A Spatial Study on Creative Community around Tongji University in Shanghai Based on the Data Analysis of Professional Social Network

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Abstract

Creative city is the current hotspot in urban planning against the background of urbanization and economic transition in China. The urban zone around Tongji University in Shanghai is a typical creative community, which has undergone more than 20 years of development, from the spontaneous clustering of creative industries to organized planning and managing led by local authorities.

This study focuses on the history and future trend of this community. Peo *element of a creative city for that* University and C*ompany* would function. University is the institution for educating people , while C*ompany* provid for the working of People . Consequently, the links among People , Univ C*ompany* reflect the *creativity performance of a community. This study visualizes this relevance with methods of data analysis. The famous international professional social network* LinkedIn is taken as the data source. *the general information of personal identity, education and employment of individuals in creative industries within Tongji Rim are collected* from users homepages. *Through analysis of the intrinsic link between the research objects by data quantification and statistical distribution observation, characteristics and internal factors of development of a university-oriented creative industries area has been observed.*

Keywords: Creative community, Career track, Professional social network

1. Introduction

1.1 *Tongji Rim: A University-oriented Creative Community in A Creative City*

Tongji economic zone is a collection of neighborhoods surrounding Tongji University (Figure 1), as the concept of an economic geography, it has nearly 10 years of history, and its development process is almost 30 years. According to the 2007 "Overall Plan of Tongji Economic Zone in Yangpu District", Tongji Rim is defined as "a economic activity circle with knowledge service as a link, and a creativity industrial cluster with creativity, innovation and entrepreneurship as feature". As a famous Chinese Engineering University, Tongji University has strong strength in architectural design, urban planning, landscape gardens, civil engineering, art and design and other disciplines.

From the early 1980s, inside and outside Tongji University have been a few design business and technology consulting services company (such as Tongji Urban Planning and Architecture Research Institute established in 1982). In the early 1990s, with a large-scale urban construction of Shanghai Pudong New Area, and the first real estate development boom in China, market demand of design industry increases, in Tongji University, teachers and graduates with relevant professional backgrounds opened a large number of design studios or companies in and outside the campus. And the emergence of these companies has prompted the gathering of downstream service industries such as computer renderings companies, models production companies, printing companies. By 2002, on the 860 meters long, 20 meters wide Chifeng Road on the south side of the campus has accumulated spontaneously more than 500 design and construction-related businesses. And Chifeng Road "street of architectural design" is formed in 2004. Around campus and this street preliminarily constitutes a complete design-oriented industrial chain supported with the graphic production, architectural models, decoration, design and consulting enterprises, which forms industrial clusters of design and plays a role as a venture incubator as well.

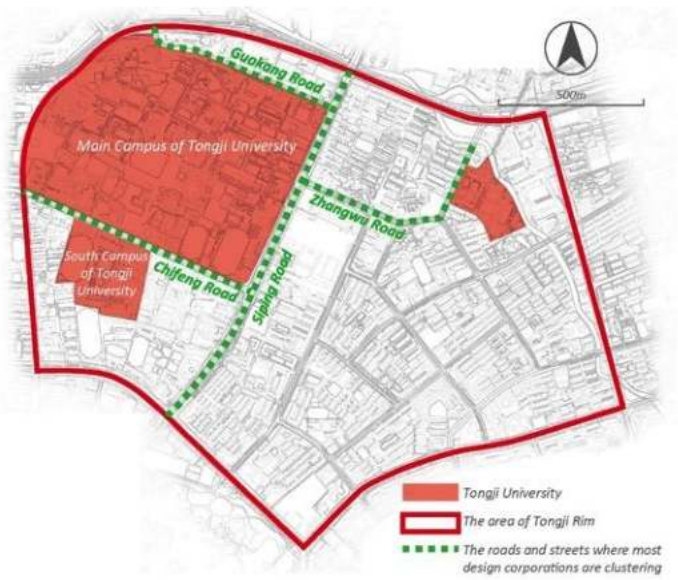


Figure 1. The area of Tongji Rim

By 2014, a total of 2,200 design firms and creative agencies have settled in the surrounding communities around Tongji University, employment ups to nearly 30,000, the annual output value nearly ups to 30 billion yuan that is over 20 times to $ 1 billion of 2002 (Figure 2). In terms of Yangpu District that Tongji University is located in, 95% of design firms accumulate in this region. As a result, Tongji Rim becomes one of the first modern service-oriented industrial base and the most influential gathering area design industry in China.

