EUROPEAN PLANNING KNOWLEDGE NETWORK AND ITS INFLUENCE

PIANIFICAZIONE URBANA E POLITICHE TERRITORIALI

YE QIMING

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ABSTRACT

The correlation among planning knowledge, scholars, and the cities are significant, such interaction constitutes the major business of planning research, practices and teaching in Europe. With the aim of unveiling and understanding such networked relationship of these entities, this research builds its topic as 'European planning knowledge network and its influence'.

To realize the research aim, three assumptions are raised, with three topics focusing on the planning knowledge, responses of urban issues, and the redefined cities. According to such structure, the research would explict how such planning knowledge has been networked, response to urban issues and influences cities. And within such three main topics, further issues are included to deepen the understanding.

In the topic of planning knowledge network, the overview and features of the network are discussed, along with study of the significant 6 planning communities as typical samples. The proper size for planning communities to effectively gain research cooperation, and stabilize are also concerned. The research found out an open, diverted, and geographical relevant planning knowledge network with planning communities as the principle rules. For community, the bigger in size, the more effective but less stable in performance. On the other hand, planning groups are the fundamental structures in the network and planning communities.

In the topic of research issues, the forms of research outputs are discussed, aiming to find out the various situations in different European cities. In addition, the responses to urban issues are studied in 7 orientations, and compared integrally. The findings indicate an integrated trend for planning academics, as well as the issues oriented direction for planning research in Europe.

In terms of the cities, anchor cities described the reflections and influences that the planning knowledge network act on physical world. 388 anchor cities and the groups manifested features like the correlation with planning communities and the geographical closeness. For planning knowledge exchange among cities, the research compares top 50 cities with knowledge input and output within a city and among cities. Finally, detailed knowledge exchange among European cities are present, findings indicate that culture, language, planning system and geographical closeness, etc. may interfere the clustering process. 6 major knowledge exchange cities groups forms the planning knowledge exchange belt in Europe.

This research gets the support from numbers of literature, information and resources. While the social network theory and technical tools shape the research most. The data base includes 80988 pieces of planning research outputs from 2023 planning scholars in 57 major European planning schools. The Planning knowledge network includes 17729 planning scholars, with 888 planning communities, as the top 20 ones occupies half of the research cooperation in the network. 338 cities are recorded as anchor cities. Methods of visualization, quantitative, and empirical studies are applied in the research. Multiple open source platforms, software contribute to the data mining, managing and analysis process.

Key Words: *Planning Knowledge Network, Anchor Cities, Urban Issues, Planning Scholars, European Planning Schools*

DIRECTORY

Chapter 1 Research Introduction

1.1 Motivation: To Understand Planning Knowledge, Scholars and Places

1.1.1 Need for Understanding the Planning Knowledge Function Process

Seen as an obligatory process, urban or town planning has helped the thousands of cities to get developed and gain prosperity. In those planning, the knowledge which realizes these achievements are valuable to be learnt. Meanwhile, obviously, some planning practices share the same theories, of which the planning Knowledge plays the essential role. In other words, from the point view of planning academic arena, it is more effective to acquire such knowledge behind those practices, to understand the process how it could be transformed into practices, rather than just duplicate them.

Therefore, the need for studying how planning knowledge functions is urgent. At least three reasons could be raised: the understanding of how such knowledge been produced, delivered, and applied, how it is shared by cities, and what kind of knowledge is essential and promising at this moment.

However, not that much literature focuses on the general process of how the planning knowledge been transformed and functions, and less pay attention to a broader horizon rather than just empirical case studies. Not to mention a more collective research that reflect a theoretical and panoramic studies on such process.

Given the fact that to know the process of planning Knowledge transformation is important, it is a duty for us to recognize, acknowledge, measure and theorize this process through proper research approaches.

1.1.2 Need for Defining the Components of Planning Knowledge

Act as the most innovative part and valuable elements in the process, planning knowledge is significant to be studied. Especially, the functions and forms should be clearly defined. How could planning knowledge be so valuable, and why it is so significant in academic fields, and what the trends for the issues that respond to urban problems. Those questions remain to be answered.

Considering the process of planning knowledge transformation is relatively a compound one, the functions and forms of planning knowledge are quite different in each phase. It is difficult to draw a communal conclusion on the functions, forms of planning knowledge during each phase. Hence, interlocking but separated studies are called, in order to get a serials of explicit conclusions of Functions and forms of planning knowledge.

1.1.3 Need for Knowing the Interactions between Planning Knowledge and Cities

The discipline of planning has the eventual aim of achieving sustainable cities in various aspects, so as to planning knowledge. Hereafter, interests are raised on how such planning knowledge been implanted to realize such dream? In other words, the elements, forms or values that the planning knowledge have influences on cities should been studied.

However, is it possible that cities, as the receiver of such knowledge, could have reactions or even feedbacks to the planning academic arena? Possible. And if true, is it urgent to gain the knowledge of how the cities reasoning to those Knowledge? The answer are definitely yes, since it could improve the understanding of the planning Knowledge transformation process as well as the subject of planning knowledge.

Therefore, it is needed to study how the planning knowledge take effect on cities, and how the cities responses. To generalize, interactions between planning knowledge and cities should be included within the discussion.

1.1.4 European Planning Knowledge: Maturity and Diversity

Europe has the longest tradition of planning, with 116 planning schools, and numbers of planning institutions, enterprises that forms the diverted planning Knowledge in the world. Overall, the planning schools are seen as the main body of the academic arena according to AESOP's conclusion (Fubini,A., 2004). To support the planning practices, planning knowledge in Europe shows the profession and maturity in developing theories, tackling emerging urban issues and promoting academic progress. Based on different backgrounds, cultures and histories, planning scholars each nations contribute to the collective pool of planning knowledge through different approaches and in various orientations.

On the other hand, the diversity displayed geographically or chronically, which give us the opportunity find out possible solution from others. In a word, the maturity, richness and diversity of the European planning knowledge remains high academic value, not only for Europe or the planning academic arena in Europe, but the rest of the world.

1.1.5 Quantified Research on Planning Knowledge Remains Blank

In fact, less research pay enough attention on the issues of planning knowledge, though lots of them display some incomplete or qualitative facts. Nearly none of them choose the planning knowledge as the research subjects in a quantified, structured way. This appears to be a blank field in the planning academics, meanwhile, the opportunity for this research to make a difference.

1.2 Research Issues: Planning Knowledge, Research Outputs, and Cities

The above reasons strongly lead us to go deeper in the research to discover the planning knowledge network and its effects with a serious and academic attitude. To achieve this, three essential part are raised as the research issues in the following context: the planning knowledge collective, the respond process and the cities that been affected by planning knowledge.

1.2.1 Planning Knowledge: Forms, Components and Features

Planning knowledge as an abstract and collective concept, is needed to be figured out a proper form to get described and measured. Besides, the components are also needed to be discovered, including the features and the connection among them.

1.2.2 Respond Process: Essential Ties between Unphysical and Physical World

Depending on the findings of planning knowledge, the second question would be raised as how such knowledge been organized and respond to urban issues and the practitioners' concerns? Meanwhile, the forms of the process and precise content is to be discussed.

1.2.3 Influences on Physical World: Redefied Cities and Exchange Knowledge

Given the fact that the major aim of planning knowledge network is to help the cities towards sustainability, it is curious that what the reflections are from the cities to the planning knowledge. In other words, what would be the consequences of the cities been affected. New discoveries of defining the cities in context of the planning knowledge is concerned. Moreover, the knowledge exchanged among cities would possibly reshape the network of cities.

1.3 Research Features: Descriptive, Modelled, Quantified and Visualized

1.3.1 Descriptive: Relying on Facts

To be more explicit, the primary task for this research is to describe the possible structure of the planning knowledge and the related entities based on literature review and other empirical experiences. This is believed to be the first and essential steps to establish the frame of the research. The description for planning knowledge, the responsive issues process and the cities provide the basic structure for modelling, quantifying and visualizing.

1.3.2 Structured: Follow the Logic of Recognition

Secondly, it is important to structuralize the research either in its research logic, or the inside contents of the research subjects. The structure of the research should obviously support us to find out the form, features, and effects of the planning knowledge, and its effect. Meanwhile, the structure ought to follow the basic rules of recognition, which the integral and detailed information are both needed and well organized. Chapter 3 Research Design explains the detailed process of how we structure the research.

1.3.3 Modelled: Original, Systematic Hypothesis

Planning knowledge is close to us, but not familiar in a certain and visible shape or form. Therefore, the task of modelling such entities into a correlative system through assumptions is needed. The modelling process remains three functions, the first is to display the integral structure, the second function is to unveil the meta structure of planning knowledge, and the last function is to make premise for understanding the interactions amnong those entities.

1.3.4 Quantified: Open Source Data and Tools

As been stated, the existing literature on planning knowledge is either incomplete or qualitative, which could not display an integral and profound understanding for planning knowledge as a collective in Europe. This research uses a quantified way to display these findings. Since such quantitative oriented research need large amount of data, meanwhile the conventional small sample studies could not stand the request, therefore, open and multi-source of data in planning knowledge is adopted. Only in this way, could the research be more integral and profound in unveiling the planning knowledge world.

1.3.5 Visualized: Display the Findings via Figures

A visualized approach would assist more direct sense and understanding of the research. In terms of the planning knowledge collective and the relationships among cities, which would be mentioned in the following content, visualization serves not only conveying the direct figure of how these items been organized, but also as parts of the measuring process. Such as grouping and counting, are quite essential through the approach of visualization. Therefore, visualized work is applied in this research. Through those visual phase, the facts would be better translated in the academic language with a vivid easy-to-access way for academies and for public as well.

1.3.6 Combined of Physical and Unphysical Entities

In terms of the physical or unphysical oriented studies, this research put efforts on the carriers of planning knowledge, the unphysical responsive urban issues, as well as the efforts on the relevant cities, which has the geographical features. In this way, this research connects the physical and unphysical ones, in order to get a more explicit understanding of the planning academics as a collective group for multiple correlated planning entities.

1.4 Probable Academic Contribution

1.4.1 Understand Forms and Constitutions of Planning Knowledge

This research allies with so many previous research, try to figure out a more appropriate way to describe, measure and visualize the planning knowledge. However, apart from them, this research would use data and visual approach to acquire profound impression and understanding for the issues. From this point, the academic contribution is quite original and important. How it organized, and what is the constitution inside of the planning knowledge collective? Those questions would be answered within this research. Moreover, it provides a fundamental platform and opens discussions for further research in this arena.

1.4.2 Understand Urban Planning in Europe

As been the context for this research, Europe planning knowledge is studied. Without doubt, it offers the best chance to gain the general understanding of urban planning discipline in Europe, especially in context of planning knowledge and scholars, etc. Besides the forms, constitution and process of planning knowledge in Europe would be defined and proved, some features for the planning scholars, and the interaction between scholars and cities would also be unveiled. In a word, this research could also been regarded as a study on the ecosystem of scholars in Europe, for the fact that the research take efforts on display and quantify the planning communities individually and collectively in Europe.

1.4.3 Urban Planning Research Trends for European Cities

By study the responsive process of planning knowledge, the research concluded the principles and forms. This contribute to obtaining the knowledge of planning research through. In this way, we could not only acquire the integral trends of the whole Europe, but the detailed dynamic change in certain orientations. On one hand, such trends could be used to predict the future development of cities, making appropriate interventions. On the other hand, the development clues for those developed cities could make models for other cities still struggling. This contribution benefits not only European cities, but also the cities in other continents.

1.4.4 European Cities Interaction via Planning Knowledge Exchange

The interaction among European cities would be defied, tested and quantitatively displayed in Chapter 7, as the cities been defined as 'anchor cities', which considers the cities that help to anchor the planning knowledge. The research takes efforts on measuring the cities' ability of output and input planning knowledge, as well as the integral figure of planning knowledge exchange among those cities. Based on that, the development trends for cities in groups are clear, and interesting findings are expecting.

