildung, passing by organisation theory. This well founded concept of comparison allows him to examine the different models of clusters in vocational education. In the end, he is in the position that allows him to describe necessary steps towards a better allocation at the fragmented labour market by clustering.

Only one thing needs to be added: Any sort of organising clusters is at the same time an approach of organising a cartel agreement. This clearly is a problem, because on the one hand in the world region examined in this writing, i.e. The People's Republic of China, the state is expected to organise the clusters in vocational education. On the other hand, normally one would expect that the state protects economy against any sort of cartel or trust (by far not only hard-headed neo-liberals or orthodox monetarists would do so!). However, at this stage of the fast growing economy in China, it appears not only grounded but even inevitable that the state intervenes 'with a drop of oil' to get the huge machinery of Chinese economy to run better and better.

In this sense, this book gives an excellent example of how the "melioristic function" of comparative education research (Wolfgang Hoerner), the function of improvement of a system, can be executed. May this book help its readers to find out about viable ways to workable clusters in the field of vocational education.

Chemnitz, March 2013 Volker Bank

Kurzfassung

Die Berufsbildung in China ist in den letzten Jahren quantitativ statt qualitativ weiterentwickelt worden. Um die Einstiegsprobleme von Absolventen zu beheben und die Qualität der Berufsbildung zu verbessern, ist in China seit einigen Jahren ein ‚Clustering' in diesem Handlungsfeld der Erziehung eingeführt worden. Für ein besseres Verständnis der aktuell gegebenen Situation wendet diese Dissertation komparative Methoden an, um eine vergleichende Analyse von einigen ausgewählten praktischen Beispielen zu machen. Abschließend werden dann einige Vorschläge für die zukünftige Entwicklung von Clustern unterbreitet.

Das Konzept des ‚Clusters' bezieht sich auf eine regional und sachlich konzentrierte Zusammenarbeit von Unternehmen in bestimmten Branchen, die zwar grundsätzlich im Wettbewerb zueinander stehen aber auch miteinander zusammenarbeiten, etwa hinsichtlich der Ausbildung neuer Mitarbeiter. Das Konzept ‚Cluster der Berufsbildung' bezieht sich auch auf die Zusammenarbeit zwischen Unternehmen und Berufsbildungseinrichtungen, in denen Partner in Kontakt bleiben, um Synergieeffekte zu schaffen. Das ‚Clustering' verweist auf den Wachstumsprozess von einer anfänglich kleinen und einfachen Beziehung zweier oder weniger Partnerunternehmen bis zu einem komplizierten Endsystem mit verschiedenen Kooperationsebenen.

Auf der Grundlage der strukturellen, hierarchischen und funktionellen Herangehensweisen der Systemtheorie und auch in Anbetracht der sozialen wirtschaftlichen und pädagogischen Implikationen des Clusters in der Beruflichen Bildung werden die Theorie von Porter (und deren Erweiterungen), die Theorie des Humankapitals und die Theorie der Bildung für die Wahl der für einen Vergleich erforderlichen Kriterien (tertium comparationis) herangezogen:

- Nach Porters Ansichten sind nationale Wettbewerbsvorteile hauptsächlich auf vier Säulen gegründet: Faktorausstattung, Nachfragebedingungen, unterstützende Industrien, sowie Fir-

menstrategie und Konkurrenz. Diese Faktoren, die einem Wechselwirkungsverhältnis zueinander stehen, schaffen eine Umgebung für wettbewerbsfähige Produktionsstrukturen. Die Rolle des Staates liegt nach der Theorie Porters darin, diese vier Determinanten zu begünstigen. Erweiterungen des Ansatzes von Porter schließen ‚Leistung' als eine abhängige Variable und zugleich den Staat als eine endogene Variable innerhalb des Modells ein.

- Die Humankapitaltheorie untersucht Investitionen in Form von Bildung und Ausbildung von Arbeitskräften und ihren möglichen Nutzen. Humankapital kann auch innere und äußere Effekte haben, und der Überschuss von Investition kann auch zu Überqualifikation (over-education), Arbeitslosigkeit und Verschwendung von wertvollen Mitteln führen.
- Nach Maßgabe der Bildungstheorie werden Zielkonzepte wie Qualifikation und dem Curriculumdesign untersucht. ‚Qualifikation' bezieht sich auf den Kenntnisstand einer Person, bezogen auf eine definierte Handlungsanforderung in einer bestimmten Situation. ‚Bildung' wird demgegenüber mit Begriffen wie ‚Freiheit', ‚Autonomie', ‚Mündigkeit', ‚Vernunft, ‚Humanität' und ‚Subjektivität' verbunden. Von Qualifikation bis Bildung bestehen verschiedene Entwicklungsstufen, die mit einer Entwicklungslogik nach dem Novizen-Experten-Konzept in Verbindung gebracht werden können. Schulen und Unternehmen sind dabei zwei komplementäre und insofern unabhängige Faktoren für die Berufsbildung. Im Spannungsfeld von Schulen und Unternehmen ist die aktive Identifizierung der Lernenden mit dem Beruf und der sozialen Umgebung entscheidend.

Auf der Grundlage der Rezeption dieser Theorien sind einige Kriterien für die komparative Analyse gewählt worden. Diese Kriterien sind:
(1) Faktoren für ein Clustering als solches, für den Prozess der Clusterbildung nebst der Rolle der Regierung in diesem Prozess.
(2) Öffentliche und private Investitionen sowie ihr Nutzen in Bezug auf Erziehung, hier i.S.v Ausbildung;

(3) Der Beitrag zur Entwicklung und Verwirklichung von qualitativen und inhaltlichen Standards in der beruflichen Erziehung.

Aus den verfügbaren Berichten über Implementationsversuche wurden die Implementationsmodelle der Cluster von Henan, Shanghai, Hainan, Yongchuan und Yantai ausgewählt. Alle Erfahrungen aus diesen Regionen wurden in zwei Kategorien gemäß ihrer Eigenschaften als professionelle und regionale Cluster untersucht. Die komparativen Analysen verweisen jeweils auf die oben erwähnten drei Kriterien.

Mit der Einrichtung der Berufscluster in Henan, Shanghai und Hainan wurde erstmals versucht, die Zusammenarbeit zwischen den Berufsschulen, den Berufshochschulen und auch den allgemeinbildenden Schulen sowie den regional ansässigen Unternehmen zu fördern. Die regionalen Regierungsorgane leiteten jeweils diesen Prozess ein und unterstützten ihn, größtenteils mittels der Veröffentlichung bestimmter Dokumente oder Verabschiedung politischer Handlungsprogramme (*policies*). Die Vernetzung unter den Mitgliedern im Cluster war letztlich nur transient und nicht sehr nachhaltig. Im Hinblick auf den investiven Nutzen hat die Durchführung des Clusterings Beiträge zur Zunahme der Registrierung von Auszubildenden bzw. Berufsstudenten, zur Verbesserung der Qualität von Bildungsanlage und zur sozialen Gerechtigkeit erbringen können. Eine Verbesserung der Qualität von Bildung durch ein Clustering im Feld der Berufsbildung ist demgegenüber unbefriedigend geblieben. Außer in Shanghai behandelte das Clustering die Berufsbildung als eine Anpassungsbildung an funktional bestimmten Arbeitsaufgaben bzw. an Arbeitsstellen. So wurde bislang das Schwergewicht auf Qualifikation statt auf Schlüsselkompetenz oder Bildung als Ausbildungsziel gelegt.

Das Regionalcluster in Yongchuan und Yantai betrachtet Clustering als möglichen Beitrag zur örtlichen sozialen Entwicklung. In Yongchuan war das Cluster mit der Investition in einen neuen Campus verbunden und wurde unter der Maßgabe eines bildungsökonomischen Interesses als eine Fördermaßnahme zur Entwicklung des Bruttoinlandsproduktes behandelt. In Yantai wurde das Clustering als ein Weg zur Entwicklung der Arbeitskraft für die lokale wirtschaftliche Entwicklung angesehen.

Regierungen in beiden Regionen investierten in die Berufsbildung, aber mit unterschiedlichen Schwerpunkten. Beide konnten durch das Clustering mehr Studenten aufweisen, aber die Studenten in Yongchuan hatten schlechtere Arbeitschancen als diejenigen in Yantai. Im Hinblick auf den Beitrag zur Verbesserung der Qualität durch die Zusammenarbeit zwischen Schulen und Unternehmen verließ sich das Modell von Yongchuan vorwiegend auf die Ausbildung durch Schulen. Demgegenüber hatte das Cluster in Yantai eine enge Verbindung zwischen Schulen und Unternehmen bevorzugt.

In Anbetracht der in den praktisch umgesetzten Modellen offenbar gewordenen Probleme werden zusätzlich einige internationale Erfahrungen herangezogen und auf ihre Erfolgskomponenten hin untersucht, z.B. wie man Faktoren für das Cluster verbindet oder wie man Anreize für die Teilnahme von Unternehmen am Cluster setzt.

Auf der Grundlage der theoretischen Analyse der praktischen Erfahrungen in China sowie andernorts werden abschließend einige Vorschläge für die zukünftige Entwicklung des Clusterings entwickelt. Sofern Koordination und Administration im Prozess des Clusterings angesprochen sind, sollte die Regierung an ein Gleichgewicht zwischen dem Markt und der Administration, der Beteiligung der gemeinnützigen Organisationen und der Regulation mit Gesetzen und Erlassen denken. Unter Berücksichtigung der gegenwärtigen schwachen Beziehung zwischen der Entwicklung des Bruttoinlandsproduktes und der Zunahme von Arbeitsmöglichkeiten kann nur eine qualitativ expansive Transformation der Industrie das empirisch gegebene Problem von fehlgeleiteten Qualifikationen beeinflussen, das vor allem in der Überqualifikation von Hochschulabgängern besteht. Für die Sicherstellung der Qualität der Berufsbildung empfiehlt es sich, zuerst einen Qualitätsstandard gemeinsam unter Beteiligung von Regierung, Schulen und Unternehmen aufzustellen. Auf dieser Grundlage können dann Lehr- und Ausbildungsrahmenpläne entworfen werden, die im Sinn der komplementären Bildungstheorie die Erziehungs- und Ausbildungsprozesse an den beiden Lernorten Schule und Unternehmen konstruktiv ordnet.

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1. About the need for dealing with misguided qualifications

Since early 2004, there has existed an apparently paradoxical phenomenon in China: on the one hand, many enterprises have difficulties in getting enough labor force for their business development; on the other hand, many graduates from higher learning institutions (including tertiary vocational education institutes) cannot find jobs. This phenomenon not only reflects the problem existing in the current social economic development, but also presents a challenge to the sustainable development of China.

The expansion of higher education launched in 1999 has resulted in an annual enrollment surge of higher educational institutes from 1.54 million in 1999 to 6.39 million in 2009[1]. But the ratios between job vacancies and job seekers (job vacancies/job seekers) with college education, bachelor education and master education are only 0.87, 0.78, and 0.68 respectively[2]. That means that more and more graduates with higher education qualification simply cannot find the right jobs for themselves.

At the same time, there are not enough qualified personnel available in the labor market. The ratio between job vacancies for technicians and job seekers reached 2.33 in 2007 and 1.84 in 2009[3], whereas for senior technicians, the ratio was 2.54 in 2007 and 1.86 in 2009[4]. Though the upgrading of the industrial structure may have created many job vacancies, there have been not enough skilled workers available for these vacancies.

The phenomenon may underly some economic background. For example, the correlation between GDP growth and employment increase

1 Ministry of Education of China, 2010

2 Ministry of Human Resources and Social Security of the People's Republic of China, 2010

3 Information Center of the Human Resources Market in China, 2010

4 Information Center of the Human Resources Market in China, 2010

has been weakened in China[5]. The GDP has been growing with an annual average percentage of over 10% in the past years between 2001 and 2008, but the employment situation has not reflected this growth. Therefore, the present economic development model cannot enlarge the employment chances anymore. According to the analyses of some experts[6], only the upgrading of the industrial structure may help the expansion of the job market.

The other causes for this phenomenon are associated with educational aspects: education develoment, especially vocational education, has significantly deviated to quantity instead of quality. As a consequence, there is an over-supply of graduates with higher education in the whole labor market. But at the same time, there is a shortage of skilled workers and technicians. From this point of view, vocational education quality is crucial to further social economic development.

In fact, the challenges to improvement of vocational education quality are too complex in China, and resources to address them are too scarce for any single player. Therefore, there is a growing recognition of the need for establishing networks and clusters in the field of vocational education.

Clustering in the field of vocational education is quite a new thing in China. In practice, implementation of clustering in the field of clustering in some cases is simply like a fashion show, being initially put on with applause and then ebbing away without any traces, sustainability or satisfactory result. Many implementation ideas are still living on papers, with very limited operations. Therefore, there is a need to analyze the present implementation situation for future improvement.

Based on this situation, comparative and systematic methods will be utilised in the research to analyze some selected typical practices. For this analysis, some criteria drawn from theory of cluster, theory of human capital, and educational theory will be applied.

5 Hu, 2006; Qiu, 2008

6 Yue & Ding, 2003

With help of selected theoretical criteria, the practices and experiences of clustering in the field of vocational education in China would be compared so as to find out some references for further development. The differences between the ideas and realities will be summarized and be considered as the challenges for further research.

The **aims** of the analysis on clustering in the field of vocational education are as follows:

(1) With consideration of the present economic and vocational educational situation, implementation of clustering is analyzed not as a separated phenomenon, but under the background of a social system.

(2) Through theoretic analyses, some criteria for the comparison among several implementation models are chosen out, which will also serve as evaluation assistance for further promotion of the implementation activities.

(3) Through comparison of selected implementation models, a clear picture of the clustering situation would be depicted, and suggestions would be proposed for future practices.

The **research methods** for this dissertation include literature analyses, theoretical reflection, and empirical researches from comparative point of view.

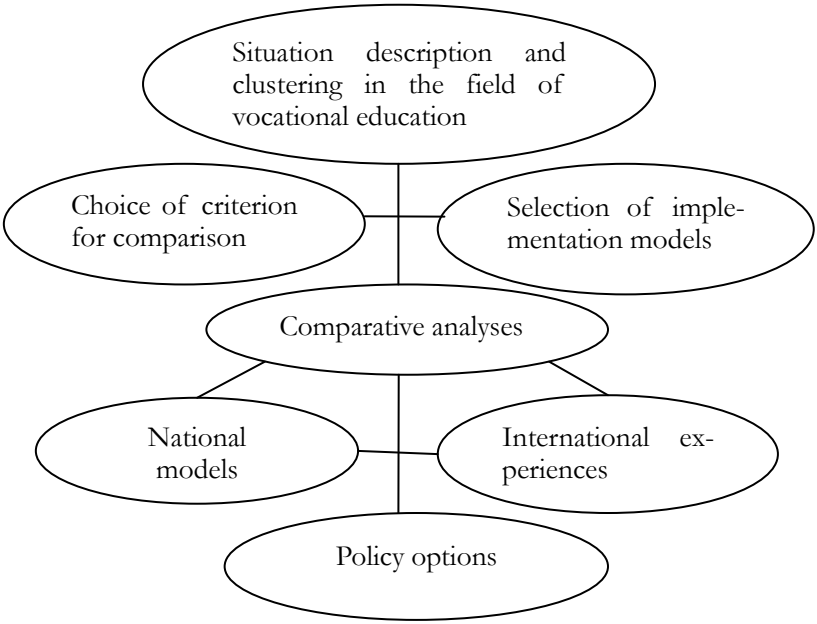
By literature analyses, many research books, periodicals, published theses and web-sites for the available theories, politics and practices related with clustering of vocational education both in China and other countries are consulted. The main analytic methods applied here are induction and comparison, and they serve for the clarification of the related concepts, understanding of the current situation and sketching out landmarks for further research.

On the basis of analyses on the situation and problems, theoretical researches would be made to answer the questions of 'why' and 'how' which concern the choice of criterion for comparison.

The empirical researchers would focus on the models from practical experiences in China with references to international experiences. The comparison among the models is for understanding of specialties of each model and seeking for better models for future development.

Based on these three steps, the argumentation of the dissertation is summarized and represented by the elements of the following figure:

Figure 1 Logic system of the dissertation



2. Situation of clustering in the field of vocational education and review of the researches

Clustering in the field of vocational education in China has already been in practice since 1980's when the formally planned economy system underwent its reform. After decades of development in economic and educational areas, clustering practices are facing a new social situation. For a better understanding of the background for the implementation of clustering in the field of vocational education, this chapter will analyze some basic information and will also review the research already carried out in this area in China.

2.1 Concept definition

A cluster is basically a concept originated or loaned from economy. Since it is used here to indicate the various forms of connection and networking in the fields of vocational education, it is necessary to confer the concept a clear definition.

2.1.1 Origin of the concept

A cluster is usually considered as an economic and social phenomenon, with relevance of geographic proximity of firms to one another and to large market areas, and also the linkage through their interdependencies in providing a related group of products and/or services[7]. In manufacturing industry, firms and especially small firms hardly operate in isolation. They are likely to have a thick net of relationship with customer firms or suppliers, with competitors, with business support organizations, trade bodies and public institutions. There are three types of cluster concept definition[8]:

7 Porter, 1990, p. 24-25

8 Hofe & Chen, 2006

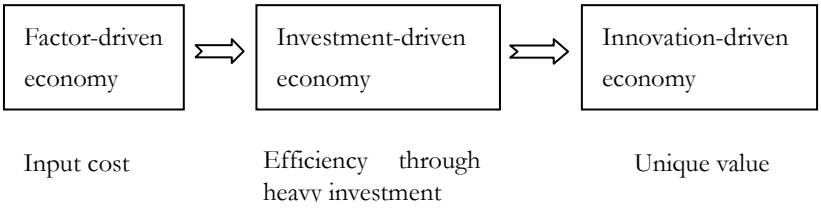
The first cluster concept is closely related to regional specialization. In its broadest meaning, industrial clusters are conceptualized as groups of establishments belonging to the same industry sector within regional geographic boundaries. Marshall (1890, 1920) is among the pioneers who acknowledge that the economic productivity of firms and businesses is associated with the location and proximity of economic agents to each other. Marshall identified three specific sources which fostered spatial cluster formation through increasing returns to scale in the long run: knowledge spillovers among firms, labor market pooling, and cost advantages attained by the sharing of industry-specific non-traded inputs. Besides the formation of a cluster, these three sources also lead to regional specialization in a certain degree.

The second cluster concept is a within-industry concept and localization-based, where all firms are interrelated in the production value chain with frequent transactions, but do not necessarily belong to the same industry.

The third cluster concept refers to Porter's theory. Michael Porter (1990) asserted that the traditional factor-driven economies represented a preliminary stage of development when a country's comparative advantage in international trade had been determined by such factor endowments as land, natural resources, labor, and the size of the local population. The second stage of development was an investment-driven economy, which referred to raising the productivity of factors through more investment. Both of these economy development strategy led to a low-cost (low-wage, low tax, cheap land) economy. Porter maintained that the best way to enhance productivity and innovative capacity was to resort to local clusters. He argued that when clusters took hold, they continually enhanced firm competitiveness through the transfers of technology and information, allowing the regional economic base to survive in globalization and technical change. These groups of firms might extend beyond a single industry, yet they were held together in varying degrees of mutual interest and geographic proximity. Porter emphasized that competitive clusters developed through positive externalities (in part because of agglomeration advantages) that led to

cost savings. Clusters also served to upgrade managerial and labor force skills and advance marketing/customer relations.

Figure 2 Porter's Stages of Competitive Development



Source: adapted from Porter, 1990, p. 73-76

Porter broadened the scope of industrial cluster concepts substantially in defining clusters as: 'geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field, which compete but also cooperate'[9]. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies or common inputs. Finally, many clusters include government and other institutions - such as universities, standard-setting agencies, think tanks, vocational training providers, and trade associations - that provide specialized training, education, information, research, and technical support[10].

9 Porter, 1998, p. 78; 2000, p. 15

10 Woodward, 2004

Though it seems that there exists no single correct definition of an industrial cluster, most (if not all) cluster concepts share a common denominator: industrial clusters refer to groups of firms, businesses, and institutions that co-locate geographically in a specific region, and that enjoy economic advantages through this co-location. Clusters could be vertically-integrated whose focus is on relationships between buyers and sellers among enterprises. Clusters could also be horizontally-integrated where industries might share one or more factor input conditions, such as a trained labor force, specialized physical or information infrastructure, and/or other similar resources. In addition, regional demand conditions as seen in common markets for intermediate and final products, firm strategies, and the local business environment are recognized as cluster suppositions.

Though clusters and cooperation networks can present very positive influence on the regional development, they can also generate negative effects on a region. These negative results could be:

(1) Regional closure. When a cluster/network focuses on the relationship only with local contacts, they could fall into the danger of regional closure and weaken the competitiveness of its individual firms or the whole cluster/network[11]. However, when the cluster/network relies too heavily on the external information, the existence of the cluster/network could be jeopardized because the external links may suppress the locality.

(2) Overwhelming previous strength. A successful cluster/network has always undertaken a long development process and possessed traditional paths toward success. These 'previous strengths' could hinder the access to new technology or the form of new competence.

(3) Embedded effect and lock-in. Economic behavior is always embedded in social relations. The firms in a cluster/network establish cooperation through embedded relationship. This relationship is interpreted as not only the business interest, but private contacts as well.

11 Wang, 2002

This kind of embedded effect could promote the information exchange and reduce the business cost on the one hand, but on the other hand, it could bring the cluster into an introverted one which is weak in adapting to outside world, and then lead to 'regional lock-in'.

(4) Lift behavior. A cluster/network is characterized by the spillover of knowledge and skills. The spillover could be a lure for many firms which would not like to invest into innovation but just take a lift and enjoy the advantages of the spillover. Therefore, there should be a good balance between the protection of the interest of the firms taking lead in innovation, and the expansion of spillovers and available resources.

2.1.2 Educational group

The phrase of 'clustering in the field of education' is generally interpreted as 'ji tuan hua' in Chinese phonetic system (known as 'pin-yin'). However, the phrase 'ji tuan hua' mostly refers to the forming of an educational group, which is a special form of cluster of vocational education.

The emergence of educational group in China took place in 1990s. It was the policy of '*Decision on Further Development of the Tertiary Industry*' issued by the State Council of China in 1992 which regarded education as a part of the third industry and triggered the theory of educational industrialization. Since then, about 50 education groups have come into operation through self-accumulation, merging and franchising[12]. In an educational group, the chairman of the board is the legal person of the whole group, while the schools in the group are operated independently but under the instruction of the strategic goal and the budget of the board. Therefore, the educational group in China is a kind of hierarchical organization, and moreover, it could happen that an education group turns its function of public service into more or less profit ori-

12 Liu, 2007

entation. As many people point out, educational groups have changed from educational institutes to joint-stock companies[13].

Actually, 'educational group' is a management system transplanted from industrial companies group. The system aims at connecting all the scattered subjects, realizing the maximization of scale efficiency and reducing of the operational cost. In this sense, it is only a special type of cluster.

2.1.3 Localization and regionalization of education

There are other two concepts related with clustering of education in China. One is so called localization of education; the other is regionalization of education. The former emphasizes that education being administrated by local government should serve for the local economic and social development, and that support from the local government should be offered to the local educational institutions. It was a kind of reform against the central planned model of education administration, and proposed a county or city administration/ authority for the primary or secondary education, as well as provincial authority for the tertiary education.

The latter emphasizes the function of education as a stimulator to the local economic and cultural development, and the necessity of adapting the curriculum to the demands from the local development. In consideration of 'regionalization', a concept of "relevance" should be introduced in the regionalization strategy of higher education. The relevance means the match between the social demand and the school's reaction[14].

The theory of regionalization of education has taken the role of education in the local economic development into account, but has simply focused on the reform of educational institutions alone. It has failed to

13 Xinhua net, 2005

14 Luo, 2004

go so far as emphasizing the role which each factor in a region should play and the coordination of the factors towards synergy alike.

2.1.4 Educational cluster and clustering of vocational education

Educational cluster is a concept originated from its economic sense, and the concept is widely used on international, national and also regional level. On the international level, education is recognized as an important sector within humanitarian response due to the role which education plays in providing physical, psychosocial and cognitive protection to children, adolescents, youth and adults affected and made more vulnerable by crises. Therefore, educational clusters are appealed to be formed as an approach to bring all actors together on country level so as to bridge capacity gaps and to ensure a more predictable, timely and effective education response, with inter-sectional links to other relevant clusters[15].

On the country level, 'educational cluster' is defined as cooperation between enterprises and educational institutions in which partners join their forces to create powerful synergies with a high potential for innovation[16]. In a cluster, teachers, experts in the educational sector and entrepreneurs can set new standards in shaping the future through intensified cooperation. Not only students, apprentices and trainees will benefit from this cooperation but also the economy and the educational institutions. As an example of establishing national level cluster, Austria has already set up around 50 regional education clusters under the joint support from its Economy Committee (Wirtschaftskammer Oesterreich) and the Ministry of Education, Arts and Culture (Bundesministerium fuer Unterricht, Kunst und Kultur).

15 The Education Cluster within the UN Humanitarian Reform Agenda, http://www.ineesite.org/page.asp?pid=1402, undated

16 Schitnig, 2007

On the regional level, an educational cluster is defined as invloving: colleges, universities, research institutes and businesses in a common region; shared infrastructure, markets and services; active communication & business channels; driven by innovation & entrepreneurship[17].

Therefore, an educational cluster could be a geographically bound concentration of educational institutions, research institutes and enterprises, which concurrently share specialized infrastructure, labor markets, services and other available resources, with active channels for cooperation, communications and dialogue among all the stakeholders. Educational cluster is also emerging as significant tools to promote regional development and technology innovation through the spill-over of locally generated knowledge, or by a focus on interactive learning and the transfer of different types of resources among the stakeholders. These resources include not only knowledge embedded in institutions such as vocational training institutions or polytechnics, but also tacit knowledge that can be shared across firms through the movement of ideas and people. The spillover or transfer happens through personnel exchanges, formal or informal meetings. And because of the tacit character of knowledge, the spillover heavily relies on direct communication, limited distance, local settings, trust, willingness to share, mutually beneficial exchange and personal experience.

With the application of new communication technologies and transport facilities, the geographical bond keeps expanding and going beyond the former concept of proximity. However, the educational clusters also share the following common elements: (1) Commonality. The partners' businesses are operated in related fields with a shared market focus or sphere of activity or common interest. (2) Concentration. There is a grouping of businesses that can and do interact. (3) Connectivity. Organizations are interconnected, linked or interdependent, with a range of different types of relationships.

Vocational education cluster is a type of educational cluster and possesses the elements aforementioned. The only difference between voca-

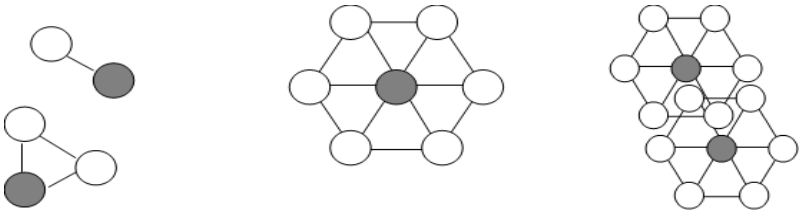
17 Béliveau & Mersereau, 2005

tional education cluster and educational cluster is that vocational education cluster concentrates more on the aspects related with occupational education and training. Cluster of vocational education can be understood as a kind of cooperative network among vocational education institutes, firms, and other social stakeholders which are related with each other by means of contracts or with capitals and facilities, or with aims at efficiency, quality and competitiveness improvement.

2.1.5 Clustering process: from partnership to network

A cluster is an evolving result from the initial partnership among 2 or 3 partners who share small and simple relationships to the final multi-involved and complicated existence (figure 3).

Figure 3 Evolving process from partnership to cluster

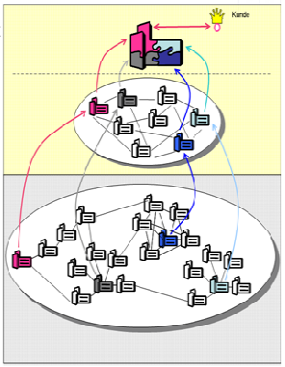


Partnership Cooperation network Cluster

Sources: Pluess & Huber, 2005, p. 8

Partnership is a state of being partners between 2 or only a few partners. A cooperation network is an alliance of 3 or more organizations with their resources, competences and experiences integrated together in order to satisfy the demand of the customer and improve the market chances (figure 4).

Figure 4 Relationship between a network and a cluster



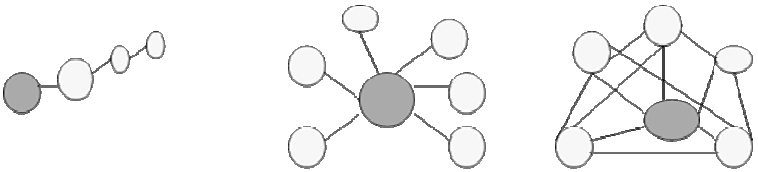
Cooperation network

Cluster

Source: Pluess & Huber, 2005, p. 16

A cooperation network is usually jointed together with contracts and consists of independent partners, while a cluster is composed of regional and co-operational network. A cooperation network usually has 3 kinds of forms (figure 5).

Figure 5 Forms of cooperation network



Functional chain Hub-and-spoke Peer-to-peer

Source: Pluess & Huber, 2005, p. 8

The first one is functional chain oriented. Organizations are strung together one by one according to their positions on the value chain of business activities. The second one is formed like hub-and-spoke,

where a main contractor functions as the center of the cooperation. The third one is a form of project-oriented cooperation, with which the partners cooperate with each other without any hierarchical difference among them.

In comparison with a network, a cluster is more related with regional development and includes more partners and organizations than cooperation network (Table 1).

Table 1 Differences between cooperation network and cluster

Cooperation network	Cluster
1. Business development as priority.	1. Region and industry branches oriented.
2. Strengthening the individual enterprises.	2. Contributing to the region development.
3. Emphasis on competence improvement.	3. Emphasis on the exchange of information and experience.
4. Agreement among organizations with similar business ranges.	4. Agreement among different interest groups.
5. Participants < 25	5. Participants > 25, usually including several cooperation networks

Source: adapted from Schoene & Huber, 2005, p. 16

While a cooperation network emphasizes individual business development and agreement among organizations with similar business ranges, a cluster is more oriented to regional development through exchange of information and agreement among different interest groups. Furthermore, a cluster is an evolving consequence from initial partnership among 2 or 3 partners who share commonality and connectivity, cooperation network among more partners with emphasis on competence improvement, to the final formation of multi-involved existence for regional development. Therefore, clustering refers to the evolving process, and clustering in the field of vocational education actually refers to the whole development process from initial small-sized partnership

to final multi-involved and complicated formation of a cluster of vocational education.

2.2 Socio-economic situation and practices of clustering in the field of vocational education

After over 30 years of economic reform and initiation of policy for opening to the world, on the one hand, China has been very successful in economic development. But on the other hand, some paradoxical phenomenon also occurs in the labor market: unemployment problem for graduates from higher education versus shortage of qualified labor forces. The reasons for this phenomenon could be originated from economic structure and also from structure of human resources. However, quality of vocational education is also one of the main contributors to that phenomenon. Therefore, quality of vocational education has triggered a public concern and measures to promote clustering in the field of vocational education have hence been adopted for solutions to problems such as unemployment of graduates and inconsistent quality standards of vocational education.