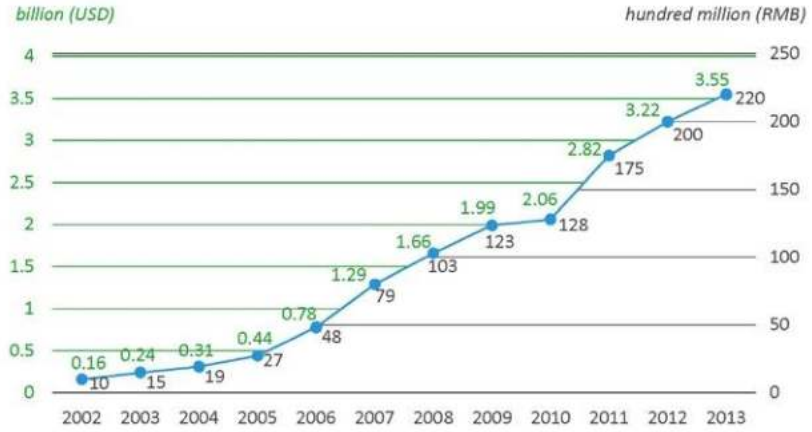


Figure 2. Total Value of Out-put of Tongji Rim from 2002-2013

Shown in Figure 1, the core area of Tongji Rim covers about 2.6 km^2 (area of Tongji University covers about 0.7 km^2, accounting for about 27% of its total area). In this region, most entrepreneurs and employees of design industry-related companies have close relation with Tongji University (faculty or graduate), while the names of these companies often contains the "Tong", as if to prove their links with Tongji University. Therefore, Tongji Rim is a typical university-led and oriented creative community. It has many similarities to the other university-oriented creative community such as Stanford University-oriented California's Silicon Valley, Harvard and MIT-oriented Massachusetts Route 128, and Tsinghua University-oriented Beijing's Zhong Guan Cun, etc.. As Edward Roberts (2009) points out, the estimated 6,900 MIT alumni firms headquartered in Massachusetts generate worldwide sales of about $ 164 billion. More than 38 percent of the software, biotech, and electronics companies founded by MIT graduates are located in Massachusetts. And these industries are precisely the leading disciplines in MIT. Thus, the spillover of leading discipline of a university often bring about a high accumulation of related people and businesses, and the formation of these disciplines-led industries cluster, to burst out an amazing innovation. Therefore, we hope to explore the main features of university-oriented creative community and the gathering track of business and people through the analysis of Tongji Rim.

1.2 People, University and Company, Three key elements of Creative Community

The direct characterization of Tongji Rim is the continuous gathering of design industry-related businesses around Tongji University, resulting in huge economic benefits. As Paul Krugman (1991) points out, remarkable concentration of production in the space is the most striking feature of the geography of economic activity. As a University-oriented creative industries area such as Tongji Rim performs is the phenomenon that a large number of leading discipline and university-related industries and enterprises gather around the campus and bring about creative production activities.

Company settle near the university in order to transfer and take advantage of resources generated in the university more easily, but the university itself does not have the resources

company need, instead, the real source is the "people" and what they carry, Maryann P. Feldman (2014) states, "Person" (human agency who construct system and make all kinds of decisions in the public and private sectors) is the decisive factor for the success of a place. Therefore, people related to the university (teachers, researchers, graduates or students) are the carrier of resource shift and energy exchange between university and company. Zhang Xisheng et al. (2009) points out that human resource (trained talent, its own teachers, introduced talent, etc.) is overflowed from the university, and directly participates in the company s development process, while improving company s culture. Among these people, some may set up new creative enterprises with their own knowledge and skills; some may become a partner or employee in other companies. They are the joints linking company and university organically, and gather in a relatively concentrated space and produce a large number of innovative products, so as to form the city's creative industries area.

In other words, a university with unique leading discipline is the material premise of rapid development of such creative industries areas in urban, and gathering of large numbers of creative enterprises is a direct promoter of creative industries, and people active between universities and company is not only the necessary carrier of realizing technology resource shift from university to company, but also the key ring linking university and company. People, university and company constitute the three core elements of university-oriented creative industries area, and "people" are the most core element.

Although the people, university and company are the three core elements of university-oriented creative industry area, but it is not to say that the presence of these three elements will be able to nurture the creative industry area in the city. They might form a sustainable "creative ecosystem" due to coupling of features under certain conditions and trigger coordination and interaction as "chemistry" university continuously develop cutting-edge theoretical knowledge and technological achievements, and cultivate entrepreneurial and innovative talent, while a lot of companies gather and incubate, and finally the "creative production " is formed in a large-scale, resulting in considerable economic benefits.

In this paper, Tongji Rim is taken as example, the three core elements "people", "university", "company" is listed as three sources of indicators of university-oriented creative industries urban area. By collecting open data from the "LinkedIn" a professional social network, the coupling relationship between the three sources indicators is analyzed to reveal the main features of coordination between them, and quantify these characteristics to each sub-index for further research.