Chapter 2 Literature Review

With the aim of exploring the planning knowledge, and the related entities in context of Europe, literature, resources and institutions that related to this topics, are concerned by this research. These include the key journal articles, chapters and books in planning education, planning research and planning scholars. The major planning schools' official website, as well as the on-site visit for several planning school campus, and departments. Institute of AESOP, of which the author participated the annual conference not only as a presenter but also obtained the vivid and profound experience for contacting planning scholars. Besides that, the large amount of resources and information is acquired from internet, which doesn't constrained only in information from research engines. However, those kinds of resources would be introduced in Chapter 3, within the discussion on research design, while this chapter mainly focus on the information and resources form literature. In that standing point, this chapter could be seen as the empirical supportive part to the whole research.

Through the process of referring to those obtained information, though fragmented and diverted, the author generally established quite a clear clue for the research. The framework for this research laid out similar to what has present today. In general, this research seems not as empirical as conventional researches in planning. Most findings of the research are quite fresh, with the massive data and designed analytical measurement. Such feature determines this research to be a more quantitatively scientific based research. In some extent, the findings from the research might contribute to related studies, as well as to other fields in the future, like networking science. However, the object and content of this research still significantly indicates the basic roots and values for planning disciplines.

Therefore, literature and multi-source information are still vital to this research. Such resources helped the author at most in terms of the theoretical supports, finding possible clues for developing the research to an advanced level.

To generalize the literature that is essential to this research, this chapter mainly focuses on two issues. Primarily, to know about the general features of the studied entities from other scholars' research. Accordingly, the first part mainly reviews the literature which is mainly focuses on the basic concepts and correlation among possibilities that the knowledge, people and spaces.

Through the process of organizing such thoughts and findings in planning knowledge, scholars and spaces, this research found out that the theory of social network could better interpreter the interrelationship among those entities. Hence, the research looks into the social network related literature, in hope of conclude the useful theoretical approaches and technical supports for this research.

Afterwards, as the European planning to be the object in this research, the literature which is related to the development of European planning education, scholars, disciplines, schools and research outputs, etc. is reviewed and displayed in the third part. On one hand, it provides us the premise to understand the situation of European planning, on the other hand, it would be useful to explain the certain phenomena or answer some questions.

Besides those present literature in this chapter, large numbers of literature is also displayed in

the rest chapters to support the research process. They are also complementary and indispensable. In general, based on the three parts of literature review, the research could have a strong and solid foundation be based on.

2.1 Correlation Planning Knowledge, Scholars, and Spaces

2.1.1 Planning Knowledge

Knowledge, is not only the carrier for created values, but also the bridge between theories and practice, which is needed to be managed (Dalkir,K., 2013). Moreover, knowledge is regarded as the intervention for practice and research (Long,N., etc. 1992). Schön admits that the professional knowledge has long been an effective tunnel for public to seek answers, through reliable scholars (Schön,D.A., 1983).

In 1981, scholar Fred Dretske discussed about the concept of knowledge. Unlike others, who regard the knowledge as the static form of values, he pointed out that knowledge, information, and perception should be considered simultaneously (Dretske,F. 1981). As here quotes:

> *Information is seen as an objective commodity defined by the dependency relations between distinct events. Knowledge is analyzed as information caused belief. Perception is the delivery of information in analog form (experience) for conceptual utilization by cognitive mechanisms.*   *– Fred Dretske*

Two major features could draw from his theory about knowledge, the first is the fluidity of knowledge, as the basic feature as the information's. However, the second feature, which distinguishes knowledge from information is the process of selection, analysis, and finally sublime into belief. Such two recognitions have already manifest how knowledge is been generated and delivered.

Comparing to knowledge, planning knowledge is less studied, partly due to the practical orientation domains this disciplines for quite a long time. However, similarly to the meaning of knowledge, it is expected to find out the analog features in planning knowledge as well.

Planning knowledge, distinct from the intelligent planning, which is in the field of artificial intelligent and design, has a very nature of describing the collective outcomes of planning scholars according to those theories and definitions for knowledge. As the concept for all forms of planning outputs, planning knowledge could be regarded as data pool for this discipline.

Could planning knowledge represent as the base for planning theory? Klosterman provides a positive answer, as one of this findings reviews the planning theory in the past thirty years, he select the planning intellectuals, also as planning knowledge, as clues for his research (Klosterman,R.E., 2011). This could be evidence for the function of planning knowledge as effective clues and foundation for establishing planning theories. According to Yiftachel's point

of view, the planning knowledge is constituted with different streams, also called as the orientations (Yiftachel,O., 1989).

However, there is not a clear boundary for the resources of planning knowledge, according to the findings from Luigi Mazza. They examined the wide ranges of disciplines that contribute to planning knowledge, which proved that the planning discipline is multipolar, with the diverted knowledge source (Mazza,L. 2014). Lots of evidence could be found as planning knowledge to be constitute from multiple orientations, and these would definitely act on the transformation of urban planning.

Sonia Hirt, etc. looked into the changes brought by disciplines of statistics, that have changed the way of planning research and practices profoundly in the last two decades (Hirt,S. 2012). In that way, the knowledge system of planning has been proved to be in the adjusting state.

The trends for the knowledge in the eyes of Paul Ginsparg, as many scholars perceives, is an integral knowledge and data network, which could be shared without borders and limitations(Ginsparg,P., 2000), once again, this correspond to Dretske's theory on knowledge. To generalize, the planning knowledge is considered to be interconnected, not only within different disciplines, but also to scholars and spaces.

2.1.2 Planning Scholars

Planning scholars, also referred to as planning researchers, and planning academics, academic planners, or planning intellectuals, even as the elites of planning, etc. according to Val Bums' studies (Bums,V., 1992), are in the center stage of planning academic research arena. In recent years, the awareness and appeals to recognize the value of planning scholars rather than in the role of planning practitioners keep rising. Matti Siemiatycki found out that more orientations of planning scholars should be taken into consideration (Siemiatycki,M., 2012)

One of the most important findings among the literature is Milton J, Friesen, with whose definition on scholars, particularly in planning. In his research, the scholars are categorized into three interrelated but different types: the scientists, the brokers, and the synthesists (Friesen, M.J., 2013), as Figure 1 shows. According to his research on planning scholars, two things could be confirmed, the first conclusion is that the planning scholars that have different orientations in functions. Secondly, this also could be treated as the proof for the influence from the outside arena of the planning scholars' arena, which divergent them into different directions.

However the role of planning scholars are, they are associated with the planning knowledge. The fact that they are active in different orientations is the reflection from the outside of the academic arena. Therefore, from the planning scholars' point of view, the correlation with the planning knowledge, and other planning related elements are quite essential.

SCIENTIST **Role:** Designs and carries out
fundamental research
Qualities: Narrow, precise
oriented to causation
eg. Shlomo Angel

SYNTHESIST

Role: Integrates research
across academic disciplines
Qualities: Broad skills and
ability to see new connections
eg. Michael Batty

BROKER

Role: Research driven most
directly by practice challenges
Qualities: Pragmatic, context
and outcome driven
eg. Bent Flyvbjerg

Figure 1 The Categories and Interactions of Three Major Scholars' Roles in Planning

(Source: Milton J, Friesen, 2013)

2.1.3 Practices Spaces

The practice spaces refers to the physical spaces that been studied and practiced by practitioners or some planning scholars. The spaces are usually referred to as the planning practice projects, since, every planning projects would tackle the issues of space. From the perspectives of the planning academic field, the space is the source of power for planning scholars and the communities (Schweitzer,L.A., etc. 2008), since the practice would bring about the feedbacks and reforms theoretically or methodologically for planning scholars.

Be as the objects to apply the planning knowledge, spaces experienced the process of physical planning to the process of agenda (Davoudi,S., 2003). Along with a large number of scholars in this field, Bj örn Malbert thought certain actors's involvement could be the linkage of the planning theory and practices (Malbert,B., 1998). Such certain actors includes the planning scholars and actors from other orientations.

On the other hand, it could not be ignored or denied that such spaces are interconnected. As the world cities are in an integral system, spaces are relevant to each other (Smith,D.A., 1995). This makes the entities, the knowledge and scholars, etc., mark with the locations. Therefore, the feature of the cities, and spaces would have kind of interactions, influence or feedbacks on those entities though this way (Beaverstock,J.V., ect. 2000).

In general, in the eyes of this research, the spaces have dual meanings. On one hand, they are the planning knowledge receiving places, as the knowledge input side. On the other hand, the spaces that carry the planning knowledge, scholars, schools, etc. would influence the process of planning knowledge producing, as the knowledge output side.

2.1.4 Correlation of Knowledge, Scholars and Spaces

One of the proof that such entities are highly correlated is from Matti Siemiatycki's findings, that the planning scholars are always in a process to link themselves with the planning goals, epistemologies, audience, sources of conflict, potential impact of their research (Siemiatycki,M., 2012), which seemly indicaties the importance of the planning scholars that manage to provide knowledge outputs in different dimensions.

The process of transforming the invisible knowledge to practice maintains the implied connection among knowledge, scholars and the spaces. Within the process, planning scholars play quite important roles, from the academic perspectives. As applying the knowledge and experience from minds to the physical world, Bent Flyvbjerg uses the term 'phronetic planning research' (Flyvbjerg,B., 2004) to represent the process and principles that obeyed by the scholars when applying knowledge to space. Similarly, Ann Forsyth also emphasized the importance of understanding the diverted impact from planning scholars on planning practice (Forsyth,A., 2012). Furthermore, he ascribe this phenomenon to the individual culture and environments. More direct test for the planning scholars that would have different impact on planning research or practices, based on the individual knowledge structures, which lead to the final unify of research and practice together via one planning community, are been authenticated by Bridget Durning (Durning,B., 2004). This conclusion could also get from Mee-Kam Nga' findings, in which the planning scholars once been defined as the 'social engineers-smugglers-experts-critical experts' to represent the significant and complex role of planning scholars in delivering the planning knowledge to practice (Ng,M.K., 2014).

In general, the scholars play a vital role in this integrally correlative system, and further research, of which, Friedmann would like to use another manned-controlled based 'planning' to compare to (Friedmann,J. 1987).

One of the overt features for physical spaces' impact on planning research, is to expose the problems directly or actively. This lead to the readjustment for planning academics to reason such issues. Therefore, the approaches such as the PBL is called for orienting a problem based learning process to directly tackle the urban issues in planning education (Shepherd,A., 1998). However, not all planning knowledge that conduct the urban planning practice is tested proper or correct. For instance, the planning knowledge of African-Americans' urbanization is quite a mistake according to Leaf's findings (Leaf,M., 1994). No matter right or wrong, these cases shows the correlation between the physical world and the planning knowledge, which is also related to planning scholars.

However, the planning knowledge, planning scholars and the spaces are highly correlated. As been indicated from the history of planning disciplines that the weaves from transformation both in the role of planning scholars and the planning education, that have influences on or been influenced by the cities in the 21st century (Dalton,L.C. 2001).

To summary, the above literature indicates the correlation among knowledge, scholars and cities in planning academics. This means to study such a mixture,proper theories, models and techniques for the research is needed.

2.2 Network: Theory and Technical Tools

2.2.1 From Social Network to the Network of Planning

Based on such correlation among knowledge, scholars, and spaces, it is more obvious that such system of planning academic arena could be treated as a mixture, which is similar to the basic features of network, as Ellison defined the social network according to features like: a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view, traverse the connections by others within the system (Ellison, N.B., 2007).

Comparing to the actor network theory, the social network theory is more close to the situation of the planning academic field. As the actor network theory emphases the different background of actors, as everyone in the network represents the special roles (Munro,R. 2009), while the social network is more planar, with the connected actors shares the equal academic states (Daly,A.J., etc. 2010).

Therefore, the social network theory would be more proper to be adopted to study this planning academic issues, since the planning scholars are individual 'social people' in the 'semi-public' academic network, while the information flow that 'connects' them together is through planning knowledge. For anyone who would like to view and traverse the network, it is achievable.

Moreover, it also indicates that the planning academic fields is a network, and such views have been adopted by many scholars' research. Hult found out that through the sourcing research, it is easy to reach the clusters in academic arena (Hult, G.T.M., 2008). This shows the evidence for network textures between planning knowledge and scholars.

Finally, the above supportive findings allows this research to view the planning knowledge, scholars and spaces as correlative network. This could largely enhance the ability for us to understand the constitution of planning knowledge, as well as the process of theories tackling problems facing with the discipline, and examine the influence on physical spaces.