2.2.1 Labor market situation

China has been experiencing a dramatic economic structural transformation from agriculture-centered to more light industry and service oriented. Between 2005 and 2009, over 45 million people have migrant from agriculture to non-agricultural sectors, and the sum of migrant workers totaled 225.42 million in 2008 since 1978[18]. Meanwhile, the higher education has also been expanding, and the number of annually enrolled students by higher education rocketed from 1.08 million in 1998 to 6.39 million in 2009, with an average increase of more than 20%[19]. More and more graduates from higher education are seeking for

18 Statistic Bureau of China, 2009

19 Ministry of Education of China, 2009

jobs, and the unemployment problem presents increasing pressure on the economy in China.

Actually the correlation between GDP growth and employment increase has been weakened in China[20]. The GDP has been growing with an annual average percentage over 10% in the past years between 2001 and 2008, but the employment situation has not reflected this growth. According to the statistics of the Ministry of Human Resources and social Security of China (2009), the annually added jobholders in urban areas were respectively 8.59, 9.8, 9.7, 11.84, 12.04, 11.13, 11.02 (in millions) from 2003 to 2009. Blatantly the present economic development model cannot enlarge the employment chances anymore. According to the analyses of some experts[21], only the upgrading of the industrial structure may help the expansion of the job market.

The upgrading of the industries demands for the qualified personnel. The fact, nevertheless, is that there are not enough qualified personnel available in the labor market. The ratio between job vacancies for technicians and job seekers reached 2.33 in 2007 and 1.84 in 2009[22]. And for senior technicians, the ratio was 2.54 in 2007 and 1.86 in 2009[23]. Though the upgrading of the industrial structure may have created out many job vacancies, there have not been enough skilled workers available for these vacancies[24], and the quality of vocational education has been under criticism for years. As a consequence, there exists an unknown personnel structural problem in China: huge supply of labor forces but a shortage of skilled workers with profound professional experiences.

China has a big number of students studying abroad. From 1978 to the end of 2009, a total of 497,400 students had returned to China after graduation from universities abroad with degrees mostly higher than

20 Hu, 2006; Qiu, 2008

21 Yue &Ding, 2003

22 Information Center of the Human Resources Market in China, 2010

23 Information Center of the Human Resources Market in China, 2010

24 Liu, 2008

bachelor. And among them, 108,300 were back in 2009, an increase of 56.2% over 2008[25]. This figure is quite impressive and could surely benefit the economic development of China. However, when compared with the demanded sum of labor forces (over 10 million per year) and graduates from higher education (over 6 million per year), the returned students from abroad could only make a very limited contribution to supply of qualified personnel in academic sense.

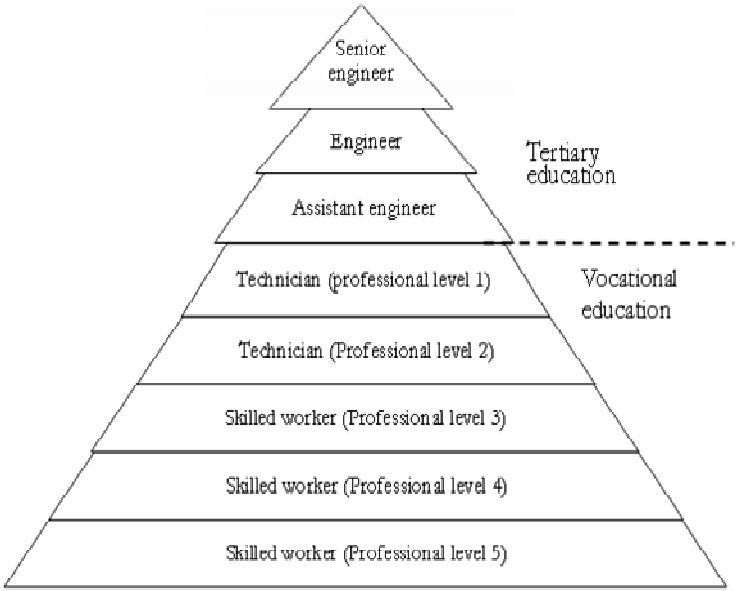
The shortage of the demanded qualified personnel could be the bottle-neck for the further development of the economy in China. The upgrading of the industry has to rely on the investment in the training and education which may help the change of labor forces from human resources to human capital in China.

2.2.2 Human resources structure

In China, the professional titles are usually divided into 8 levels (Figure 7). The 5 lower levels are usually for the graduates from vocational education, while the 3 upper levels are for graduates from tertiary education.

25 Ministry of Human Resources and Social Security of People's Republic of China, 2010

Figure 6 Professional titles' level



Source: adapted from Ministry of Human Resources and Social Security of the People's Republic of China, 2010-05-21

The bottom level, level 5, is for the career beginners with some simple and basic training. The top level, senior engineer, is usually for those graduates from higher education and with many years of working experience in a profession. The 5 bottom levels are usually qualifications for the people with vocational education and training. The 3 upper levels (preliminary qualification, intermediate qualifications, and advanced qualifications) could also be differentiated into 4 or 5 levels according to different professions and are usually for the graduates from higher education. For example, the basic educational requirements for qualification as an engineer (intermediate qualification) are: With master degree and working experience as an assistant engineer for more than 2

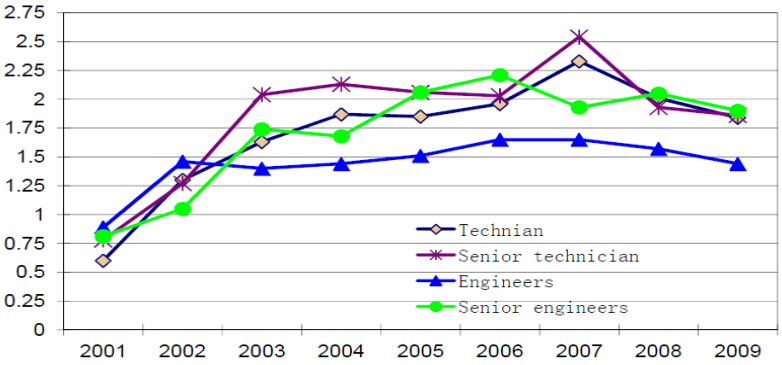
years; or with bachelor degree and working experience as an assistant engineer for more than 4 years; or with college education and working experience as an assistant engineer for more than 5 years. Those without higher education could only be promoted to the level of engineer in an extraordinary way[26].

It happens in China that certificates from schools (secondary education certificate, college education certificate, Bachelor, Master, Doctor, etc.) are regulated by Ministry of Education, and professional titles from level 5 to level 1 are administrated by Ministry of Labor while the qualification level from assistant engineer to senior engineer are controlled by Ministry of Human Resources. Therefore, the certificates from schools have no direct equivalence to the professional titles listed above. Those who would like to get the corresponding professional titles should take part in the special professional training or are assessed by a certain evaluation procedure.

Since 2002, there has always been a serious shortage of skilled personnel (Figure 7), while there has been an over-supply of graduates from tertiary education (Figure 8). Since 2002, the gap between the demand and supply of technicians, senior technicians, engineers and senior engineers has been mostly over 50%. There has been always a short of skilled personnel. In 2007, the difference reached its peak: more than doubled so many technicians and senior technicians were in demand as the labor market could supply. On the contrary to this short of supply, there has always been an excessive supply of job seekers with tertiary education. Most of the time, over 10% graduates from higher education could not find the right jobs. In the economically recessive years like 2002 and 2009, near 30% graduates from higher education could not find job vacancies. Actually in the whole demand for personnel, the job seekers with tertiary education only take a humble percentage of around 20%. It can be concluded that the education expansion in the past years has not met the demand for qualified personnel from industries. A huge number of students may have been qualified in the sense of duration of schooling, but not in the sense of professional quality.

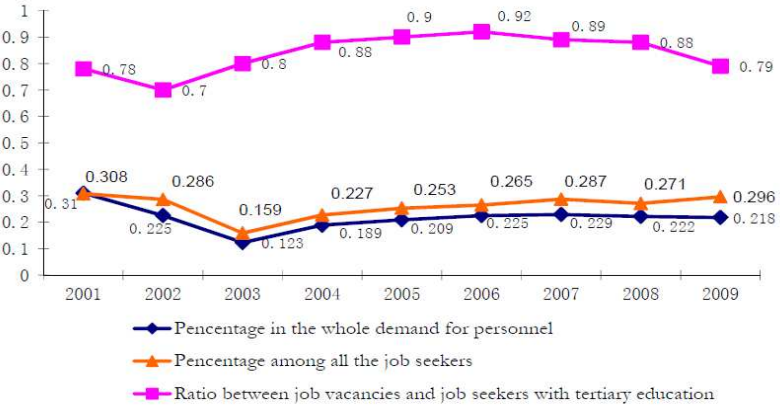
26 Jiangxi Provincial Department of Human Resources, 2005

Figure 7 Change of the ratio between demand and supply of skilled personnel



Source: Ministry of Human Resources and Social Security of China, 2010-05-24

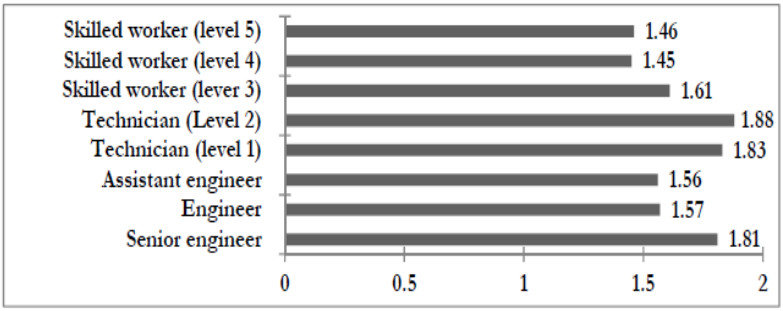
Figure 8 Change of the demand and supply of the personnel with tertiary education background



Source: Ministry of Human Resources and Social Security of China, 2010-02-22

The latest statistics from the Information Center of the Human Resources Market in China showed the thirst of the industries for skilled workers (Figure 9). The largest ratio is 1.88 for technicians. It means that there could be 188 job vacancies for technicians, but only 100 technicians would be available.

Figure 9 Ratio between demand and supply of skilled personnel in the second season of 2010



Source: Information Center of the Human Resources Market in China, 2010-02-21

Therefore, the unemployment problem could be primary because of the shortage of the total job vacancies in quantity. And the second would be the structural problem. Many jobs cannot be occupied by the qualified personnel, while many persons cannot find their right jobs. For the further supply of more job chances, industries should be upgraded and further developed. As to the structural problem, the main solution could only be the development of vocational education[27] and training.

In order to change the labor forces from human resources into human capital, vocational education in China has also been experiencing innovation and reform. Huge investment into human capital has already

27 Different from countries like Germany, vocational education in China includes vocational schools and training centers at the level of secondary education and polytechnics (colleges) at the level of tertiary education.

been made in China, at least in the past ten years, for the citizen's benefit, social mobility, productivity, and adaptability of labor forces to the varying production needs. And the innovation and reform are not restricted in the vocational institutions, but go further to handle the problems of vocational education from a broad point of view, such as emphasizing the role of the government and promoting the close relationship among vocational schools, enterprises and other social resources.

In fact, the challenges to vocational education are too complex, and resources to address them are too scarce for any single player. Therefore, there is growing recognition of the need to find new approaches which optimally use the resources and comparative advantages of both vocational schools and industrial sectors. There is also a need to develop a suitable framework for analysing and delivering learning opportunities, and for analysing and identifying skills needs (competencies) in anticipation of contemporary and future job profiles, and to ensure that newly acquired information and knowledge lead to improved entrepreneurial performance. Therefore, the implementation of cluster of vocational education is actually a requirement for the development of vocational education in China, and also a requirement for delivery of improved learning offers and learning opportunities. In November of 2005, the State Council of China issued a *Decision of the State Council on Vigorously Developing the vocational Education* (guo fa [2005] No. 35) and declared that vocational education institutes should cooperate well with enterprises, all kinds of resources should be integrated well, and clusters of vocational education should be carried forward further on.

Since 2003, the Central government has invested extensively in vocational education and especially funded 1,080 training bases, 1,235 training centers in the county level and vocational schools as model schools. Apart from that, 12,000 teachers have been further trained with the financial support from the Central government[28]. In addition, many different training projects for technicians, migrant workers and other kind of employees have been carried out and annually 150 million peo-

28 Tang & Ma, 2008

ple have received the training and further education[29]. For tertiary vocational education, Chinese government decided on investment into 100 tertiary vocational institutes all over China in 2005 and expected that these institutes would be demonstrative for other thousand institutes in China in terms of involving factors like industries, trades, enterprises, professions and practice in vocational education. These 100 institutes would get financial and political support in exploring the cooperation possibilities with enterprises and establishing an occupation-oriented and competence-based curriculum[30]. And many of them also become the key members of cluster of vocational education.

Some local governments have also been taking actions to support the development of vocational education and training. Jiangsu Province decided that 20% of the additional education revenue should be allocated to vocational education and training. Enterprises should take a sum of 2% out of the salary for training practices, and among this sum, 0.5% would be under the allocation of the local government. When any enterprise does not organize any training, then the total sum will be transferred to the local government[31]. Ningbo City in Zhejiang Province also declared that the municipal government would invest on building 10 training centers which would be shared by vocational schools and colleges.[32]

Some enterprises are also seeking ways out to relieve the present situation. For example, Guangdong Bureau of Middle-and-Small-Sized Enterprises organized annually a forum of technicians' information exchange for more than 150 vocational schools and more than 500 enterprises. This forum is aimed at establishing school-enterprise cooperation networks, so that the enterprises can offer the schools personnel qualification standards, practice chances, and trainers for special skills

29 Zhou, 2008

30 Ma & Guo, 2009, p. 22

31 Opinions on Promoting the Innovation and Development of Vocational Education of Jiangsu, http://www.jsvler.net, undated

32 Notice on the Measures to Setting up Training Basis in Enterprises in Ningbo, http://law.baidu.com, undated

and technologies, while the schools can also train demand-oriented students for the enterprises[33].

Implementation of cluster of vocational education has therefore become a development trend in China, with official support by government with policies and investment, with some positive reactions from schools and enterprises.

2.2.3 Situation of vocational education

Besides the above-mentioned social situation, vocational education in China has also some typical features of its own, such as the administrative system, development situation of vocational education, quality dilemma and also the traditional attitudes toward vocational education.

2.2.3.1 Administrative system

In China, there is not any unified administrative system for vocational education. Normally vocational schools are under the administration of educational bureaus according to the policy of funding and administration by each local government. The technical schools and employment training centers are usually run by the labor departments (now named as Department of Human Resources) in four levels, namely the central government, the provinces, the municipalities and the counties. Those vocational institutes funded by the organizations such as companies and other government departments, rather than by educational bureau or labor department, are also administrated by educational bureaus or labor department according to their categorization: secondary vocational schools by educational bureaus, and technical schools by labor department. The administration functions of both educational bureaus

33 Yu, 2007

and labor department include: approval of operation application, review of enrolment plan, instruction for teaching and training.

But this kind of administrative system leads to many malpractices. Firstly, the partition of hierarchical and regional administration makes the macro management out of control. The situation of vocational institutes of an area run and administrated by different governmental departments results in small scale of schools, low efficiency, and limited services' availability. Secondly, the divergent administrative system also causes the repetitive delivery of the similar program and scattering of the limited educational resources.

Moreover, since some secondary vocational schools and higher vocational education institutes are under the administration of the educational bureau while the occupational qualifications are controlled by the labor bureau, it happens that the students from the part of the educational bureau have to take part in extra but unnecessary examinations before they can get the corresponding occupational qualifications. Otherwise, they can only get the schooling certificates which are categorized into secondary education or tertiary education, while the occupational qualifications are divided into several levels according skills and capabilities level. There is no direct equivalence between schooling certificates and occupational qualifications, and there are no unified standards for the students from these vocational schools or colleges.

As a result, the vocational education, especially tertiary vocational education, has been brought into an awkward situation: neither a theoretical nor a practical curriculum system exists. On the one hand, the former subject-based curriculum is not welcomed because of its known for its impracticality. On the other hand, there has never been a practical guideline or curriculum existing among the vocational education institutes. Therefore, time and content arrangement for practice in many vocational institutes are quite chaotic.

2.2.3.2 Development of vocational training and education

Generally speaking, with the expansion of higher education since 1999, annual enrollment for higher education has rocketed from 1.54 million in 1999 to 6.39 million in 2009, with an average increase of more than 20%[34]. The percentage of enrolment in tertiary education among the schooling-aged population reached 23% in 2008[35]. Among this expansion, the Enrollment in Polytechnic/Colleges[36] increased from 0.61 million in 1999 to 3.47 million in 2009[37]. Nevertheless, the expansion has not satisfied the demand of labor market. The quality problem of vocational education is becoming more and more challenging in China.

Most vocational schools were originated from general schools, and the college or polytechnics offering tertiary vocational education were renamed from former secondary vocational schools or technical schools only in late 1990s. As a result, tertiary vocational education tended to be as shortened bachelor education, being dissociated from practice and job market, and unsuitable for the vocational students who are weak with theories learning.

Due to the lack of experience and the pressure from the expansion of higher education, the colleges and polytechnics are pushed to differentiate themselves from general higher education institutes by promoting their professional and practical characters. Therefore, these colleges and polytechnics are rushing to occupational qualifications to crown the practical skills and technical qualifications as the teaching guidelines, and a compromise idea of integrating the schooling certificate into occupational qualification certificate is put forward as a new quality

34 Ministry of Education of China, 2009

35 Report on the Reform and Development of Tertiary Vocational Education between 2000 and 2010, Higher Education Press, 2010, Beijing, p. 4

36 The school system in China is generally divided in pre-school education (kindergarten), primary education (6 years), secondary education (3-year-schooling junior middle schools and 3-year-schooling senior middle schools or 3-year-schooling vocational schools), and tertiary education (3-year-schooling polytechnics/colleges, or 4-year-schooling universities)

37 Ministry of Education of China, 2009

ensuring measure for the improvement of students' adaptability to the job market.

Up to now, there have been several interpretations of the idea of the integration of two certificates. First, it is a mutual recognition and communication between schooling certificates and occupational qualification certificates. On the one hand, the curriculum contents in the school should be compatible with the qualifications' demand of the related professions. On the other hand, both certificates should be comparable and replaceable between themselves[38]. Second, it is an effort to unify the educational standards and occupational qualifications[39]. Third, it is to adjust teaching contents according to national occupational qualifications, so as to meet the demand of the job positions for competence and experience. Furthermore, theoretic teaching in schools should cover the basic knowledge while practical training should bring forward the practical competence required by occupational qualifications[40]. Therefore, the integration of two certificates is actually a unification of the qualifications from schooling and professional training, in a bid to establish a kind of teaching system dominated with occupational qualifications and competence. However, due to many theoretical and practical limits, the integration of two certificates, namely schooling certificates and qualifications certificates, has been confronted with many difficulties.

The qualification system available at the moment was made for the classification of workers under the planned economy time. After several times of adjustment and amendment, this system is still mainly reflecting the interest of the administrative government, rather than the interest from industries or employees. Structurally the system is mostly based upon subject system and is detached from the industrial and technological development trend.

38 Bo, 2008

39 Wu, 2006

40 Luo et al., 2008

The qualification system consists of the qualifications for specific work or tasks. Usually one profession is composed of one or several kinds of work, and one work can consist of one or several tasks. On the contrary, one subject in a tertiary vocational school can cover several or dozens of tasks. Furthermore, one of the features of the qualifications system is its national standard tests, but each of the tertiary vocational education institutes makes its own examinations by following the referential national syllabus[41]. Therefore, the certificate from tertiary vocational education is not equal to the occupational qualifications system. Especially when the present occupational qualifications system in China covers only the specific technical standards for limited professions or tasks, it would not be realistic to rely on the present occupational qualifications system to establish a professional-competence-based teaching system in tertiary vocational education.

The occupational qualifications system has many limitations in its own implementation. Compared with abundant supply of subjects in tertiary vocational education institutes, many occupational qualifications are still not available. Furthermore, the amendment of qualification standards cannot catch up with professional development and technical progress. Moreover, because of the lack of proper control, it happens that the occupational qualification certificates are often issued out against payment without following strict examination procedure. Therefore, the qualification certificates are not very reliable and cannot be a good guideline for tertiary vocational education.

The implementation of the idea of integration of two certificates has already resulted in some problems. The first is public negative attitude toward schooling. Since training as short as half a year is already enough to make a trainee fit in a working position, there seems to be of no need for years of schooling. The second is the simplified choice of teaching contents. Only the skills and the knowledge required by working positions are expected to be involved in learning and instruction, and these skills and knowledge should be documented with a series of qualification certificates. Culture and humanities courses are considered

41 Wang, 2008

as too academic and hence are often eliminated from the syllubus. The responsibility of education as cultivating capabilities for life learning is reduced to a simple technical and skills training.

As a result, tertiary vocational education has been bogged in an awkward situation: neither a theoretical nor a practical curriculum system is available. On the one hand, the former subject-based curriculum is abandoned because of its bad reputation of not being related to practice. On the other hand, there has never been a practical guiding system or curriculum existing in tertiary vocational education. Therefore, due to many theoretical and practical limits, the integration of two certificates has not brought forward the quality improvement as expected.

Furthermore, it is the GDP oriented strategy of economic development that has led to the expansion of higher education since 1999, because of the fact that the expansion injected huge investment in building new campuses, thus consequently having stimulated domestic consumption market by charging tuition fee from education sector, which in return boosted the increase of GDP index. Higher education has since then been market oriented, which means some disadvantageous families may not be able to afford the cost for higher education on the one hand, and on the other hand, higher education institutes may be more cost concerned than labor market oriented by delivering curricular programs[42]. Or in other words, the supply from higher education is not oriented to the demand from labor market. For example, among 250,000 annually graduated engineering students from higher education, around 100,000 of whom are from the field of informatics and computer science[43].

Moreover, public financial investment in vocational education has been quite limited in the past years. For example, the subsidy for secondary vocational education dropped from 11.58% of the total educational

42 Sun, 2009, p. 24

43 Sun, 2009, p. 25

budget in 1997 to 5.74% in 2005, and consequently the tuition accounted for 28.13% of the whole funding in 2005, an increase of 26% over 1997[44]. And this problem was even severe in the countryside and in those cities located in economically marginalized areas where the local governments did not dispose sufficient financial resources.

In spite of the total increasing funding sum and favoring policies in recent years, the development of vocational education still encounters many difficulties. Since 1999, the expansion of the enrollment has reduced the per capita amount of educational resources available to each student, while diminishing allocation of resources and inefficiently repeating establishment of similar programs.

Most of the vocational schools and colleges are also faced with problems in tems of recruiting teachers with practical experiences, and also of getting enterprises involved for the provision of practical chances. Therefore, a lot of training is done merely by reading from books, and "practical experiences" are accumulated from blackboards[45]. Though many vocational schools and colleges would still be able to award for each student certificates of qualification or skills, but these certificates cannot be the proof of the skills level demanded by enterprises.

Due to various restrictions, a great quality disparity of vocational education occurs among regions, educational and training institutes, programs, and schooling years of the same institute. Therefore, there is still a long way to go to make demand-oriented programs and training measures available.

2.2.3.3 Quality standards

Actually several arguments have been brought forward concerning the definition of quality of education in China.

44 Editor office, Development of Vocational Education in China in the Past 30 Years, Vocational and Technical Education (J), 2008.10, p. 26-39

45 Xie, 2009

The first opinion emphasizes the change of core services according to the various development stages of tertiary education, namely elite higher education (lower than 15% enrollment rate of the population of school age), masse higher education (between 15% and 50% enrollment rate) and popular higher education (over 50% enrollment rate). At the elite stage, higher education is to train the personality of elites for governmental and academic positions. At the mass higher education stage, higher education turns from personality forming to both personality forming and professional training. And at the popular higher education stage, education is aimed at improving the population's adaptability to the changing society[46].

The second opinion is based on the demands of stakeholders involved in education. According to this opinion, there should be social quality of education which refers to society's satisfactory with graduates from schools, inner quality which refers to students' satisfaction with higher education institutes, and work quality which is related with school administrators' satisfactory with educational work[47].

The third opinion emphasizes the importance of educational goal. The quality of higher education is actually the matching degree between the result of educational activities and the expected education goal[48].

Another opinion categorizes the quality into inside quality and outside quality according to educational process. Inside quality is the preparatory quality of education which helps students to advance from one learning stage to another. Outside quality is the satisfactory degree of customers[49]. The quality throughout educational process includes quality of educational goal, educational process, educational system, educational facilities and educational products[50].

46 Pan & Xie, 2001

47 Ma, 2001

48 Wang & Wang, 2002

49 Yang, 2002

50 Zhao, 2000

Quality is essentially a value judgment, and could be evaluated from quite diversified points of view. In China, the evaluation practice is a monolateral value judgment dominated by government, and is used as a specific tool of administration. No matter whether the evaluation happens outside of higher educational institutes or inside, the evaluation is always applied as a downward control measure, seldom as a step toward self-improvement[51]. Moreover, since there still exists no third independent party who can give a fair evaluation, and government is still the main sponsor for tertiary vocational education, government is still expected to play a dominant role in guiding the development of vocational education. Therefore, it is governmental policies that dominate the definition of quality in China.

2.2.3.4 Traditional inclination toward higher education

Because of lack of transparency of quality supervision, as well as credibility of education, students with higher educational level are usually considered as more capable and adaptable than those with lower educational level. Since investment in human capital results in increase of costs, most enterprises tend to employ persons offering a level of education higher than required for specific working positions in order to save costs for training and further education. Therefore, there is and will further be in future a push from both enterprises and individuals toward seeking higher education.

However, according to a review made in 2008, only 21% enterprises were satisfied with graduates from tertiary vocational education[52]. The main reason could be the less competent educational background of students for tertiary vocational education. In China, all the students graduated from secondary education have to take part in a national higher education entrance examination, and they are filtered through the scores they achieve in the examination for different type of tertiary education. The students with the highest scores will be chosen by those

51 Chen & Li, 2000

52 Tang & Jiang, 2008

top universities, and the tertiary vocational education institutes usually get the students with the lowest scores. They are usually weak with basic knowledge or professional skills and have commonly low motivation for learning. Therefore, it is not very realistic to upgrade this kind of students to an ideal level of all-around developed students in the 3-year-schooling time[53]. This situation also constrains the improvement of quality of tertiary vocational education in academic sense or in professional sense.

2.2.3.5 Role of enterprises

Up to now, many an enterprise in China still relies heavily on foreign investments as a link to international industry system, and enterprises themselves function as only a manufacturing centreof the whole industrial value-chain, with market, capital and technology all located in foreign countries[54]. This kind of situation actually constrains the further development of manufacturing enterprises and also the development of vocational education in providing training for an industry as a whole.

Usually the manufacturing enterprises have also a very limited willingness or ability to provide training. The motivation of enterprises to develop skills is primarily driven by their short-term objective of meeting their own needs to increase productivity and improve the quality of goods and services. A lot of enterprises have no interest in cooperating with vocational schools or colleges, because vocational schools or colleges have no apparent strenths in research and development, or marketing or provision of demanded personnel. Most enterprises do not like to provide their own production plants or lines freely to students for practice or get involved in the training activities of vocational schools or colleges. Many enterprises prefer to employ technical workers directly from free labor market, because it is quicker and cheaper than on-job training by enterprises themselves. Also, there has been no

53 Zhou & He, 2005

54 Lang 2010, p. 53

tradition or mechanism for enterprises to get themselves involved in the training procedure. There are no related financial incentives or favorable policies from government granted to enterprises. Therefore, enterprises just have low passion for cooperation with vocational schools or colleges[55].

Neither is 'Training on the job' very popular among enterprises: In 1996, only 14.6% enterprises in China established their own training schemes, and in comparison with their counterparts, 70.9% enterprises in America and 83.9% of the enterprises in Japan had their own training schemes[56]. In 2002, 38.7% of the enterprises made a budget for on the job training which accounted for only 0.5% of the salary of the total staff. And 38.7% of the enterprises arranged a budget totaling 0.5%-1.5% of the whole salary. In 2003, most enterprises invested only ¥195 (about €19.5) per person per year on offering training to the staff, which accounted for only 1.4% of the whole salary cost, even lower than the minimum faction of 1.5% requested by government[57].

However, the need for enterprises to retain their competitive edge gives rise to a dilemma: the short-term objective of keeping costs down tends to limit investment in training, while pressure to keep pace with rapid industrial upgrading, makes advanced skills imperative in the long-run. Confronted with this choice, short-term considerations often prevail and only a small percentage of employers invest in training for their staff, or get involved in providing training themselves. Moreover, the training provided by employers has weaknesses: it is often unsystematic, job-specific and only focused on those better skilled workers, and therefore does not literally enhance the flexibility and mobility of the individual employees[58].

55 Chan & Zhang, 2004; Cai, 2007

56 Liu, 2007

57 Ministry of Labor and Social Security, 2004

58 Yang, 2004

2.2.3.6 Training offered to migrant workers

In the process of urbanization and economic development in China, a huge number of population from rural areas has moved to the coastal and urban areas. According to the statistics of Chinese government, the migrant workers from rural areas totaled 225.42 million in 2008, and 229.78 million in 2009. Among them 140.41 million in 2008 and 145.33 million in 2009 worked in the areas beyond the local communities, cities or towns[59]. These migrant workers take over 50% of the whole labor forces in the manufacturing and service industries. Therefore, the integration of these migrant workers into the economic development and metropolitan life is vital to the sustainable development of economy and harmonious development of society.

There have been many different kinds of training offered to migrant workers by governments, enterprises, training centers or communities. However, these training activities have also been impeded by many factors: (1) Motivation. Migrat workers have no obvious motivation or target for taking part in training. They have very limited free time due to the normally long working hours on the job and participation in training usually costs a lot of time and money. (2) Low involvement of enterprises in offering training. Some enterprises may offer some training for beginners, but the training is usually limited to the skills for specific positions at a production line, such as fixing nuts and bolts, fusing the electronic components, etc.[60] (3) Uncertainty of the training quality. There are no unified training standards in many professions, and the quality of training offered in training centers or schools are not transparent or predictable. The unsecure effectiveness of the training also pushes the migrant workers away from spending their time or money on participating in this kind of training. (4) Unsatisfactory community education. Community education in China was initiated in the eighties of last century and marked with the appearance of a government organization named as Committee of Community Education. The Committee's tasks included providing educational services to the

59 Ministry of Human Resources and Social Security, 2010

60 Yue & Ding, 2008

communities and helping them to serve the local schools as their outside campuses. In this period of time, community education was mainly operated by schools with moral education for the youngsters as its education focus[61].

Since 1993, community education has been further developed in the fields of educational theory, function, contents and network. Its goal is regarded to construct learning community through the integration of the socialization of education and the educationalization of society, to serve the community as well as to promote all-round and sustainable development of community members"[62]. Many areas are still applying traditional education mode for community education, despite community education has not achieved the expected quantity or quality efficiency in practice. According to a questionnaire made in Tianlin District of Shanghai[63], most of the inquired people showed their dissatisfaction with the community education (Table 2).