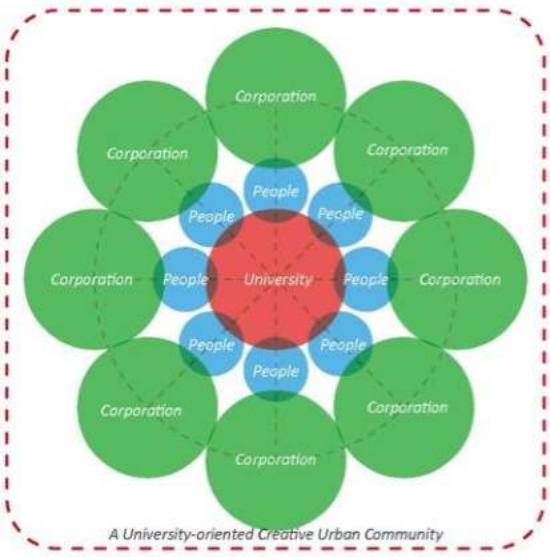


Figure 3. Three key elements of a university-oriented creative urban community

1.3 To Informationize the Relevance between Three Elements

How to define the relationship between "People", "university" and "company"? As mentioned above, "people" is the most core element of the university-oriented urban creative industries area. The coupling relationship between "university" and "company" is realized through every independent "person". As Torsten Hägerstrand (1969) proposed two concepts: (1) the study of the individual can understand the development of social and groups; (2) A link between space and time should be developed.

Therefore, in this paper, people who are related to those companies in Tongji Rim are defined as the research object to analyze their correlation with Tongji University and its surrounding companies. This correlation can be displayed by certain information of individual characteristics. Among them, the correlation between "university" and people can be reflected through individual educational information (graduate schools, academic, major, etc.); and the one between company" and "people" can be done through individual work background information (work units, headline, projects, etc.). These two aspects of a person's information constitute the individual complete career information library under definition of two dimensions time (age, school year, working years) and space (location). With this information base, the relationship between "people", "university" and "enterprise" is transformed into information.

Therefore, by collecting and analyzing personal career information database of "creative people" in Tongji Rim, some characteristics of a personal career information can be found, which might be reflect the comprehensive feature of Tongji Rim.

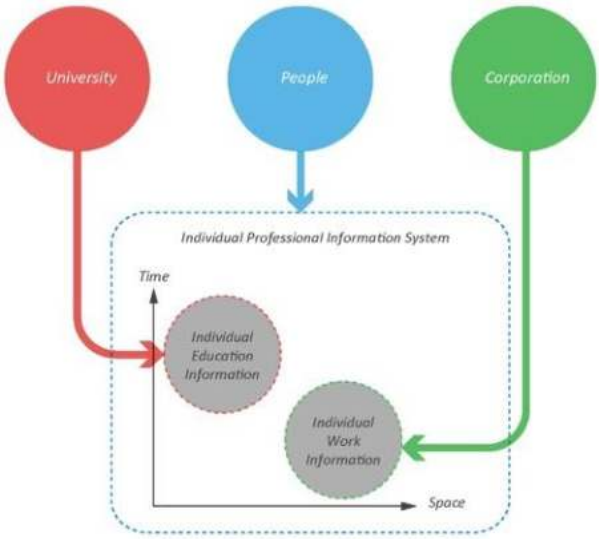


Figure 4. To Informationize the Relevance between Three Elements by the individual professional information system

1.4 LinkedIn s Database

LinkedIn offers the possibility of observing "university" and "enterprise" two dependent variables through "people" as independent variables. Firstly, as a global, wide-used professional social network tools, LinkedIn has a large number of individual users, each individual user has a comprehensive education information and work background information; secondly, as a semi-open social platform, most information of the users is public and available easily to some extent; LinkedIn also has considerable business users, the overall information associated with these businesses crowd can be found. Therefore, by the collection sorting and visualization of user information on LinkedIn, it is possible to describe group career information for further description of features of university-oriented creative industries area.

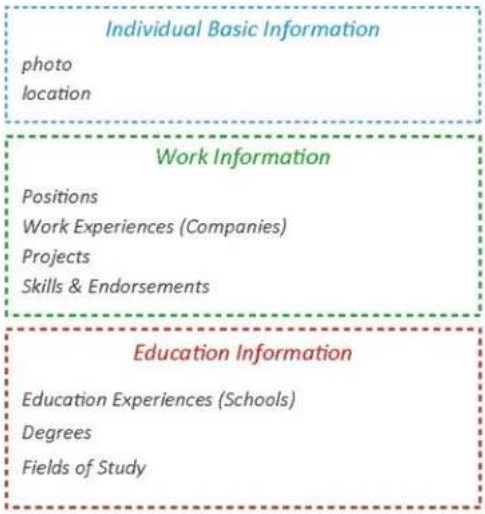


Figure 5. The basic structure of an individual user s profile

2 Methodology

2.1 Quantification and Graph of People, University and Company

Based on every user profile on LinkedIn, a single individual is described and defined by classification of the three categories that profession, contacts and education, and which respectively involves a total of eight tags that company, previous company, experience, industry (profession), connections (contacts) and education, major, skills (education), the following is formula:

$$Person_n = \{I_{an}, I_{bn}, I_{cn}, I_{dn}, I_{xn}, I_{mn}, I_{nn}, I_{on}\}$$

$Person_n$ represents the n individual (Figure 6);

$I_{an}, I_{bn}, I_{cn}, I_{dn}$ belong to profession category, respectively represents company, previous company, experience and industry of the n individual (Figure 7);

I_{xn} belongs to contact category, represents connections of the n individual (Figure 8);

I_{mn}, I_{nn}, I_{on} belong education category, respectively represents education, major, skills of the n individual (Figure 9).