2.2.2 Applicable Analytical Tools

In terms of the social networks, the core value of this discipline is to display the connection, and set examples for other disciplines on how to measure these connection, as Cantner concludes (Cantner,U., 2006). And Caroline Haythornthwaite once said, the social network been regarded as an approach of which contains a set of techniques, that are used to study the exchange of resources (Haythornthwaite, C., 1996). Many studies focuses on the methods for analyzing the network (Hanneman,R.A., 2005), as well as introduces the network techniques to other fields.

Based on that recognition, network analytical techniques are adopted by numbers of scholars for their research. To use Facebook open sources to collect data, and research (Hossmann,T, etc., 2011), to use such techniques for visualizing the Nordic academic web (Ortega,J.L., etc. 2008), and to adopt such techniques in analyzing organizations even dating back to early years

(Tichy, N.M., etc, 1979).

In general, the applications and techniques from social network analysis are quite rich and mature. This research would build up a scientific research structure according to such principles from the social network, and give fully consideration for the basic features of planning discipline.

2.3 European Planning: Success and Struggles

2.3.1 European Planning's Success

The united European has been achieved in several aspects in planning. Such success could be read from three aspects. The first one is the complicity of the orientations in planning disciplines. Secondly, as the multiple associations that serves the knowledge and scholars or students' exchange, contribute to activate the manifest of European Planning as models of the world.

One of the remarkable success is to have organized several associations to establish the exchange platform across states. This include AESOP, EURA, ERASMUS, etc. On one hand, such platforms activate the interaction among scholars' instant exchange seasonally or annually, such as the PhD workshop programs and the annual conferences (AESOP, 2013). On the other hand, through the year round exchange programs, exchanges could bring the planning research and teaching to an advanced level.

AESOP, the Association of European Schools of Planning, founded in 1987, is the most important associations, with the aim of promoting the teaching and research in the field of planning, instigating exchanges and cooperation among European planning schools, coordinating the initiatives, and representing the planning schools at national or international level (AESOP, 2013). Alessandro Balducci, former chair of this association, puts that, the AESOP should activate planning scholars to give response to contemporary urban problems.

AESOP, in the point view of this research, is the pioneer that promote the integration of planning knowledge, scholars, schools and urban issues. Given to that fact, this research is convinced to rely on AESOP for basic information.

2.3.2 European Planning's Struggles

Not mention the global economic crisis that have impact on the planning disciplines (Cotella, G., 2012), there are some problems that are not resulted from such crisis, technically, from the development process and the structure. Comparing to those achievements for European planning, struggles still exist.

According to major analysis on this issues, the divergent governance, planning system, and the inconsistent planning disciplines (Kunzmann, K., 2006). The major problems First of all, the process of integration is tough. The transitional process of education in regions like East Europe makes it possible to integrate a more balanced and efficient education system. While, there are

still quite long way to go and quantities of gaps to fill (Anchan, J.P., 2003).

Secondly, it is a long process for planning education to reach the ideal place. Even though as the Bologna Process has promoted the higher education to a more integrative and even situation, including planning education in Europe (Reinalda,B., etc. 2005), unevenness still seen in Europe. Most of the transition countries, other than Poland, has suffered a less successful process of developing a multi-programmed planning education (Frank, A., 2009). According to Frank's series of research on planning education, the undeveloped provision of planning education reaches nearly 10% in Europe (Frank, A. 2012). Divergent are still remains in the Accreditation and quality assurance of planning education in Europe (Frank, A., 2010), which is another possible invisible walls from interaction across nations.

Besides that, in terms of urban planning, the obstacle for integration comes from the diverted state governance system. However, it is never an easy task, as Umberto Janin Rivolin indicated in this research that the divergence on the definition of basic planning knowledge still existed (Rivolin, U.J., 2005). Never been conceived to be a mutual process from the Central commission of Europe to the lowest level of local government, the planning practice are fragmented, as Andreas Faludi puts in his research (Faludi, A., 2002), which is believed to result in the less unified situation in planning education systems in Europe.

Besides that, as the pioneer region for discussion the future of planning, argument about the future trends for planning is also a challenging issues. Andrew Isserman discusses about the issues and find it struggle for planning futures to choose, whether to be the realistic or more ideal oriented (Isserman, A., 2014). In other words, as Dowell Myers thought it important to open the planning discipline for development, rather than setting boundaries (Myers,D., 1997). He even questioned directly as how should planners proceed to put the future back in planning? (Myers,D., 2001). For Scholars like Mironowicz, they are more concerned about the progress in shifting the role of planners, as strongly correlated with planning scholars, from the top-down role to a more participatory and bottom-up role in the future (Mironowicz,I., 2013). Yet, In Chapter 4 there are some voices been recorded as the concerns for European planning schools, which could also been a proof for such struggles.

2.3 Literature Summary

In addition, the planning knowledge, planning scholars, and practice spaces are quite correlated with each other, as evidenced through many literature. Such mixture of entities supports the process of applying the planning knowledge, but also the feedbacks and influence from physical spaces to planning scholars and knowledge. This provides opportunities for networking those entities together. And only in this way, could we achieve to understand the planning academics better. In terms of planning scholars, Friesen's findings of three orientations of planning scholars, proofs that the planning scholars are diverted which is influenced by practical world or the nature of research inside of the academic arena. Meanwhile, it provides clues to explain the differentiation when discover the planning scholars in Chapter 5.

Moreover, through the study of social network, the research found out that there are similarities shared between the social network and the mixtures of planning. Inspired by that, literature on

social network are studied, along with the techniques and applications, in the aim of applying such analytical methods to this research.

The third part focuses on the European planning situation, in both positive and negative approaches. As the research issues, European planning have achieved great success in some ways, including the organizing the association for exchange and integration, like AESOP, and also in setting up plans for such strategies. On the other hand, the European planning is now facing with problems, as the planning education is not balanced across the region. Furthermore, concerns about the future development of planning remains uncertainty as well.

From the perspectives of the planning knowledge network, the literature would support the assumption in Chapter 3. Throughout the research in planning knowledge network, the planning responsive urban issues, and the related cities, this research would unveil the planning academic achievements in Europe as well as explain those phenomena through the facts.

Chapter 3 Research Design

3.1 Research Assumptions

As David Kempe described the influence could be strengthened through the resources exchange process in network (Kempe,D., 2003), planning knowledge would expand with the help pf the network. While, Tuomi added his point of view to the network, that it would be impossible for the communities to create knowledge within its circumference rather than connect to each other (Tuomi,I., 2001). Along with the literature in Chapter 2, they provide such a reasonable foundation for the assumption. As been put, according to the comparison of social network and the network of planning, it is convincing to set assumption as the planning knowledge to be a network.

Therefore, the following question would be how to establish such assumption, and how to authenticate them? As the planning knowledge is invisible, it is needed to use planning scholars, cities, research outputs, etc. to make it visible and measurable. Moreover, planning knowledge would certainly obey some rules to get itself functioned, if the assumption works.

3.1.1 Assumption 1: Planning Knowledge as a Network

Such assumption is essential for the research to be based on, since it proved to be the premise for the following research. Therefore, this research adopt the thoughts to assume the planning knowledge as an integral network.

To testify such assumption and achieve the research aim, the following research design content includes the whole structure of the research, the assumptive models for planning knowledge network and related cities, and eventually, the indicators, algorithms, data, sources, methods, and tools that lead the research to the final outcomes.

As the cooperation is the principle and domain ways of doing research, such kind of relationship among planning scholars provides opportunity to build up such 'network'. Therefore, inside this planning knowledge network, planning scholars are represented as key nodes, while the links between scholars are cooperated research outputs. The meta structure of the network could be simplified as shown in Figure 2. It should be noted that, the meta structure also includes non-cooperative research outputs.

Counting on these massive meta structure, the planning knowledge network is established, the assumptive model for planning knowledge network shows in Figure 3. It is not only a collective cloud we assumed for planning scholars to work and cooperate, but also the carrier for planning knowledge.
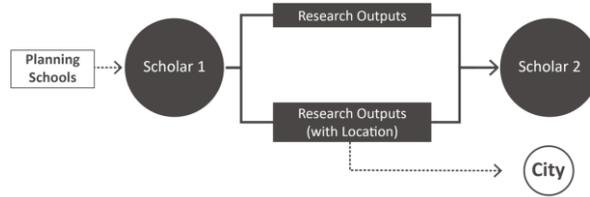
Figure 2. Meta Structure of Planning Knowledge Network

(Source: Schemed by author, YE Qiming, 2015)
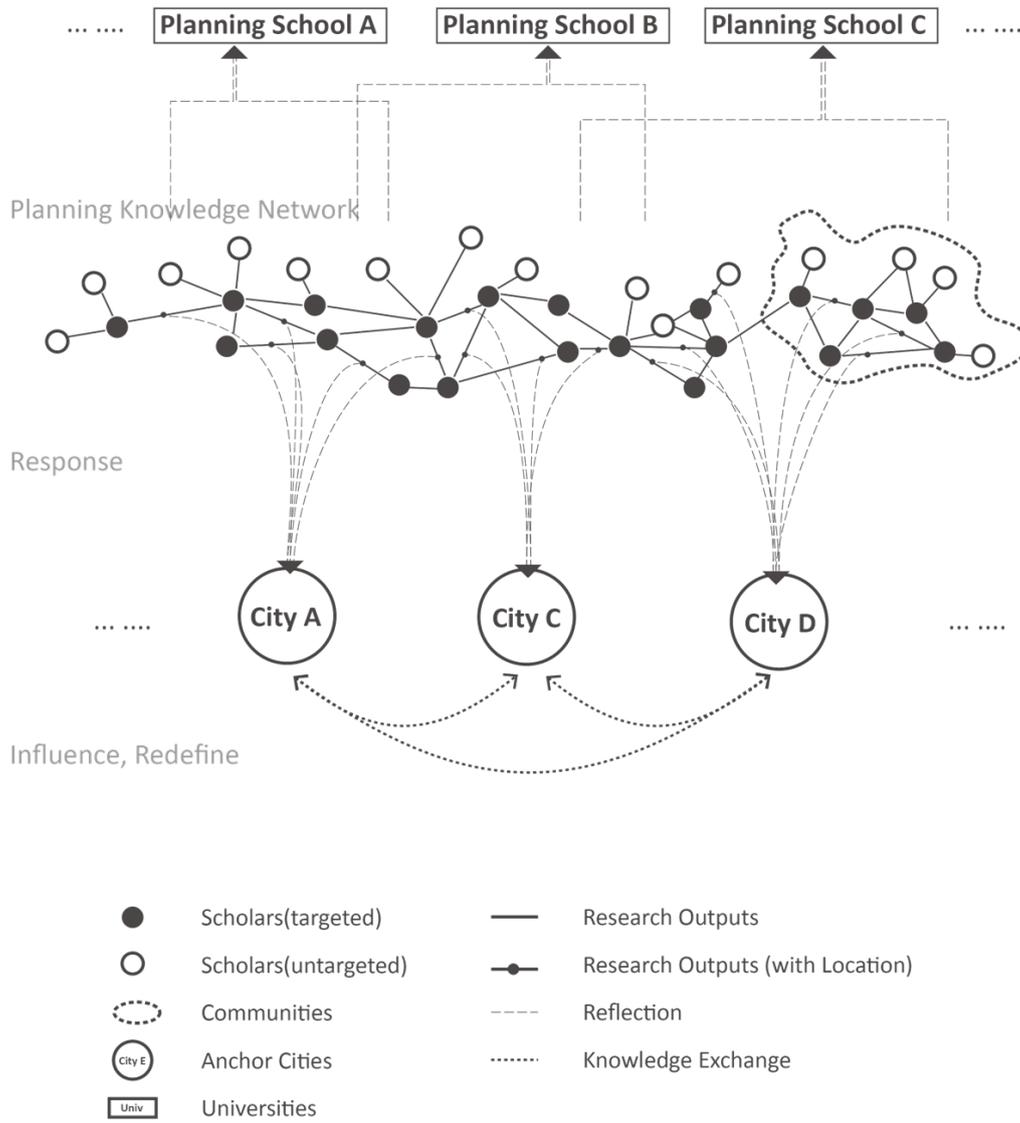
Figure 3. Assumptive Models for Planning Knowledge Network, Responsive Issues and Cities
(Source: Graph Schemed by Author, YE Qiming, 2015)

3.1.2 Assumption 2: Responsive Issues as Ties

According to the firs assumption, such research outputs are the ties between scholars due to the cooperative relationship. Similarly, as the planning knowledge contribute to cities' development via research outputs, the connections between planning knowledge and cities displays themselves through the research issues in each piece of research outputs.