Table 2 Main problems of the community education

Main problems	persons	Percentage (%)
Limited contents	320	37.0
Lower level	55	6.4
No relevance	70	8.1
Superficiality	50	5.8
Few participants	146	16.9
Others	49	5.6
No comment	175	20.2
Total	865	100

Source: Liu, 2004, p. 24

Many local governments are taking some active measures in this matter. Beijing Municipality plans to increase the percentage in population with

61 Xuan, 2001

62 Gu, 2003

63 Liu, 2004

secondary education or secondary vocational education in its suburb areas to 50%, and to provide practical training to 500,000 farmers annually, so that they can transfer to city work or master one or two advanced technology of planting and breeding. Hubei Province launches a vocational education project to help its 6 million people out of poverty. The project is aimed "to train one member for employment so as to enrich one family".[64]

The challenges to vocational education are too complex, and resources to address them are too scarce for any single player. There is growing recognition of the need to find new approaches which optimally use resources and comparative advantages of both vocational schools and industrial sectors. Therefore, implementation of clustering in the field of vocational education is actually a demand from the development of vocational education in China, and also a demand from delivering improved learning offers and learning opportunities to society.

2.2.4 Implementation of clustering in the field of vocational education

The history of 30 years' development in China between 1978 and 2008 is divided in 3 stages[65]. The first stage is the period from 1978 to 1992. During this period, reform on planned economy was initiated in 1978, farming contract system was launched in 1979 in countryside and decision on economic system reform was made in 1984. The second stage was from 1992 to 2001. Market economy and deregulation to the world investment were widely recognized and accepted. Macro control resulted in the soft landing of economy from 1996 to 2000, and China joined WTO in 2001. The third stage was from 2001 to 2008, marked with China's membership in WTO, prosperous economic development and inauguration of Olympic Games in Beijing

64 Proposal for the Clustering of Vocational Education in China, http://www.czgz.gov.cn/guozyj/ShowArticle.asp?ArticleID=124' 2007-02-13

65 People Net, 2008

In reference to this division, the development of vocational education clusters during these years is also divided into 3 stages, namely initiation stage (1978-1991), exploring stage (1992-2001) and unified planning and exploring stage (2002-present)[66].

Initiation stage (1978-1991). The open policy and reform was initiated in 1978 in China. At the beginning, the reform targeted at the countryside and commodities economy. On 6th May 1983, *Notice on the Issues Related with Strengthening and Reforming of School Education in Countryside* was issued by the Central Committee of Chinese Communist Party and the State Council, in which it regulated that "each region should gradually and uniformly plan and increase the number of agricultural high schools and vocational schools according to local situation". In practice, primary education, vocational education and adult education were under unified administration so that teachers and laboratory facilities could be shared among schools. Furthermore, vocational education centers in prefectures constituted from vocational schools were also established to integrate available resources. But these newly established vocational education centers were in difficulty to get students especially when the former employment arrangement system was abandoned in early 1990s. Since then, employment was not arranged by government and every student had to find his or her own chances in job market. Because of the distance between countryside and the industrialized cities, students from vocational schools in countryside had usually obvious disadvantages in getting jobs. As a result, vocational education became not as attractive as before.

Exploring stage (1992-2001). At the 14th plenary meeting of CCCCP in 1992, the targeted model of building social market economy system was first raised. In 1993, the *Decision of the Central Committee of Chinese Communist Party on Issues Related to Establishment of Social Market Economy System* was approved by the 3rd session of the 14th plenary meeting of CCCCP. The market has since then functioned as the basic allocator of resources under the macro control of central government. Under this situation, *Principles of Educational Reform and Development in China* (zhong

66 Yu, 2009, p. 7

fa [1993] No. 3) was issued by CCCCP and State Council in 1993, demanding running vocational schools with multiple forms and multiple levels, active adaption of vocational schools to the local social market economy, and combination of industry and education. Since 1992, vocational education groups emerged occasionally and spontaneously in some coastal cities where economy prospered. These education groups had more advantages than other vocational schools in offering training courses, because they were more active in contact with enterprises, more flexible in programs organization, and more service-oriented in offering training programs. However, these vocational education groups usually got very limited financial support from government and hence relied heavily on tuition fees. They experienced a very brief development history before they had established their own reputation in sense of quality. After the organizational reform in State Council in 1998 which resulted in the abandonment of running vocational education by many industrial ministries, those vocational schools formerly under administration of these ministries were handed over to the administration of local government, meanwhile enrolment as well as employment mechanism also changed accordingly. Together with the higher education expansion since 1999 which admitted many students from vocational education to general education, vocational education got involved in a difficult situation.

Unified planning and exploring stage (2002-present). In 2002, *Decision of the State Council on Vigorously Promoting the Reform and Development of vocational Education* (guo fa [2005] No. 35) called for the establishment of modern vocational education system which should be integrated closely with market demands and employment. Under the encouragement of government, a few vocational schools and enterprises began to seek for new ways of cooperation on the basis of school-enterprises cooperation, integrating working with learning, and combination of production, learning and research. In 2005, the State Council of China stated clearly in "*Decision of the State Council on Vigorously Developing vocational Education"* (guo fa [2005] No. 35) that "the model of integrating working with learning as well as integrating schools with enterprises should be heavily promoted" and "the integration and reorganization of resources of public vocational schools should be encouraged". In

2006, the Ministry of Education (MoE) published a paper entitled V*iews on Improving the Education and Teaching Quality of Higher Vocational Education* (jiao gao [2006] Nr. 16), demanding that work-integrated learning should be regarded as an entry point of the reform on training talents in the higher vocational education[67]. These authoritive documents are considered as the recognition/official accpetance of clustering in the field of vocational education from political point of view and also as encouragement for the establishment of training model which is employment oriented and service centered[68].

The clustering of vocational education in China was initiated in 1980s as a method of adjusting vocational schools' location structure, integrating resources and promoting the development of vocational education. By the end of September 2007, 23 provinces and municipalities had established vocational education clusters, which totaled 305 and involved more than 6,479 members in the clusters[69].

2.3 Review of the researches on clustering in the field of vocational education

There is hardly any international theoretical research carried out on the corresponding aspect of clustering in the field of vocational education, and the researches done are mostly case studies about some educational groups, like Apollo Group in America, Career Education Group of NIIT in India. These educational groups are mostly profit-oriented and operated in diverse prototypes, and especially their experiences of funding through capital market arouse the interest of many experts of education and economy both in China and abroad. However, due to the fact that capital market belongs to the most developed stage of market economy and China somewhat began its transformation from planned

67 Zhao, 2011, p. 44

68 Yu, 2008, p. 11, 70

69 Editor office, Development of Vocational Education in China in the Past 30 Years, Vocational and Technical Education (J), 2008 (10): 26-39; Collection of the Thesis for the First Forum on Clustering of Vocational Education in China, http://www.chinazy.org/item/1027.aspx, 2008-11-18

economy to market economy only in 1980s, when the market economy in China was still not fully developed and the term of capital market was still quite sensitive and difficult for the organizations of education in China. Facing the situation of present market economy, clusters of vocational education are usually non-profit oriented. Since different countries may have very different social economic and cultural systems, it is definitely not sure whether the models of educational groups in foreign countries can be successfully transplanted in China. Furthermore, educational groups are just one kind of educational cluster. Therefore, the dissertation will not further take these international education groups in consideration.

The "*Law on Vocational Education of People's Republic of China*" (1996) stated that "an inter-communicative and coordinative development of vocational education system of both vocational schooling and training should be established along with other kinds of education", and "vocational education covers primary, secondary and tertiary vocational education" while "vocational training covers training before employment, career training, training on the job, further training and other kinds of vocation training" (chpt. 2, p. 12-14). Cluster of vocational education in China is a special organizational model of cooperative education originated from the theories and practices of vocational education in China, and it is difficult to find out those international literatures on the topic of "cluster of vocational education". In consideration of this situation, the dissertation will only review those researches made in China.

Since its initiation in 1990s, clustering of vocational education has attracted a lot of researchers' interest. And up to now, a lot of researches have been conducted in the following aspects: (1) concept definition, (2) types and models, (3) nature and advantage of vocational education cluster, (4) organizational structure, and (5) role of the government.

2.3.1 Concept definition

Many researchers have defined the concept from different point of view. According to Dazi Zhou, a vocational education cluster is a kind

of cooperation network among vocational schools with the possible participation of local enterprises or organizations[70]. Chenrong Ma[71] defines it more detailed. According to him, a vocational education cluster is the combination of the independent but also inter-related factors of schools, enterprises and other social sectors, with an aim of forming inter-relationship for personnel training among schools and also between schools and enterprises. Furthermore, the vocational education cluster is also a non-profit social organization related with both economic and social aspects. Weidong Gao[72] considers the vocational education cluster as a vocational education alliance composed of independent vocational schools and related enterprises or organizations bundled by contracts or partnered with investing capitals and facilities. Besides the definitions made by experts, the concept of 'cluster of vocational education' is also explained by governments of different levels. For example, in its *"Views on Promoting the Implementation of Clusters of Vocational Education in Shanghai*" (hu jiao wei zhi cheng [2007] No. 26), Shanghai Educational Committee defined the concept as "an organization with no independent legal status, established with connection through professions, by focusing on one or several vocational schools or colleges, with involvement of related industries, enterprises and schools, on basis of voluntary and agreement, and aimed at sharing resources as well as realization of cooperation between enterprises and schools".

Therefore, many researchers focus on defining cluster of vocational education as a kind of alliance, but not as an entity itself with legal status or managing function.

2.3.2 Types and models

Application of different standards would result in different categorization of types of vocational education cluster. The frequently used

70 Zhou, 2002

71 Ma, 2005

72 Gao, 2004

standards include: directions (horizontal, cross, mixed cooperation), ownership (public, private, mixed), development model (supported by industries, led by government, found through accumulation), connections (capital, contracts, blended), location (regional, professional, blended), relationship (close, loose, combination of loose and close relations), members (schools with schools, schools and enterprises, multiple stakeholders), etc.[73] Up to now, mostly categorization is made on theoretical deductive analyses, seldom with references to practical cases.

Furthermore, many researchers have also tried to categorize clusters into several forms, such as regional clusters, professional clusters and mixed clusters, or clusters with close, loose or mixed relationship[74], or clusters among schools, schools and enterprises, or multiple stakeholders[75]. Most of the categorizations were from theoretical point of view and failed to bring forward the detailed characters of different forms of clusters.

Models of clustering in the field of vocational education are developed from practical experiences and keep changing together with progress of practice. Therefore, there exist many kinds of models of clustering. The most influential conclusion of the models refers to Henan Model (combination between urban and rural schools and led by urban schools), Hainan model (3-staged cooperation between cities and counties), and other models of cooperation between schools and enterprises[76].

73 Yu, 2009, p. 57

74 Feng & Duan, 2003

75 Chen, 2004

76 Yu, 2009, p. 57

2.3.3 Nature and advantages of vocational education cluster

Cluster of vocational education can be categorized into the third sector of social organization as a non-profit organization[77]. Many researchers recognize that vocational education cluster can contribute to the share of resources among members of a cluster and it could also be beneficial to the improvement of management quality. Yuan Xie[78] perceived the advantages of the vocational education cluster exceeding the aspects aforementioned, and stated that clustering in the field of vocational education could bring vocational education directly in the market to adjust itself accordingly. Clustering can therefore improve the competence of vocational education in the market.

Many researchers have also analyzed the implementation of clustering in the field of vocational education by means of economic theories, such as economy of scale, system optimization theory, economics of scope, network economy, etc. However, most of these researches are just trying to explain and support the existed vocational education clusters, but fail in proposing any suggestions on how to build a cluster, nor relating the theory with operative activities.

2.3.4 Organizational structure

Researches made on organizational structure of cluster of vocational education are limited in quantity and quality. Most of these researches attempt to apply the experiences with organizational structure of industrial company groups into research on organizational structure of cluster of vocational education and seldom refer to detailed cases. Concerning the organizational structure of vocational education clusters, Yuan Xie (1997) divides it into two levels. The first level is macro structure, which refers to the structure among members and consists of planning, operation and controlling structure. The second level is micro

77 Ma, 2005

78 Xie, 1997

structure, which means the inner structure of each member. Xiangqin Feng and Zhijian Duan[79] put forward a structure as management commission under a governing board. When the involvement of government is considered, many experts agree on the idea that government should play an initiating, supporting, and controlling role[80].

2.3.5 Role of the government

The theoretical support to governmental involvement in directing vocational education usually relates to the theory of public goods and especially the externalities of vocational education.

The theory of public goods distinguishes public goods from private goods according to two characteristics, namely non-rival instead of rival, non-exclusive instead of exclusive. "Non-rival" refers to the situation where newly added consumers would not raise the cost of the provider of the goods or diminish the consuming effect of the former consumers. There exists no competition among consumers of the same goods. "Non-exclusive" refers to the situation where the existing consumers could not exclude the other new comers or those who would not pay from sharing the goods[81]. Or as defined by Samuelson (1954), public goods are the ones "which all enjoy in common in the sense that each individual's consumption of such goods leads to no subtraction from any other individual's consumption of that goods"[82].

The provision of public goods is a correction of market failure resulting from non-exclusion of free-rider problems or because of the concern of "communal wants"[83], in which an individual is considered as a member of a community. Communal goods are needed "where many

79 Feng & Duan, 2003

80 Yang & Yi, 2007

81 Case, 2008, p. 350

82 Samuelson, 1954, p. 387

83 Musgrave, 1996/97, p. 143

individuals find that they cannot obtain an adequate provision without collective action"[84].

Public goods involve externality, which is a concept referring to the effect which individual production or consumption activities exert on the external individual or group. This effect, which could be positive (beneficial) or negative (harmful), is not produced by the individual intentionally or actively, nor is it possible to be evaluated with price system[85]. Because of the presence of externalities, government should enter as a mechanism needed to correct market failure, or even appear "as the subject of wants, overriding the private preferences of its members"[86].

Vocational education, especially the service provided by vocational education institutes, is mostly regarded as a kind of quasi-public goods, with characteristics of both public and private goods[87].

The consumption of the products of vocational education has both direct effect and indirect effect. The direct effect, also called 'internal effect', refers to the improvement of knowledge, abilities and social identification of the students after education. The indirect efficiency, also called external effect, refers to the contribution of the raised knowledge, abilities and social identification to the improvement of social economic development and social harmony. Therefore, the external effect of vocational education usually results in the consideration of the costs for vocational education as human capital investment[88]. Furthermore, the external effect is also related with social fairness, since vocational education can enable people to get rid of the inherited poverty with gained knowledge and skills, and can promote the mobility of people from lower into upper social classes[89].

84 Musgrave, 1996/97, p. 157

85 Jin & Guo, 2008, p. 54

86 Musgrave, 1996/97, p. 186

87 Huang & Zhou, 2010; Yuan, 2003

88 Huang & Zhou, 2010

89 Huang & Xu, 2008

The direct consumption of vocational education is usually exclusive and rival. The increase of students' quantity could not only raise marginal cost in the sense of accordingly increased costs for study places, but also erode the quality of educational service to former group of students. For example, the average attention of the teachers to each student would be weakened, and other educational resources available to each student would also be lowered. Furthermore, vocational education can bring students skills and knowledge for a better employment chance than those without vocation education. Therefore, the benefit from vocational education is exclusive. From this aspect of view, education has some nature of private goods.

The indirect consumption of vocational education includes some non-rival and non-exclusive features. Primarily, vocational education can contribute to the improvement of students' income and social status, which cannot be shared by the other persons and hence has rival and exclusive features. In addition, vocational education can also benefit the social economic development by means of supply of qualified personnel for labor market. This supply of labor power can be harboured by all industries with no marginal cost for the added consumer, and no exclusion of any industries from benefit from this supply. In this sense, vocational education is a kind of quasi-public goods.

However, the character of social products is changeable due to technological development, social attitude toward the externalities of products, and governmental consideration of cost and benefit. Actually the character of vocational education as public goods, private goods, or quasi-public goods is a kind of arrangement and choice of institution according to the social development situation[90]. Vocational education is just like other kinds of products or services whose character as a different kind of goods is decided by their provision mechanism. Whether vocational education is provided by government as public goods or by market as private goods, is just a kind of institutional arrangement[91].

90 Gu, 2007

91 Wang & An, 2004

In recent years, with the appearance of the problem of employment difficulty and shortage of skilled workers, the externalities of vocational education are expanded and vocational education is expected as a possible solution to those problems. Since vocational education has obvious externalities, it cannot exclusively rely on the market, but should get government actively involved in promoting efficiency of resources relocation and maintaining social fairness.

2.4 Open questions

Though the practice of clustering in the field of vocational education encounters many problems, it has contributed to the improvement of practice chances for students and teachers, connection between secondary and tertiary vocational education, and facility improvement, etc. However, since vocational education clusters are quite a new thing in China, therefore it is understandable that most of the researches are just trying to explain and support the existing vocational education clusters from different points of view. According to the summarization of Xiuqing Yu whose several years of literature analyses and interviews with executives of clusters of vocational education, there exist three main problems for further implementation of clustering in the field of vocational education. The first is that theoretical researches on clustering in the field of vocational education lag behind the practical process. The second is the insufficient orientation of governmental policies, and the third is the problem related with clustering system and mechanism[92].

In order to solve these problems, many researchers have brought forward a wealth of suggestions, such as to handle well the relationships between scope expansion and quality, industrial management and educational administration, economic efficiency and social efficiency, etc.[93]

92 Yu, 2009, p. 58

93 Liu, 2005, p. 55

However, many questions like the above-mentioned problems and also about how to evaluate the operative activities as well as how to learn from the practical experiences are still open.

Moreover, the implementation of clustering in the field of vocational education also reflects the problem with orientation of clustering toward industrialization[94]. Therefore, the question related with establishment and realization of goals of clustering in the field of vocational education is also open.

Clustering in the field of vocational education may contribute to the improvement of efficiency of resources and competitiveness of members in a cluster in market economy, but its ultimate goal should be improvement of quality of vocational education. Clustering in the field of vocational education is not just aimed at formation of a cluster itself, but also at its economic, social and educational goals, which are sometimes interpreted as reducing costs, improving employability, and creating a synthetic force out of different resources for improving average quality of vocational education. On the basis of the achievement up to now, the cooperation among members of cluster would transit from cooperation in form into cooperation in key value, such as getting involved in teaching process. Meanwhile, guided by the principle of sharing responsibility, rights and benefits, a balanced management mechanism would also be required in cluster[95].

Vocational education as a sub-system belongs to the system of society as a whole. Education functions do not stay in a vacuum, but interact with other sub-systems of society. Clustering in vocational education is actually a process of progressive systematization from physical summativity to wholeness. Therefore, this research will rely on the theory of system to do comparative analyses with criteria derived from theories of cluster, educational economics and also that of education. By com-

94 Liu, 2009, p. 22

95 Xing, 2009

parison of selected implementation models, a clear picture of the clustering situation would be presented, and suggestions would be drawn out for future practices.

3. Theoretical background of comparative criteria

The comparative method is normally used to observe two or more related subjects with certain criteria for exploration of their similarities and differences[96]. Usually, the comparison includes 4 partly concurrent functions: (i) idiographic function which is to search for specialty through description and explanation of phenomenon; (ii) ameliorative function which is to search for better model or to learn from positive experiences; (iii) evolutional function, which is to focus on development trend; and (iv) experimental function which is aimed at universality through creation of artificial experimental situation to compare phenomena under different backgrounds[97].

In consideration of the research scope, the comparative analysis of selected implementation models of clustering in the field of vocational education will focus more or less on the first two functions of comparison, namely idiographic and ameliorative function. Therefore, the theory of system functions as the bases for the choice of comparative criteria.

3.1 Systems theory and choice of comparative criteria

System theory takes into consideration the relationship between objects and between their attributes, and views the relationship in a whole. Since clustering in the field of vocational education actually is a process of progressive systematization, system theory is therefore applied here as a fundamental theory. Based on this theory and also with consideration of features of clustering in the field of vocational education, comparative criteria for further analyses on the implementation models

96 Yang, 2010

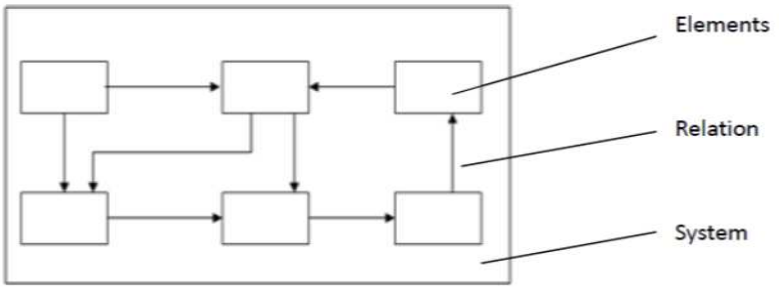
97 Hoerner, 2004, p. 235

will be deduced from theory of cluster, theory of human capital and theory of education.

3.1.1 Systems theory

According to the system theory, a system is 'a set of objects integrated with relationships between the objects and between their attributes'[98]. Here, objects are simply the parts or components of a system, which can be physical parts such as atoms, stars, etc. They can also be abstract objects such as mathematical variables, rules and laws, etc. Attributes are properties of objects, such as temperature, relative velocity and distance of a star from other stars. The relationships to which we refer are those that 'tie the system together'[99]. Therefore, in a system, wholeness is different from the summation of parts, because of relationship among them. This is also called as structural feature of a system (figure 10).

Figure 10 Structural aspect of a system:



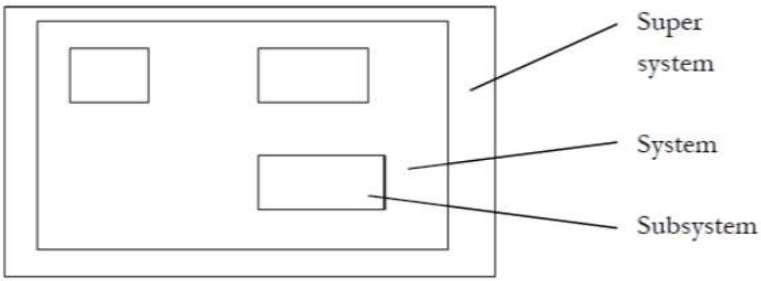
Source: Ropohl, 1978, p. 15

98 Hall & Fagen, 1956, p. 18

99 Hall & Fagen, 1956, p. 18

For a given system, an environment is 'the set of all objects a change in whose attributes affect the system and also those objects whose attributes are changed by the behavior of the system'[100]. Any given system can be further subdivided into subsystems, and objects belonging to one subsystem may well be considered as part of the environment of another subsystem. This property of systems is called hierarchical order of systems (figure 11).

Figure 11 Hierarchical aspect of a system:



Source: Ropohl, 1978, p. 15

If every part of the system is so related to every other part and a change in a particular part causes a change in all the other parts and in the total system, the system is said to behave as a whole or coherently. At the other extreme is a set of parts that are completely unrelated. The variation in the set is the physical sum of the variations of the parts. Such behavior is called independence or physical summativity[101]. Most non-abstract systems change with time. If these change lead to a gradual transition from wholeness to summativity, the system is said to undergo 'progressive segregation'[102]. If there is strengthening of

100 Hall & Fagen, 1956, p. 20

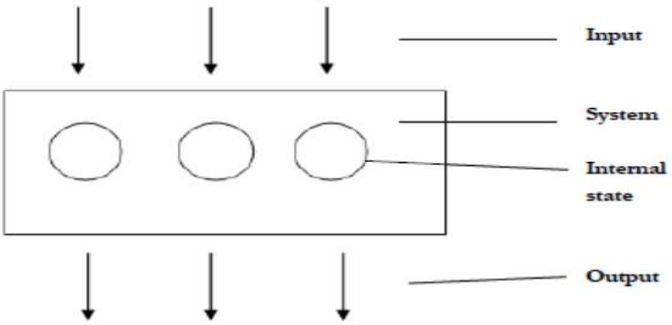
101 Hall & Fagen, 1956, p. 21

102 Hall & Fagen, 1956, p. 22

pre-existing relations among the parts and developing of relations among parts previously unrelated, then the change is called as 'progressive systematization'[103].

A system can also be observed from its functional aspect (figure 12). In this way, a system is considered as a 'black box' which functions as a whole in an environment. The functional aspect of a system does not answer the question of 'what is it?' but that of 'what does it do?'[104]. In this case, the state of a system is described, according to its input and output volume, as its occasional status change.

Figure 12 Functional aspect



Source: Ropohl, 1978, p. 15

3.1.2 Consideration for choice of comparative criteria

As mentioned in the previous chapter, a cluster of vocational education is a geographically bound concentration of vocational educational institutions, research institutes and enterprises, which share specialized

103 Hall & Fagen, 1956, p. 22

104 Ropohl, 1978, p. 16

infrastructure, labor markets, services and other available resources, with active channels for cooperation, communications and dialogue among all the stakeholders. And clustering is a step by step growing process, from the initial small and simple relationship to the final multi-involved and complicated existence. Or, in other words, a cluster is an evolving result from the initial partnership among 2 or 3 partners who share commonality and connectivity. Therefore, a cluster is actually a system constituted of various interrelated elements, whereas clustering process is actually a kind of 'progressive systematization'[105].

Clustering in the field of vocational education has economic, social and educational features. The economic feature is reflected in the economic relationship among the members in a cluster, and products and service supplied by vocational education institutes, etc. The social feature refers to the status of vocational education organizations as subsystem in a society and related with other subsystems of the society. Investment in vocational education has its external effect, and vocational education itself has some features of public goods. Finally, clusters of vocational education are mostly targeted at the output like educating personnel for the requirement of industrial development and also for the improvement of individual personality as well as competence in a society[106].

In consideration of the structural and hierarchical aspects of the theory of system, and also the features of clustering in the field of vocational education, Porter's theory and its amended models will be reviewed, especially those related with factors and their relations. Furthermore, with reference of the functional aspects of the theory of the system, theory of human capital and theory of education will also be reviewed for the choice of comparative criteria in light of input and output.

105 Hall & Fagen, 1956, p. 22

106 Nie, 2008

3.2 Criteria and their related theories

Based on the system theory as well as the features of clustering in the field of vocational education, the choice of criteria for comparison will be made with review of their related theoretical backgrounds.

3.2.1 Theory of the cluster and its amended models

Porter sees national competitive advantages as the ones being built on four main factors which mutually reinforce each other and constitute a system. He maintains that 'clusters represent a new way of thinking about how companies should be configured, how institutions such as universities can contribute to competitive success, and how governments can promote economic development and prosperity'[107]. His theory is considered as short of a sound methodology which could turn his concept into action, and is therefore amended by other experts.

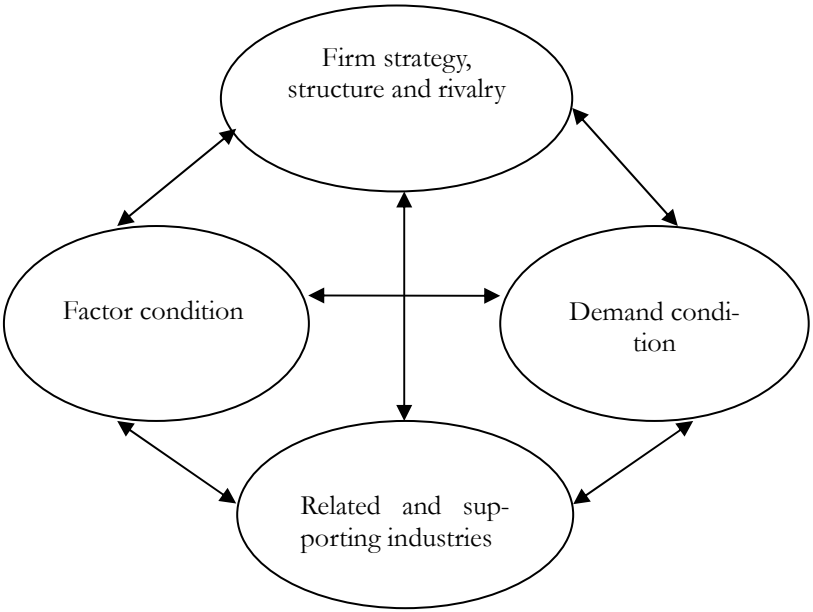
3.2.1.1 Porter's theory

The national competitive advantage is built on four main pillars: factor conditions, demand conditions, related and supporting industries, firm strategy and rivalry, which result in the 'diamond of national advantage'[108].

107 Porter, 1998, p. 78

108 Porter, 1990, p. 77

Figure 13 Determinants of national competitive advantage



Source: Porter, 1990, p. 77

According to Porter, the factors can be grouped into a number of broad categories, including human resources (i.e. the quantity, skills, cost of various types of labor/management, hours of work and work ethics), physical resources (abundance, quality, accessibility and cost of the reaction's land, water, minerals, etc.), knowledge resources (in various forms), and infrastructure.. The factors could also be divided into two separate categories into basic factors and advanced factors. Basic factors include natural resources, climate, location, unskilled and semi-skilled labor, and debt capital. And, advanced factors include modern digital data communications infrastructure, highly educated

personnel such as graduate engineers and computer scientists, and university research institutes in sophisticated disciplines.

Furthermore, advanced factors are the most significant ones for competitive advantage and the factor-creating mechanisms in a nation are more important to competitive advantage than the nation's current factor pool, because 'they are necessary to achieve higher - or competitive advantages such as differentiated products and proprietary production technology'[109]. Advanced factors are scarcer because their creation requires large and often sustained investments in both human and physical capital. And, the institutions (such as educational organizations) themselves also need affluent human resources and/or technology to create truly advanced factors.

Porter views this influence of home demand as a dynamic one. There are three broad attributes of home demand that Porter finds significant: the composition (i.e. nature of buyer needs) of home demand, the size and pattern of growth of home demand, and the mechanisms by which a nation's domestic preferences are transmitted to foreign markets. To Porter, a nation's firms gain competitive advantage if domestic buyers are more sophisticated and demanding. These customers put pressure on local firms to meet high standards in terms of quality, features, and services.

For Porter, another determinant of national advantage in an industry is the presence of related and supporting industries in the nation, which are internationally competitive. 'Related industries are those where firms can share activities in the value chain across industries (for example, distribution channels technology development) or transfer proprietary skills from one industry to another'[110]. To Porter, the presence of internationally competitive supplier industries in a nation creates advantages in downstream industries in several ways, such as preferential access to the most cost-effective inputs, on-time coordination and perception of new methods and opportunities to apply new technology.

109 Porter, 1990, p. 77

110 Porter 1990a, p. 72

Firm strategy, structure, and rivalry refer to the conditions that determine how companies are established, organized and managed, and those determine the characteristics of domestic competition in a nation, and therefore have some cultural aspects. Domestic rivalry creates pressure on firms to improve and innovate. Local rivals push each other to lower costs, but to improve quality and service.

These four factors constitute a system and are mutually reinforcing, or in other words, the effect of one factor is dependent upon the state of others. First of all, the advanced factors are more important to competitive advantage than the nation's current factor pool. Secondly, the sophisticated and demanding home demand has a dynamic influence on a nation's firms, such as pushing out advanced products when there are qualified human resources available. Thirdly, supporting industries can contribute to cost-effective inputs and ongoing co-ordination. Lastly, vigorous domestic rivalry stimulates the development of specialized factors and upgrade domestic demand in an industry.