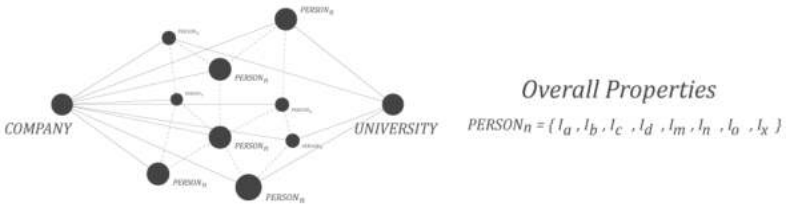


Figure 6. The graph of Personal Properties

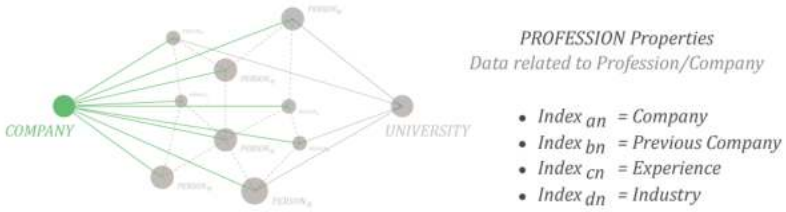


Figure 7. The graph of Professional Properties

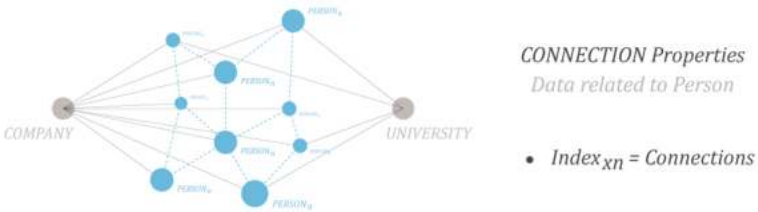


Figure 8. The graph of Connection Properties

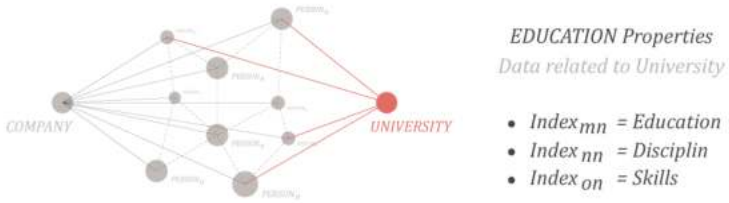


Figure 9. The graph of Education Properties

For a research on a university-oriented creative industry cluster, the object are the companies, people and university, and personal information contains companies and university, so it is the first thing to do that filtering and determining the study sample people active in the region, obviously, "in the region" is the qualification, and only I_{an} (company) has spatial attributes in the eight individual tags, so I_{an} is defined as the qualification to filter out all the people information which contains I_{an} in use of Advanced Search on LinkedIn (the features include keyword, name, title, company, graduate schools, location and many other information) (Figure 10). It needs to be emphasized that the company information (company's name used in this research) as the filter keyword is not to limit its timing, which means both cases that the company is the one people currently or once work in. Taking such a filter condition is to remain the dynamic attributes on time-line of personal data, so as to analyze the track of creative talent more completely.

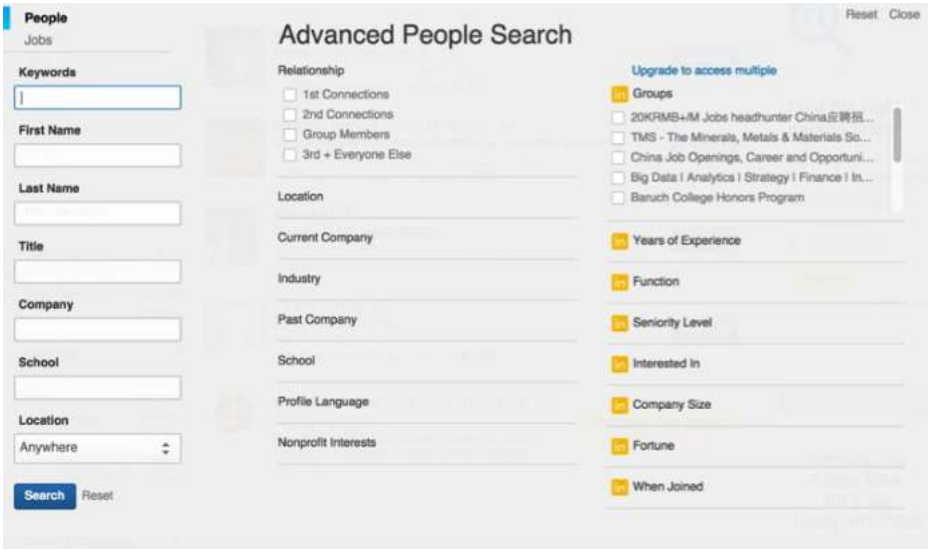


Figure 10. The advanced people search panel on LinkedIn

A user list that meets the condition will be shown after filter, each of the personal information contains three categories of information, career, contacts and education. When data is adequate and objective, after classification and statistics, it can be the quantized evidence to analyze the intrinsic relationship between company and the university (Figure 11). So analyzing the intrinsic link between the research objects by data quantification and statistical distribution observation is the core methods in this study.