Based on these relationship, the second assumption established the hypothesis, in which the responses to urban issues are regarded as the ties between knowledge and physical spaces. Such assumptive approach would largely help us to acquire the dynamic transformation in urban planning research on cities, for it is accessible to measure and analyze the acquirable research issues rather than some abstract knowledge.

The responsive issues lays in the second layer of the assumptive models in Figure 3, between the assumptive planning knowledge network and cities' layer.

3.1.3 Assumption 3: Cities Anchor the Network

One of the major task is to find clues that the planning knowledge network contribute to cities and affect cities. As it known, most of the research outputs have a certain producing location, along with the certain scholars. Even inside of part of the research outputs, with the content been related to certain places, they are place marked. Since the research outputs and scholars are the key elements in the planning knowledge network, the network itself are partly marked by certain locations.

Considering such facts, we assumes that the cities, referring as to such 'certain places', represents the function of mark the planning knowledge network with locations. In other words, the cities are seemly to be the anchor role for the network. To be tested through massive data, such assumption discusses the effect of anchoring the planning knowledge network. To some extent, cities could be redefined, grouped and displayed certain features. The interactions among cities are also predictable while cities output and input planning knowledge. In Figure 3. The lower part of the assumptive model shows how the cities anchor the network, as well as the inside knowledge exchange activities among cities.

3.1.4 Assumptive Models

According to such three assumptions, this research tried to establish an integral model consists of planning knowledge network, the responsive issues and cities, see Figure 3. With the assumptive micro interactions inside each parts, and an integral eco system of planning academic field in Europe. Interactions exist among: scholar-scholar, city-city, responsive issues-city and responsive issues-scholar.

To generalize, this model is established to seek answers for both basic and profound understandings. By converting these answers into research tasks listed below, the research

structure would be quite clear.

1) Testify the network form and feature of planning knowledge network.

2) Discover the features and dynamic trends of research outputs.

3) Find out the direct or indirect influence the network acts on physical spaces

3.2 Research Methods

3.2.1 Empirical Means

In terms of the empirical studies, literature of related researches are referred. The needs for empirical studies could be generalized as to understand the general constitution of planning knowledge, scholars and the responsive urban issues, on the other hand, to gain better understanding of the characteristics of the planning academic field, for structuring the framework for further studies. The explicit methods are selected in this research:

1) Narrative

2) Enumeration

3) Comparison through Facts (Phenomenon), etc.

Narrative means are mainly used in describing the process of research, the outcomes of each small procedures, as well as literature review parts. It is a scientific and academic way for recording procedures or facts. Enumeration is also widely used when presenting examples for clarifying the myth of the research subjects. Comparison through facts is always widely used when describing the phenomena among different objects.

Those empirical means are applied in this research either to get a solid support from theoretical foundation, or to cope with quantitative studies to define the key entities, and to present findings: the planning knowledge network, the responsive issues and the anchor cities etc.

3.2.2 Quantitative Means

To rely on the empirical studies, and the assumptive models, quantitative means helps this research to display, testify and define entities, features, etc. As one of main approach in this research, the quantitative means make it different from other analogy researches. The planning scholars, the amount of planning knowledge and the influenced cities, along with their manifest features would be quantified. Moreover, such quantified results would be used as the foundation for analytical study, or visualization. Some major methods in quantitative approach are listed below:

1) Comparison through Data

2) Key Words Calculation

3) Grouping

4) Force Calculation

5) Weight Calculation, etc.

As for comparison through data, the methods of key words calculation is used to seek, select and calculate the right items from massive data, as for certain indicators like the responsive issues, planning knowledge inputs, and planning knowledge outputs, etc. Besides the means from general statistics, another essential branch for quantitative studies comes from social network analysis. Grouping, force calculation, depth calculation, weight calculation are targeted to quantify the planning knowledge network and the influence.

Through these approaches, we could have a clearer and relatively scientific knowledge of the planning intelligent and related elements. It is believed that, the application of quantitative studies could testify to the empirical studies, modify the incorrect part and unveil the hidden phenomena behind the planning intelligent.

3.2.3 Visualized Methods

Visualizing approach as one of the methods in this research to gain more direct understanding of planning knowledge. It also assist the analytical studies in certain ways. This methods are adopted in unveiling the emerging, developing process of planning knowledge, as well as the overt figure of European planning knowledge network. Later on, such methods would be applied in visualize the network of cities' exchange planning knowledge in Europe.

1) Illustration

2) Networking

3) Clustering

4) Modularity, etc.

Illustration plays an important role in defining the subject and display the research structure and models in a logical way. It is used in modelling phase and structuring phase. Networking is used through software to satisfy the request for 'displaying the form' of planning knowledge network and the network of cities as well. Clustering is applied when analyse the planning knowledge networks, since certain indicators are built upon clustering results, this means is quite essential. Modularity is the premise phase for planning community definition, it help us to clarify different planning communities in the context of an integral planning knowledge network and cities' network.

Besides the network, graphics and tables are part of the visualized work. And through such approach, the results are better conveyed and some internal but hard to find characteristics would be discovered and studied.

3.3 Data Source

3.3.1 Data and Resources

As one of the aim of this research is to realize a visual, quantitative approach of understanding the planning knowledge network and its influence, the importance of data is self-evident. Though the planning knowledge network is invisible and difficult to capture, some fixed form is ought to be selected. With requires of easy-to-measure and carrying the information of such planning knowledge, the research outputs of planning scholars is selected eventually.

Research outputs are selected as the major data basis of this research, since the research outputs are the outcomes of planning scholars, with the aim to respond to the problems of the cities and the discipline. There are different forms of research outputs: journal articles, conference proceedings, books, chapters, and editorials, etc. as the published forms, and reports, consults, working papers, unpublished thesis, etc. as the unpublished forms.

3.3.2 Reasons of Selecting Research Outputs as Major Data Resource

There are three reasons for us to choose research outputs as the resources of study the planning knowledge.

First of all, as mentioned in previous context, research outputs serves as the carrier of the planning knowledge with different forms. They carry all the information, or at least the most valuable part of the planning knowledge, which could be acquired easily through the records from the internet or through other channels.

Secondly, research outputs includes not only the published planning intelligent patterns, such as the journal articles, conference proceedings, books, and book chapters, etc. but the unpublished reports, working papers, consultant papers, and thesis as well. It remains the completed coverage of the entire planning knowledge. In other words, the planning knowledge would not exclude any forms of outputs, and it is the content and contribution that matters.

Finally, in order to gain understanding of the planning knowledge, especially to measure and visualize it, a strict structured information ought to be acquired. However, less data resource could meet such standard other than the research outputs. Usually, the uniformed research outputs contains the such adequate information which represents the value of planning knowledge, that the research outputs could serve as a structured information collections of planning intelligent.

3.3.3 Sources

The following question facing the research is where to get such resources of data basis. In fact, even though there are several online research engines, like google scholars, research gates, etc. collecting and sharing such data, it is easy to find out the incomplete records of those engines.

Hence, a more scientific, though tough, way is to find out the producer of such research outputs, and get the data from the very starting point, rather than those search engines. This is another way to guarantee the integrity of the data basis for a more solid research foundation. It is only in that way, the quantitative and visualized work is expected to achieved.

The second question follows by, if we choose to get the research output data at the very starting point, say, the records of an individual planning scholars, who would be these planning scholars? As been discussed in previous context, planning scholars related to this research includes the college teachers, researchers, institute staffs, etc. It is quite impossible to get access to all of these scholars' data.

Therefore this research begins with the data collection from the most accessible and important ones, the planning schools scholars. In hope of the scholars would be unveiled automatically through the investigated certain ones. The following research would prove such assumption is correct, due to the openness and connective attribute of the planning knowledge network.

Referring to the AESOP planning schools membership directory by the year of 2015, 116 schools are on the full membership list. Considering the fact that not all the 116 planning schools provides satisfactory data which could live up to the research's standard, the final data sources is consist of 2023 planning scholars of 57 selected major planning schools. More detailed studies for planning scholars, and the research outputs from major European planning schools is presented in Chapter 4.

Apart from the official website of each planning schools, other important collective resources which provides official and completed data for research outputs are included. For example, the website of Halshs.Archives[1] is one of the reliable and collective resources website providing French planning scholars' research outputs.

Besides the mentioned methods that help this research to get the research to get the research outputs, data from the research engines is also essential and complementary. Not only because those planning scholars that has less or even no recorded data from the official website, but also for some research outputs that lacks key information, where the research engine would help to complete such data as much as possible.

In general, the resources for the research outputs data of each planning scholars are basis obtained through the official websites of 57 planning schools in Europe. Some other internet resources would also be complementary and helpful for acquiring the research outputs. To complete the missing data, these research engines plays an important role. With all the possible resources that could be helpful for establishing a relatively completed research outputs data biasis, the research spend several months to get the raw data.

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[1] Halshs.Archives : https://hal.archives-ouvertes.fr/

3.4 Data Management

3.4.1 Key Parameters to Obtain

Parameters of the research outputs are the remained key information to describe the planning knowledge, relevant entities and the process. According to the attributes these entities have, 20 parameters are selected as follows:

Planning Schools: the universities or schools in which this research was been produced

Title: the title of this research output, including chapter's title

(Main) Author: the recorded author

Abbreviation (of Main Author's Names): the abbreviation of the name of the recorded author

Producing Citing: the number of been cited

Year: the complete year of the research output

City: the produced location of the research output

Publisher: the journals' name, publisher, conferences name, or organization

Type: article, article review, book, chapter, editorial, proceeding, report, or working paper

Order (of Main Author): the order of the main author among all authors

Author-1: the first author

Author-2: the second author

Author-3: the third author

Language: the language of this thesis

Target City-1: the first studied city according to the content

Target City-2: the second studied city according to the content

Target City-3: the third studied city according to the content

Target City-4: the fourth studied city according to the content

Target City-5: the fifth studied city according to the content

Responsive Issues: research issues in 7 orientations

To point out that, these parameters are obtained from the resources mentioned in previous context, mainly from the official website of each planning schools, along with the complimentary of online research engines like google scholars, research gate, etc.

3.4.2 Forms of Data

Even though not all of records contains the completed parameters, the complicity degree reaches 93%, majorly lacking in the category of language and citing. For all these obtained data, they are in the raw state before the management process. Through the process of data management, all the research outputs are structured into the similar form in data basis.

As each row in the data basis represents a piece of research output, the planning knowledge in other words, and each column shows the parameters of every research outputs, see Figure 4.

Figure 4 Layout of Research Outputs in Data Basis (Randomly Selected)

3.4.3 Utility of Parameters

There are two major utilities of these obtained parameters. First function is for some directed analysis based on these parameters. For instance, when referring to the forms of research outputs, the analysis of the proportion could be concluded from the parameter of 'Type'. Another case is to figure the planning knowledge chronically, the parameter of 'Year' would be useful.

On the other hand, to gain deep understanding, parameters would be combined, calculated and developed into different indicators through various algorithms or visualizing process. To take the planning knowledge network as an example, the first three authors are taken into account, as such connections between them would reflect the cooperation relationship that helped to produce certain research outputs. In this case, the parameter of 'Author-1', 'Author-2', and 'Author-3' are needed. Afterwards, calculation, grouping and the force atlas process take place, with the visualized network would be realized.

3.5 Principles, Indicators and Algorithms

3.5.1 Principles and Algorithms

1) Force Atlas 2

As a key process for visualization the planning knowledge network, Force Atlas2 algorithm obeys the basic rule of both Hooke's law and Coulomb's law in physics. It is used as the rules to visualize the relationship of planning scholars, via the connection through planning knowledge, the research outputs.