These reinforcing factors create an environment that promotes clusters of competitive industries. According to Porter[111], the best way to raise productivity and innovative capacity is to resort to local clusters. Clusters capture important linkages, complementarities, and spillovers in terms of technology, skills, information, marketing, and customer needs across firms, industries, and institutions of various sorts. Clusters also 'provide a forum for dialogue among related companies, their suppliers, government, and other institutions'[112], and 'a cluster is a system of interconnected firms and institutions whose whole is more than the sum of its parts'[113]. Interconnections and spillovers within a cluster often are more important to productivity growth than is the scale of individual firms, and clusters represent a combination of competition and cooperation, which can coexist because they are on different dimensions or

111 Porter, 1990, 1998, 2000

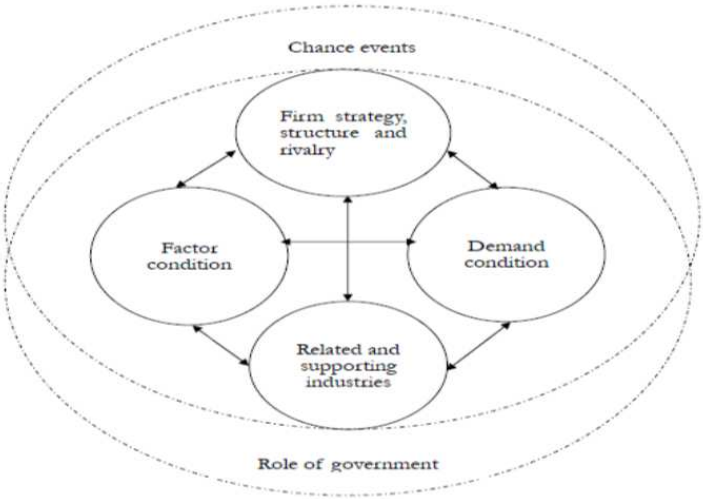
112 Porter, 2000, p. 20

113 Porter, 2000, p. 21

because cooperation at some levels is part of winning the competition at other levels[114].

Besides these four factors, Porter also notices the following factors: (1) Public policy, which can have a strong impact on the development of a cluster, particularly the location of infrastructure investment, R&D expenditure and public sector procurement. Policies regarding the use of land and limits on development are also influential. (2) The role of chance events, which are characterized as occurrences that serve to initiate clustering activities. The chance events could be an important variable, but they are not considered essential to the development of internationally competitive industrial clusters.

Figure 14 Chance events and role of government in cluster



Source: adapted from Wickham, 2005, p. 15

114 Porter, 2000, p. 25-27

Though Porter's cluster approach may present some instructional and referential features for rethinking the promotion of regional development, he does not offer a sound methodology that would actually enable the translation of his concepts into action. His theory is therefore more or less a regional development philosophy. Besides that, Porter's approach also overlooks the role of firms in clusters.

In consideration of the role of government, Porter maintains that 'government's real role in clustering for competitive advantage is in influencing the four determinants'[115]. And the government's role can be both positive and negative. For example, government can influence factor endowments through subsidies, policies influencing capital markets, government's education policy, and other measures. Government can influence or shape domestic demand for a product through local product standards, or by regulations that mandate or influence buyers' needs. Despite its explanatory power, Porter's Model has been criticized for its apparent weakness at providing a predicative framework for economic policy development. And the poor performance is almost entirely predicated on the confused role of government and its policy makers[116].

3.2.1.2 Amended model – role of firms

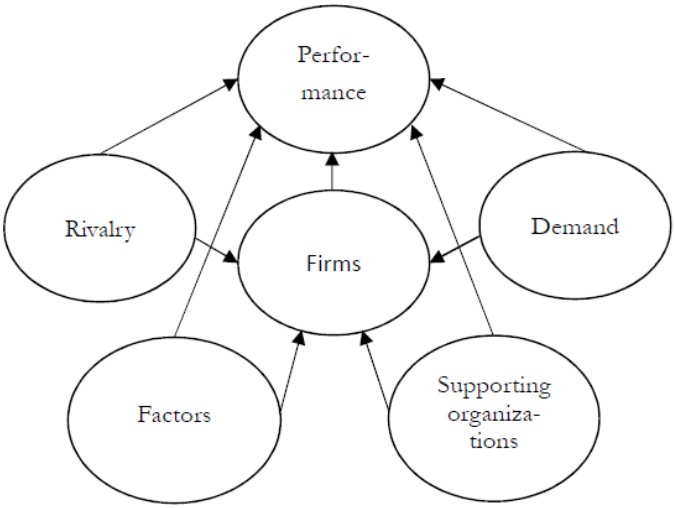
The performance of the cluster as a whole is dependent on the success of the individual firms and moderated by the cluster conditions[117]. At the center of the cluster, model should be cluster firms. Therefore, another amended cluster model is brought forward as follows:

115 Porter 1990a, p. 126-127

116 Brown, 2000

117 Cassidy et al., 2005

Figure 15 Amended cluster model by Cassidy



Source: adapted from Cassidy et al., 2005, p. 7

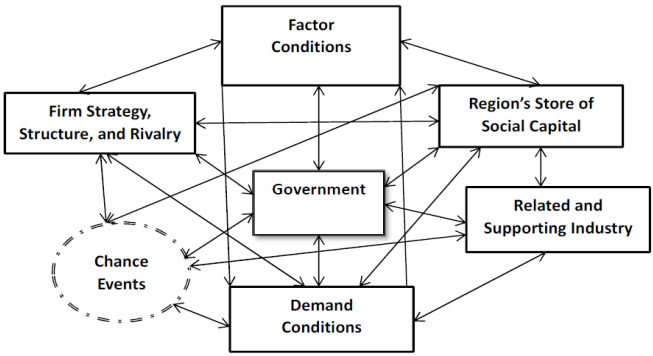
This model has important differences from Porter's Diamond Theory. First, cluster firms and their capabilities are explicitly included in the model. Second, the model has a dependent variable - cluster performance - that allows the measurement of how changes in cluster conditions, resulting from the activities of cluster actors, have impact over time.

Moreover, in this model, Porter's 'related and supporting industry' has been expanded to include public and non-profit organizations that support cluster development, and re-labeled as 'supporting organizations'. Furthermore, those factors that are influenced by government are also explicitly identified.

3.2.1.3 Amended model – role of government

Wickham[118] explored the role of government with a case study in Australia, and declared that the government of a regional economy needed to position itself as an endogenous variable within Porter's Model, so as to positively and effectively influence economic growth through the government's interaction with the diamond factors. Firstly, the government should recognize the existing and potential synergies that prevail within the industry cluster, but should not artificially create the synergy within the industry cluster or pre-empty the needs of the industrial cluster. Secondly, besides providing the required infrastructural needs of the developing industrial cluster, the government should play a variable role over the life cycle of the industry cluster, and avoid the adoption of a 'one size fits all' policy for its set of industrial clusters. To Wickham, the key to an effective government role centers on the timing of its policy initiatives and the changing life cycle needs of the industry cluster.

Figure 16 Role of government in cluster



Source: Wickham, 2005, p. 15

118 Wickham, 2005

3.2.1.4 Criteria deduced from theory of cluster

Though Porter's theory is criticized as lack of precision in the definitions of some of key concepts and specification of relationships between them, it extends beyond the theories of competitive advantage based upon resources endowments and offers new insights into the development of competitive advantages within a dynamic context[119]. The four attributes to national advantage are factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. They are also determinants which create a national environment in which companies are born and learn how to compete. Moreover, they affect the national competitive success mostly as a system.

Cassidy's model is a further development on the basis of Porter's four pillars. Clusters are not just there ready to be examined. Most of the time, they are just in a certain stage of development process, from initiation, mature to full development. And in the clustering process, the attention should be focused on the clustering firms and their performance. Furthermore, the expansion of the 'related and supporting industry' to 'supporting organizations' is also quite referential for the clustering in the field of vocational education. Education does not have an obvious supply chain, but education needs a lot of support from public and non-public organizations, such as consulting, further education and providing of available resources, etc. This model also identifies some factors that could be influenced by the government, but fails to give an explanation about how government should play its role in the clustering process.

In comparison to the modest opinion of both Porter and Cassidy et al. on the role of government as an influencing factor, Wickham emphasized the role of government as an endogenous role in clustering process and also pointed out that government should position itself appropriately according to the different stages of cluster's life cycle.

119 Grant, 1991, p. 540-541

Therefore, for the comparative analyses of selected implementation models of clustering in the field of vocational education, the following criteria would be deduced from the above review: (1) factors which constitute the environment for clustering and reinforcing relationship among factors; (2) clustering process and role of government in fostering cluster.

3.2.2 Human capital theory

Human capital theory deals with investment in human resources and its possible benefits. The investment could be in different forms and the benefits could also be various.

3.2.2.1 Investment and effects

Human capital could be defined as the 'quality components as skill, knowledge, and similar attributes that affect particular human capabilities to do productive work.'[120] This quality could be enhanced through investment in (1) health facilities and services; (2) on-the-job training; (3) formally organized education at the elementary, secondary, and higher levels; (4) study programs for adults that are not organized by firms; (5) migration of individuals and families to adjust to changing job opportunities[121]. Only through these investments human resources can be transformed to human capital. As Becker points out, the future productivity of the labor force could only be improved at a cost, which included the value placed on the time and effort of trainees, the 'teaching' provided by others, and the equipment and materials used[122].

Among the different kinds of investment, the investment in education and training is the critical part of human capital. As most human capital theorists pointed out, the provision of training and education is seen as

120 Schultz, 1961, p. 8

121 Schultz, 1961, p. 9

122 Becker, 1975, p. 16

an important productive and beneficial investment. On the basis of distribution analyses and empirical analyses, Mincer also concluded that the human capital which consisted of education and working experience was the decisive factor for the attribution of earnings[123].

Human capital could also have internal and external effects. The internal effects are 'the returns to which accrue to the individual (or his immediate family)'[124]. The internal effects are also described as private internal rates of return by Bronchi[125]. 'The internal rate is equal to the discount rate that equalizes the real costs of education during the period of study to the real gains from education thereafter'[126]. Investment in tertiary education 'tends to be less prone to positive externalities than lower education leve1s'[127], and 'the gross wage differentials are narrower between people with secondary education and people with upper-secondary education than between people with upper-education and people with tertiary education'[128]. Besides wage differentials, lower risk of unemployment for more educated people, investment in education could also bring non-monetary benefits, for instance, better health[129].

The external effects 'have to do with the influences people have on the productivity of others, so the scope of such effects must have to do with the ways various groups of people interact, which may be affected by political boundaries but are certainly an entirely different matter conceptually'[130]. The external effects result from the spillover of knowledge and experience from mutual contact and learning in groups. Or in other words, the investment to human capital could also result in both private and social returns. Usually 'private returns are higher than

123 Mincer, 1974
124 Lucas, 1988, p. 36
125 Bronchi, 2003
126 Bronchi, 2003, p. 25
127 Bronchi, 2003, p. 26
128 Bronchi, 2003, p. 41
129 Bronchi, 2003, p. 46
130 Lucas, 1988, p. 37

social returns, where the latter is defined on the basis of private benefits but total (private plus external) costs'[131].

In general, training and education can help to minimize the gap of earnings among citizens. The research made in China also proved that among people with higher educational level, the Gini coefficient is lower than that among the people of lower educational level[132]. This result indicated that among people with a higher educational level in China, the distribution of earnings tended to be equal.

3.2.2.2 Concepts of efficiency, fairness and abundance

Education plays a significant role in the human capital, thus educational expenditures are regarded as a form of investment in human capital. For this investment, the concern about efficiency, fairness and abundance constitute the core concept of economics of education.

The concept of efficiency consists of two parts: internal efficiency and external efficiency[133]. The internal efficiency refers to the ratio between input and output in the system of education, while the external efficiency refers to the contribution level of educational investment (input) to the labor market and social development (outcome).

Fairness refers to the equal provision of educational opportunities to all people with the same social status, supportive provision of educational chances to people with weak social status, and prevention of the unfairness from transferring among generations[134]. Therefore, the fairness of educational investment should focus on the fair distribution of public educational resources, educational chances and benefits.

131 Psacharopoulos & Patrinos, 2004, p. 112

132 Li, 2003; Yue & Liu, 2006

133 Li, 2004

134 Psacharopoulos & Woodhall, 1985, p. 54-59

The concept of abundance concerns the financial input in education. Because of its various forms of input and output as well its striving for quality, educational institutes are not allowed to be the economic industries which aim at maximum profit with minimum cost. On the contrary, to ensure the quality of education, the cost per capita keeps increasing. Therefore, for the quality of education, a certain amount of financial investment should be guaranteed[135].

3.2.2.3 Human capital theory and the idea of over-education

A shortage of human capital might be disadvantageous to economic growth, but according to some theoretical approach, excess supply of human capital might lead to over-education, unemployment and waste of precious resources.

Over-education refers to the situation in which one person's educational level is higher than that demanded from his or her job requirements[136]. In China, due to the expansion of higher education and the slip of quality control, it happens that the graduates may have different capabilities. Therefore, there are two kinds of over-education in China: superficial over-education and genuine over-education. Genuine over-education refers to the capabilities promoted by education higher than those required by the occupations, while superficial over-education refers to the situation that those with the higher educational level can only take those lower positions because of their comparably lower capabilities[137]. In a word, the increase of investment in human capital does not always equal to the increase of the adaptability of the human resources to the demand of the labor market.

Moreover, investment in education is sometimes also considered as a push result from the screening effect of education. While human capital

135 Li, 2004

136 Dunkcan & Hoffman, 1981, p. 75

137 Wu, 2007

theory emphasizes the enhancement of human resources' productivity through investment in education and training, the screening model of education emphasizes the signal function of education. According to this model, the human being's capabilities were formed or developed during their earlier age. The higher education only functions as legalization of these capabilities and screening out the students as part of a productive group, even if that higher education may not give the students any skills particularly useful in the production.

The criticism on human capital theory focuses on two problems. The first is that to what extent education or other forms of human capital investment could be directly attributed to improvement in job chances and earnings for individual persons. The second is that how to explain the gap between people's growing learning efforts and the diminishing number of available jobs[138]. Regardless of the criticism, human capital theory is still a dominant theory in the economics of education and social development. The theory is also widely accepted because of its concept that investment in education would result in improvement of productivity, quality of life and social fairness. On the contrary, over-education, especially superficial over-education, could be a result of education of low quality.

3.2.2.4 Criteria deduced from human capital theory

Human capital theory concerns about the improvement of quality components necessary for productive work through investment in education and training. This kind of investment input can, on the one hand, result in output like private wage differentials, lower risk of unemployment and other non-monetary benefits. And on the other hand, it can also influence social productivity through spillover of knowledge and experience, and also promote social fairness through provision of education to students from families with weak social status.

138 Olaniyan & Okemakinde, 2008, p. 160

The investment, in terms of money, chance costs and effort, could be both from private and public resources. In relation with public investment, efficiency, fairness and abundance are the core concerns of economics of education. Besides excessive supply of higher education and push from screening effect of education, over-education tends to be mostly a result of limited quality of education.

For the comparative analyses of clustering in the fields of vocational education, the following criteria related with human capital theory would be applied: (1) Investment inputs from government, enterprises and individual families which have been made; (2) Results which have been achieved with these investments.

3.2.3 Theory of education

In daily use the terminology 'education' is vaguely applied to represent concepts like Bildung' and 'Erziehung' in German language and educational science. Both being commonly translated by 'education' into English language, 'erziehung' signifies more precisely the iteractional process of two people, typically a preceptor or a teacher, and a learner, a student or a puipil. On comparison, 'Bildung' is related with some abstract elements like freedom, autonomy, maturity, rationality, humanity and objectivity[139]. Since the practical issues of clustering of vocational education are concerned in this dissertation, the focus of the theory of education will be more on the theory of 'Erziehung', namely more on theories about qualification, competence, key qualification, and, of course, bildung.

3.2.3.1 Theories of qualification, competence and key qualification

From module training, so-called competency-based education to the levels of qualification, 'qualification', 'competence' and 'key qualification' are the 3 often referred concepts in vocational education.

139 Bank, 2005, p. 182

'Qualification' is a concept mostly used in the research on labor market, curriculum theory and competence theory. Reetz defined the concept from the point of relationship between individuals and environment. Individuals and environment are connected with each other through 'action'. Individuals need 'capabilities of action' to understand, organize and manage the environment; and qualification can be obsolescent or lose its value because of the social development and the application of cheaper production factors[140]. Therefore, qualification usually refers to an individual's proficiency degree of action in certain situation. As far as vocational education is concerned, the concept of qualification refers to an evaluation of learning process, and is more or less aimed at adapting the labor force to the existing requirements of the labor market. It is a collection of acquired individual segments of skills and knowledge[141].

Qualification and competence are often used as synonyms. Qualification, however, mostly refers to functional knowledge and skills and it belongs to economic category which requires 'should-be' competence, while competence belongs to individual category for performance realization[142]. Qualifications can be divided into: (1) cognitive and intellectual skills, such as analytical, methodical and creative thinking; (2) social and communicative skills, such as capability for negotiation and discussion, group leading and motivation; (3) capabilities of undertaking responsibility and making decision[143]. From certain points of view, competence can be divided into social competence, professional competence, method competence, and self-competence (sense of responsibility)[144].

The concept of key qualifications, initiated by Mertens, is a logical consequence from the observation of the labor market change. According to him, key qualifications could refer to four different types of

140 Reetz, 1990, p. 17, 29

141 Bank & Reckstadt, 1998, p. 136, 150

142 Bank, 2005, p. 189

143 Bank & Reckstadt, 1998, p. 151

144 Bank, 2005, p. 191

educational elements: (1) Basic qualifications, which refer to those general upper educational elements that can be vertically applied to specific situation, such as logic thinking[145]. (2) Horizontal qualification, which enables the individual use of social information horizon, and is basically related with a key qualification – being informed with information[146]. (3) Extended elements. They are those special knowledge and skills which are required by various activities in practice. For example, the knowledge about measuring technique, work safety and maintenance of machines can be found in the requirement of many training professions[147]. Vintage factors are related to adult education with an aim of minimizing the intergenerational educational gaps[148].

On one hand, actually the concept of key qualification is based on the utilization of qualification; on the other hand, by the metaphor meaning of 'key', it implies the key to the gate of future[149]. Key qualifications should not only convey specialized knowledge, but also those knowledge about professional and private living situation, so that the attained qualifications and capabilities could be reliable for comprehending the specialized situation and then taking different actions accordingly[150]. As a key to future, key qualifications have therefore no separate functional qualifications, but are bound to the individuals by inter-related learning aims[151]. They are not subject to time but are important for accomplishment of present and future tasks[152].

Also, key qualifications are those knowledge, skills and competences which are not confined in certain practical activities. They can enable persons to manage different positions and functions at the same time, and also to cope with unexpected changes in life. Therefore, key qualifications refer to individual's fully developed capabilities in handling

145 Mertens, 1974, p. 41, These 31

146 Mertens, 1974, p. 41-42, These 34

147 Mertens, 1974, p. 42

148 Mertens, 1974, p. 41, These 37

149 Bank & Reckstadt, 1998, p. 148

150 Bank & Reckstadt, 1998, p. 152

151 Reetz, 1990, p. 21

152 Bank & Reckstadt, 1998, p. 154

with the changing environment[153]. Or in other words, it depends on personal creation, independence in learning and experience to catch up with the ever changing requirements of future professions. Furthermore, learners are not just as carriers of specialized knowledge, but are also as elements of a social system, a part of a group who share the responsibility in the learning process. Therefore, a key qualification is a kind of living and holistic learning, which is not only related with professional learning, but also with personal development and social learning[154]. Since key qualifications usually refer to enhanced personal competence in action, the concept of key qualification can also be considered as theory of personality or theory of action. Personality is classified according to different competence: (1) fact competence and intellectual maturity; (2) social competence; (3) self-competence and moral maturity. Action capability is based on five human strength and skills, namely motivation system (e.g. achievement motivation), value system (e.g. responsibility consciousness), orientation system (e.g. abstraction ability), control system (e.g. persistent regulation) and learning system (e.g. ability of concepts revision). These personal basic capabilities and attitudes are the basis of key qualifications which are related with specific work situation. The system of action competence depends on a developed system of motivation, value and orientation, which in return contributes to the development of controlling, and learning system as well as action capability[155]. Therefore, key qualifications actually integrate the separate competence (specialized, social and human competence) into generation of action competence[156]

The requirements for key qualifications are thought to be pushed by several factors[157]:

(1) Technical change. The progress of technology and application of new technology in workplace lead to once acquired knowledge and

153 Reetz, 1990, p. 18-21

154 Arnold, 1997, p. 143 - 144

155 Reetz, 1991, p. 32-34

156 Bank & Reckstadt, 1998, p. 175

157 Bank & Reckstadt, 1998, p. 145-148

skills being soon overtaken. The causes to the consideration of key qualifications are at least due to two trends. The first one is that the quick change of technology results in the quick obsolescence of knowledge and skills. The second one is the ongoing profound effect of technology application, just like the change brought by micro-electronics to production (CAD/ CAM/CIM), service and administration[158].

(2) Economic change. Due to globalization, accessible new market and also shift of industrial sector, the demand for innovation and productivity is increasing. Therefore, the competence level should also be accordingly upgraded to a level at which holistic, motivated and responsible action is executed in sense of anticipative preparation and planning. The other causes could be that the actual demand from the labor market in market economy cannot be anticipated globally, regionally, professionally or in terms of qualification. The unpredictable or unforeseeable development in future also raises the question about what kind of qualifications would be appropriate for the future[159]. The employee's qualification should be accommodative to the future open situation, where there is actually no suitable solution available[160].

The prognostic as an orientation for educational plan is actually an effort of seeking a recipe of future educational requirements, such as getting to know how appropriate professional education structure would be derived from economic structural change through labor market research. However, in dynamic society the concept of profession cannot reflect the contents or requirements of a position in job market anymore and there is still no better category of professions available in the statistics of job market[161]. 'The adaptability for the non-prognostic future could be a pivot for educational planning decision'[162], and the friction between educational system and employment system, and that

158 Bunk et al., 1991, p. 365

159 Bunk et al, 1991, p. 366

160 Arnold, 1997, p. 136

161 Mertens, 1974, p. 38

162 Mertens 1974, p. 39

between individuals and society could only be minimized through the orientation of education to the improvement of personal quality. 'The mental capacity should not be used as a kind of storage of knowledge, but as a treasure center for intelligent reaction'[163].

(3) Value change. Work has been changed from pure existence necessity to contribution to improvement of life quality. Business world should be humanistic and the virtue like readiness for taking responsibility is more and more cherished.

Education is a decisive factor for the mobility, which is contributive to harmony of divergent society. The requirement of mobility goes beyond original job market to general requirements for spiritual movement and adaptive capability, which people in dynamic society should possess for the change of roles in society[164].

(4) Change in the work organization. The increasing stress from competition pushes forward the application of new technologies and advanced technical systems. Therefore, routine work would be decreasing which would create more space for self-decision at work position. The enterprises would like to welcome the labor forces with learning capabilities and flexibility for different positions. Flexibility, work motivation, achievement motivation, cooperation ability are at least as important as those specialized qualifications[165].

The concept of key qualifications is almost still a concept of educational philosophy. It is short of psychological or learning psychological explanation to the concept, or the explanation to the transfer of knowledge and competence. In this case, Bank's simplified formula of 'I°V|Sit' [166] is more informative and instructive. With this formula,

163 Mertens 1974, p. 40

164 Mertens, 1974, p. 38

165 Reetz, 1991, p. 20, 32

166 In this formula, 'I' is interpreted as 'content components' (Inhaltskomponente), 'V' as 'behavior components' (Verhaltenskomponente), 'Sit' as 'situation', '°' as 'would be integrated with', and '|' as 'by condition of'. Bank, 2005, p. 183–191

the process from qualification to 'Bildung' is described into 5 different escalating stages.

(1) $\overline{\overline{I^{\circ}}\ \overline{V}|\overline{\overline{Sit}}}$ All components are determined. This situation is typical vocational training for qualifications.

(2) $\overline{\overline{I^{\circ}}\ \overline{V}|Sit}$ The situation is open, which requires individual flexibility in society. In this stage, competence is required for preparation of one or more behavior manners which could apply to a content in detailed uncertain situation.

(3) $\overline{I^{\circ}\ V|Sit}$ Contents (key knowledge) are in association with various behavior components, like understanding of chemistry reaction can help with the understanding of health, production process and other fields

(4) $I^{\circ}\ \overline{V}|Sit$ Aimed behaviorial components, acquired through different content components. This is the stage of key competence. For example: general cultural capacities such as logic thinking, calculation, writing, reading, acquisition and processing of information, as well as punctuality, diligence.

(5) $I^{\circ}\ V|Sit$ Not restricted with any environmental situation. This is the stage for extension of individuals' possibilities, such as autonomy, maturity, humanity, etc. ('Bildung').

As depicted from these formulas, the differences among each step of development from qualification to final 'Bildung' are clearly defined.

3.2.3.2 Theories of curriculum

From beginners to experts, the competence development follows a logic progress. The concrete development of competence may not be described as a curriculum, but can be stimulated and promoted with potential logic curriculum. Therefore, it is necessary to take some theories of curriculum in consideration.

a) The development logic of learning

According to Dreyfus & Dreyfus, skills are divided into 5 levels with corresponding characteristics as depicted as follows:

Table 3 Skill level and its characteristics

Skill Level	Characteristics
1. Novice	Rigidly adhering to taught rules or plans; Little situational perception; No discretionary judgment
2. Advanced beginner	Following guidelines for actions based on attributes or aspects; Situational perception still limited; All attributes and aspects are treated separately and given equal importance
3. Competent	Coping with crowdedness; Now sees actions at least partially in terms of longer-term goals; Conscious, deliberate planning; Standardized and reutilized procedures
4. Proficient	Understanding situations holistically rather than in terms of aspects; Seeing what is most important in a situation; Perceiving deviations from the normal pattern; Decision-making less labored; Using maxims for guidance, whose meanings vary according to the situation
5. Expert	No longer relying on rules, guidelines or maxims; Intuitive grasp of situations based on deep tacit understanding; Analytic approaches used only in novel situations or when problems occur; Vision of what is possible

Source: adapted by Stan Lester Developments 2005, Dreyfus & Dreyfus, 1986

Dreyfus' model of competence development is widely used to provide a reference to assessing and supporting progress in the development of skills or competencies, and also to provide a definition of acceptable level for the assessment of competence or capability. However, Dreyfus' model is only restrained in development steps of qualifications in certain situation, while Bank's model demonstrates more extensively the development process from qualification to 'Bildung'.

b) Subject-based curriculum, module training and competency-based education

The subject-based curriculum follows strictly the theoretical logic system of a subject itself. It is quite common in curriculum design in universities, and has also been guided for several years by choice of teaching contents for colleges in China. However, this kind of curriculum splits the integrated knowledge and skills needed by occupations. It provides either conceptual or factual knowledge, or separated experiences and skills. Under this kind of curriculum, the contact teaching plays a prominent role and learning and becomes a very passive process. Moreover, the active learning and the technique cultivation for the whole working process is neglected[167]. Furthermore, the subject-based curriculum not only results in fade-out of working-related learning contents, but also in underestimation of the utilitarian value of skills and the relationship between work and technique. This kind of curriculum will reduce the learning of technique as a pure learning task instead of an acquirement of tools for professional work[168].

As a reform of subject-based curriculum, module training and competency-based education are set as guidelines for vocational education in China[169]. Module training means the training of certain capabilities through selected learning tasks in modules, which are actually modules of employable skills. The design of module training curriculum follows a process of 'profession → position → skills → modules → learning'. This kind of curriculum is simple to design, closely related with practice, and flexible in time organization. However, it targets at simple skills training and is arbitrary in choice of module quality and quantity. It cannot give students a systematic vocational training, nor can it be contributive to the development of comprehensive competences.

167 Jiang, 2005

168 Rauner, 2002, p. 114-115

169 gao jiao si, 2004, p. 11

Competency-based education follows the competence requirements of working positions. The design of this kind of curriculum includes analysis on labor market, profession, position, specialized skills, development and implementation of teaching plan, etc. The curriculum is based on the required skills of a profession and the teaching contents are sequenced according to level of complexity. However, vocational education is not equal to the training of skills for specialized positions. It is also difficult to match curricula with specific working positions in detail. Therefore, the competency-based curriculum has also its limitations.

Both of module training and competency-based education are adaptation oriented, trying to fit the students into labor market.

c) Systematic view of the curriculum

Systematic education considers not just the individual elements (factors), but also complexity and complicity of the relationship among the elements. Here complexity reflects the power of elements quantity and its n-times order of relationship, while complicity is characterized with difficult relationship among the elements[170].

In a system, wholeness is bigger than the sum of elements because elements (factors) are in complex or complicate relationship with each other. Wholeness of curriculum can be described according to the different relationship structure of elements which determines the relationship complexity of a didactic system. A system could be an upper system for one or more sub-systems, and could consist of less complex sub-systems. The order of the systems follows the intensity and direction of elements' arrangements as well as the quality of information which reflects certain morphologic position of elements. Take the sequence of letters as an example: OTOT can have a very different in-

170 Jongebloed, 2004, p. 5

formation value against TOTO or OTTO[171]. Based on this knowledge, there could be 6 development stages in a curriculum.

Stage 1, elements for learning have no inside order or have just ambiguous and accidental relations, just like a group of kids who accidentally stay together during a break in a court. In this kind of situation, any increase or decrease of elements in quantity (e.g. a bundle of unrelated qualifications) can seldom result in obvious qualitative change.

On stage 2, there appears to be firstly a kind of internal relationship among the elements and their relationship could be grouped differently according to different criteria. Being different from stage one where learning is just like to learn the words listed on dictionary which have no connection with each other in meaning, on stage 2 the elements can promote the learning for each other. The words like 'apple', 'peach' and 'fruit', have some kinds of inside relationship with each other in concept, and their order for learning is changeable[172].

On stage 3, the order of the elements is determined by the relationship of 'important/unimportant' or 'previous/later'. The position of elements presents additional information, and a 'principle of methodical order' should be followed. As in the production of a wood toy, the toy should be firstly carved before it is painted. This principle is also applicable to the learning modules. When there are no specific sequence of time and contents among modules, they could be reduced to stage 2 or stage 1[173].

Stage 4 is characterized with multi-dimensional order of elements. The learning elements are related with neighboring elements as the parts of a jigsaw puzzle. The informative meaning can only be revealed when almost all elements find their right positions. In other words, only when all elements become parts of a whole, they can get their power of ex-

171 'Toto' naming a gambling game, 'Otto' being a first name; other permutations do not make any sense. Bank, 2011, p. 38

172 Bank, 2011, p. 36-38

173 Bank, 2011, p. 38-40

istence from this order. When the elements for whole picture are not fully fit together, they can only present some information of inside relationship as stage 2. The acquirements of facts or qualifications could be the initiation of individual education when (1) the facts are obviously related with each other in contents; (2) many facts or qualifications to be acquired are in this relationship; (3) there is reflection on this relationship and awareness of its existence[174].

On stage 5, all elements are directly or indirectly related with each other in an ambiguous and changing way. It is difficult to say where the relationship begins and how the sequence order of the elements looks like. The stage could also be called 'stage of theory', which is based on systematically defined contents like the disciplinary system of physic or biology. Being different from productive process or learning modules, the boundary of disciplines is analytic and therefore arbitrary. The boundary is just for facilitating an overview of the contents of the discipline[175].