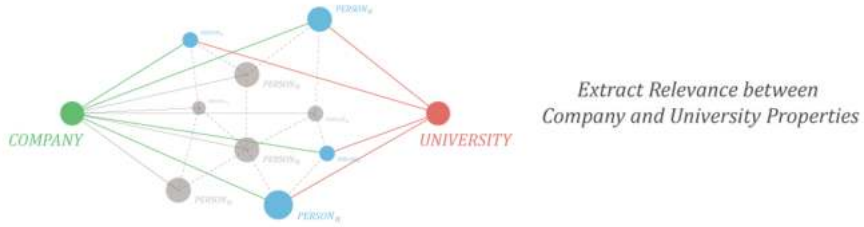


Figure 11. The graph of relation to be extracted between company, people and college

2.2 The Framework and Flow of Research Method

In this paper, the research object is Tongji Rim. On the basis of statistical methodology described in Section 2.1 above, the feasibility of data collection is evaluated in advanced to ensure a certain scale of users who relate to the company in LinkedIn database (> 100, based on consideration of a single company size, constraints on LinkedIn site, user incomplete information and other factors). The final selection are the following four companies in Tongji Rim as the qualification I_a: a. Architecture Design & Research Institute of Tongji University, sample size is 170; b. Shanghai Municipal Engineering Design Institute (Group), sample size is 115; c. Tongji urban planning & design research institute, sample size is 115; d. CCDI GROUP, sample size is 177. After collection, the corresponding personal data is classified into eight tags for mass distribution statistics respectively

This paper focuses on the following four data Stats: 1. Statistics of I_{nn} education situation of users who relate to I_a company; 2 Statistics of $_{dn}I$industry situation of users who relate to $_a I$ company; 3 Statistics of annual number change of related people who work in I_a company as graduation (the data comes from experience $_{cn}I$the earliest years of employment with the company information); 4. Statistics of annual number change of related people who transfer in I_a company (the data comes from experience $_{cn}I$the years of transferring with the company information).

From statistics of the four companies (a,b,c,d), the resulting mass distribution (histogram) and their distribution characteristic come to determine analysis of relations between company, people and university in Tongji Rim as well as the cause of development of a university-oriented creative industry cluster. The following is the specific research method flow (Figure 12):

Figure 12. The framework and flow of research method

3 Results and Discussions

3.1 The Results of Statistic

After the statistics of related groups in four companies, based on four focus mentioned in Section 2.2, the four mass distributions (histogram) are obtained.

(1) Mass distribution of education situation of people who relate to the four companies:

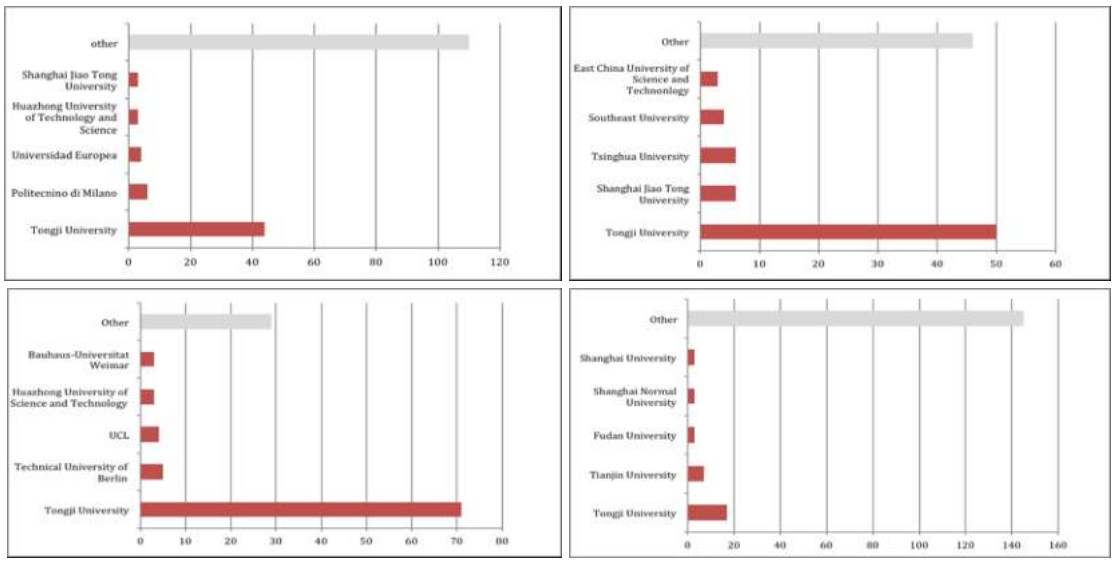


Figure 13. Mass distribution of education situation of people who relate to the four companies

The figure shows that Tongji University (among other things) has the highest occupation in education situation in all of the four companies, which accounts for 73%, 72%, 83%, 52%, respectively in a, b, c, d company, its average occupation ups to 70%, which means that 70 percent of the related people of the four companies in Tongji Rim graduated from Tongji University.