In terms of the Hooke's law, it describes and displays the attractive force between each two linked objects, as the spring force in real world (Ugural,A.C., 2003).

$$F = -kX, \quad [2].$$

While the Coulomb's law deals with the repulsion force against each entities in a group. This principle is widely used and transferred into multiple disciplines. One of the major application case is the gravity model familiar to most of the planning scholars (Coulomb,C.A., 1785).

$$\mathbf{F}_1 = k_e \frac{q_1 q_2}{|\mathbf{r}_{21}|^2} \hat{\mathbf{r}}_{21}, \quad [3].$$

Those two laws together could simulate the relationship among objects in a community, as the reality dose. They have been referred into the graphic area for graph drawing as the 'Force Atlas' form, known as the Force-directed graph drawing. According to such principles, the network would organize the nodes according to the force it bears and display each nodes in appropriate locations, till the forces in the integral system is balanced. Figure 5 illustrates the process of Force Atlas 2 algorithms.

(a)   (b)   (c)
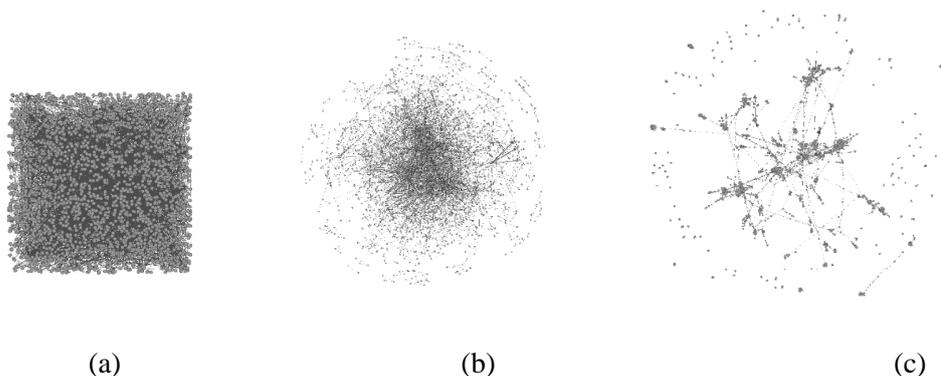
Figure 5 Three Stages of Force Atlas 2 Models for Visualization: (a). Raw Stage, (b).Processing Stage, (c). Final Layout (Source: Graph generated through Gephi, 2015)

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[2] Hooke's Law: 'k', as the characteristic of the spring, 'X' is proportional to that distance, 'F' is the Force to attract

[3] Coulomb's Law: 'ke' is Coulomb's constant, 'r21' is the vectorial distance between the objects. 'q'are the signed magnitudes of the charges

3.5.2 Key Indicators and Algorithms

2) Average Degree

Average Degree reflects the entire cooperative degree of each scholar. The higher value of the average degree a scholar get, the more cooperative relationship the network would be[4].

$$a = \frac{1}{N} \sum_{i=1..N} Degree(V_i)$$

3) Modularity Degree

The indicator of Modularity is raised and optimized by Newman in 2004 and 2006, which is used to describe the strength of division of a network into modules (Newman, M.E.J., 2006). According to the indicator of modularity, it could be helpful to define and measure the planning community in overt planning knowledge network.

The higher value of modularity gets, the harder efforts are needed to modulate such network. In other words, this indicator reflect the cohesiveness of a network. Generally, if the modularity value is above 0.9, then the network is believed to be relatively cohesive[5].

$$\delta(c_v, c_w) = \sum_r S_{vr} S_{wr}$$

$$Q = \frac{1}{2m} \sum_{vw} \sum_r \left[A_{vw} - \frac{k_v k_w}{2m} \right] S_{vr} S_{wr} = \frac{1}{2m} \mathrm{Tr}(\mathbf{S}^T \mathbf{B} \mathbf{S}),$$

$$B_{vw} = A_{vw} - \frac{k_v k_w}{2m}.$$

4) Average Clustering Coefficient

This indicator measures the degree of which scholars in a network tend to cluster together. Duncan J. Watts and Steven Strogatz introduced the indicator of clustering coefficient (both directed and undirected) to determine whether a graph is a small-world network (Duncan J. Watts, etc. 1998). And since the connection among scholars has no direction, we adopted the undirected local clustering coefficient to be calculated. Finally an average value of the overt clustering coefficient values are studied to know the general clustering situation of the whole planning knowledge network[6].

$$C_i = \frac{2|\{e_{jk} : v_j, v_k \in N_i, e_{jk} \in E\}|}{k_i(k_i - 1)}.$$

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[4] 'a', value of average degree. N, the number of scholars. V, the set of scholars, Svr to be 1 if scholar v belongs to group r and 0 otherwise

[5] Q, value of modularity of the network. S, Non-square matrix having elements Svr. B, Modularity matrix, which has elements. 2m, Total number of degree among all scholars

[6] Ci, value of local clustering coefficient for a certain scholars. V, the set of scholars. E, the set of edges between all the scholars. Ki(Ki-1), possible links exists between all neighborhood scholars

5) Closeness Centrality

The indicator of closeness centrality is used to describe the centrality state in a network, from this stand point of view, the leadership could be attained. This concept is originally raised by Dijkstra (Dijkstra,E.W., 1959) and developed by Freeman (Freeman, 1979). It explains how central a node is positioned, by measuring the amount of distance from this certain node to all nodes that is directed or undirected connected in this community. However, such kind of nodes must be reachable by certain nodes. As shown in Figure 6. there are two communities, ABCDEF and HIJ, while K belongs to neither one. For instance, the centrality of Node B could only been calculated within Node A\C\D\E\F\G\, since the distance between Node B and H\I\J are infinite (Opsahl, 2010). In this case particularly, closeness value for Node B is 4.33. The algorithm is quite understandable as put below:

$$closeness(i) = \sum_j \frac{1}{d_{ij}}$$ (Opsahl,T. 2010)
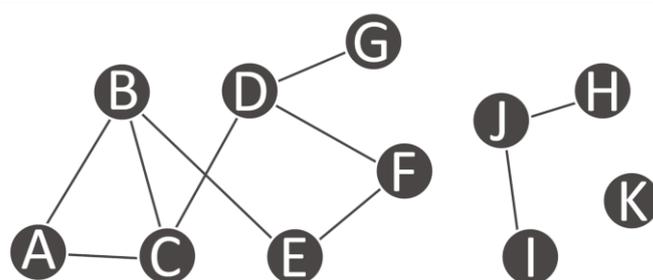
Figure 6 Illustration for Closeness Centrality

(Source: Graph Schemed by Author, YE Qiming 2015)

6) Completed Triangles

Completed triangles refers to as the total number of triangle cooperation, or connection, in the network or within a planning community. This indicator describes the structuralized constitution of the network. The higher the value of completed triangles is, the probability stable could get. In this research, such indicator is calculated through the visualization software, Gephi, and been used as one of the basic indicators for more advanced indicators such as stable index 1 and 2.

7) Stable Index 1 and 2

Stable Index 1 and Stable Index 2 is invented in this research, in order to measure the stability of the planning knowledge network and planning communities or groups. The main idea for this index is to use completed triangles as the basic value for calculation, through dividing the certain number of scholars' equal ideal number of triangles, to get the proportion. Then compare such proportion of this planning community or group with the integral network, the final ratio

is the value for stable Index.

Stable Index 1 and 2 shares such theoretical back ground, while different in the stable threshold. As the ultimate stable standard requires any nodes been included at least in one triangle. On the other hand, the Stable index 2 is stricter, which insist that either three nodes should be included in a unique triangle. Such varies on stable threshold lead to the difference in algorithms.

In order to compare Stable Index 1 and 2, the value of Stable Index 1 is suggested to be normalized with 10^{-3}, The algorithm are listed below, with Stable index 1 as S1, Stable Index 2 as S2:

$$S1 = \frac{\left[\dfrac{n}{C^3_{(n-1)}}\right]}{\left[\dfrac{\sum_{i=0} n}{C^3_{((\sum_{i=0} n)-1)}}\right]}/10^3$$

$$S2 = \frac{\left[\dfrac{n}{C^2_{(n-1)}}\right]}{\left[\dfrac{\sum n}{C^2_{((\sum_{i=0} n)-1)}}\right]} \quad {}^{7}$$

8) Responsive Issues

This indicator is a set including ten dimensions, according to conventional classification in planning disciplines: 1),Social Studies, Economic, 2),Law and Industries Studies, 3),Ecologic and Environment Studies, 4),Planning Theory and Urban History, 5),Strategic, Spatial planning and Policy Studies, 6),Art, Culture and Design and 7),Technology, Engineering and Transportation.

For each dimension, we set essential key words and calculate them to select the right research outputs. Finally, such responsive issues are studied according to each dimension chronically, to figure out the major orientations through time change. Somehow, it would also been used to display the research issues classified by scholars.

9) Cities' Planning Knowledge Output Degree

The cities' planning knowledge input degree describes the total amount of planning research outputs been produced in a certain city. This indicator reflects the ability to produce intelligent or knowledge of a city to the academic arena and other cities. On the other hand, through analysis on the diverted kinds of outputs, such as journal articles, editorials, conference proceedings, working papers, reports, books and chapters, etc., the outputs degree could also define the preferences of research outputs of the city, implying the features like the interactions

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among planning scholars and practitioners, etc.

For instance, if one city performed well in outputting the conference proceedings, comparing to other forms, it means the city did well in organizing conferences or related academic activities. And the reasons behind the phenomena is worthy to be figured out.

Based on the planning knowledge output degree, some derived index such as the annual planning knowledge output index, or regional planning knowledge outputs could be acquired.

10) Cities' Planning Knowledge Input Degree

Contrary to the planning knowledge output degree, the input degree for cities' planning knowledge refers to as the amount of planning knowledge research outputs that a city receives. This indicator is calculated through key words calculation, indicating the cities that a piece of research output studies. In general, the higher in this indicator for a city, the more possibility it would be as the hot spots to be studied in planning academic arena. Similarly, the reasons behind is meaningful and remain research value. Similarly, the annual and regional index for planning knowledge input could be calculated.

11) Cities' Planning Knowledge Exchange

Combining with both the cities' planning knowledge outputs and inputs, the indicator for cities' planning knowledge exchange reflects the oriented research outputs from certain cities to the others. Only if the research outputs has both the recorded producing cities and receiving (studied) cities, could it been taken into account.

In other words, such kind of research outputs are required to have both location marked in producing side and receiving side. Therefore, research outputs are classed into directed loops or undirected loops, see Figure 7 This indicator provides opportunities to figure out how the knowledge is delivered and applied among cities.
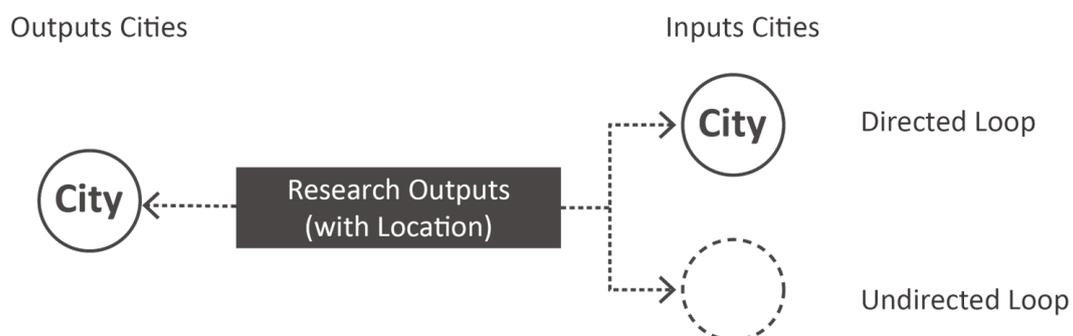
Figure 7 Directed Research Outputs and Undirected One

(Source: Graph Schemed by Author, YE Qiming, 2015)

3.6 Research Structure

The structure of the research obeys the common rules of discovering and recognition. And also it highly correlated with the assumptive model. The following Chapter 4 to Chapter 7 constitute the main body of the research. Figure 8 shows the structure of this research including the premise of research parts in Chapter 1 to Chapter 3, the main body from Chapter 4 to Chapter 7, and finally the Chapter 8 for conclusion.