On stage 6, the relations are so complicated that they can only be identified as wholeness through try and errors. Wholeness will be irreversibly destroyed when it is taken apart as components, because the elements dependent on each other in functionality. When the functionality is separated from each other, a system as wholeness will come to an end. As analytic and reflexive learning on stage 5, learning from experience as a wholeness can maximize the efficiency of learning[176].

Therefore, the structure of a system is not only determined by the relationship among elements, but also by the manner and amount of relations. When curriculum follows the idea of system, then not only individual knowledge, skills or competence will be acquired, but also disciplinary and interdisciplinary systems as of stage 5 will be learned. In

174 Bank, 2011, p. 40-42

175 Bank, 2011, p. 42-44

176 Bank, 2011, p. 44-45

didactic sense, when the relationship of learning elements is more strict and extensive, the learning would be more efficient[177].

Based on systematic view of curriculum and with consideration of the limitation of subject-based curriculum, module training and competency-based education, there are also some more instructive theories of curriculum development available.

d) Learning fields

The key purpose of introducing 'learning fields' concept into vocational schools is 'to link the curricula and ultimately the learning processes to the work activity and simultaneously to promote action learning at the curricular level'[178]. Usually 'learning fields' is derived and described on the basis of validation of occupational fields, which are defined as 'complex tasks that contain significant situations for the occupation, life and society'[179]. However, due to the different approaches and criteria, there is no precise procedure for the transformation from evaluation of the work process and working tasks to learning fields[180]. Therefore, there have always been attempts for closing the gap between work analysis and curriculum development. Among them, Jongebloed's interpretation presented an innovative approach.

According to him, the concept 'field' refers to the relationship between parts and wholeness[181]. When a structure is composed of at least two factors which are dependent on each other, this structure can be called as a 'field'. Field should be always considered as a whole. Any separated analysis of parts of a field could only erode the wholeness[182].

177 Bank, 2011, p. 52

178 Bauer & Przygodda, 2003, p. 24

179 Bader, 2001, p. 26

180 Bauer & Przygodda, 2003, p. 35

181 Jongebloed, 2004, p. 3

182 Jongebloed, 2004, p. 5

Learning is a conscious process and is a kind of action, and action always happens in a field. Learner is not just an observer of the around situation, but a part of the field. He or she exerts decisive effects on the action field with abilities in form of knowledge and cognition, expertise and attitude toward other parts of the field. In this case, field can only be integrated with, not to be dominated[183].

Any place or situation where learning action takes place is for learners a learning field. Therefore, every school, lecture hour, learning objective can be a learning field. In this case, learning field is an action field in didactic sense and operated in schools. However, the learning place 'school' is not a production enterprise and its content is not of a field structure but of a collective structure in form of discipline system, with an aim of getting cognition in form of description and explanation[184]. Actually with deconstruction of learning field to association as structure of teaching contents (teaching plan as association, sum or tuple), learning field is not a field any more. It is just a new system of contents arrangement, structurally solidified, and is not action-oriented anymore[185].

In consideration of action field 'enterprises' and its vocational relationship, there could be several consequential scenarios. One can get maximum wholeness (individual elements are interactively related with each other, such as mosaic), or association (elements are related with each other in order, such as discipline system), or sum (elements are additional to each other, such as modules or the amount of eggs needed for making an omelet) or only tuple (the relationship between elements are not clear or just independent, such as the amount of cars that pass over a bridge in one hour)[186].

Actually learning field as action field is a configuration of action and can be understood as a schema of process and structure, or in sense of

183 Jongebloed, 2004, p. 7

184 Jongebloed, 2004, p. 10-13

185 Jongebloed, 2004, p. 17-18

186 Jongebloed, 2004, p. 5, 12

curriculum as a process-content (P°C) system. In order to arrange all occurrences in a certain order according to the demand from different people, only the schema of structure-process which is in form of content-process (C°P) could be applied in curriculum[187]. All curriculum elements are composed of two parts: structural contents components (C) as scalar and the procedural behavior components (P) as vector. They can take place as C°P or P°C. However, C°P or P°C is not commutative[188]. Therefore, the theory of complementarity is developed to address the problem of the theory of learning fields.

e) Theory of complementarity

'Complement' is the identity of different possibilities to treat the same object as different[189]. The theory of complementarity is thought to overcome the contradiction of learning field theory.

Vocational education takes place in schools and enterprises, which are contradictory but are both required. In schools curriculum elements follow a principle of C°P [190] configuration, in which the elements are chosen from the perspective of contents as well their hierarchy and are mostly arranged in accordance with cognitive and taxonomic relationship. C°P configuration underlies a strict analytic method (association structure) and can be marked in general as knowledge[191].

In the part of enterprises, the curriculum elements are arranged according to the perspective of procedural behavior (P) and its taxonomy, and later be experienced as contents field (C). P°C configuration follows the process perspective and underlies systemic circulation (field structure). It could be marked in general as experience[192].

187 Jongebloed, 2004, p. 14

188 Jongebloed, 2004, p. 25

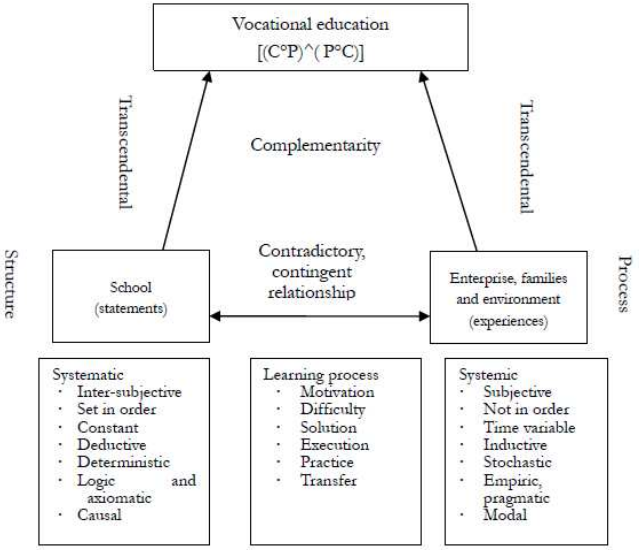
189 Jongebloed, 2004, p. 29

190 C: contents field (structural). P: procedural behavior (procedural), o: is connected to

191 Jongebloed, 2004, p. 29

192 Jongebloed, 2004, p. 30

Figure 17 Complementarity and learning process



Source: compiled from Jongebloed, 2004

Schools and enterprises are two contradictory and contingent factors for vocational education. According to the complementarity theory, professional competence is not the total number of qualifications awarded by schools or enterprises, but an integrated, dynamic and complementary union[193]. Furthermore, the complementary learning process depends on the trainees themselves. This learning process can only be facilitated but not totally influenced by the outside factors. The complementary cooperation between schools and enterprises can be

193 Jongebloed, 2004, p. 33

expected that more theories in form of knowledge to be delivered in schools and more practice as experiences be provided by enterprises[194].

f) Shaping-oriented curriculum

Shaping orientation (Gestaltungsorierung) theory considers the trainees as crucial. According to this theory, it is not the working situation as social context that controlls the action of students, but their perception, re-definition and emotional judgment of the situation in practice communities that gears their activities[195]. Shaping-oriented curriculum is also executed to enable the trainees to take the social and economic responsibility and to get involved in the job market[196].

The experience in a working situation will first be helpful for the acquirement of professional knowledge and understanding, and will later result in communication and reflection of work experience. And the communication and reflection will facilitate the students' identification with a community[197].

The shaping-oriented curriculum of the vocational education takes into consideration of not only the technology itself, but also the students' active identification with the profession, and also the social environment of technology application. Actually the students should not only learn the skills but also get to know the social situation where they could apply the skills[198]. The learning content is not only depending on the learning goal from the qualification, but also on the learning situation which includes psychological and social cultural factors. And the learning process should include the situation which the individuals in the future working fields would meet with. Moreover, the learning pro-

194 Jongebloed, 2004, p. 35

195 Wehner,1996, p. 77

196 Deutscher Bundestag, 1990

197 Rauner, 2002, P. 119-120

198 Xu, 2006

cess should also be helpful with getting rid of the barriers of communication and satisfying the social needs[199].

3.2.3.3 Criteria deduced from theory of education

As far as the theory of education is concerned, vocational education is to educate for vocational bildung, however, in most cases limited to train for qualifications, competences, or key qualifications. Generally, qualification refers to functional knowledge and skills in certain situation, while competence refers to performance realization. And key qualification is knowledge, skills and competence which are not confined in certain practical situations, and is therefore related with personality and action. On the one hand, qualifications should be related with each other for the improvement of learning efficiency. On the other hand, the development of competence follows a logic development order from novice to expert.

In order to achieve the higher goals of vocational education, a corresponding curriculum should be applied so that the learning in both schools and enterprises can be learnt in complementary structures. For this reason, learning at school must be more systematic with structurally well-ordered contents, while learning in enterprises should be more systemic with involvement of experience in real working situations. Furthermore, the design of the curriculum should make sure that the students' active learning and experiencing can happen in certain time-frames that respect the ability of the students to memorize and to recall certain contetns in different learing environments.

Therefore, for the comparative analyses of clustering in the fields of vocational education, the following criteria would be deducted from theory of education: (1) contribution of clustering to the set-up of goals of vocational education, such as qualification, competence and

199 Zabeck, 1997

key qualifications; (2) contribution of clustering to the realization of the goals of vocational education: systematic, systemic and complementary.

4. Implementation models and comparative analyses

Clustering in the field of vocational education can be traced back to early 1980s, when the economic reform on planned economy was initiated in China[200]. After decades of development, clustering has entered into a new era of unified planning and exploring stage since early 21st century. Various implementation models have come into being. Based on the criteria deduced from above theoretical analyses, several representative implementation models would be described and compared here.

4.1 Types of manifestation of clustering in the field of vocational education

Clustering in the field of vocational education has been generally considered as an attitude toward integration of schools and enterprises. Only in sense of formal registration in governmental organization or declaration in public can the methods of developing vocational education be divided into forms of clustering and forms of non-clustering.

4.1.1 Types of clusters

Clustering in the field of vocational education has been taking place in several forms. The first one is *clustering by structure*, which is through merging or coalition of vocational education institutes, so as to form clusters big in size and multiple in training level. This kind of clustering was first driven by two factors. One was the transformation of economic systems from planned economy to market economy. During initial stage, the demand to train the surplus labor forces from reform

200 Yu, 2009, p. 49

in countryside[201] resulted in the establishment of some training centers in county level. In 1990s, many enterprises which funded vocational education institutes in the time of planned economy began to reduce their financial support on vocational education and gave up these institutes to society, which constituted a situation that educational administrative government had to collect these vocational institutes shed out from enterprises. The other factor was the problem of insufficient enrollment of new students in many scattered vocational schools due to the limit of their size and resources. All these institutes had a need of combining their power and improving their competitiveness. The clustering was mostly initiated by government and would change the former ownership of the individual schools into clusters. And the clustering usually happens among vocational schools, with limited involvement of enterprises. There were some comparative advantages in scope and scale having resulted from the structural clustering, but the newly established clusters functioned again as individual vocational schools and needed to seek for further professional clustering with other schools and enterprises. Therefore, this form of clustering will not be further discussed in the dissertation.

The second form is *clustering by profession*, with strong professional characters. This kind of clustering mainly takes place by means of supporting schools by enterprises or enterprises supported by schools. The clustering can be mutually beneficial to both enterprises and vocational schools. On the one hand, the curricula of the schools are designed according to the requirements from occupations and are employment oriented. On the other hand, schools also run some related and advantageous enterprises in certain professions, and these enterprises benefit the education vice versa. However, the clustering does not change the former ownership of its members, and the cooperation among the members is usually regulated with contracts. The structure of cluster was loose and it could happen that the support from the enterprises to

201 In the early 1980s, a household contract policy was implemented in countryside in China. The land field used to be cultivated by commune was contracted to household, so that each household could distribute its own labor forces to maximize its income. As a result, agricultural efficiency was greatly improved and huge amount of labor forces were liberated from agriculture, which further contributed to the industrial development in China.

the teaching and training is also limited. In consideration of the big concern about the quality of vocational education, this kind of professional clustering has been mostly promoted in China, in order to solve the problem like integration of study and work.

The third form is *clustering by region*, normally initiated by the local educational administration. All the vocational educational resources are encouraged to get integrated, including those industrial clusters in the region. The clustering does not change the ownership of the participating members. Normally clustering is under direct instruction of regional government, and is closely related with local economy. The enterprises involved have no direct capital investment in the schools, but usually they would like to entrust the schools with responsibility for training the enterprises' staff, so as to establish a demand and supply relationship between enterprises and schools. In comparison to that, professional clustering emphasizes relationship among factors in terms of profession, while regional cluster emphasizes affiliation of factors to a region.

Another clustering form is called as *blended clustering*. This kind of clustering is formed on the basis of general cooperation between schools and enterprises. The schools and enterprises normally with similar specialties or features bring together their strength and set up clusters with loose economic relations. There can be tight clustering of schools like structural clustering, and also loose clustering of schools and enterprises. The educational and economic contacts are carried out through various forms like cooperation, trusteeship or rent. Actually this form is a kind of mixed form of structural, professional clustering and regional clustering, and has no clear character as the other three forms. Therefore, the comparative analyses will focus on the implementation models in forms of clustering by profession and by regional.

4.1.2 Non-clustering form

The *non-cluster model* refers to the development model of those individual vocational colleges which have not officially registered or declared their involvement in any clusters.

Since 2006, these vocational colleges have been categorized into 2 types: demonstrative and undemonstrative colleges. In 2006, Ministry of Education and Ministry of Finance published '*Views on Implementing Model of National Demonstrative Higher Vocational Schools and Speeding up Reform and Development of Higher Vocational Education*' (jiao gao [2006] No. 14) and decided that between 2006 and 2010, 100 high-level senior vocational colleges among over 1000 colleges all over China would be extra funded by central and provincial government to establish 500 programs with good facilities, close relationship with industries and high quality. Besides that, about 4000 good quality core courses should be established with corresponding textbooks and teaching materials. Furthermore, employment and training of teaching staff with both academic and industrial experiences would be encouraged. Teaching resources would be made available for students, and cooperation between demonstrative colleges and those in under-developed areas would be promoted for the improvement of vocational education as a whole in China. With the publication of this document, concepts like 'cooperation between schools and small-sized enterprises' (xiao qi he zuo), 'integration between work and learning' (gong xue jie he) and 'teaching staff with academic and industrial experiences' (suan shi jiao shi) were first officially proposed[202].

These demonstrative colleges should first be recommended by provincial government and then be approved by central government. Those who would be qualified as demonstrative colleges should have excellent quality of teaching staff and facilities, effective and long-termed cooperation relationship with enterprises, excellent program design with

202 Cai, 2011

progress in establishment of training bases and curriculum, and good public service.

Those demonstrative colleges are encouraged to establish curriculum system with obvious characteristics of integration of work and learning. Furthermore, those demonstrative colleges are also required to recruit no less than 30% of its students from other provinces. Those demonstrative colleges in middle and east China should recruit no less than 10% of its students from west China.

In April 2011, one of the demonstrative colleges, Shenzhen Polytechnic, was approved by Ministry of Education of China to award Bachelor degree. This case was considered a historical breakthrough in vocational education in China[203], which symbolizes the beginning of establishing a system consisting of secondary vocational education and tertiary vocational education[204] for applied technologies.

In many provinces and provincial level cities like Shanghai, many demonstrative colleges are already the core members of various clusters. The other unofficially (i.e. registered in government) involved in any clusters have actually established their own cooperation networks, because good cooperation with enterprises and other schools is a prerequisite for being a demonstrative college. These networks, though not called clusters, are actually professional clusters.

According to the document '*Views of Ministry of Education on General Improvement of Teaching Quality of Higher Vocational Education*' (jiao gao [2006] No. 16), all vocational colleges should strengthen the cooperation between schools and enterprises and follow the model of integration between work and learning. The degree and result of cooperation with enterprises in forms of students training, teachers training, establishment of training bases and services for enterprises are the critical part of quality evaluation which takes place for each college every five years. Therefore, for those non-demonstrative vocational colleges,

203 Cai, 2011

204 3-year-schooling for certificate, 4-year-schooling for bachelor degree, and 2-3 years schooling for master degree

though they may be disadvantaged in financial support, students' quality (demonstrative colleges have rights to choose students first) as well as teaching facilities, they have to establish their own networks of cooperation for survival and development. They are on the way toward clustering, mostly in form of professional clustering and regional clustering, and the experiences from different models of implementing clustering in the field of vocational education can be referential for these schools.

Actually there is no vocational school which can and will abandon its responsibility of cooperation with enterprises. The cooperation between enterprises and schools may vary from schools to schools in terms of scope and scale, or in forms of partnership, network or cluster. There exists no development model of vocational education contradictory to clustering.

4.2 Selected models of implementation

Based on the information available on academic periodicals (CNKI, zhong guo zhi wang, 1990-2010), newspaper (China Educational Daily, zhong guo jiao yu bao) and websites (China News Net, etc.) and above mentioned description of forms of cluster, the dissertation will compare the representative models (cluster by profession and cluster by region) selected from Hainan (province, South China), Shanghai (provincial level city, East China), Henan (province, Central China), Yongchuan (prefectural level city, West China) and Yantai (Prefectural level city, North China).

4.2.1 Professional clustering in Henan Province[205]

Henan is located in the middle of China. In 2003, its average GDP per capital totaled 7570 RMB Yuan, ranked 17th among the 30 provinces in

205 Except those specially noted , all the related information in this part are from Du, 2008; Qin, 2009; Yang, 2007; Yao, 2010; Yu & Yu, 2008; Project group for clustering in the field of vocational education in Henan, 2007

China. Among the 96 million provincial populations, the agricultural part accounted for 80% and totaled 77 million. In 2003, 13 million surplus farmers left countryside and the number of migrant workers from Henan took up 10.9% of the whole national migrant labor forces. However, these migrant workers were the most under-educated (79% with education lever lower than junior middle schooling) and with no professional training. In 2004, among 1.98 million graduates of junior middle schools, 1.76 million were in countryside where only 24% of the graduates were qualified to enter into senior middle school. Henan's economic development relies heavily on the industrialization, urbanization, and agricultural modernization. Talents, especially the big quantity of well trained workers and technicians, were considered to be vital to the development.

The government of Henan decided in 2003 to promote its vocational education and balance the development of vocational education and general education. However, by that time, vocational education met with several problems. The first problem was the declining of the enrollment for secondary vocational education. From 1998 to 2002, the students' population in vocational schools took the percentage of 66.48%, 61.33%, 57.92%, 48.78%, and 41.47% respectively in the whole students' population in the stage of senior middle school. The second problem was the humble facilities in vocational schools. Most of the schools were small-sized and suffered from scarce resources. The third problem was the low quality and polarised development of vocational education in cities and at the countryside. The fourth problem was the difficulty in enrollment and employment. Vocational schools with better facilities could not enroll enough students while the huge number of graduates from vocational schools in countryside could not find jobs. In order to reform its vocational education system, Henan government launched clustering development of vocational education in 2004.

On the basis of some cooperative practices between schools and enterprises in forms of 'training orders' (ding dan pei yang) and 'work-study rotation' (gong xue jiao ti), the Department of Education of Henan Province set up a leading group for establishing clusters in

the field of vocational education in Henan in 2004 and published '*Views on Establishing Clusters of Vocational Education*' (jiao zhi chen [2004] No. 247) and '*Views on Strengthening the Establishment of Provincial Clusters of Vocational Education*' (jiao zhi chen [2005]No. 388). Both documents determined the tasks, principles, forms and favorable policies for clustering in the field of vocational education. In October 2004, through the publication of '*Official Answer to the Establishment of Nine Provincial Level Clusters of Vocational Education*' (Yu jiao zhi cheng [2004] No. 251) , the Department of Education of Henan Province authorized the establishment of 9 provincial level clusters of vocational education which were centered on vocational schools with outstanding professional characteristics. The administrative system and status of each member of the clusters would not be changed and the cooperation among the members was guided by the 'Statute of Clusters'. Each cluster was required to be under the administration by both Department of Education and other departments of related professions, and to strengthen exchange and cooperation among schools as well as between schools and enterprises.

Till 2007, 18 clusters had been established in Henan, among which 13 were led by middle vocational schools and 5 by colleges or polytechnics. According to their service area division, 14 of them belonged to professional clusters and 4 of them belong to regional clusters. The 18 clusters consisted of 651 member organizations, including 269 secondary vocational schools, 5 colleges and polytechnics offering tertiary vocational education, 73 industry associations, 282 enterprises and 22 research institutes. Among all the members of vocational institutes of both secondary and tertiary levels, secondary vocational schools took up 98.2%.

Basically all the clusters were managed by the board of directors. Under the principles of 'equality, volunteering, mutual benefit and development', any vocational education institute and enterprise with independent legal status which would like to follow the cluster's statute were eligible to join the cluster. The members of the clusters did not need to change their previous ownership, administrative relationship, or employment status of the staff members. Therefore, 14 professional clus-

ters were quite loose in management structure, and were mostly linked with each other through contracts, cooperation among schools or between schools and enterprises. The 14 professions ranged from agriculture, transport, health, finance, civil engineering, arts to tourism, mechatronics, light industry and pharmacy, covering almost all the pillar industries in the Province. The other 4 regional clusters were planned and coordinated by governments. Among these 4 clusters, 2 county-level clusters were closely integrated, and the other 2 loosely connected with each other.

The cooperation among schools, especially among those in urban and rural areas, helped the expansion and promotion of vocational education. Vocational schools from urban and rural areas enrolled students together, and the annual enrollment of middle vocational schools totaled 419, 439.6, 507.1, 578.9 (in thousands) respectively from 2003 to 2006. Besides, the cluster of the vocational schools contributed to the sharing of resources and mutual benefit from the advantages of each other. Vocational schools in the clusters were run in a '1+1+1 model', namely, students spent their first year in rural vocational schools for basic knowledge, the second year in cities for professional skills, and then the last year in enterprises for practice. This type of cooperation model bridged the vocational schools in cities and those in countryside, and helped to solve the problem of insufficient enrollment for city schools, and also the problem of limited employment chances for the rural schools graduates.

The clustering schools generally were keen on 'training orders' from enterprises. They took the employment orientation as their curriculum reform guideline and sought to reach the goal of 'seamless transfer' of graduates from schools to the working positions. The cooperation between schools and enterprises in form of half-work-half-study and teaching factories (integration of production workshops and training workshops) were promoted to enhance professional skills of students. Meanwhile, some enterprise members in clusters also funded some training bases in schools or provided some offcampus training bases.

Besides the establishment of a platform of cooperation between cities and countryside, among schools and also between schools and enterprises, the clustering in Henan promoted the administrative unification of enrollment, employment of teaching staff, practice and assessment. Through clustering, many former small and weak vocational schools were re-organized and therefore contributed to the optimization of the resources and minimization of the administrative costs.

In order to describe a specific example, a cluster of agricultural vocational education shall be sketched out as follows.

Under the guideline of Department of Education of Henan Province, Henan Provincial Vocational Education Cluster led by Henan Agricultural Polytechnic was established in April 2005. Officials from Department of Education and Department of Agriculture, and executives from 77 vocational institutes and enterprises attended the inauguration.

Members of the cluster cooperated with each other through 'contracts'. With the establishment of cluster, the following objectives were expected to be achieved:

(1) Establishment of bases for combination of production, learning and research. Henan Agricultural Polytechnic invested over 40 million Yuan (about 4 million Euro) for a comprehensive practice base, and other members also established 12 bases for production, learning and research. All these bases were shared by cluster members for students' practice, experimental research for new products and also incubation of new technologies.

(2) Cooperation between enterprises and schools for mutual benefit. First, schools provided technological support for enterprises. Secondly, enterprises invested in work-study bases on campuses and also within enterprises. Thirdly, enterprises got involved in teaching and training process of schools through sending some technicians to schools as trainers, or naming a class after the name of an enterprise so as to match the teaching contents with the requirements of the corresponding enterprises. Fourthly, enterprises provided practice positions for

some students with payment so that they could get experience as well as some financial support.

(3) Share of resources among schools. School members of the cluster included polytechnics, vocational schools, training centers in countryside which differed from each other in quality of teaching staff and facilities. Through clustering, the members of the cluster could share the common platform for teachers' exchange, administration of teaching affairs, experiment and practice, skills evaluation, especially in enrollment of new students in form of '2+1' or '2+3'[206], the cooperation between polytechnics and vocational schools and among schools in urban and rural areas contributed to the expansion of students' quantity at least in polytechnics.

After two years of operation, the following problems arose: (1) Insufficient relationship among the members of the cluster. Most members were not closely related with the cluster and were involved passively in the cluster's activities. (2) No common interest. The interest of the cluster as a whole was unspecificied and indirect. Each member usually put its own interest as priority which led to the internal loose connection among the members of the cluster. (3) Financial limit. Since there was no financial links among the members, many cooperation activities were short-termed and irregular. (4) No sufficient practice bases available. Some school members had no own practice bases. The other school members or enterprises provided very limited chances for practice or even unwilling to provide this kind of chances.

Conclusion: The clustering of vocational education in Henan was summarized as 'planned by the governments, led by key schools, cooperation among schools, integration between schools and enterprises, mutual benefit between urban and rural areas'. However, up to now, the clustering has mostly happened in vocational education itself, with an aim at coordinative development of both comparatively strong and

206 "2+1" or "2+3" refers to 2 years schooling in one school and then 1 or 3 years schooling in another school for exchange or for degree certificate.

weak vocational schools, sharing of resources and enhancement of general quality.

Though much success had been achieved, the clustering of vocational education in Henan was still with difficulties and problems. The clustering was comparatively loose in organization and was in short of an operative mechanism to motivate the participating members. The interest of a cluster as a whole was usually neglected and members usually focused on their own interest. The consideration of a cluster as a whole was mostly maintained by a few members with personal relationship. Therefore, many clusters might be established in form, but members in them were actually not united as a whole[207]. Further, enterprises usually had less interest than schools in getting involved in clustering. Finally, the financial support and efficient involvement of the governments were still quite limited. Clusters of vocational education were not independent organizations and they could not make business for income. Without extra financial support from government, the member fees were insufficient for the operation of a cluster[208].

4.2.2 Professional clustering in Shanghai[209]

Shanghai is a provincial level municipality. With its over 19 million permanent residents, it has created annual fiscal revenue which takes 1/8 of whole country (China Finance Net, 2010). Its GDP per capital already reached 5642 US Dollar in 2003, the highest in mainland China. Its primary industry, secondary sector and tertiary sector took a percentage of 0.7%, 39.9%, and 59.4% respectively in 2009, and the tertiary sector was over 50% of the whole industries for 11years. There are 66 higher learning institutes (tertiary education) with a total students' population of 512.8 thousand, and 884 secondary vocational

207 Yang, 2007

208 Yu & Yu, 2008

209 Except those specially noted, the information referred in this part are from Shanghai Commission of Education, 2007; China Educational News Net, 2009; Zhang, et al, 2010; Inspection group for Clustering in the field of vocational education in Shanghai, 2011

schools with a total students' population of 773.9 thousand[210]. Both its number of higher learning institutes and vocational schools and students population are top among all the provinces in the mainland, China.

Due to the further reform of former planned economic system in 1990s, many enterprises did not provide direct support to vocational education anymore. Consequently many vocational schools got into the difficulties like graduates unemployment, non-unified teaching materials or teaching goals. Therefore, many vocational schools tried to establish some cooperation relationships to cluster the strength as well as to re-establish links with enterprises. Though the cooperation networks were not named as 'cluster' or 'group' (ji tuan hua), the scope and form of cluster had actually existed[211].

During this period of time, many kinds of clusters had been established. There were structural clusters among secondary vocational schools, colleges and polytechnics, regional clusters interactive with regional economic development, professional clusters based on the vocational schools' former characteristics and linked with related enterprises, and also blended clusters with loose connections. The structural cluster dominated by Shanghai Yangpu Vocational School was originated from the merging of more than 20 vocational schools under the administration of Yangpu District. The professional cluster led by Shanghai Jianfeng Polytechnic was featured by its character of education run by enterprises as well as that of enterprises affiliated to schools. The regional cluster led by the Center of Vocational Education in Luwan District of Shanghai. It was the result of integration of vocational education resources in a region, such as schools, enterprise, and other social organizations, with the aim at cooperating in the exploration of human resources.

Shanghai Communications Polytechnic was an example of blended clustering, which was formed on the basis of involvement of the en-

210 China Finance Net, http://news.zgjrw.com/News/2010315/city/539671136800.shtml, 2010-03-15

211 Guo & Ma, 2008

terprises from different industries. The cluster consisted of 5 institutes and 31 enterprises which joined the cluster through agreements. Therefore, there were broad bases and a strong development trend for clustering of vocational education in Shanghai. However, the past experience also proved that without good cooperation between schools and enterprises, the clustered resources would not have contributed to the improvement of comprehensive quality of vocational education.

In 2006, Shanghai Municipal government issued a document named as '*Decision of Shanghai Municipal Government on Vigorous Development of Vocational Education*' (hu fu fa [2006] No. 10). It stated that clustering and networking of vocational education should be speeded up. Based on demonstrative vocational schools and colleges, vocational education clusters should be established with involvement of social educational institutes and training bases, communities and enterprises, so as to realize the interaction between vocational education and social economic development, to promote unification of qualification standards of vocational education, and also to facilitate the connection between secondary and tertiary vocational education. Ten clusters would be firstly formally established in fields such as electronic information, CNC, communications and logistics, construction, light industry, chemical industry, tourism, modern arts, nursing, and modern agriculture.

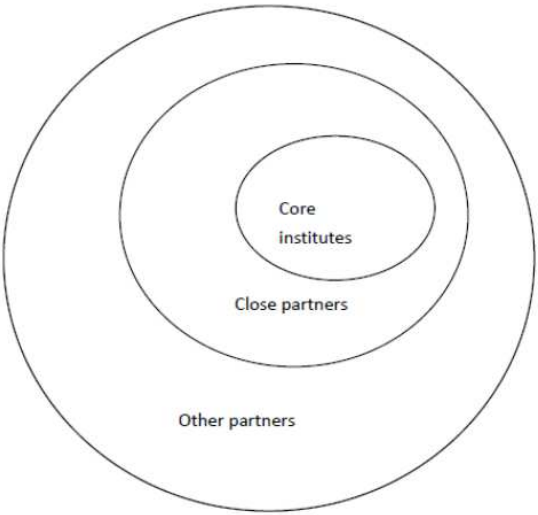
In 2007, Shanghai Committee of Education published '*Views on Promoting the Establishment of Clusters of Vocational Education'* (hu jiao wei zhi cheng [2007] No. 26). The documents defined the nature of clusters of vocational education, forms of cooperation, objectives of clusters, development steps, and governmental support. As to the goals of clusters, the document stated that clusters should focus their goals on 5 aspects: to promote cooperation between schools and enterprises, between schools and communities; to promote clustering and spillover of high quality educational resources; to broaden social service function of vocational schools; to push the reform of teaching model for skilled personnel; to promote share of resources and the connection between secondary and tertiary vocational education. Government support included favorable policies in reform of program, curriculum and enrollment; priority consideration in terms of allocation of fiscal support;

special subsidy; favorable policies for those enterprises participating in clusters, etc. All these documents had given the development of clusters in Shanghai a strong push not only in political sense, but also in practical sense.