(2) Mass distribution of industry situation of people who relate to the four companies:

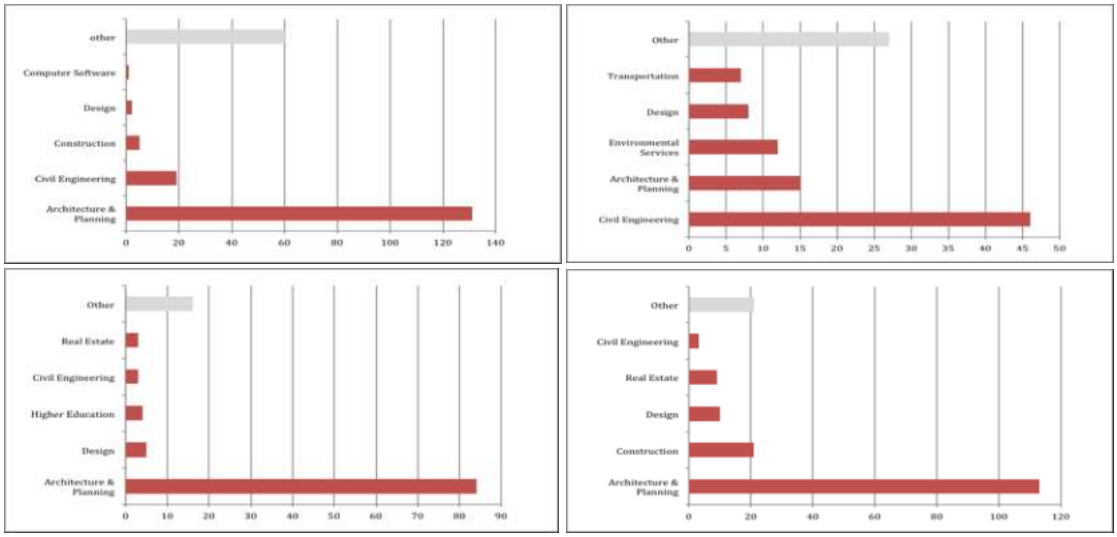
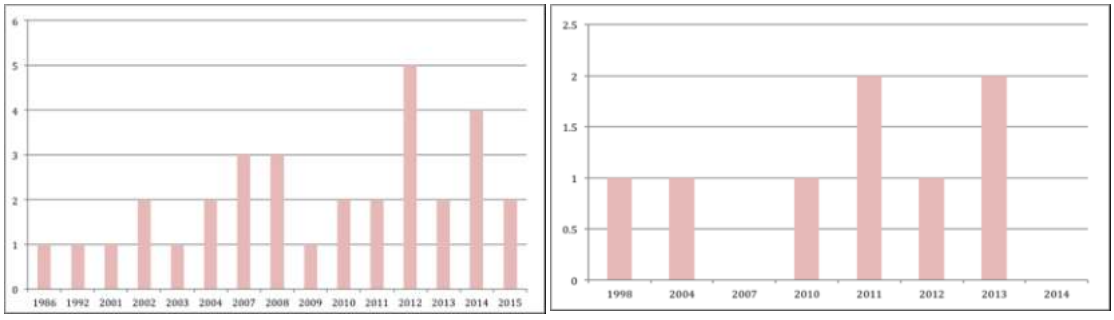


Figure 14. Mass distribution of industry situation of people who relate to the four companies

The figure shows that the industry of people who relate to the four companies are involved in the following three areas: architecture and planning, civil engineering, design. In a, b, c, d companies, architecture and planning (among other things) accounts for 83%, 17%, 85%, 72% respectively, and 64.25% on average; civil engineering (among other things) accounts for 12%, 52%, 3%, 2% respectively, and 17.25% on average; design (among other things) accounts for 1%, 6%, 5%, 6%, and 4.5% on average. The three industry average occupation reaches 86% in sum, which means that an average 86% of people in any one of the four companies come from architecture and planning, civil engineering or design, and the most come from architecture and planning.

(3) Mass distribution of annual number change of related people who work in I_a company as graduation:



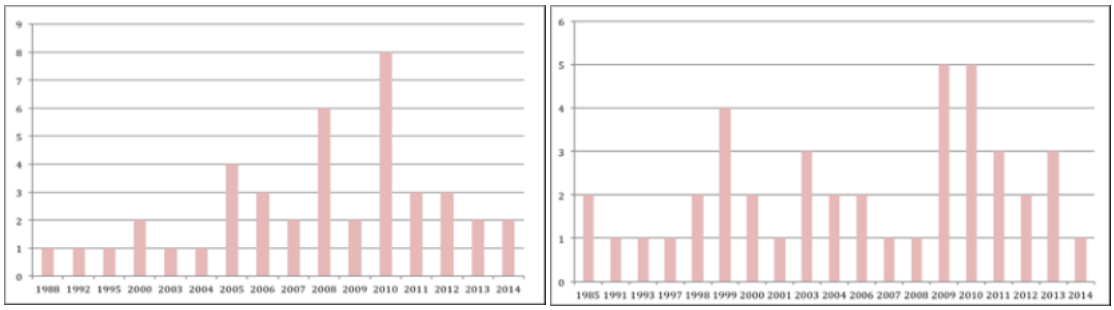


Figure 15. Mass distribution of annual number change of related people who work in I_a company as graduation