It could be seen as the corresponding to the three assumptions proposed in previous context. Therefore, the task for the following main body is on one hand, testify the assumptions, and on the other hand, discover, understand and investigate the subjects in a reasonable, quantitative, visualised and structured way.
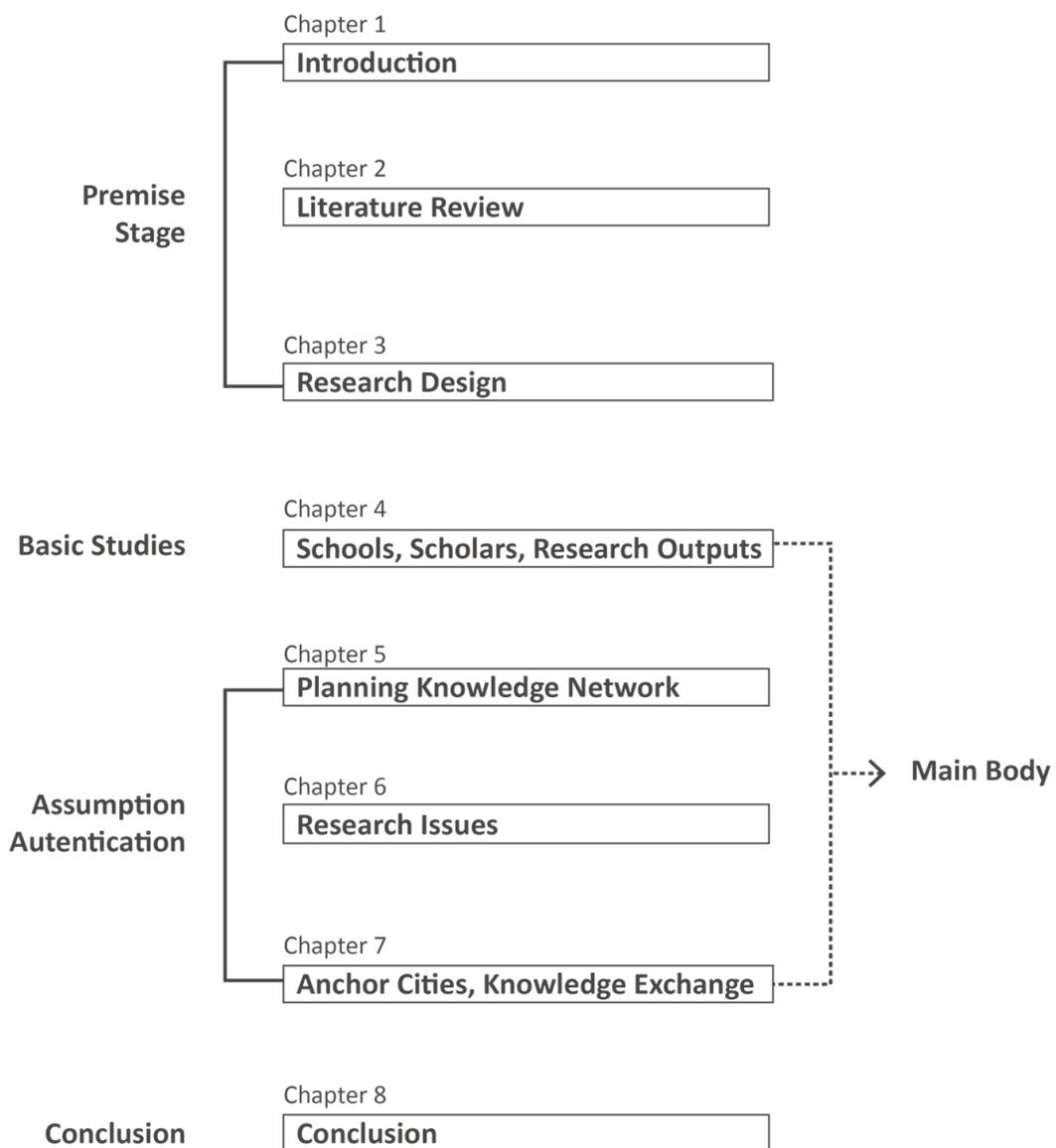
Figure 8 Comprehensive Scheme of Research Content

(Source: Schemed by author, YE Qiming, 2015)

3.6.1 Premise Stage for Research: Chapter 1- Chapter 3

Form Chapter 1 to Chapter 3, the research makes preparations for discussing the topic of European planning knowledge network. This includes illustrating the motivation and possible academic contribution of the research, as well as the research issues and features. Most importantly, relying on the literature review from three significant phases, we established a scientific process of research design.

In the research design phase, the priority task is to propose assumptions. Such assumptions that concerning the planning knowledge network, the responsive issues and cities simultaneously as a collective assumptive structure.

Afterwards, the methods are discussed in empirical, quantitative, and visualization dimensions. Along with what kind of data is needed as well as where should this data been collected. This research adopts the open and multiple source data to guarantee the reasonable and quantified outcomes.

Thereafter, key principles, indicators and the related algorithms are discussed. They are essential in analyse the subjects, and helpful in quantify, visualize and illustrate the outcomes as well.

Relying on these premise works, the structure for the main body is laid out. Those assumptions are answered in each chapter, with methods been applied and indicators been calculated, the outcomes of each chapter is convincing.

3.6.2 Base: Planning Schools, Scholars and Research Outputs: Chapter 4

In this chapter, planning schools and scholars as the bases for planning knowledge network is discussed. Some basic facts are presented to present the situation of planning discipline in Europe. Thanks to AESOP's efforts, the research selected 58 schools as the detected data source, with scholars and their research outputs been studied.

Though in this chapter, the assumption of planning knowledge network could not been testified, the efforts contributes to Chapter 5, where the networking process request the massive data from planning schools, scholars and the research outputs.

3.6.3 Planning Knowledge Network: Chapter 5

As the first chapter of the main body, Chapter 5 discussed the issues of planning knowledge collective. Been assumed as the form of network, the priority task is to testify the assumption. By visualizing this network under the help of the Gephi, the assumption is been authenticated.

Afterwards, the quantified means are applied in examine the attribute of the network, such as the clustering index, modularity, connecting efficient, etc. In this way, a more sensible and understood European planning knowledge network is presented.

To know more about the planning knowledge network, by investigating the planning community which reflected from the network, this research discusses the nature of the planning communities. Comparing and illustrating the major communities in European planning academic arenas, the deep understanding from diverted angles like location, orientation, inside organization, etc. are obtained.

3.6.4 Responsive Issues as Ties: Chapter 6

As the linkage role between planning knowledge network and the cities, the responsive issues is discussed. Aiming to find out the features of European planning knowledge, the research issues is studied, to category the planning issues into 7 dimensions. For those dimensions, certain groups of scholars and cities are tied, and promising trends are predicted.

Through the analysis of these research outputs chronically, the dynamic trends would be obtained, as well as the regional diversity in topics. In this way, understanding for urban planning in Europe is deepened. A profound knowledge for planning knowledge network and the cities could be expected.

3.6.5 Anchor Cities' Features: Chapter 7

Followed by the chapters concerning the planning knowledge network and he research issues, anchor cities are discussed in Chapter 7. First of all, the research explains the term of 'anchor cities', as it refers to the cities that marked the network both by means of producing the planning knowledge, actually by providing contribution to contain the planning scholars, and receiving the knowledge of planning intelligent. As the planning knowledge network been hooked by these anchor cities, some certain features displayed by cities are expected, since the connections established between cities and the network.

This Chapter focuses on the basic features of these anchor cities. Moreover, through the shared scholars, the cities are clustered, and grouped as 'anchor cities groups'. Meanwhile, the research try to evaluate the cities in perspectives from planning knowledge input, outputs and effective exchange. Index for these evaluation are raised to examine cities' performance. Finally, we try to grasp the development trends through investigating the input knowledge for certain cities.

Chapter 4 Planning Schools, Scholars, and Knowledge

4.1 European Planning Schools

4.1.1 Planning Schools in Europe

In terms of the planning research, the situation various from nations in Europe. The government ministrations, the institutions, the private sectors, and individual planning researchers are all included in the research bodies along with the planning schools. However, among those entities, planning schools are regarded as the majority part with the majority population is the planning scholars in academic field. Alessandro Balducci thought universities in Italy are the main bodies of research (Fubini,A., 2004). This is also evidenced in United States, where 95% of the interviewers reported the principal planning knowledge are received from planning schools (Hoch,C. 2011). Given the fact that the planning schools are the primary power in planning research, it is natural for this research to pay more efforts on European planning schools, since the remaining planning scholars in those schools are the major entities to be studied.

Even though the research use the term 'European planning schools' to represent the planning education and research organizations across Europe, the disciplinary degree and institutional degree still remains significant gaps among those organizations, according to the AESOP's official findings (Fubini,A., 2004). As been pointed out in the research, taking the case of France as an example, a few schools of planning and research entities of 'planning'. As an extreme example, in Finland and Norway, there is neither distinct planning education, nor a degree. Therefore, the task of defining the right European planning schools as the needed one turned critical for this research.

Given the fact that the European planning schools are diverted in institutions and disciplinary constitutions, reliable resources which contains the qualified planning schools seems essential. Thanks to AESOP, which plays a significant and unreplaceable role in networking, selecting the standard higher education of planning in Europe, and integrating planning education, research and scholars. More importantly, it is such an institution that covers all main planning schools in Europe. Therefore, the process of defining the standard planning schools largely relies on the work of AESOP. In other words, AESOP provide 116 member schools candidate for this research to choose from, till the year 2015.

4.1.2 57 Major Planning Schools

With the list of the 116 European planning schools provided by AESOP, we looked into the detailed information and resources of each schools, through checking the official websites of the 116 planning schools. According to the principle of the acquirable data of the planning scholars, as well as the importance of the completion of other needed information, 57 schools out of the 116 is selected. For Such 57 planning schools, they covers most planning schools of the traditional western European continent, as well as the United Kingdom. They are regarded to be the main bodies of the planning schools in Europe. The group of such 57 planning schools

fully covers the planning schools in United Kingdom, Italy, Germany, France, Switzerland, Austria, Belgium, Denmark, and covers the majority part of Netherland, and Spain.

Table 1. 57 Major European Planning Schools List

Countries	Selected Planning Schools
United Kingdom (17 schools)	*Birmingham City University, Cardiff University, University of the West of England, University College London, London School of Economics and Political Science, University of Westminster, University of Liverpool, University of Manchester, University of Newcastle, University of Ulster, Oxford Brookes University, University of Reading, University of Sheffield Hallam, University of Sheffield, University of Glasgow, Queen's University of Belfast, University of Glasgow*
Italy (11 Schools)	*University of Cagliari, Polytechnic University of Bari, University of Florence, Polytechnic University of Milan, University of Naples Federico II, University of Palermo, University of Chieti-Pescara, Sapienza University of Rome, Roma Tre University, Polytechnic University of Turin, IUAV University of Venice*
Germany (8 Schools)	*Technical University of Berlin, Technical University of Dortmund, Erfurt University of Applied Sciences, HafenCity University Hamburg, University of Kaiserslautern, University of Kassel, Nürtingen-Geislingen University, University of Stuttgart*
France (11 Schools)	*Paul Cézanne University, Universite de Paris VIII, University de Paris XII: Val de Marne, University Pierre Mendes-France, University of Lyon, University of Nantes, Paris Institute of Political Studies, University of Bordeaux, University of Reims Champagne-Ardenne, University Francois Rebelais, LILLE 1 University - Science and Technology*
Netherlands (2 Schools)	*University of Amsterdam, Delft University of Technology*
Switzerland (1 school)	*ETH Zurich*
Spain (1 school)	*University of Madrid*
Austria (1 School)	*Vienna University of Technology*
Denmark (2 Schools)	*Aalborg University, Aarhus School of Architecture*
Belgium (3 Schools)	*University of Leuven, University Gent, University of Antwerp, University of Leuven*

(Source: Graph Schemed by author, YE Qiming, 2015)

From the geographical perspective, Figure 9 shows the distribution of such major planning schools in Europe. As been displayed in the figure, those planning schools are located in the traditional western European and United Kingdom regions, major planning schools clusters are deserved to be mentioned.

United Kingdom, separated from the mainland Europe, plays a very important role in leading the development of planning education and research. 17 schools constitute the studied groups of the planning education and research structure in United Kingdom.

The joint region of Belgium and Netherland is consist of 5 major planning schools, with 3 in Belgium and 2 in Netherland. They stay quite close to each other geographically.

In Italy, the 11 schools distribute quite balanced geographical position alongside the coast, with the planning schools in Milan and Turin in northern part, and Rome, Naples, etc. in the south.

In Austria, Spain and Zurich, planning schools that has a long tradition and profound in urban research and planning issues are selected. Comparing to other schools in these countries, these three schools are important and professional.