Again there will be a specific example. Here it will be the description of a cluster of nursing vocational education.

With the approval from Shanghai Committee of Education, the first professional cluster at municipal level, Cluster of Nursing Vocational Education, was established in October 2007. The cluster was composed of core institutes, close partners and other partners (figure 19).

Figure 18 Members' structure of cluster of nursing vocational education



Source: adapted from Shanghai Commission of Education, 2007

The core institutes were composed of 4 core schools, which were responsible for strategy decision and organization of cluster meetings. The close partners included other partner schools and hospitals. The other partners referred to the participating schools outside Shanghai and other commutity organizations.

The cluster was approved by Shanghai Committee of Education and Shanghai Bureau of Health, and was under the guidance and supervision of Shanghai Committee of Education. The daily management team was made of the representatives from the core institutes. Since the cluster itself was not a corporation body, all the cooperation activities among the members of the cluster were guided with agreements and contracts. However, these agreements and contracts had legal effect because each signing partner itself was a corporation body.

The cluster intended to:

(1) Increase the nursing training volume, improve the educational quality and meet the demand of the society for huge amount of qualified nurses. A unified profession standard would be agreed among the members of the cluster and put forward to guide the nursing training and education. This qualification standard could also benefit the further training and certificating for all the nursing personnel in the city.

(2) Make full use of the resources of the advanced training institutes and also that of hospitals. A unified system for teachers and trainers training, employment and assessment would be established. Professionals in the hospitals would be employed by the training institutes as guest professors or coaches. And a team of professors, trainers and doctors would be organized to counsel the reform and innovation of the training process.

(3) Bridge the gap between secondary and the tertiary vocational education, so that the nurses with secondary education certificate could have chances for further education toward higher education certificate.

(4) Enlarge the practice platform for nursing training. Practice centers would be set up and shared by all the members in the cluster.

(5) Cooperate with the international partners to train internationally qualified nurses.

Thus far, 18 educational institutes and hospitals had participated in the cluster. Some more members also showed their interest in the clustering. Since this cluster targeted at specified positions like nursing and medical care, and had close corresponding relationship with occupation, it had more advantages than other kinds of vocational schools in interaction between learning and practicing.

Conclusion: With its comparatively better financial situation and continuous investment in vocational education, vocational education in Shanghai generally has good bases for further development. The initial probe into clustering has proved that the focus of a cluster should be on the cooperation between production and education, as well as on the integration of schools and enterprises.

With the appearance of first officially approved cluster of vocational nursing education and later approved many other professional clusters, the implementation of clustering in the field of vocational education in Shanghai also reflects the following problems: (1) Disconnection between schools and enterprises. Though there are already many forms of cooperation between enterprises and schools, there is still no corresponding demand-supply relationship. This situation results into a passive position for vocational schools in choosing training forms, designing teaching objectives as well as ensuring graduates' employment. (2) Unbalanced development among vocational schools. There is still a need to create a mechanism through clustering to make full use of the available information, facilities, training and practicing bases and to share them among vocational schools. (3) Standardization of curriculum and improvement of quality. (4) Extension of educational and society-serving function of vocational education.

4.2.3 Professional clustering in Hainan Province[212]

Hainan is located on an island in South China with a population of 8.6 million in 2010[213]. Its economy is mainly based on agriculture and tourism. According to the statistics of 2004, among all economic sectors its primary industry took 34%, secondary industry sector 25.1% and tertiary sector 40.9%. The low investment in industry since long also resulted in a weak industry in Hainan. In 2004, the added value from industry accounted only 18.5% of GDP in Hainan, much lower than the average 46% in China. Furthermore, because of the weak industrial bases, the tertiary sector was mainly composed of traditional transport and communication, wholesale and retail, and catering. This inferior economic situation also resulted in small-sized, and low efficient vocational education with scattered resources.

In late 1990s when the former nationally planned employment dispatch system was abandoned, many vocational schools got in difficulty in students' enrollment and employment. Some vocational schools tried to cooperate with each other in form of '1+2' to attract students from countryside. The students studied in the first year in rural vocational schools and in the later two years tranferred in urban vocational schools. This kind of cooperation was later followed by some other vocational schools in urban areas.

The reaction of government took place in 2007 with the publication of '*Views of Hainan Provincial Government on the Decision of State Council on Vigorous Development of Vocational Education*' (Qiong fu [2007] No. 5). The document stated that small-sized schools should be merged with good quality vocational schools to build 10 key vocational schools of national level. And, in form of 'initiation by schools', support from government and participating enterprises, six training and practice bases have been established.

212 Except those specially noted, the information referred in this part are from Zhao, 2007; Hainan Xuezi Net, 2007-11-20 ; Zhou, 2009; China News Net, 2011-10-29; Hainan Bureau of Statistics, 2008-03-17

213 Department of Education of Hainan, 2011

In Hainan, the clustering in the field of vocational education was initiated by the key vocational schools in cities, and was composed of vocational schools from county level. The clustering model was developed from '1+2' in early 1990s to later a so-called '1+1+1' model, namely, the students learned some basic theories and basic skills in the county-level vocational schools in the first year, then furthered their training in the key schools with good facilities in the second year, and finally spent their last year in the enterprises for practice.

This kind of clustering resulted in some successes. For example, Haikou Tourism Vocational School developed from a student population of fewer than 300 in 1993 to 3200 in 2007 and 4487 in 2011. Hainan Mechatronic Engineering Vocational School also boomed from a student population of 1600 in 2004 to 5000 in 2007 after cooperation with 12 county level vocational schools. In general, the students' population in secondary vocational schools surged from 78 thousand in 2006 to 128 thousand in 2008.

In the clusters in Hainan, each member school kept its independence with personnel and financial arrangement, but was unified with other members of the cluster on enrolment, teaching contents, students' management, practice and employment. This time, the specific example will be a cluster of vocational education in tourism.

Haikou Tourism Vocational School is located in Haikou, the capital city of Hainan Province. Since 1998, the School cooperated with some other vocational schools in remote areas and named these schools as its branch schools. In consideration of the situation of insufficient available resources, teaching staff and facilities, a model of '1+1+1' was initiated. In the first year, the students learned basic theories and skills in local schools, to save the cost of learning in cities and to get some subsidy (30-50 Yuans per month) and half deducted tuition from local government. In the second year, the students from other partner schools would stay in Haikou to intensify learning of theories and skills. In the third year, these students would be sent to hotels for practice for one year.
In order to solve the problem of 'output' for the students from rural

areas, Haikou Tourism Vocational School established cooperation relationship with many hotels. These hotels functioned as practice bases for the students. Some of them even provided some financial support to the students during their time in schools. Through this kind of network, enterprises got qualified personnel while students had good chances in practice and employment, and schools could enjoy their development in quantity and quality.

In 2008, Haikou Tourism Vocational School initiated the establishment of Hainan Vocational Education Cluster of Tourism with 42 members[214].

Conclusion: The clustering in Hainan helped to solve the problems like insufficient enrolment for the city schools, deficient training facilities in the rural areas, and unsmooth employment channels. More schools getting involved in the clustering resulted in more students, bigger in size, and more chances for the schools to cooperate with enterprises. Also, under the idea of 'to support one family through training one of its members, so as to serve the whole society', the clustering also contributed to elimination of poverty.

Since the clustering of vocational education in Hainan had not much support from government, it was difficult to establish a deep cooperation relationship among schools, enterprises and society. The relationship between schools and enterprises were loose and the enterprises were seldom active or enthusiastic in contacting schools for cooperation. Also, among the schools members in the cluster, it was also difficult to coordinate among them since all of them were independent administrative organizations. Therefore, the cooperation among the members in clusters was temporary and not very sustainable.

214 Hainan Xuezi Net, 2011

4.2.4 Regional clustering in Yongchuan[215]

Yongchuan is located in South-West China, under administration of the provincial level city Chongqing and is around 200 km away from the capital city of Sichuan Province, Chengdu. Yongchuan has a population of 1.06 million, with around 270 thousand in urban area. The clustering of vocational education in Yongchuan is a kind of regional clustering.

Chongqing Commission of Education and Yongchuan municipal government initiated the clustering of vocational education in September 2004, with consideration of vocational education as a 'wheel that carries forward the development of the city'[216]. At that time, vocational education was thought: (1) to be contributive to the development of GDP through consumption and investment in immobile facilities; (2) to be critical for the change of labor resources into human capital.

The clustering of vocational education was aimed at building the city into a vocational education center. The local government provided all vocational institutes with platforms of constructional development (building new campus by the government), public resources, information and services, teaching staff, investment and finance, quality control, enrollment and employment, and cultural exchange. In November 2005, Yongchuan municipal government issued '*Notice on the Clarifying of Responsibilities of Related Units in Building Chongqing Bases of Vocational Education'* (yong wei fa [2005] No. 139) and required all departments of the government should strengthen the coordination among each other in building new campuses for vocational education institutes. All vocational schools were located in the different parts of the city, so that they could share the existing public resources like libraries, stadium and other cultural or commercial facilities.

The government also undertook the enrolment and employment of the students for all the vocational schools in the region as one of its

215 Except those specially noted, the information referred in this part are from Chongqing Commission of Education, 2011; Sohu Education, 2008; China Net, 2008; Fenghuang Net, 2011; Kong, 2011

216 Editor office, 2005, p. 14

main responsibilities. On behalf of the vocational institutes in the region, the government made contacts with the other neighboring cities and signed with them contracts for cooperation. Besides, the government tried to integrate all the possible vocational education resources, including the colleges, vocational schools and all the training centers, to supply multiple offers of vocational education and training to the society. For the future, the government also planned to introduce more vocational institutes into the region so as to improve the cluster's competitiveness in the city. In order to support the quality improvement of the vocational education, the government also cooperated with several big companies and set up dozens of practice centers.

In 2007, the vocational institutes in Yongchuan totaled 30, and among them 6 are colleges, 20 secondary vocational schools, and 4 adult schools. The students' population reached 100 thousand, almost one third of the urban population of the city. And 85% of the students were from the areas outside Yongchuan.

The clustering of vocational education in Yongchuan was initiated by the local government and was successful in expanding the volume of vocational education. The population of students of vocational education developed from 83 thousand in 2005 to 109.5 thousand in 2010. In 2010, 30 vocational schools were merged into 25, to improve scale efficiency and quality. Since 2008, all students of vocational education from Yongchuan had been exempted from tuition[217].

However, concerning the quality improvement, the clustering still has a long way to go. Since the clustering happened in a small area without many enterprises, most of the graduates had to find jobs in other area. Few of them would stay in Yongchuan to serve the local economic development. This employment situation in return affected the enthusiasm of the local enterprises in getting involved in the vocational education. As a result, it happened that the vocational education in Yongchuan lacked teaching staff with practical experience, and the

217 Yongchuang Government Net, 2011-2-22

investment in the building of practice centers relied heavily on the government with very limited funding availabilities. Therefore, emphases of vocational education in Yongchuan were put more on theoretical education than practical training, more on enrolment than management.

Further on, the students' resources which Yongchuan heavily relied on the other parts of China will further shrink and jeopardize the existence of the clustering. The clustering of vocational education in Yongchuan brought forward a huge demand for students' resources from outside areas. Nowadays, the vocational education in whole China is all under vigorous development. The flow of students from other areas to Yongchuan may be weaker than before.

4.2.5 Regional clustering in Yantai[218]

Yantai is a coastal city located in Shandong Province in East China with around 6.5 million dwellers. In 2005, Yantai municipality decided to establish clusters of vocational education on the basis of its pillar industries. With the publishing of '*Views on the Establishment of Municipal Level Clusters of Vocational Education*' (yan jiao [2005] No. 82), the government pushed the establishment of clusters of vocational education on the basis of representative vocational schools and enterprises. The establishment of clusters should follow the principles like volunteering, complementary, led by key schools and enterprises, and mutual beneficial, with an aim at realization of cooperation between schools and enterprises on broader and higher levels.

The clusters functioned in three fields. The first was to set up practice bases in the key schools and also in related enterprises, so as to serve the practice demand from all member schools. The second was to collect employment information ('order') from enterprises and then to distribute it among all member schools, so as to promote the enrolment of new students in member schools as well as those in rural areas. The

218 Information referred in this part is from articles on Yantai Education Net, 2005-11-23, 2007-07-20 (a,b)

third was the reform on curriculum design which was exercised by the key schools according the requirements from enterprises, and then the newly amended curriculum could be shared by all other member schools.

It is reported that through clustering, those key schools had been further developed, the relationship between schools and enterprises had become closer than before, and those vocational schools in rural areas got also development.

For the enterprises, clustering helped alleviation of the disproportion between the huge demand of economic development in Yantai for skilled personnel (120 thousand per year) and the decreasing supply of vocational students (around 20 thousand per year). On the one hand, through clustering, students from rural areas of Yantai and also from other provinces could be attracted to the vocational schools in Yantan city and serve for the development of economy in Yantai. On the other hand, the enterprise members in clusters of vocational education could give their requirements and standards for the employees to school members, so that those schools could arrange their curriculum and train the students accordingly. Consequently, the recruitment for employees is changed into enrolment for students and enterprises could save some cost and time for training new employees.

For schools, clustering helped them to orient their curriculum reform to the latest information from enterprises, such as positions available, quality requirements, etc. Further, the function of schools went beyond the former 3-years-schooling system, and took more activities in offering in-service training and further education for society. The other benefits that the schools could get from clustering included the practice bases supported by enterprises and also trainers with practical experiences from enterprises.

The Cluster of Constructional Vocational Education was one of the clusters established in Yantai. It was composed of Yantai Construction School and other 9 vocational schools as well as 18 constructional companies. One of the companies in the cluster invested in building a

practice workshop in Yantai Construction School, and 4 other companies also agreed to be practice bases for all member schools in the cluster. Besides regular schooling, the member schools in the cluster also offered in-service training and further education for all the staff members in the constructional field, and had trained more than 5000 project managers, more than 400 company managers, and more than 15000 technicians in constructional field since 2005.

The clustering in the field of vocational education in Yantai was aimed at setting up a platform for the extensive and intensive cooperation between schools and enterprises. It was initiated by government, led by key schools, and with intensive and extensive involvement of enterprises. The clustering did not change the former administrative status of each member, and government's investment also focuses on the key schools in the cluster. However, though enterprises became members of clusters, there was no common crucial interest between enterprises and schools and the relationship between them was quite unstable and unsustainable.

4.3 Comparative analyses

No matter whether the above mentioned models are in form of professional clustering or regional clustering, there are many communities such as connections among governments, schools and enterprises. However, for the convenience of comparison, these models will be grouped in two categories: clustering by professional and clustering by regional. And the comparative analyses will be made on the basis of the following criteria deducted from the theoretical analyses in last chapter: (1) factors, clustering process and role of government (factors which constitute the environment for clustering and reinforcing relationship among factors; clustering process and role of government in fostering cluster); (2) investment inputs and results from them (investment inputs from government, enterprises and individual families which have been made; results which have been achieved with these investments); (3) contribution to the set-up of goals and realization of these goals (con-

tribution of clustering to the set-up of goals of vocational education, such as qualification, competence and key qualifications; contribution of clustering to the realization of the goals of vocational education: systematic and complementary).
Furthermore, in consideration of the scale of clustering and the availability of related data, the comparison will be made more detailed on the models of professional clustering that those regional.

4.3.1 Implementation of professional clusters in Henan, Shanghai and Hainan

Among these three provincial level regions, Shanghai is a municipality while the other two are provinces. Because of their natural situation and also development history, there are some basic differences among them (Table 4).

Table 4 Basic comparative information about the three regions in 2006

	Shanghai	Henan	Hainan
Gross Regional Product (100 million Yuan)	10366.37	12495.97	1052.85
Total Population (million person)	18.15	93.92	8.36
Gross Regional Product per Capita (Yuan)	57115	13305	12593
Composition of the Three Strata of Industry (%)	0.8:47.3:51.9	15.7:55.0:29.3	31.1:22.6:39.3
Average Earning of Employed Persons (Yuan)	37585	16791	15843
Government Revenue (million Yuan)	157607.42	67917.15	8181.39
Expenditure for education (million Yuan)	20546.00	23314.85	2784.79
Per Capita Annual Income of Urban Households (Yuan)	22808.57	10339.20	10081.70
Per Capita Net Income of Rural Households (Yuan)	9138.65	3261.03	3255.53
Number of Students Enrolled in Undergraduate/Specialized Courses in Institutions of Higher Education	292859/173474	449914/524182	41414/48724
Number of Students Enrolled in Secondary Vocational Schools (Institutions)	200636	1198163	64135
Government Appropriation for Education (million Yuan)	27506.48	23573.89	3142.44
Tuition and Miscellaneous Fees	7289.76	6973.17	523.34

Source: adapted from China Statistical Yearbook 2007

The differences are also reflected in the number of key schools and demonstrative colleges. With the issue of '*Notice of Ministry of Education on the Publication of the First Group of Newly Recognized National Key Vocational Schools*' (jiao zhi cheng ting [2004] No. 1) in 2004 and '*Notice of Ministry of Education on the Second Group of Newly Recognized Key Vocational Schools*' (jiao zhi cheng ting [2005] No. 1) in 2005, a total of 1504 vocational schools have been evaluated as national key vocational schools

under the motto of 'evaluation for promotion of construction, reform and development'. Among these 1504 key vocational schools, around 50 are in Shanghai, 104 in Henan and only 5 in Hainan. In November 2006, Ministry of Education launched and funded 'Project of Hundred Demonstrative Colleges of Tertiary Vocational Education' and a total of 109 colleges have been named as national demonstrative colleges and received extra funding direct from central government[219]. Among them, 5 are in Shanghai, 4 in Henan and 1 in Hainan. All these differences will serve as a base for further comparative analyses.

4.3.1.1 Factors, clustering process and role of government

On the bases of experiences from structural clustering and cooperation with enterprises since 1990s, the implementation of cluster of vocational education in Henan, Shanghai and Hainan has some similarities and also some differences in the fields of cooperation among factors, clustering process and also governmental role in the process.

First of all, the clusters of vocational education in these 3 areas all focused on certain professions, for example, cluster of agricultural vocational education in Henan, cluster of nursing vocational education in Shanghai and cluster of tourism vocational education in Hainan. Therefore, the factors involved in clustering were quite similar: vocational schools of different levels, enterprises in certain professions and governmental organizations.

So far as the clustering process is concerned, all clusters emphasized the cooperation among vocational school and colleges, and also that between schools and enterprises, but had some special features of each own. In Henan, secondary vocational schools (elements) in a cluster (system) were related with each other through a '1+1+1 model', or through '2+1' or '2+3' or '3+2' model among colleges/polytechnics and secondary vocational schools. And this relationship was mostly initiated by vocational schools themselves. Between schools and enter-

219 China Education online, 2011-07-18

prises, it was encouraged by government or was pushed by labor market situation to establish a kind of relationship in form of 'training orders', half-work-half-study, teaching factories (integration of production workshops and training workshops), and co-investment in work-study bases on campuses and also within enterprises, etc. The administrative system and status of each member in clusters had not been changed and the cooperation among the members was guided by the 'statute of clusters'.

In Shanghai, the establishment of cooperation among vocational schools and enterprises already began in 1990s in rich forms of structural cluster, regional cluster, professional cluster and blended cluster. Since 2006, the implementation of clustering in the field of vocational education has been speeded up. Based on core vocational schools and colleges, the relationship among schools, communities and enterprises was encouraged by government to be established for the promotion of unification of qualification standards of vocational education and facilitation of connection between secondary and tertiary vocational education. As demonstrated by Shanghai Vocational Educational Cluster of Nursing, the cluster was composed of elements of 3 different levels, namely core schools, close partners and other partners. All cooperation activities among the members were guided with agreements and contracts, and were managed by representatives from core institutes. And the cluster had very clear and detailed goals, such as establishment of unified training standards of international level, extension of practice platform for nursing training and unified system for teachers and trainers training, employment and assessment, etc.

In Hainan, the model of cluster of vocational education was developed from '1+2' in early 1990s to later a so-called '1+1+1' model, namely the students learned some basic theories and basic skills in the county-level vocational schools in the first year, then further their training in schools in cities with good facilities in the second year, and finally spent their last year in enterprises for practice. These enterprises functioned as practice bases for the students. Some of them even provided some financial support to the students during their time in schools. Through this kind of network, enterprises got qualified personnel while students

found good chances in practice and employment, and schools could enjoy their development in quantity and quality. In Hainan, each member school of clusters also kept its independence with personnel and financial arrangement, and was unified with other members of the cluster on enrolment, teaching contents, students' management, practice and employment.

The clusters in these three areas were guided with statute of clusters (Henan), or agreements/contracts (Shanghai, Hainan), and the administrative system and status of each member of the clusters had not been changed. However, clusters were all comparatively loose in organization and in system. In Henan, the implementation of clustering mostly happened among vocational schools/colleges themselves. There was neither common interest nor financial links between vocational schools and enterprises, which resulted in short-termed and irregular cooperation activities. Enterprises usually had less interest than schools in getting involved in clustering, and the consideration of a cluster as a whole was mostly maintained by a few members with personal relationship.

In Shanghai, regardless of its comparatively better economic situation and continuous investment in vocational education created good bases for further development of vocational education, there was also no corresponding demand-supply relationship between schools and enterprises. In the case of Hainan, the relationship between schools and enterprises was loose and the enterprises are seldom active or enthusiastic in contacting schools for cooperation. Also, among the schools members in the cluster, it was also difficult to coordinate them since all of them were independent administrative organizations. Therefore, the cooperation among the members in clusters was temporary and not very sustainable. It had been proved difficult to establish a deep cooperative relationship among schools, enterprises and society.

Furthermore, clusters of vocational education were not independent organizations and they were not allowed to do business for profit. As reflected from available information, extra governmental financial support for implementation of clustering is commonly limited. And the

member fees could not be enough for the operation of a cluster. This situation also led to the loose connection of factors in clusters.

In the clustering process, governments in these three areas played a favorable and supporting role, mostly by means of publication of certain documents or policies. In Henan, each cluster had been authorized by government and two documents had been issued to encourage the implementation of clustering in the fields of vocational education: '*Views on Establishing Clusters of Vocational Education*' (jiao zhi chen [2004] No. 247) and '*Views on Strengthening the Establishment of Provincial Clusters of Vocational Education'* (jiao zhi chen [2005] No. 388). In Shanghai, clusters were approved and put under the guidance and supervision of Shanghai Committee of Education. Shanghai Municipal government had issued two documents to support the implementation of cluster of vocational education, namely '*Decision of Shanghai Municipal Government on Vigorous Development of Vocational Education*' (hu fu fa [2006] No. 10 and '*Views on Promoting the Establishment of Clusters of Vocational Education*' (hu jiao wei zhi cheng [2007] No. 26). The support from the government also included favorable policies in reform of program, curriculum and enrollment; priority consideration by allocation of fiscal support; special subsidy; favorable policies for those enterprises participating in clusters, etc. In Hainan, the implementation of clustering in the field of vocational education had also got support from government with the publication of '*Views of Hainan Provincial Government on the Decision of State Council on Vigorous Development of Vocational Education*' (Qiong fu [2007] No. 5). The document stated that small-sized schools should be merged with good quality vocational schools and special funds would be allocated to demonstrative schools or programs.

4.3.1.2 Investment inputs in human capital and their results

According to 'China Statistics Yearbook', the education sector in China is funded with government appropriation, funds from social organizations and citizens, donations, tuition and miscellaneous fees, educational taxes and other incomes from services and engagements of schools. Generally, though the relationship with enterprises is often emphasized in the clustering, the donation from enterprises, usually through provi-

sion of monetary and facilities' availabilities to vocational schools, is random and very limited as mentioned in the above chapters. Among all these resources, government appropriation and tuition takes the dominant part in the whole funding.

Henan is a province where agricultural population takes up 80% of the whole provincial population. In 2003, 13 million surplus farmers left countryside and the number of migrant workers from Henan took up 10.9% of the whole national migrant labor forces. Among those migrant workers from Henan, 79% were most with education level lower than junior middle school. The cooperation among vocational schools as well as between vocational schools and enterprises bridged the vocational schools in cities and those in countryside, and helped to solve the problem of insufficient enrollment for city schools, and also the problem of limited employment chances for the rural schools graduates, which in return encouraged more families in rural areas to invest in vocational education for better employment chances. Besides, more trained labor forces could be available in labor market for enterprises. Furthermore, through the implementation of '2+3' or '3+2' model, more graduates from secondary vocational education were able to enter into tertiary vocational education, which could help the improvement of social movement chances for those from families with weak social status.

Hainan Province has a similar situation. The economy of Hainan Province is mainly based on agriculture and tourism. The low investment in industry since long has resulted in a weak economy in Hainan and in consequence vocational education is small-sized, and low efficient with scattered resources. With implementation of so-called '1+1+1', the students learned basic theories and skills in local schools in first year, to save the cost of learning in cities. In second year, the students from other partner schools would stay in major cities to intensify learning of theories and skills. In the third year, these students would be sent to enterprises for practice for one year. Through this kind of cluster, the member schools all got more students, and more chances for the schools to cooperate with enterprises. For the students, they could save some money for training, at least that tuition for the last

year of training was taken by enterprises where the students made practice. Also, under the ideal of 'to support one family through training one of its members, so as to serve the whole society'[220], the implementation of cluster of vocational education also contributed to elimination of poverty and improvement of social movement chances for those people from countryside. Therefore, the investments in clustering in the field of vocational education in Henan and Hainan took the following goals as their priorities: (1) to enable the transfer of the labor forces from rural areas to urban areas through training and connection with enterprises; (2) to eliminate poverty through improvement of training and employment chances for those from poor families.

Shanghai has the highest GDP per capita in mainland China. Its primary industry, secondary sector and tertiary sector took up a percentage of 0.8, 47.3 and 51.9 respectively in 2006[221]. Therefore, the availability of comparatively more abundant investment in vocational education contributed to tuning of vocational education development from quantitative to qualitative development to meet with the requirements of local social development. As demonstrated by the cluster of nursing vocational education, the cluster had very clear and detailed goals, such as establishment of unified training standards of international level, connection between secondary and tertiary vocational education, extension of practice platform for nursing training and unified system for teachers and trainers training, employment and assessment, etc. For the individual students, the investment in vocational education could not only ensure a better paid job in Shanghai, as showed in table one, but also open a possibility of transition from secondary vocational education to tertiary.

Because of the effect of vocational education on social fairness, it is noticeable that Chinese government also expanded the investment in vocational education in recent years. In 2009, several ministries of China jointly publicized '*Opinion on Waiving of Tuition for Those Students from Rural Poor Families and Those for Programs Related with Agriculture in Second-*

220 China News Net, 2011-10-29

221 China Statistical Yearbook, 2007

ary Vocational Education' (cai jiao [2009] Nr. 442). The sum of those waived tuition should be shared between central government (60%) and provincial government (40%). With the publication of this policy, provincial government also took some reaction. Henan provincial government issued '*Plan of Henan Province for the Tuition Waiving Project for the Students from Rural Poor Families and Those for Programs Related with Agriculture in Secondary Vocational Education*' (yu cai jiao [2010] Nr. 13) which allowed a gradual waiving of tuition since Autumn semester of 2009, and decided that no more than 15% of the whole students' population (except those for programs related with agriculture) could be entitled to this exemption.

In Hainan, all the students for programs related with agriculture in secondary vocational schools have been exempted tuition since 2010. Since autumn 2011, tuition has been waived in secondary vocational schools for those students from rural poor families. It is planned that all students in secondary vocational education would be waived of tuition in 2013[222].

4.3.1.3 Contribution to the set-up of goals and realization of them

Development of vocational education is normally unbalanced, between those in urban and rural areas, and between those key schools/demonstrative colleges (with comparatively better facilities and quality) and those normal ones. Therefore, generally, the implementation of clustering in the field of vocational education in Henan, Shanghai and Hainan all had an aim at coordinative development of both comparatively strong and weak vocational schools, sharing of resources and general improvement of quality.

However, besides the consideration from social point of view (increase of enrolment of students, contribution to human capital and social fairness, etc.), the improvement of quality is still a big concern of implementation of clustering in the field of vocational education.

222 Hainan Daily, 2012-02-16

By slogan of 'employment oriented' (jiu ye dao xiang), vocational education is still prevailingly a kind of adaptive education, trying to fit the students into presently available work positions. There are still many difficulties in establishing a transparent and comparable standard for vocational education. Therefore, quality varies greatly among vocational schools in the same or different regions.

As happened in Henan and Hainan, the cooperation between schools and enterprises was various in forms, such as training according to training orders from enterprises, practice availabilities in enterprises, or curriculum design including half-work-half-study rotation, etc. The cooperation was expected to enable schools to take the employment orientation (qualifications) as their curriculum reform guideline and to reach the goal of 'seamless transfer' of graduates from schools to the working positions. However, due to the quick change of requirements for a working position (change of requirements for a qualification) and the irregular cooperation relationship between schools and enterprises, vocational schools/colleges lost very often their orientation. The quality standard for vocational education was consequently ambiguous, and the practice part of vocational education was irregular.
Therefore, the model of Shanghai in implementation of cluster of vocational education, especially strategy and steps toward building professional standards for vocational education as demonstrated by the cluster of nursing vocational education, seemed quite successful. After several years' implementation, positive results were achieved in sense of definition of training contents (publication of textbooks), training by instructors with both academic and industrial background, regular integration of learning in schools and practice in enterprises, etc.

4.3.2 Implementation of regional clusters in Yongchuan and Yantai

Yongchuan and Yantai are prefectural level cities in Chongqing City (provincial level municipality) and Shangdong province respectively. Because of their different locations and economic development situa-

tion, they have also some differences in implementation of clustering of vocational education in their own regions.

4.3.2.1 Factors, clustering process and role of government

The implementation of cluster of vocational education in Yongchuan and Yantai is quite different from each other, maybe mainly because of their different location and economic situation. Yongchuan is a prefectural city in West China and has a population of 1.06 million, with around 270 thousand in urban area, while Yantai is a coastal city located in Shandong Province in East China with around 6.5 million dwellers and much more advanced industrial development than Yongchuan. Therefore, the starting points for implementation of clustering in the field of vocational education were different. In Yongchuan, implementation of cluster of vocational education was for its direct contributionto increase of GDP through campus construction and students' consumption. In Yantai, it was for serving better the pillar industries in local area.

In Yongchuan, the connection among members of clusters was established by Yongchuan municipal government under the consideration of vocational education as a 'vehicle that carries forward the development of the city'. Through provision of new campus, services by enrolment and employment, and platforms for information exchange, the municipal government expected that all the vocational schools in the region would be contributive to building the city into a vocational education center. Not only the relationship among vocational schools was arranged by government, but also the relationship between schools and enterprises was manipulated by government.

Since Yongchuan had not many enterprises in its region and most of the graduates had to find jobs in other area. Few of them would stay in Yongchuan to serve the local economic development. This employment situation in return affected the enthusiasm of the local enterprises in getting involved in the vocational education. Furthermore, the reduced students' resources due to the general development of vocational edu-

cation in other areas could also jeopardize the existence of the clusters of vocational education in the region.