The figure shows that the number of people who work directly in the four companies as graduation has fluctuate growth in 2000-2014. The peak respectively appears in 2012, 2010, 2011 and 2010. For further analysis of number change of talents the four companies attract between the 15 years (2000-2015), it is necessary that statistical analysis of annual number change of related people who transfer in the four companies.

(4) Mass distribution of annual number change of related people who transfer in the four companies:

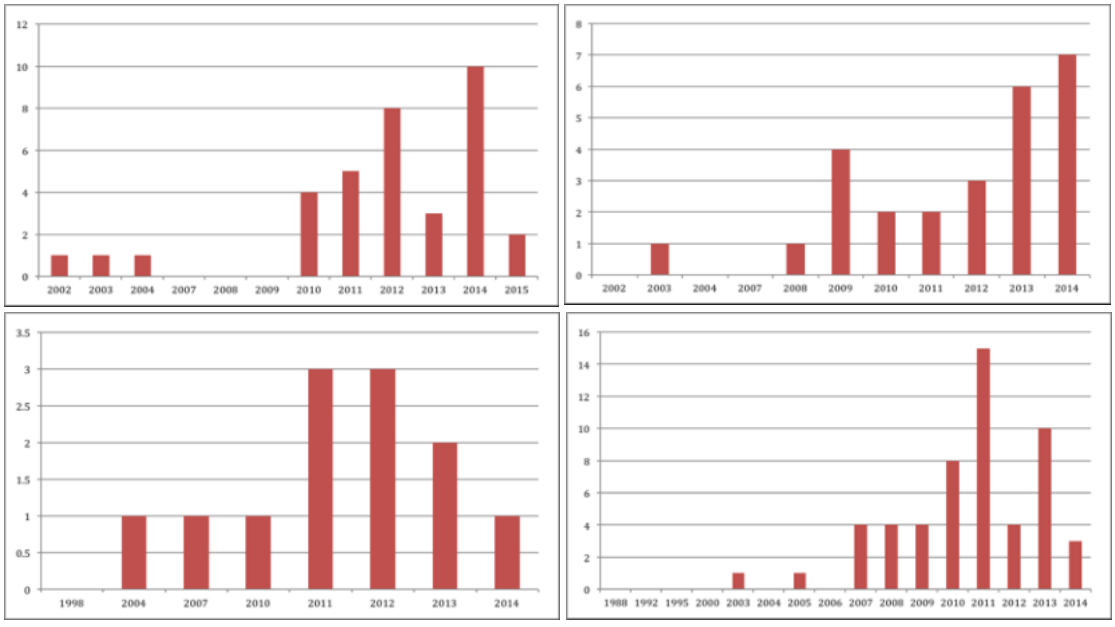


Figure 16. Mass distribution of annual number change of related people who transfer in the four companies

The figure shows that the number of people who transfer in the four companies also has fluctuate growth in 2000-2014. The peak respectively appears in 2014, 2014, 2012 and 2011. By accumulation of the (3) and (4) mass distribution, annual overall distribution of people who relate to the four companies will be obtained for the next discussion on internal factors of development of a university-oriented creative industry cluster. The mass distribution of overall

number of people who relate to the four companies is as follows:

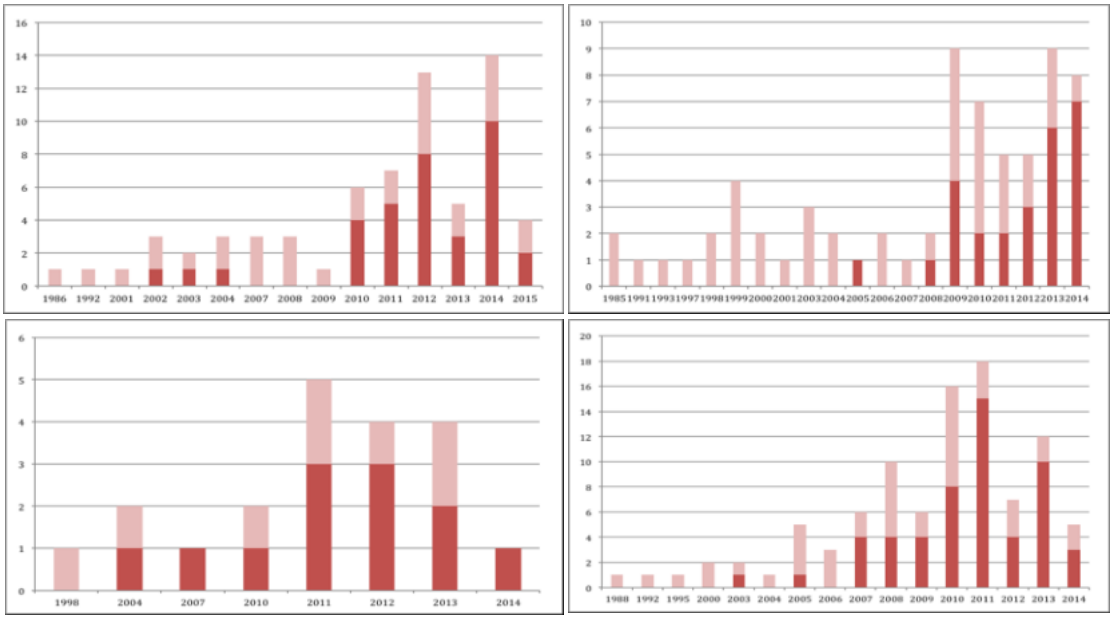


Figure 17. Mass distribution of overall number of people who relate to the four companies

The figure shows that the overall number of people who relate to the four companies still has fluctuate growth in 2000-2014, while it has a greatly increase between 2009 and 2011. The peak respectively appears in 2014, 2009, 2011 and 2011.

3.2 The Sustainable forces for A University-oriented Community Development

According to the result of 3.1 (1) statistics, it shows that spillover university talents provides a stable of human and intellectual resources for industrial concentration and development around the university; according to the result of 3.1 (2), it shows that the overflow of a university s leading disciplines forms characteristics of its surrounding industry (in the 2012 National Assessment of Universities Leading Discipline, Tongji University s architecture and planning, civil engineering, design ranks second, first, sixth respectively of all universities in China); according to the result of 3.1 (3) (4) statistics, it shows that once industrial clusters with characteristics and advantages forms, it will be able to attract more relevant people, including graduates and transfer talent, and gradually forms internal productivity and external attractive force for sustainable development.

From this paper, the research results achieved by means of LinkedIn database and conclusion mentioned above, to some extended, coincide the points purposed by Reid Hoffman (2013), the CEO of LinkedIn: (1) Evaluation of a group depends on the individuals that make up this group; (2) Each group has some common characteristics; (3) Geographic density is also very important. Cooperation would be maximized when information and ideas spread among all groups which have common interest, if which happens in the same geographic region.

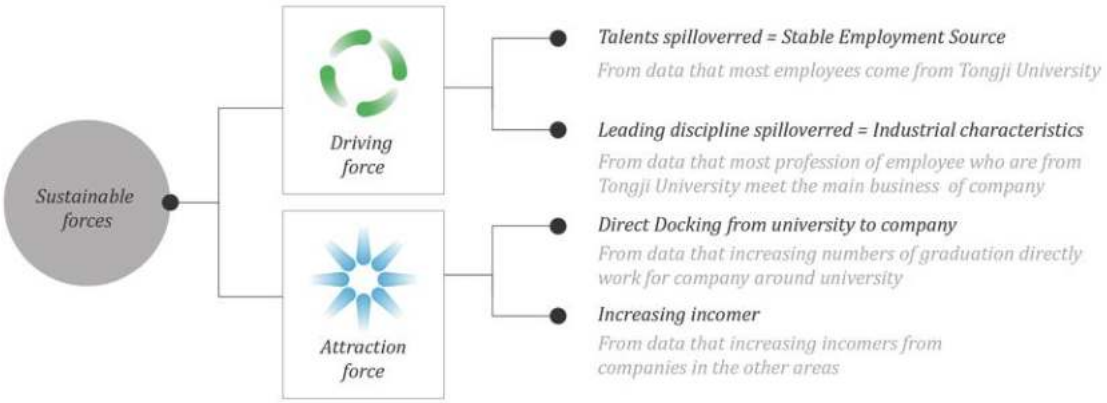


Figure 18. The Sustainable forces for A University-oriented Community Development

3.3 Future Application

In summary, by LinkedIn s user information statistics and analysis, certain characteristics in a university-oriented creative industries area has been observed from the perspective of social networks. These features are shown through the quantitative relationship between people, university and company, which in turn is based on each individual education and profession background. In this study, the relevant conclusion is drawn after preliminary exploration to Tongji Rim as a study case. Studies have shown that in result of directly or indirectly talent output, the spillover leading disciplines and professional technology and attraction from the outside, a university-oriented creative industry cluster can be able to gather a lot of talent, and these talent is the driving force behind the development of this kind of creative industries cluster. Therefore, this study provides empirical evidence of creative function layout and element configuration to urban managers and planners. Meanwhile, thanks to LinkedIn s wide application and huge amount of users in various regions and industries, based on preliminary results of this study, the quantitative analysis can be applied in other similar cities and regions for further analysis and follow-up survey, such as Beijing Zhong Guan Cun, Route 128 in Boston and San Francisco Bay Area and other places. As the amount of data on the LinkedIn platform increases, the accuracy of quantitative analysis will be greatly enhanced, and it is possible to combine with geographic information systems for more accurate visual expression of space gathering of creative industries and people.

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