In Germany, planning schools also performed a balanced distribution. While in France, besides Paris, planning schools are also investigated in cities like Grenoble, Marseille, Lyon, etc.
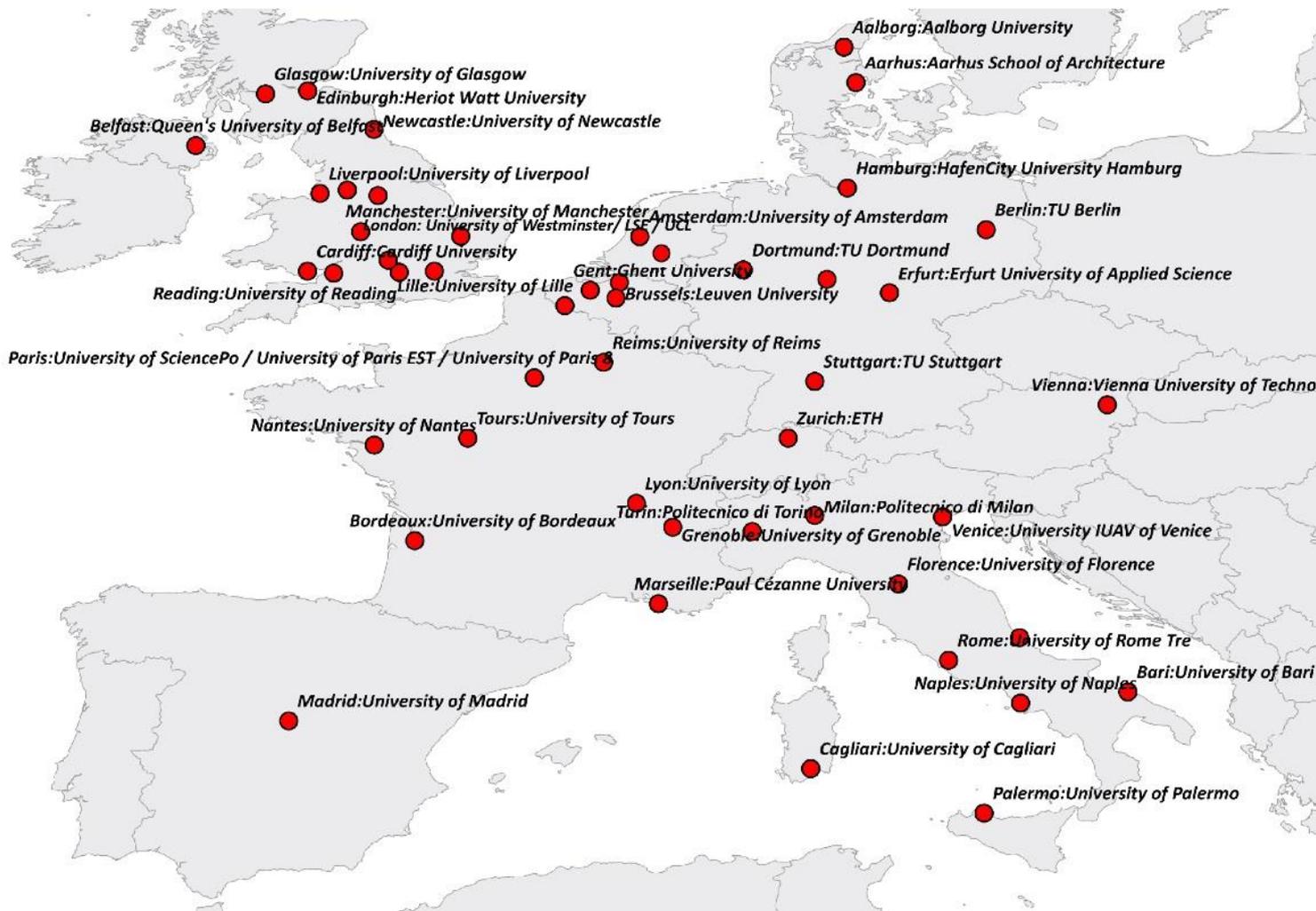

Figure 9 Distribution of Studied European Planning Schools

(Source: Generated through ArcGIS, YE Qiming, 2015)

4.1.3 Planning Schools in Changing

Not all planning schools are always in an ascending state. In the ecosystem of planning, schools are also facing with challenges at times. University of Kingston in United Kingdom is a case to reflect how the planning disciplines been dissolved by other disciplines and such planning schools are shrinking even closed down.

It is a tragedy for planning scholars in schools like this, been absorbed into other disciplines like geographical science, mathematics, social studies, etc. or other planning schools. However, the scholars' are kept in the ecosystem yet, even though the brand name of schools changed.

Therefore, Based on such 57 selected major planning schools in Europe, this research would establish the data basis, which includes the information of the recorded research outputs of the planning scholars, as well as the orientation. To draw a basic map for understanding the planning knowledge network, the planning schools is quite fundamental.

4.2 European Planning Scholars

4.2.1 Planning Scholars in Major European Planning Schools

As been set as the research base, the 57 planning schools provides a profound information for the planning education as well as the research information. Associated with such two activities, the most essential part that to our major concern, is the teaching staffs and researchers, referred to as planning scholars in this research.

A total number of 2023 planning scholars is recorded, along with the basic information of them and the research outputs. These 2023 planning scholars includes professors, associated professors, assistant professors, senior lectures, lectures, researchers, teaching assistant, etc. Besides the title they earned in schools, we also recorded the orientation of each scholars as much information as possible, in order to have a completed understanding of the planning knowledge produced by them.

In terms of the amount of planning scholars, such number varies form planning schools. For instance, Vienna, with the total number of 159 planning scholars, ranks the first place among 57 major planning schools. However, schools like Polytechnic University of Bari, and University of Nantes, etc. are less populated in planning orientation.

However, it is quite a difficult process sometimes when the disciplinary definition is blurred in some planning schools. According to the research outputs and the teaching courses, we finally defined those planning scholars one by one in those tough cases. On the other hand, cases would be different in planning scholars, where some of them belongs to more than one disciplines. As the case in the University of Antwerp, planning scholars are all have the background of different orientations, additionally, from different departments or institutes. However, such discipline of planning is quite institutionalized with strong focus on urban issues and research orientations in planning. Therefore, such scholars are included and studied, even though they are not entitled as the planning scholar in the conventional department of planning.

Figure 10 Distribution of Major Planning Scholars in Europe

(Source: Generated through ArcGIS, YE Qiming, 2015)

4.2.2 Academic Exchange across Border

Given the fact that the planning scholars distribute in different locations, the planning schools and the cities dose not set borders to limit their planning research and participations in academic activities across Europe. One planning scholar may have several cities to be as the research output recode cities.

According to Figure 11, the top 20 Planning scholars who have the most research outputs record in different cities represent the general trend of mobility of scholars in Europe. Thanks to the activation of the interaction among cities, the academic activates, as well as the planning conferences provide opportunities for planning scholars to engage themselves in different cities.

Such across border academic activities are essential to this research, as such detected traces reflect the planning knowledge exchange among cities. Besides that, it is one of the approach to reflect the influence from the planning knowledge network acting on cities.

Figure 11. Number of Cities of Research Outputs for 20 Planning Scholars

(Source: Graph Schemed by author, YE Qiming, 2015)

4.3 European Planning Research

4.3.1 The Challenges Facing Planning Schools

As Christian Lefrvre puts, the most important changes facing with the planning research not only for France but also the Europe academic arena, is the decentralization process, the integration, the development of social exclusion, the emergence of new actors, and the increasing fragmentation of public action (Fubini,A., 2004). In a word, the planning arena is facing with the issues for embracing new actors and to issues the emerging problems. Therefore, as the origin hubs for planning academics, it is also critical time for us to think about this problems.

In fact the European planning discipline has always faced with challenges since the first planning school established in Liverpool, as the discipline of civic design in University of Liverpool (University of Liverpool, 2015). Nowadays, this challenge seems more critical, since the social and economic uncertainty (Cotella, G., 2012) haunts in Europe.

On one hand, the challenges forces the planning schools to evaluate their abilities in research and teaching, while seek appropriate and strategic orientations in planning. On the other hand, the knowledge export turned into one of the important strategies, European planning is not facing with the problems generated in Europe continent, but also requested to acquire the ability to handle the issues outside of Europe.

One of the way to get itself strengthened is to absorb new disciplines from new fields targeting new planning issues (Myers,D., 1997). By turning the fringe fields as new battle fields for planning, some schools are catching the highland of those areas. For instance, the spatial computing science is getting stronger in certain schools, like University of College London (CASA, 2015). Though institutionalize these strength and resources, these schools are more specialized in those new fields. Other schools like Vienna University of Technology, University of Amsterdam, etc. the planning discipline are comprehensive, they launched reforms in several aspects to guarantee a balanced development. Case like the University of Antwerp, the planning discipline is constituted by planning scholars from different departments, with such diverted but urban issues focused institutions, the blood of the planning schools gets refreshed.

By escalating the quality in research and teaching, the ability to issues beyond territory of Europe is expected. More studies orients the global horizon comparing to the past, contributing to cities' development globally rather than only Europe cities. It is expected that the studied outside Europe is raising where we find clues to prove the expanding of European planning knowledge in the following context. It is believed that through these ways, the planning schools are strengthened.

4.3.2 Europeanize the Research Outputs

As been stressed in the findings of AESOP, the European academic planning system is quite distinct due to the regional differentiation (Fubini,A., 2004). Therefore, planning research is facing with the process of integration and transformation within Europe itself. Figure 12 shows the recorded research outputs counted by cities. As London, Vienna, Turin, Milan, Aalborg, Paris, etc. performed the most active among the recorded cities that Europe. While the rest of the cities are also well recorded in research outputs.

Moreover, such unevenness occurs also inside of the boundaries of nations. For instance, Vienna as the capital of Austria, is the primary city with the significant research outputs than the cities within the territory of Austria. Such gap between Vienna and other cities is huge. Same situation also happens in the case of Denmark. Comparing to that, the agglomerations of planning schools in United Kingdom, Belgium Netherlands joint regions, West Germany, and Italy seems more balanced. However, in areas like the central France and Spain, planning research outputs are relatively weak, according to the recorded data.

This figure on one hand, indirectly reflects the planning schools distribution across Europe. On the other hand, it shows how planning research and education resources distribute geographically.
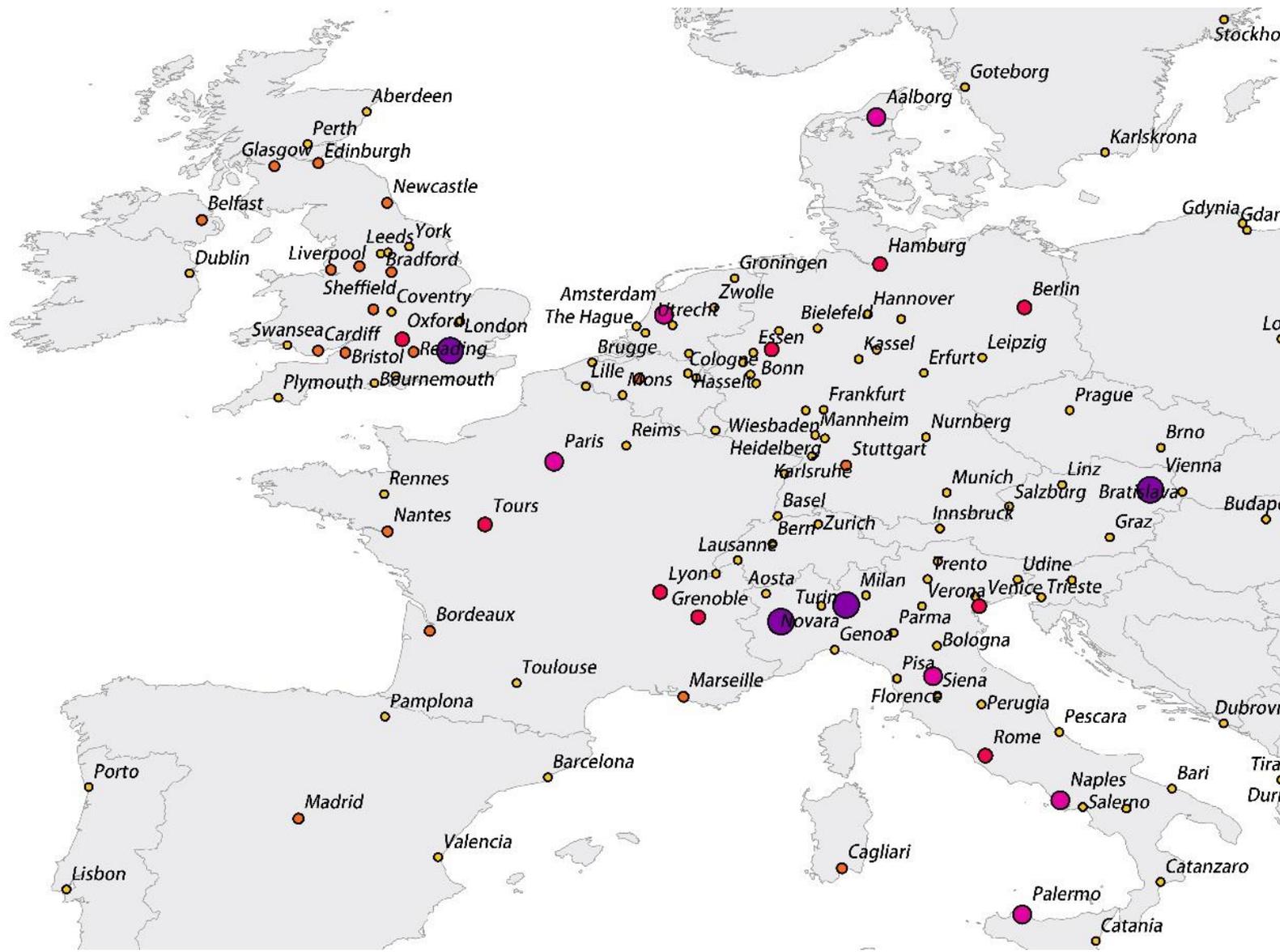
Figure 12 Distribution of Planning Research Outputs in Europe