The implementation of cluster of vocational education in Yantai was also pushed by Yantai municipal government to serve the pillar industries in the region, while following principles like volunteering, complementary, led by core schools and enterprises, and mutual beneficial. Vocational schools, colleges and enterprises were related in several aspects, such as practice bases invested by government and enterprises in core schools and a related enterprises would be shared by all member schools, employment information or training orders from enterprises would be collected by government and then distributed among all member schools, and curriculum design with consideration of requirements from enterprises would be carried forward by core schools and then shared by all other member schools.

The direct involvement of government in the implementation was officially announced through its publication of '*Views on the Establishment of Municipal Level Clusters of Vocational Education*' (yan jiao [2005] No. 82).

However, though enterprises became members of clusters, there was no common crucial interest between enterprises and schools and the relationship between them was quite unstable and unsustainable.

4.3.2.2 Investment inputs and results from them

Through implementation of cluster of vocational education in Yongchuan, students' population of students of vocational education developed from 83 thousand in 2005 to 109.5 thousand in 2010, almost one third of the urban population of the city. And 85% of the students were from areas outside Yongchuan. Therefore, it reflects that the passion for investment in vocational education is also quite high in western China, though the employment chances seem not as good as in Eastern China.

In Yantai, the implementation helped alleviation of the contradiction between the huge demand of economic development in Yantai for skilled personnel (120 thousand per year) and the decreasing supply of vocational students. Therefore, it attracted the investment from other parts of Yantai in the vocational education in Yantai. Besides regular schooling, member schools in clusters also offered in-service training for the personnel of enterprises.

4.3.2.3 Contribution to the set-up of goals and realization of these goals

Because of the disadvantageous industrial situation, Yongchuan had difficulties in getting teaching staff with practical experiences from enterprises, and the investment in building practice centers relied heavily on the municipal government with very limited funding availabilities. Therefore, emphases within vocational education in Yongchuan were put more on theoretical education than practical training, more on quantity than quality.

In Yantai, with governmental investment in practice bases in the key schools and also in related enterprises, and collection and distribution of employment information (training orders) from enterprises, core or demonstrative vocational schools/colleges could carry forward reforms on curriculum according to the requirements from enterprises, and then share the newly amended curriculum with all other member schools. Therefore, through clustering, Yantai has successfully improved its conditions for theoretical and practical training, and is coming near to the establishment of quality standard.

4.4 Conclusion

Implementation of clustering in the field of vocational education was an ideal of governments of different levels in China toward promoting vocational education in quantity and quality, changing labor forces to

human capital as well as promoting social harmony. For vocational schools and colleges, implementation of clustering in the field of vocational education functioned as a way of building a platform of cooperation between schools/colleges in rural and urban areas, and also between schools and enterprises as a bridge of 'seamless transfer' for graduates from schools to the working positions, and also as a solution to the optimization of the resources and minimization of the administrative costs. As most practices revealed, implementation of clustering in the field of vocational education emerged as a significant tool to promote the development of vocational education through the integration of resources, expanding the scale of education and training, improving the quality of education through establishment of standards, and the spill over of generated knowledge in the process of cooperation and networking between enterprises and schools.

Moreover, implementation of clustering of vocational education has contributed to the increased enrollment of students in vocational schools, improved employment chances for the students from rural areas, more intensified cooperation between vocational school and enterprises than before, and also beneficial try of setting up quality standards (as showed in the case of Shanghai). However, since cluster of vocational education was relatively a new concept and practice in China, there were still a lot of difficulties revealed in these implementation models.

4.4.1 Systematization of a cluster and role of government

Clustering in the field of vocational education was a trans-industrial or trans-regional re-organization process. In China, enterprises and schools were literally two different types of organization under different public administration policies. Since the transformation of the economic system from planned economy to market economy, schools funded formerly by the enterprises have been separated from the sponsors, and have lost the former natural intimacy with each other. Furthermore, in provincial trans-regional situation, it was impossible to form a cluster with common capital basis, since the members for clus-

tering were under different administrative governmental organizations. Therefore, all the implementation models of clustering in the field of vocational education faced a status problem, and members (elements) were just called to be together instead of connecting with each other through some inner relationship, nor with a progressive systematization process. This status problem caused many difficulties.

The first difficulty was in achieving the stability of the cluster. When anybody would take part in the cluster or cooperate with the members of the cluster, an agreement or contract could only be signed between interest parties and the leading members of the cluster, but not with the cluster as a whole. This kind of linkage was vulnerable to the strength change of the leading members in cluster, and was consequently very unstable. Furthermore, since members of clusters had only contract binding relationship with the leading partners, it would be the leading partners who took the responsibility for all good or bad things happened to the whole clusters. Therefore, it could happen that some members could deliberately abdicate their responsibilities or only focus on their own interest on the cost of the whole clusters.
The second difficulty was the problem of authority. The legal effect of all the regulations can only be realized through the corporate status of the individual members of a cluster, normally the leading organizations. It would be impossible for a cluster without corporate body to sign cooperation contracts with partners outside the cluster. In such a situation, the clusters have no way to excise their authorities.

In most of the implementation models, governments played a role as initiators and manipulators. They supported, authorized or directly excecuted implementation of cluster of vocational education. However, due to lack of related laws and appropriate methodologies, most clusters were comparatively loose in organization, and lack stable relationship with each other. The implementation was not very stable and sustainable, and in some other areas it tended to be a political show and a transient phenomenon.

4.4.2 Involvement of enterprises and the problem of educational quality

To strengthen the relationship between enterprises and educational institutes was an important goal of implementation of clusters of vocational education. Vocational education would lose its orientation if there was no support from enterprises. However, since there were still neither specific policies nor common interest between vocational schools/colleges and enterprises which could encourage enterprises' active involvement in clusters of vocational education, the relationship between enterprises and educational institutes were usually loose and unsustainable, as reflected in these models. In addition, the gap between the structural features of industries and expansion of tertiary education is also a cause to the loose connection between schools and enterprises.

For enterprises, they had also their own difficulties: limited budget for further education for its own staffs; extra personnel cost for coaching those practicing students or for lecturing in schools; increased cost of wear and tear when machines were made accessible to those unskilled students. Therefore, enterprises usually had less interest than schools in getting involved in clusters, especially when they were labor intensive and could get enough labor forces from free labor market for those low skilled positions. And this situation also aroused the worry about over-education.

Implementation of clustering in the field of vocational education was to make full use of various educational resources, including different schools and enterprises. The clustering in the field of vocational schools surely influenced previous independence of each individual school, and cause a conflict against prevailing management system. For example, there would be a credit transfer problem in trans-school or trans-profession training. Besides, the linkage between secondary and tertiary vocational education would also be hindered by prevailing administrative system because that each of them was under the administration of different governmental organizations in China. Furthermore, it is not certain when detailed requirements (training order) from

enterprises differed from basic educational standard, whether vocational schools or colleges would surrender their responsibility as educating institutes by name of 'employment orientation'.

In most cases, because of the shortage of committed involvement and integration of enterprises, implementation of vocational education became only a game of vocational schools and colleges themselves, with not much contribution to the improvement of quality of vocational education. Meanwhile, the distrust of enterprises on the quality of vocational education also affected the interest of enterprises in cooperation with vocational schools. Therefore, it is very necessary to establish quality standards of vocational education acceptable and realizable to multi-stakeholders.

Since implementation of clustering of vocational education is still quite new in China, all the selected models have not revealed those problems which could be caused by clustering, such as regional closure, embedded effect, lift behavior, etc. It is not sure whether these problems will also occur in these areas in the future.

In consideration of the revealed problems, some practical experiences from other countries will be reviewed as references for future improvement. And for those problems related with theoretical concerns, further analyses will be made as suggestions for future.

5. International experiences

Though there are seldom international cases similar to that implementation of clustering in the field of vocational education in China, some international experiences are still referential in aspects of getting factors into connection, role of government in the systematization process, etc.

5.1 Tourism-learning-area approach in Europe: concrete steps toward clustering

The European Commission's communication 'Working together for the future of European Tourism' of 2001 pointed out that 'strategies and measures designed to upgrade skills in the tourism industry show a trend towards more holistic solutions based on partnerships and dialogue between training institutions, the tourism industry and other major stakeholders, such as public authorities'[223]. In 2006, the '*Handbook on how to create a tourism learning area* (TLA)'[224] was published as a specific action to promote the economic and social stability of European tourism. According to the handbook, a tourism learning area is a European-level action and multi-stakeholder problem-solving approach that addresses challenges of improving SME performance, educational governance, tourism sector skills and qualifications by optimizing communications and learning opportunities in the region. This optimizing objective will be achieved through clustering approach: grouping together the 'learning-experience clients' and the 'learning-experience providers', clustering of products and services in the regional tourism supply chain, and developing a structure for a website that will link all tourism informal and formal learning processes into a regional knowledge network.

According to the handbook, the overall process of setting up a learning area involves three main steps (namely initiation, coordination and de-

223 Commission of the European Communities, 2001, p. 23

224 European Communities, 2006

velopment).[225] This will involve an initiator to get the ball rolling; identification of stakeholders who have an interest in developing learning and networking mechanisms; raising awareness of needs and challenges, and forming goals and possibilities; establishing a coordination process for stakeholders to act collectively; profiling the TLA learning offers and requirements; developing a work program that involves designing and constructing a web portal to bring stakeholder networks together; implementing learning opportunity improvement projects and processes; monitoring the progress, etc.

The Handbook also puts out 'A Checklist of How to Set up A Tourism Learning Area' as a concrete guideline[226]:

Phase I (initiation). (1) Understand the concept and definition. (2) Consider your needs, potential goals and the possibilities of how to apply the TLA concept to meet the challenges facing your destination or subject area. (3) Do a brief informal survey to gain a preliminary profile of stakeholders, existing activities and identify the TLA boundaries (geographical area or thematic area). (4) Prepare explanatory material to disseminate the learning-area concept in your own language (stating the concept, business case, needs, etc.). (5) Develop multi-level contact lists and identify key stakeholders and potential ambassadors of the approach. (6) Create awareness and interest, make contacts, disseminate material calling for a working meeting.

Phase II (coordination). (At the working meeting) Identify and agree on some common goals and a coordinating body or partnership from key stakeholders. At this stage the initiator can register their interest in setting up a learning area with the Enterprise and Industry, establish a working group, develop a work plan, identify resources and support, draw up a comprehensive stakeholder list of learning-experience providers, draw up a comprehensive stakeholder list of potential learning-experience clients, draw up list of examples of learning experiences relevant to region (gap analysis, best practice), develop a website as an

225 European Communities, 2006, p. 30

226 European Communities, 2006, p. 30

information exchange forum and multiple marketplace central information point, develop, agree and sign a simple protocol of collaboration (open access/participation).

Phase III (development). This phase involves using this structure to execute specific actions, such as to draw up an in-depth regional profile, develop an operational framework (goals, partnership commitments, meeting schedules, events) including a list of practical activities, and monitor learning-area progress.

The Handbook actually details the holistic solutions based on partnerships and dialogue between training institutions, tourism industry and other major stakeholders. It emphasized interrelationship between learning-experience providers and learning-experience clients, and provided very detailed referential steps for the successful clustering process from initiation to development.

5.2 Building learning towns and cities in Britain: check list for networking development

The UK's Learning City Network (LCN) has grown steadily since 1996 from a small core of supporters to around 20 affiliated 'Cities'. The guidelines '*Practice Progress and Value - Learning Communities: Assessing the Value They Add*' was published in 1998 by Department for Education and Skills and LCN of Britain to help communities assess the value added by learning city/town initiatives[227].

This guide is structured around three strands of development, which were identified in the research work. The first strand is partnership – learning to build connections between sectors. This means setting up, developing and sustaining partnerships. The second refers to participation – learning to involve the public in the policy process. This means involving the wider community in learning and in contributing towards changes in their community. And the third is performance – learning to

227 DfES, 1998

evaluate progress. It means how communities measure progress against their own targets, against the progress others are making and looks at how an assessment of the value added by working for the creation of a learning city might be assessed.

For the building of partnership and involving of the public in the policy process, the guide advises the following steps (see table #a, #b). This case considers establishment of connection between factors as a systematization process. Factors like purposes, people, plans and organization process all together function as linkage to bring all elements together step by step. Connection is not built just in one day through signing of a contract or through publication of a policy. And most important of all, in each step, the function of the connection as performance was accordingly evaluated as a check point.

Table 5: Learning to collaborate across organizational boundaries

	LEVEL 1 Getting Organized (Building)	LEVEL 2 Towards Shared Understanding (Dialogue)	LEVEL 3 Cycles of Learning (Reflection)
Purpose	*Co-ordination* · mission statement · launch	*Joint Organization* · shared vision (understanding and agreement) · common agenda · trust	· Joint Evaluation · annual conference
People	· organizational leaders/decision makers · consultants/ catalysts	· practitioners/ enablers · joint professional development	· users · external enablers and evaluators · researchers
Plans	· priorities · pump-priming resources · committing time	· strategic planning system · participative planning · budgets dedicated	· routine audit · information systems · feedback and review loops
Process of organization	· seminars · steering group · co-coordinator · networking · clear roles and responsibilities · clear lines of communication	· conference · forums · inter-organization project teams · partnership constituted · joint decision-making	· quality circles · citizen/user juries
Performance	· criteria	· measures · databases	· routine evaluation · accountability

Source: DfES, 1998

Table 6: Learning to involve the public in public policy

	LEVEL 1 Getting Organized (Building)	LEVEL 2 Towards Shared Understanding (Dialogue)	LEVEL 3 Cycles of Learning (Reflection)
Purpose	Consultation · public service orientation · responsiveness · listening	Participation · public participation, deliberation · voice	Citizen *Evaluation* · culture of public accountability
People	· representatives of community groups · cross-sector/ council authorities	· wide involvement of citizens · local practitioners/ enablers	· public · external consultants · researchers
Plans	· consultation on local issues · devolved resources · community grants/ community chests	· local needs/ priorities in strategic plans · community capacity building · dedicated resource for community decision-making	· cycle of audit, review and reflection
Processes of organization	· area offices (one stop shops) · decentralized management	· forums · empowering localities · flexible organization	· issues forums · citizen juries · the transparent organization
Performance	· criteria for local issues	· measures of participation, number, scope	· the accountable democracy

Source: DfES, 1998

5.3 Development of networks in Germany: networking phases and role of government

With its programme, '*Learning Regions – Providing Support for Networks*'[228], the Federal Ministry of Education and Research of Germany promoted regional cooperation and networking. The objective of the programme was to bring together important players from different educational sectors of a region to make life-long learning feasible through networking and cooperation, while cooperation and networking offered educational providers and organisers a chance to actively create a structural change for life-long learning.

In providing support for networks, the federal government and the states together first selected the most promising concepts in Germany for a 12-month planning phase. This phase involved developing the networks and devising innovative measures. Then the networks entered a four-year implementation phase. In this phase, the networks should be implemented and should raise a gradually increasing financial contribution of an average of 30% to the whole budget. This financial contribution required sustainable forms of co-operation, a business sense and convincing business models. Within the framework of the programme, a network was supported for a maximum of five years, including planning and implementation phases.

Within the networks, support was given to one main project which concentrated on developing and coordinating the network. This usually happened with a professional administrative office which simultaneously developed central educational programmes and took care of marketing. Usually linked to the main project were several sub-projects, which were concerned with offering services relating to specific subjects and business fields that promote lifelong learning.

In many cases, the development of the network was carried out not only by adult education centres, but also chambers, institutions of higher education and business development societies. In order to en-

228 Bundesministerium für Bildung und Forschung, 2004

sure lasting cooperation, most networks were operated according to their objectives, in form of registered associations, non-profit companies with limited liabilities or foundations. All networks were open to additional members.

The network's destiny was guided by a coordination board and by the network office. The network office was seen as a trustworthy and stable contact point. That included measures that helped to build up trust, visits with the partners, respecting appointments and dependability and a strong product orientation.

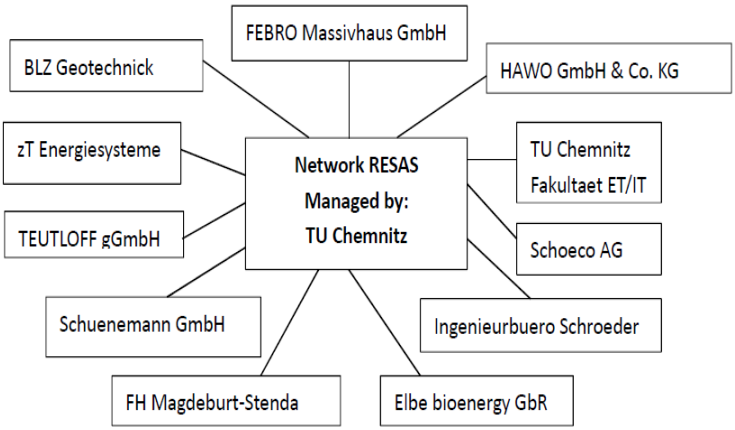
In this case, the networking process was divided into two phases and was thoroughly planned. In the first phase of planning, government would choose out a promising concept with ideas for sustainable cooperation, a business sense and convincing business models. In the implementation phase, government decreased its funding annually and support was given to one main project which concentrated on developing and coordinating whole subprojects. The main project was usually managed by a coordination board and a professional administrative network office which simultaneously developed central educational programmes and took care of marketing. And networks were not only carried out by educational institutes, but also by chambers or business societies, and took a form of registered associations, non-profit companies with limited liabilities or foundations. In this case, government initiated the networking with investment and also with encouragement for sound business sense of networking.

5.4 RESAS' components: lifespan of networking

The network 'Regenerative Energy System Sachsen-Anhalt/Sachsen' (RESAS, figure 20) was initiated in 2003, in order to integrate the competence of the small-and-middle sized companies in the fields of regenerative energy from the both states of Sachsen-Anhalt and Sachsen of Germany so as to meet the demands from the private and public

customers. RESAS is an example of the 8-components strategy towards successfully networking[229].

Figure 19 The structure of RESAS



Source: Groth & Tempke, 2005, p. 3

The 8 components for cooperation network are: (1) Vision, strategy and aims. Vision is usually an idea for the future. Strategy is a further development of the vision, based on the network's market and competition situation, organizational structure, and resource availabilities. And aim is a concrete goal of each operation. (2) Management, partners. Network needs good management and corresponding management structure. It is also important to bring the right partners into the network. (3) Marketing. Marketing serves as a part of the network cooperation in improving the available market and attracting more customers. Marketing includes market research, communication with existing customers and potential customers, and selling at the end. (4) Personnel

229 Pluess et al., 2005, p. 21

development. Personnel development in a network refers to personnel demand planning, employing, re-assigning, and qualifying. (5) Organization, right, finance. It is important to find an appropriate organization form for the network. (6) Regional development. Cooperation network and cluster could exert influence on the regional development through innovation. (7) Media/communication. Efficient communication is vital to the success in a network. Communication relied not only on IT technology, but also on other instruments like meetings, experiences exchange, mutual visits, and social events and also other kind of media. (8) Further development of the network. During the development of network, market demand, partners' competences and requirements on the network can vary greatly. Therefore, it is very important for each partner of the network to develop a strategy for the further development of the network.

The network RESAS followed this 8-component strategy. The members of the network first set the vision for the network as consulting, project development, installation, service and training, all from one hand. And the strategy is to unite the efforts of each member to win quantitative and qualitative contracts and orders from domestic and also international markets, and also to attract more companies with specific competences for renewable energy system to join the network. And at the end, a network company should be set up on the basis of the network.

For the management of the network, Chemnitz University of Technology (TU Chemnitz) undertook the responsibility and provided scientific reference to all partners of the network. And the direct contact partner for partners and customers was a solar center, who should try to win contracts from industrial and public customers, provide consulting service to private customers on the spot, coordinate the execution of the contracts among the partners, develop the public relations with research institutes and local governments, and to attract further partners for the network.

The marketing work of the network began with its development of its corporate identity, for example, the logo design. Further, the network

published booklets and flyers to introduce each partner and its business scope to the public. A web site for the partners and customers was also established with a domain address www.netzwork-resas.de. Also, an information truck was put into use to bring mobile and visible information about the members of the network to the public.

The further education for network 'RESAS' management in the fields of project management, moderation and presentation, coaching and conflict management was provided by the organizations outside of the network. For the development of young generation, the network helped the lectures on 'regenerative energy system' in middle schools with its information on its internet platform. Further, the network provided chances of photovoltaic experiment in the partner companies in the network to the chosen middle school students.

The rights and responsibilities of each partner in the network were defined in the cooperation contract. A network company with its own legal status was under preparation. The network management was partly financed through the sponsor program 'Netzwerk-Management Ost' with a total sum of 300,000 Euro digressively for 3 years. In the first year, the network should share 10% of the network management cost by membership fee. In the second year the network should share 30% of the cost, and the third year 50%.

The network RESAS contributed to the regional development and improvement of local region image through its public relation and lobby work with politician and economic organizations beyond the regions, and also through its promotion work for the young generation. With the presentation on regenerative energy system in schools, universities and on other public occasions, more and more people would get to know the latest development of the regenerative energy system and later become the potential customer of the network partners. The network improved its popularity grade greatly with the help of an independent press office who had good relationship with regional and national newspapers and publishing houses.

The future development of the network firstly referred to the involvement of further companies from other regenerative energy systems, so as to improve the variety and complexity of the network. Secondly, the contact with other network and companies should be intensified so as to gradually forge the network into a national competence center and cluster of regenerative energy system. Finally, training and export projects should also be further developed.

The network RESAS covers the whole lifespan of a network, from bleeding phase (vision) to expansion phase (future development). Moreover, a lot of experiences similar to the former 3 cases can also be found here, such as coordination methods, management structure, stimulus from government, sense of business, etc. After the end of the public funding, the network, however, silently has disappeared.

5.5 Cluster of education in Waterloo: developing cluster with supporting organizations

The region of Waterloo is located in south west of Ontario, Canada. It has a population of 500,000, the 10th largest in Canada and the 4th largest in Ontario. Post-secondary education and knowledge institutions include the University of Waterloo, Wilfrid Laurier University, Conestoga College, University of Guelph, Fanshawe College, McMaster University,Mohawk College,and University of Western Ontario[230]. Besides, the region also has more than 150 private and public research centers. The major industries in the Waterloo area include automotive, equipment/machinery manufacturing, and insurance and financial services. The fastest emerging industries in the region include biotechnology, engineering and environmental technologies, and communications technology.

The cluster in Waterloo called itself a cluster of education and knowledge creation, and it was made up of above-mentioned 8 institutions to exercise world-class research and commercialization activities.

230 Canada's Technology Triangle, 2005b; Béliveau & Mersereau, 2005

The practices of two institutions toward clustering were typical among the 8 institutions.

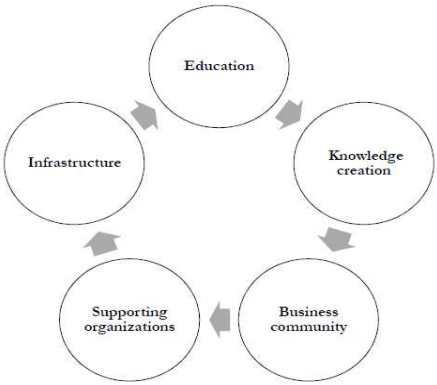
The first was Conestoga College. It took a leading position in developing and delivering four-year, college-based programs in Ontario. Its contributive performances to the Waterloo region's cluster were its community partnerships with universities and local supporting institutions. The Winston Park Research and Learning Centre for Seniors Care were initiative programs involving University of Waterloo, Conestoga College, and Village of Winston Park. Researchers at University of Waterloo provided knowledge and strategies to improve the quality of life of senior residents, while Conestoga College's curriculum, faculty and students focus on the delivery of services. In the fall of 2005, Conestoga College and University of Windsor were involved in a collaborative agreement to deliver Windsor's weekend MBA for managers and professionals at Conestoga's Doon campus in Kitchener. Recently Conestoga's Kitchener campus joined forces with Toronto-based Canadian Management Centre to bring three leading-edge management training seminars which focused on knowledge and skills for effective workplace performance and organizational advancement. Also, Conestoga's commitment to building a high quality educational institution had attracted support from local business. In the fall of 2003, the company Manulife Financial announced a donation of $500,000 over a five-year period to Conestoga to re-equip the College's health sciences labs and to assist the development of the Health Informatics Management degree.

The second was the University of Guelph. It is a research-intensive and learner-centered institution, and well-known for its commitment to open learning, internationalism and collaboration. Guelph also joined forces with other Canadian universities and colleges to create an educational environment emphasizing collaboration and technology transfer. University of Guelph, University of Western Ontario, University of Waterloo and McMaster University were the first Canadian universities to sign a Memorandum of Understanding to collaboratively protect and commercialize technologies derived from research at each institution. Sharing resources and expertise could establish broader partnerships,

more effectively market and commercialize technologies, and provide the ability for them to apply jointly for private and public funding opportunities. Later, the Memorandum of Understanding was expanded to include over 30 universities and research institutions across Canada.

Generally, the cluster in Waterloo followed such an interactive pathway (Figure 21). That supporting the strong educational presence from the region's college and universities was a fast-growing and highly supportive business environment. Building from the core of educational institutions, the collective force of this Education and Knowledge Creation Cluster now includes internationally-renowned organizations, entrepreneurial start-ups, high-tech university spin-offs, and venture capital and angel investor networks.

Figure 20 Developing the cluster



Sources: Adapted from Canada's Technology Triangle, 2005a, p. 20

Besides, the Waterloo region contains numerous other supporting industries and Chambers of Commerce which enhance the links within educational clusters between higher learning institutes and local business as well as entrepreneurs. These supporting organizations can often

be one of the biggest driving forces behind clusters. The main role of these organizations is to facilitate the exchange of information and technology and to foster cooperation and coordination between educational institutions and business communities. These roles have an overall positive effect on enhancing social capital by creating relationships, establishing trust within a cluster, and identifying common strengths and agendas between community players. Canada's Technology Triangle (CTT) is one good representative of these organizations.

Canada's Technology Triangle is a not-for-profit, private-public economic development organization built on supporting the education cluster and collection of high-tech firms within the region of Waterloo, Kitchener, Cambridge and Guelph. It provides a resource for industry companies and educational institutions to gain access to Waterloo local clusters through networking opportunities. Its main activities are marketing Canada's Technology Triangle to the world and developing private and public sector partnerships to enhance economic development activities.

The Education and Knowledge Creation cluster in Waterloo has collected the following experiences: (1) Clusters are built on networks and inner-cluster relationships. Synergies could occur within clusters, and local resources could be used with greater effectiveness and efficiency through building clusters. (2) Available resources and funding could limit schools' flexibility, and available supporting organizations could be important for the success of a cluster. (3) Continued collaboration and open discussion between all municipal governments are crucial to improve synergies, build partnerships, and sustain growth. (4) The close proximity of the institutions presents potential concerns of cross-cluster competition and local rivalry. Therefore, fostering all cluster relationships involves balancing open cooperation and competition between educational institutions, businesses and supporting organizations.

5.6 Summarization of international experiences

The above-mentioned experiences England, Germany and Canada in building learning areas, networking or clustering show the detailed steps toward networks and clusters. They have functioned under different circumstances and have their own specialties respectively. However, these practices are still quite referential for the implementation of clustering in the field of vocational education, especially in operational sense.

5.6.1 Establishment of relationship among factors of clusters through certain forms of connection

Connections among the factors in a cluster are problems concerning stability, authority and sustainability of the cluster as a system. The international experiences show that the connections have an evolution process, from initiation by an individual player, formation of a working group out of connected partners, to a kind of registered association, or non-profit limited company or foundation on the basis of inter-related networks.

The handbook '*How to Create a Tourism Learning Area*' points out that the overall process of setting up a learning area (connections among multi-stakeholders in an area) involves three main steps (namely initiation, coordination and development). First, an initiator should get the ball rolling and 'marketing' its vision. Then, a working group should be established to develop a work program. Finally, process monitoring should be taken good care of.

The British guidelines for building learning towns and cities emphasize the role of a steering group and then a flexible and transparent organization, such as an area office which provides one-stop services.

According to the Federal Ministry of Education and Research of Germany, there should be first a concept raiser, then a professional admin-

istrative office for planning and implementation. Finally, in order to ensure lasting co-operation with business sense, most networks would operate in form of registered associations, non-profit limited company or foundations.

The RESAS networking strategy also follows a routine from an initiator-centered form to an independent network company. Chemnitz University of Technology (TU Chemnitz) first took the responsibility to manage the network and provided scientific reference to all the partners of the network while a solar company became the direct contact partner for partners and customers. And the final objective would be also a RESAS network company.

The case of clustering of education in Waterloo follows the same suit. Educational institutes like Conestoga College first established community partnerships with universities and local supporting institutions. And then the factor of supportive business environment including supporting industries and Chambers of Commerce got involved. These factors altogether promoted the development of Education and Knowledge Creation clusters. Finally organizations like Canada's Technology Triangle came into being, which was a not-for-profit, private-public economic development organization, with its aim as facilitating the exchange of information and technology and fostering cooperation and coordination between educational institutions and business community.

Therefore, a cluster would finally have an independent legal form themselves or be under care of independent legal organization, to ensure the formal connection among all stakeholders for network/cluster's sustainability, authority, and a kind of business sense in monitoring the network/cluster's development process. This legal form of association, non-profit limited company or foundation does not mean that there can certainly be a status conflict between individual stakeholders and the network/cluster as a whole. Actually each stakeholder or partner can keep its formal legal independence, and at the same time share the fruit growing from the clustering flower.

5.6.2 Involvement of enterprises in the systematization process

The involvement of the enterprises in the clustering process is vital to the success of vocational education. The problem is how to get the enterprises connected with other stakeholders in the systematization process of clustering.

As showed in international experiences, the first step to get the enterprises involved in a cluster of vocational education is to understand the needs to the enterprises, to share a common vision on the clustering process with the enterprises, and to build a kind of mutual trust. Moreover, government or other organizations could promote the get-together of all the stakeholders, such as schools and enterprises, by means of covering most of the initial cost. Therefore, there would be no loser for neither of the partners even if the clustering work could not be further developed.

In the stage of coordination, attention should be put on establishing a coordination process for stakeholders to act collectively; profiling the all possible learning offers and requirements; establish a working group; and developing a work plan and identifying all possible resources and support. Only when enterprises agree on clustering, can they be involved in the working group to act collectively.

In the stage of development, it is important to find an appropriate organization form for the network to monitor the clustering process. It is also important to develop an operational framework, to do marketing work for all the learning offers, to sustain the development of the cluster, and to balance open cooperation and competition between educational institutions, enterprises and supporting organizations.

Therefore, to get enterprises involved in the clustering strategy requires careful handling through whole clustering process. It needs a shared vision, a trust basis and also a business sense. Otherwise, the enterprises could be disconnected to those educational institutions or other parts of a cluster, and such enterprises in a cluster could just be a kind of physical summativity.

5.6.3 Coordination and role of government in strengthening the relationship among stakeholders

According to the handbook *"How to Create a Tourism Learning Area'*, coordination is to 'identify and agree on some common goals and a coordinating body or partnership from key stakeholders' (p32). Therefore, coordination begins with common goals. Only on this basis can a working group be established and a simple protocol of collaboration be agreed and signed. Of course, an appropriate organizational form for cluster is a guarantee for the positive result of coordination.

Government is primary stakeholder for clusters. It can be an initiator of a clustering process and be the important partner who gets the ball rolling and identifies other key stakeholders. In most cases, government functions as a supportive factor for the clustering process: to contract out the network/cluster management to independent consulting company, or provide labor policies to improve labor environment, or to provide financial support to the network/cluster management (for example, the program 'Netzwerk-management Ost' sponsored the network RESAS with a total sum of 300,000 Euro digressively for 3 years). Actually, how and to what extent a government supports clustering are usually the vital contributors to the success of clustering.

6. Policy options

On the bases of above mentioned theoretic analyses and difficulties reflected from comparative analyses on implementation models, some suggests will be put forward here with reference to the international experiences mentioned in the former chapter.

6.1 Systematization process of clustering

Clustering in the field of vocational education in China was initiated by governments to meet the demand of industries and that of establishment of harmonious society. As showed in the selected implementation models, clustering was usually led by key schools or demonstrative colleges, and aimed at integration between schools and enterprises. However, in practice, its focus tended to be more on results than process, more on forms than on contents.

As reflected in the selected models, all implementation of clustering failed to take good care of its systematization process. Consequently, most clusters are loose in organization and are not as effective as expected. Actually, connections among different factors cannot be built just in a single day through signing of a contract or through publication of a policy. As showed from international experiences, linkage toward systematization is a process step by step, from initiation, coordination to final development. In each step, a business sense and convincing business models should be encouraged, and the function of the connection as performance should be accordingly evaluated as a check point. The success of each step decides whether a cluster can be successful further developed or not. Moreover, government and supportive business environment can promote the get-together of all stakeholders effectively.

6.2 Administration of government in future

In all implementation models, governments of provincial and municipal levels all played a role as initiators. They issued out policies, but seldom with direct investment. They also undertook the responsibilities of administration, but seldom as an endogenous variable in the clustering process. Therefore, the key is actually not the role of government, but the administration methods of government.

Since vocational education has obvious externalities, government should actively get involved in promoting efficiency of resources relocation and maintaining social fairness. How should government adjust its administration methods to fulfill its role in the clustering process in the future? The question can only be answered with consideration of the administrative system and also with some theoretical analyses.

China applies a centralized administration model with multiple administrative tiers, namely central government → province → city →county →town. The features of this model are: (1) Monopolistic. Only the central government reserves the final decision power, and the decision could only be carried out by the hierarchical governments in coordination. (2) Close-circuited. The administrative system is a comparatively closed inner-circulative system, with only the grass-root administrative units facing the public and the whole administration system operated in a linear way. The administrative units of upper and middle levels respond to only their lower administrative units, instead of the public in demand of services or the parallel administrative units in need of coordination.

The conflict between the administration system and economic development is becoming intense. On the one hand, the centralized administration system hinders the productive factors' movement among the different administrative areas. On the other hand, the industrial structures of different administrative areas incline to be seriously similar and repetitive, with a result of low efficiency and waste of resources.

Nowadays, the central government has already carried out reform on Chinese administrative system in the following three directions: from control to service, from economy-centered to public administration, from manual work to info-structure[231]. Though there have not been much detailed measures put out, the reform at least indicates a development trend and is welcomed by the society.

The clustering of vocational education in China will surely need government's support. Chinese government has the political power to influence every aspect of life, and also the access to abundant resources. However, government should not replace the organizations in the cluster or take the clustering process under its strict control. It should keep a balance between market and administration, getting non-governmental organization involved and implement administration through institution.

6.2.1 Balance between market and administration

Economic consideration has been influencing the operational field of education, specially the formulation of educational policies, and the supporting idea to this influence is that when economy in a society prospers, the society is blessed[232]. The integration of market mechanisms into vocational education becomes a development trend since it is believed that market mechanisms are the most efficient mechanism for relocation of social resources[233]. Tuition and private capital are introduced into public education to relieve the financial pressure on government. Some administrative and operational authorities are transferred to individual vocational education institutes to enable them to implement their authority and independence like enterprises. Furthermore, parents are allowed to choose among institutes for their children so that the parents and students become consumers of educational service instead of pure trainees.

231 Ye & Feng, 2004; Zhao, 2009, p. 67

232 Bank, 2011

233 Gao & Yang, 2005

However, market can fail in provision of vocational education as public goods. Vocational education institutes as well as enterprises are usually two training places or necessary partners for vocational education. When the enterprises believe that they can share the general effect of vocational education as public goods without putting any prior investment in it, they would have low intention at investing in the training procedure. Also, when the idea of market orientation is implemented in vocational education institutes, they will intend to provide those programs mostly needed by the market while diminishing those unpopular. However, because the economic situation changes rapidly and there is also no objective prognostic system available, the vocational educational institutes are just chasing those volatile goals futilely, which leads to serious structural problem inside vocational education.

Since many students in vocational schools are from the families of disadvantaged social status, and the emphasis on market orientation sometimes is an excuse for cutting down the budget for vocational education, this situation weakens the function of government in maintaining social fairness and sustainable development of vocational education[234].

Therefore, there is a need to keep a balance between administrative mechanism and market mechanism. The consumption exclusiveness and providers' tendency toward maximization of private profit can result in two situations. The first is that the students from families with weak social status may not be able to get the education chances or good educational conditions, so that the social fairness might be damaged. The second is that the providers of educational service may take advantage of the unbalanced information between themselves and consumers to provide education service under quality standard. These situations proof that supply of vocational education totally through market mechanism may lead to the loss of public interest. Hence, there should be only some factors of the market mechanism be introduced into the provision of vocational education and a quasi-market institutional environment should be established[235]. Government is the main provider

234 Chen & Xia, 2008

235 Gao & Yang, 2005

and beneficiary of vocational education. It is expected to intervene into the relation between supply and demand of vocational education service, and to encourage its positive external effect while preventing those negative.

6.2.2 Involvement of non-profit organization

The failure of the market results from the intervention of government. However, the problems which cannot be solved by market mechanism are also faced by government, which has limitation and failure.

Public products are usually difficult to be defined in quantity and quality and hence the efficiency of governmental provision of public goods is difficult to evaluate. Moreover, government can make advantage of its monopoly status for extra profit. Therefore, government has a natural expansion tendency in sense of quantity and importance, especially for those public organizations intervening in social activities (Wagner's law[236]). This tendency is often pushed by the increasing demand for public goods, and results in expensive expansion of intervening function, and increase of organizations and personnel of government. Furthermore, due to the complexity and variability of social activities, government has difficulty in collecting all related information and can also make improper decisions[237].

Because of the failure of both government and market, there has been a call for non-profit organizations[238]. Government usually allocates the public resources according to the rule of voter median, which refers to the main part of the voters. Demand from those over or below this median cannot be met satisfactorily. It is this unsatisfied public demand that provides the chances for the emergence of non-profit organizations. Furthermore, contract failure situations occur, such as the low

236 The law predicts that the development of an industrial economy will be accompanied by an increased share of public expenditure in gross national product (Diamond, 1977, p. 37)

237 Wang, 2004

238 Frumkin, 2002, p. 65-67

trust among the contractors because of lack of transaction information, immeasurable quality of products or service, etc.[239]. In these situations, non-profit organizations may be helpful for the establishment of trust mechanism among the contractors because of the characteristics of non-profit organization such as no owner and with non-distribution constraint.

6.2.3 Administration with institutions

Institution functions as social game rules to regulate people's behavior, and to lead it into a reasonable and expectable orbit[240]. Institution is the uniformity of all kinds of social regulative rules, includes both formal regulations issued by government and informal rules such as traditions, value system, ethic and ideology[241]. Formal regulations are compulsory political rules and economic contracts which are consciously issued by government or administrative organizations, while informal rules emerge spontaneously among members of a society and are accepted widely by the society. Actually, social activities like economy and education are not autonomous. It is subject to politics, religion and social relations, and therefore is embedded in a society[242]. However, after a certain period of time, the formulated institutions could result in institutional inertial, which can suffocate people's thinking as well as action[243]. Also, the commonly used concept of 'reality' usually refers to the perceptual environment which is determined by accumulated cultural factors[244].

Usually market expansion would initiate specialization and division of labor, which can in return lead to increase of transaction cost and waste of resources. This occurrence reflects that the present system is not adaptable to the economic situation and hence institution should be

239 Hansmann, 1987, referred in: Yan, 2005

240 Cheng & Xu' 2004

241 Cui, 2006; Zhang, 2009

242 Lu, 2009

243 Chen & Xia, 2008

244 North, 1994

applied to optimize the transaction. Moreover, the critical factors for long term economic development should be adaptive efficiency, which is originated from the adaptability from effective embedding of informal and formal regulations in society[245]. From this point of view, the construction of corresponding institution regulates and also strengthens the relationship among all stakeholders.

6.3 Upgrading industry to overcome the problem of misguided qualification

The problem of misguided qualification is usually related with a vague concept of over-education, which refers to superficial over-education caused by problem of educational quality and genuine over-education caused by the lower developed economic situation. Clustering in the field of vocational education helps the extension of formerly terminating secondary vocational education to tertiary vocational education, and therefore results in over-education in some areas like Yongchuang, Henan and also Hainan. In these areas, the industrial development situation limited the provision of enough employment chances for graduates with higher education degree. The causes for the quality problem will be addressed in other section, and here the over-education problematic situation will be analyzed with consideration of education as a subsystem of social economic system and the influence of economic situation on education.

The expectation for the investment in education is for the improvement of productivity in a society and also for a better life of a family. However, the investment from government and household in tertiary vocational education has already met many problems. It happened in some western areas in China where those villages with more graduates from tertiary vocational education were more vulnerable to poverty[246]. Fur-

245 North, 1990, referred in: Lu, 2009; Fang, 2008

246 Nangfang Weekends, 2006-05-25

thermore, at the present time, the contribution of investment in vocational education to social equality is not obvious[247].

In fact, industries in China are labor intensive and there is still a huge need of low-paid labor forces. In 2009, over 80% of the demands for labor forces were from the labor intensive industries such as manufacturing (32.5%), wholesale and retail (15.4%), hospitality (11.9%), construction (4.2%), etc.[248] These labor intensive industries have no willingness nor just no capabilities to pay for higher salaries to the migrant workers because most of the labor intensive industries have only low added-value and do not have much play-room for a big increase in salary. Furthermore, though the government has issued some laws in regard with the minimum payment, many enterprises even failed in paying the employees with the required minimum salary in time due to the lack of control of the local labor organizations[249].

Since there is no structural change taking place in industries, the lower salary compared to the costly tution fee for higher education and the enterprises' uncertainty of the capabilities of the graduates from higher education also result in the difficult situation for those graduates to fit themselves into the labor intensive industries. At the same time, those industries in the areas of advanced manufacture, modern service still have no international competitive capacity and therefore cannot offer enough jobs for the graduates from higher education[250].

Actually the traditional labor intensive industries are confronted with many challenges such as low added value, pollution of the environment, competition from the other countries with cheap labor forces, etc. And the low price of goods due to low salaries and low added value have also triggered conflict with the international trade barriers and sanctions from European and American economies[251]. Furthermore, the financial

247 Bai, 2004

248 Information Center of the Human Resources Market in China, 2010

249 Mo, 2004

250 Tang & Wang, 2010

251 He, 2010

crises in 2008 had a negative impact on the labor intensive industries. According to the research report made by the Chinese Academy of Science, 40% of the small and medium-sized enterprises went bankrupt during the financial crises. 40% of them were in a critical situation, and only 20% of them were not affected by the crises. Among the bankrupt small and medium-sized enterprises, more of them were in coastal areas[252]. In *Industry Blue Paper 2010: Report on the Competence of Chinese Industries* published by the Chinese Academy of Social Science, the primary products made in China were losing their international competence. The market share of Chinese products in the American market dropped to the second place. Due to the rapid increase of the cost of energy and raw materials, and also the stimulus policies applied by Western countries in their domestic market against the crises, the products' competitiveness was decreasing and China had an adverse trade balance in March of 2010, the first time in the past 26 years.

The competitive capability of the labor intensive industries in China in the international market used to be the low personal cost. However, with the price of land and expanding of real estate facilities, the cost for living is also increasing, which in return pushes the demand for a higher salary. Furthermore, the change of the value affects the choice of graduates for the labor intensive industries. Since late 1990s, the 'new generation of rural labor forces'[253] has come into being. This generation is different from the old generation of migrant workers who condone those hard jobs in the urban areas just for survival. The new generation, with more available information and a higher education level, are flowing to the cities not only for getting higher earnings than in the rural areas, but also for self-development and self-realization.

Therefore, the economic development of the labor-intensive model cannot enlarge the employment chances and only the upgrading of the industrial structure may help the expansion of job market[254]. The economy in China has entered into a new era with generally improved

252 Academy of Social Science, 2009-6-12

253 Luo & Wang, 2003

254 Ding & Yue, 2003

life standard and expectation, with experience and wealth accumulation especially since 1978, and also with the challenge and competition from the global economy. It could be expected that China would turn to upgrading its industries instead of merely increasing GDP through investment in infrastructure, so as to restructure economy from only manufacturing to the forming of a whole production chain, from purely labor intensive to a mixed structure of labor, capital and intensive technology. Moreover, upgrading of labor intensive industries will be necessary to allow the enterprises to make more profit and to afford a higher salary for their employees, which in return would help to release the conflict between investment in education and the fear of genuine over-education.

6.4 Quality concern in implementation of clustering in the field of vocational education

Quality improvement is the ultimate goal for the implementation of clustering in the field of vocational education. Or according to the functional aspect of a system, quality improvement should be the most important output resulting from all kinds of inputs in the system of a cluster. As reflected from the above mentioned models, the goal was reached to a very limited degree. And for a sustainable clustering in the field of vocational education, it is still necessary to further the research on ways toward setting up and also satisfying the quality standards.

6.4.1 Quality standards - from qualification to 'Bildung'

The uncertainty of quality standards is a big concern for vocational education in China. Sustainable quality of vocational education is a call for evaluation, and evaluation is a judgment of social value of vocational education on the basis of social requirements or governmental requirements. At the moment, the evaluation practice in China is a mono value judgment dominated by government, and is used as a kind of tool of administration. No matter whether the evaluation happened outside of educational institutes or inside, the evaluation is always ap-

plied as a downward control measure, seldom as a step toward self-improvement[255]. Since there exists no third party who can give a fair evaluation and the government is still the main investor for vocational education, government is therefore playing a dominant role in guiding the development of vocational education and therefore it is governmental policies that dominate the definition of quality in China.

According to the "*Educational Quality Evaluation Plan for the Tertiary Vocational Educatio*n" issued by the Ministry of Education of China in 2003, only the institutes with an average employment rate over 70% of the new graduates can be considered as qualified. And only the qualified institutes would be allowed to enroll students. In 2004, the Ministry of Education issued out "*Several Opinions on the Deepening the Reform of Tertiary Vocational Education through Employment Orientation*", and since then the idea of "employment oriented development of vocational education" has been cherished by almost all vocational institutes in China[256]. The idea of employment orientation has been generally interpreted as to speeding up the development of the professional training and education mostly demanded by job markets while limiting or adjusting that not in great need[257]. Employment oriented vocational education calls adapting education for specified job positions[258]. And the quality of vocational education is mostly considered as the adaptability of the students to the job market[259]. Employment orientation is hence becoming a key evaluation criterion for the tertiary vocational education, especially under the situation of higher education expansion and the growth of employment difficulties.

For the vocational schools, the idea of employment oriented development is helpful for them to get rid of the label as 'schooling certificate oriented', so as to change the curriculum design model from subject system based to working procedure oriented. However, this employ-

255 Chen, Li, 2000

256 Pan, 2007

257 Zhang, 2006

258 Pan, 2007

259 Xiao, 2004

ment orientation has also got some misleading effect in practice. Vocational education is targeted at the transfer of the knowledge and skills needed by those employment positions. Since the economic structure and the employment positions are always in rapid changes, many vocational schools cannot promptly adjust targets.

Usually the concept of quality is detailed as quality standard. Different from education goal which is mostly a description of the would-be-reached result, quality standard is a minimum requirement of knowledge and competence in a certain area which must be met with[260]. At the moment, quality standards are almost monolateral determination of schools or administrative departments of vocational education, with very limited involvement of enterprises or other social organizations. The consultation with enterprises for the decision on quality standards is usually very casual. The reason could be, on the one hand, that there is still no functional union of enterprises which could represent all enterprises. It is therefore difficult to get in contact with the enterprises of one industry and to ask for their general opinion on requirements of training and education standards. On the other hand, it is almost impossible in terms of financial and personnel resource for a vocational school or college to get in contact with all those enterprises related with the programs offered by the school or college and to set up its own standards.

Therefore, the quality standard is mostly limited as fixed working position orientation, or so-called 'seamless transfer from schools to enterprises'. It is more or less just a collection of several qualifications which could be outdated soon.

Actually qualification belongs to economic category which requires "should-be" competence, while competence belongs to individual category for performance realization[261]. Qualifications can be divided into several levels. The first level refers to those specific skills required by individual professions or positions. The second level is related with the

260 Cao, 2007

261 Bank, 2005, p. 189

general skills fit for the certain trades and industries, and the third level covers the key qualifications adaptable to all professions. Generally, skills are the tools for the accomplishment of a certain task and could be outdated because of the application of the improved technology.

The concept of key qualifications is a logical consequence from the observation of the labor market change. Key qualifications should not only convey specialized knowledge, but also those knowledge about professional and private living situations, so that the available qualifications and capabilities could be relied on for comprehending the specialized situation and then taking different actions accordingly. They are not subject to time and are important for accomplishment of future tasks[262]. As a key to the future, key qualifications are therefore not separate qualifications, but a catalog of qualifications as well as a system of learning aims[263].

Typical vocational training for qualifications is the stage when all components (learning contents, behavior contents and situation) are determined. Only when there is no restriction with any environmental situation, does it comes with the stage of education ("Bildung") for extension of individuals' possibilities, such as autonomy, maturity, humanity, etc. From beginners to experts, the competence development follows a logic progression. The concrete development of competence cannot be described as a curriculum, but can be stimulated and promoted with the potential logic curriculum[264], which is not according to the subject system based curriculum.

Therefore, single qualifications do not match the concept of employability. Actually employability is closely connected with the vertical and horizontal mobility of workers in the labor market and requires a maximum of flexibility and adaptability from the individual. It is a continuing process of the successful transition from school to initial employment, including changes in employment, progress on the career

262 Bank & Reckstadt, 1998, p. 152, 154

263 Reetz, 1990, p. 21

264 Rauner, 2002

ladder and/or the generation of employment for oneself. For individuals, employability is the capacity to find, keep and quit employment, including the ability to generate self-employment. For the enterprise, employability means that its human resources are sufficiently adaptable and flexible to respond to changing requirements in the workplace and to enhance enterprise's competence and growth. For a country, it means creating a workforce that is flexible and adaptable to the changing demands of the labor market as a critical step towards achieving the objective of full employment.

Employability does not just refer to an individual's proficiency of action in a given situation. It is not just a collection of acquired individual segments of skills and knowledge. Employability is actually related with some abstract elements like key qualifications, freedom, autonomy, etc. It is therefore nearer to the goal of 'Bildung' as defined by Bank[265] in the tradition of German theory of bildung.

Employability does not just refer to an individual's proficiency of action in a given situation. It is not just a collection of acquired individual segments of skills and knowledge, i.e. qualification. Reducing vocational education to training for qualifications not just lowers requirements for vocational education (especially tertiary vocational education) to a kind of training, but also leads to superficial over-education and mistrust of enterprises at quality of school education. For future, implementation of clustering in the field of vocational education should therefore take the consideration of establishment of appropriate quality standards as its main goal. Otherwise, the cooperation effort between schools and enterprises would lose its guidelines and evaluation measures. Furthermore, the setup of quality standards should be an effort between schools and enterprises, not just one-side decision of schools, because the standards are related with enterprises and depends on the involvement of enterprises during execution.

265 Bank, 2005, p. 181-212

6.4.2 Setup of quality standards

When being compared with secondary vocational education which is more or less guided by professional certificates or qualifications, tertiary vocational education is just swaying between academic (theoretical) learning and practical learning with a tendency of retreating to qualification level of secondary education.

According to a review made in 2008, only 21% enterprises were satisfied with the graduates from tertiary vocational education[266]. The main reason could be the weaker educational background of the students for tertiary vocational education. In China, all the students graduated from secondary education have to take part in a national higher education entrance examination, and they are filtered through the scores they get in the examination for different type of tertiary education. The students with the highest scores will be chosen by those top universities, and the tertiary vocational education institutes usually get the students with the lowest scores. They are usually weak with basic knowledge or professional skills and have commonly a misconcept or negative attitude toward learning. That is why many people consider that it is not very realistic to upgrade this kind of students to an ideal goal of all-around developed students in the 3-year-schooling time[267]. This situation constrains the improvement of the quality of tertiary vocational education in theoretic sense or in practical sense.

Most of the tertiary vocational colleges were just originated from secondary vocational schools a few years ago, and that is the push for these new emerging colleges to turn to International Standard Classification of Education for their "legal status" as "tertiary education".

According to the '*International Standard Classification of Education*' (1997), the tertiary vocational education could be categorized as "level 5 – first stage of tertiary education not leading directly to an advanced research

266 Tang & Jiang, 2008

267 Zhou & He, 2005

qualification". "This level of tertiary programmes has an educational content more advanced than those offered at levels 3 and 4. Entry to these programs normally requires the successful completion of ISCED level 3A or 3B or a similar qualification at ISCED level 4A" (§ 80). Level 5 belongs to post-secondary education. At level 5, there are two kinds of tertiary education. One is called 5A, which is theoretically based and research preparatory. The other is called 5B, which is practical, technical and occupationally specific. 5B focuses "on occupationally specific skills geared for entry into the labor market, although some theoretical foundations may be covered in the respective program" (§ 87). The content of ISCED level 5B programs is mainly designed for participants to acquire the practical skills, and know-how needed for employment in a particular occupation or trade or class of occupations or trades (§ 89).

In China, the colleges and polytechnics are for the graduates from secondary education (Level 3 and level 4), and offer mostly 3-year schooling leading to college diploma. Therefore, the colleges and polytechnics are usually considered as tertiary education.

According to ISCED classification, the tertiary vocational education at level 5B should be a form of education between tertiary academic education and secondary vocational education, and the 5B programs should have a higher and stricter requirement on experience, knowledge and skills than the secondary vocational education[268].

However, many researches have already proofed that higher education is obviously contributive to the improvement of cognitive social capability[269]. Also, from the point of the psychological development of the students in tertiary vocational education, they are still not fully developed and thus have potential for further development, physically and psychologically. Tertiary vocational education should not be the education for 'losers', nor should it be a kind of end of education. It is necessary to help these students to get rid of the past negative experience

268 Guo, 1996

269 Li, 2010

and help them to reconstruct themselves according to the demand of the occupations and prepare themselves for life-long learning.

The value of higher education as academic education and vocational educational training as an inferior type of education prevents the development of a modern architecture of education. Understanding and mastering of tasks in the world of work requires holistic problem solving and consideration of all important requirements and circumstances that influence the solution of the problem. Professional knowledge and scientific knowledge are fundamentally different but at the same time constitutive of each other. Professional knowledge would stagnate without the assimilation of scientific knowledge. Scientific knowledge needs to be embedded in the dynamics of society to exploit the potentials of science[270].

As initiated by the government and responded by many institutes, the tertiary vocational education is also seeking to establish its own standards on two platforms – sustainable platform and open platform. The former is for the transfer of the basic knowledge, and the latter is for the professional skills which should be trained outside schools[271]. For the establishment of both platforms, it needs to get all the stakeholders involved in the quality improvement activity. The stakeholders include government, enterprises, schools, students, etc.

Generally, tertiary vocational education has firstly its academic and professional characters. Tertiary vocational education is a kind of education which is staged between academic higher education and secondary education. When compared with secondary vocational education, tertiary vocational education is expected to provide broader and profounder subject-related knowledge. When compared with general higher education, the tertiary vocational education should be more practical and related with working situation. Therefore, when the quality standards for the tertiary vocational education are considered, the references from the standards of general higher education and secondary voca-

270 Rauner, 2011, p. 23-26

271 Zhang, 2007

tional education should be taken into consideration. Furthermore, tertiary vocational education should not only be a kind of adaptive education to enable the students' employment in the job market, but also be constructive education to enable the students' active engagement in the theoretical and practical learning. Therefore, an appropriate learning situation should be provided with the involvement of schools, enterprises and society, to ensure the realization of the quality standards.

6.4.3 Realization of quality standards

Quality standards should be realized through design and execution of right curriculum. The subject system based curriculum splits the integrated knowledge and skills needed by occupations, by which the active learning and the competence cultivation for the whole working process is neglected[272]. This kind of curriculum reduces the learning of technology as a pure learning task instead of as an acquirement of tools for professional work[273].

As a reform of subject-based curriculum, module training and competency-based education are set as guidelines for vocational education in China[274]. Module training means the training of certain capabilities through selected learning tasks in modules, which are actually modules of employable skills. However, it targets at simple skills training and is arbitrary in choice of module quality and quantity. This curriculum cannot give students a systematic vocational training, nor can it be contributive to the development of comprehensive competences.

Competency-based education is based on the competence requirements of working positions. The curriculum is based on the required skills of a profession and the teaching contents are ordered according to level of complexity. However, vocational education is not equal to the training of skills for specialized positions. It is also difficult to match curriculum

272 Jiang, 2005

273 Rauner, 2002

274 gao jiao si, 2004, p. 11

with detailed working positions. Therefore, the competency-based curriculum has also its limitations.

Actually schools and enterprises are two contradictory and contingent factors for vocational education. In schools curricular elements are chosen out from the perspective of contents as well their hierarchy and are mostly arranged in accordance with cognitive and taxonomic relationship. In the part of enterprises, the curriculum elements are arranged in accordance to the perspective of procedural behavior and later be experienced as contents field. According to the complementarity theory[275], professional competence is not the total number of qualifications from schools or enterprises, but an integrated, dynamic and complementary union. The complementarity cooperation between schools and enterprises can be expected that more theories in form of knowledge to be pursued in schools and more practice as experiences be provided by enterprises. Furthermore, the complementary learning process depends on the trainees themselves. This learning process can only be facilitated but not totally influenced by the outside factors. It is not the working situation as social context that shaped the behaviors of students, but their perception, re-definition and emotional judgment of the situation in practice communities that geared their activities.

The experience in a working situation will first be helpful for the acquirement of professional knowledge and understanding, and will later result in communication and reflection of work experience. And the communication and reflection will enable the students' identification with a community[276].

Therefore, there should be a systematic view of implementation of cluster of vocational education, especially the cooperation between schools and enterprises. As far as the aim of quality is concerned, not only a quality standard system should be designed and agreed with multi involvement of vocational schools, enterprises, governmental and non-governmental organizations, but also an appropriate curriculum to

275 Jongebloed, 2004

276 Rauner, 2002

satisfy the quality standard requirements. In this sense, implementation of clustering in the field of vocational education should first consider how to relate all possible elements with each other, and then consider the function and output of the cluster, especially its contribution to the improvement of social fairness and quality of vocational education.

7. Summary

In recent years, vocational education in China has been developed in quantity instead of in quality. In order to solve the employment problems of graduates and to improve quality of vocational education, clustering in the field of vocational education has been implemented in China since several years ago. For a better understanding of the implementation situation, this dissertation applies comparative methods to make analyses on some selected implementation modes, and then puts forward some suggestions on the analytical basis for the future development of clustering work in China.

The concept 'cluster' refers to geographic concentrations of interconnected companies in a particular field that compete but also cooperate with each other. Originating from the concept's industrial sense, 'cluster of vocational education' also refers to the cooperation between enterprises and vocational education institutions in which partners are connected with each other to create synergies. And 'clustering' is a step-by-step growing process, from the initial small and simple relationship between two or a bit more enterprises to a final multi-involved and complicated system.

Based on the structural, hierarchical and functional aspects of the theory of system, and also in consideration of the social economical and educational features of clustering in the field of vocational education, Porter's theory and its amended models, theory of human capital and theory of education are reviewed for the choice of comparative criteria.

Porter views that national competitive advantage is built on four main pillars: factor conditions, demand conditions, related and supporting industries, firm strategy and rivalry. These factors reinforce each other and create an environment that promotes clusters of competitive industries, and governments' real role in clustering for competitive advantage is in influencing the four determinants. The amended models of his theory include cluster performance as a dependent variable and position government as an endogenous variable within Porter's model.

Human capital theory centers on investment in human resources and its possible benefits. The provision of training and education is seen as an important productive and beneficial investment. Human capital could also have internal and external effects, but excess investment in human capital can also lead to over-education, unemployment and waste of precious resources.

In consideration of educational theory, theories related with qualification and curriculum design are reviewed. Qualification usually refers to an individual's proficiency degree of action in certain situation, while 'Bildung' is related with some abstract elements like freedom, autonomy, maturity, rationality, humanity and subjectivity. From qualification to final 'Bildung', there exist different development stages and development logic. Schools and enterprises are two contradictory and contingent factors for vocational education. Between schools and enterprises, the students' active identification with the profession and social environment of technology application is crucial.

Based on the review of these theories, some criteria have been chosen for comparative analyses. These criteria are: (1) factors of environment, clustering process and role of government; (2) inputs from public and private investments and their outputs; (3) contribution to the set-up and realization of educational goals.

Based on the available information, some representative implementation models are selected from Henan (province, South China), Shanghai (provincial level city, East China), Hainan (province, Central China), Yongchuan (prefectural level city, West China) and Yantai (Prefectural level city, North China). All the experiences from these areas are grouped and compared in two categories according to their features: professional clustering and regional clustering. And comparative analyses are made in reference to the above-mentioned three criteria.

The professional clustering in Henan, Shanghai and Hainan first tried to promote the cooperation among vocational school and colleges, and also that between schools and enterprises. Governments in these three areas played an initiating and supporting role, mostly by means of pub-

lication of certain documents or policies. However, the cooperation among the members in clusters was temporary and not very sustainable. In sense of investments and returns, implementation of clustering resulted in increase of enrolment of students, improvement of productivity and social fairness, etc. The improvement of quality is still a big concern of implementation of clustering in the field of vocational education. Except in Shanghai, professional clustering still treated vocational education as a kind of adaptive education for specific tasks, and emphasized so-called seamless transfer of students from school to working positions.

The regional clustering in Yongchuan and Yantai concerned more about the contribution of education to local social development. In Yongchuang, clustering was related with investment in new campuses and was treated as a way to stimulus GDP development. In Yantai, clustering was viewed as a way of training personnel for local economy development. Governments in both areas invested in vocational education, but in different projects. Both of them admitted more students through clustering, but students in Yongchuan had less employment chances than those in Yantai. In light of contribution to improvement of quality through cooperation between schools and enterprises, Yongchuan's model of clustering still relied heavily on the part of schools' education, while Yantai established a close relationship between schools and enterprises.

In consideration of the problems revealed in the implementation models, some international experiences are referred as examples in some practical aspects, such as of how to connect factors for clustering, of how to assist the clustering to live through its whole lifespan, and of how to get enterprises involved.

Furthermore, some suggestions for future development of clustering are also made from theoretical point of view. Regarding coordination and administration of clustering process, government should consider a balance between market and administration, involvement of non-profit organization and administration with institutions. With references to the current weak interrelation between GDP development and increase

of job chances, upgrading of industry can be an effective way to get rid of over-education problem. And for the quality concern, a quality standard should be first set up jointly with involvement of government, schools, enterprises and other stakeholders. Then a curriculum should be designed in complementary and constructive sense.

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