(Source: Generated through ArcGIS, YE Qiming, 2015)

4.3.2 Research Outputs Targeting Global Wide

In fact the influence of European planning research has already expanded globally. As shown in Figure 13 and Figure 14 (a), (b), (c), even though the Europe are the most significant regions that maintains a relatively large amount in research outputs. The rest parts of the world also witness and experience such influence expansion.

Four prominent regions around the globe are highlighted in the figure. As the east coast of United State of America, are highly associated with the activities of European planning research. The increase is seen in major cities of this region, such as New York, Boston, and little inner cities like Chicago, Washington, DC, etc. However, the rest part of the United State of America

also performed well in output the European planning knowledge. Same increase also occurs in Middle America, as the Mexico City to be an example.

Besides the North America, the South America are also sees a fast growth in output the planning knowledge of Europe. Similarly to the case in the United States, the North and South part of America have a long tradition and connection with European countries, the European planning scholars' rise in mobility in those places is reasonable.

The Third places that sees the significant growth in European planning knowledge output is Australia. With a record close to New York, Sydney and the coast cities of Australia contribute to the expansion of European planning knowledge in great sale. The major form of these research outputs is conference proceedings, of which is quite understandable, as the cities are suitable for conference and naturally, they became the destination of research outputs of Europe.

The last but not the least is form East Asia region. As the generally increasing exchange programs, and different types of study tours, conferences, etc. East Asia region are more important in European planning knowledge outputs. On the other hand, Asian cities are hotspot for urban studies, which becomes another attraction for researches to commute to. Therefore, cities like Shanghai, Beijing, Tokyo, Seoul, etc are now the port cities for research output of European knowledge in Asia.
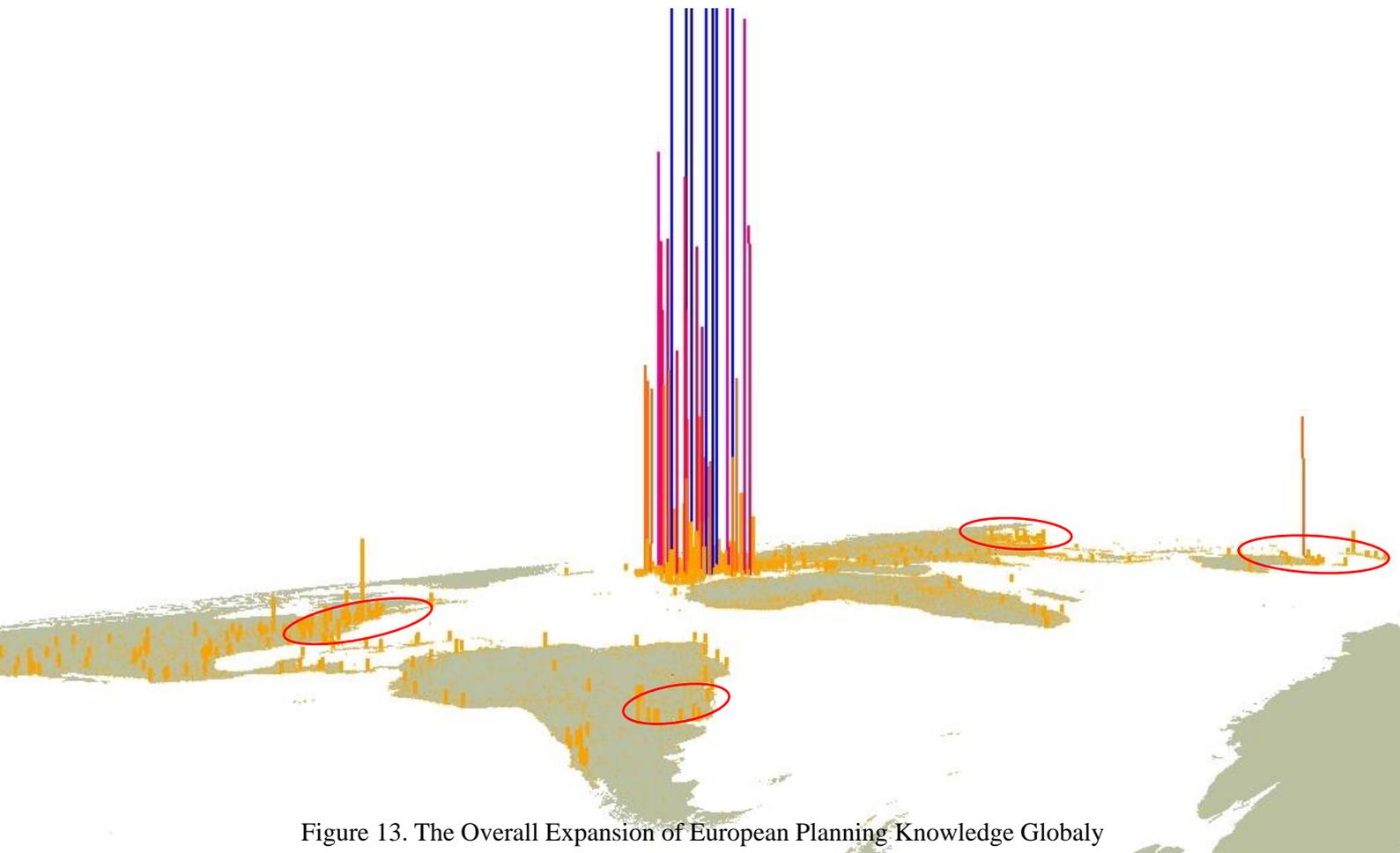
Figure 13. The Overall Expansion of European Planning Knowledge Globaly

(Source: Generated through ArcScene, YE Qiming, 2015)
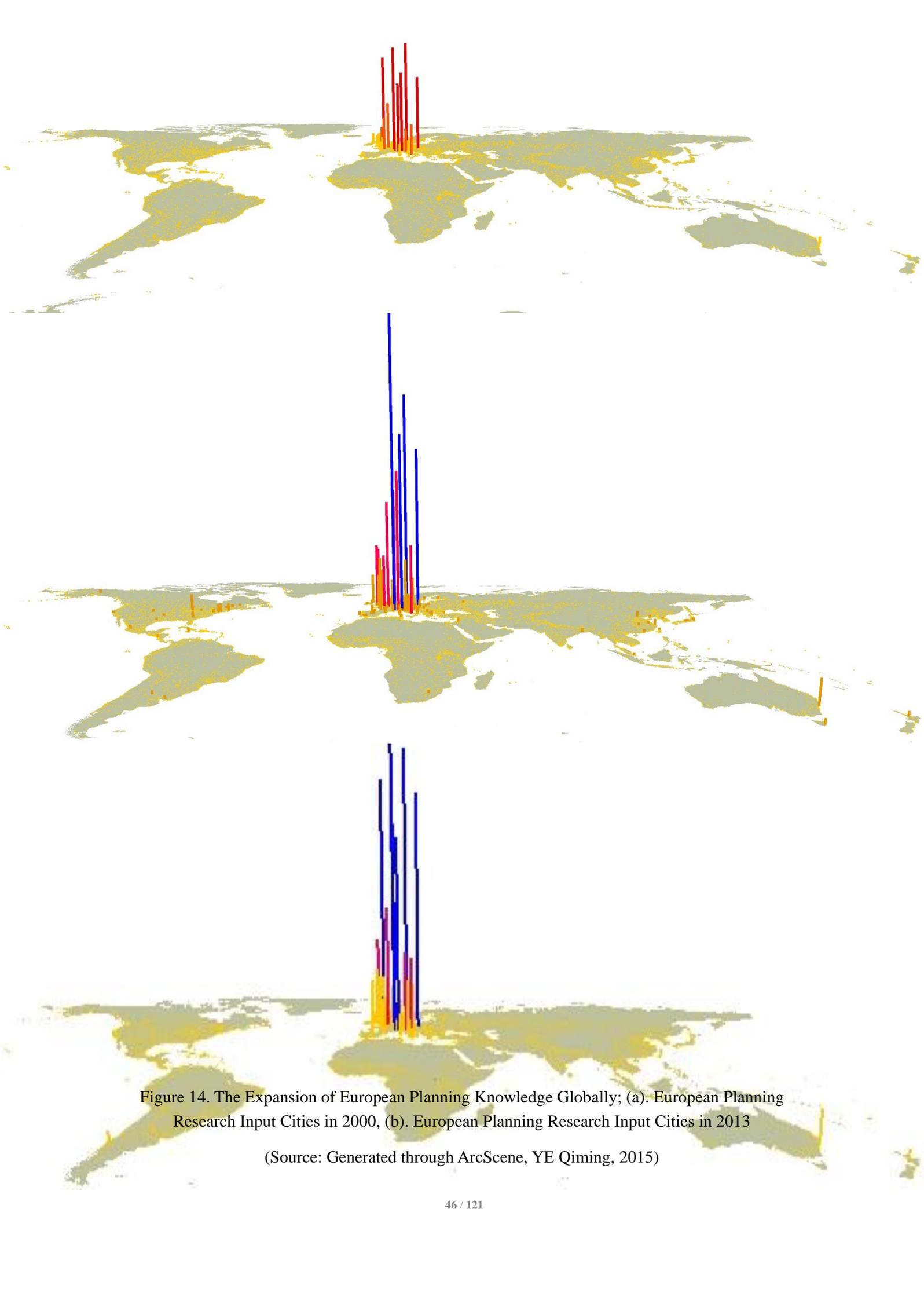
Figure 14. The Expansion of European Planning Knowledge Globally; (a). European Planning
Research Input Cities in 2000, (b). European Planning Research Input Cities in 2013

(Source: Generated through ArcScene, YE Qiming, 2015)

4.4 Chapter Summary

In this chapter, the research mainly focuses on the fundamental information that is related to planning knowledge network and the influenced cities in Europe. Planning schools, planning scholars, and the planning research outputs are the three major discussed issues.

Considering the planning schools are different in constitutions, the disciplinary or institutional organization, AESOP are tested and convinced to be the most important resources to rely on. As 57 planning schools shows the significance in planning discipline and the complicity in the required data, the research pay efforts on such 57 schools out of the total registered AESOP member schools in Europe. And such 57 planning schools show the enough value and importance in European planning education and research.

For the planning scholars, as entitled by different planning schools, their geographical agglomeration results in the differentiation in schools' size. However, this does not become the limitations for planning scholars to gain the mobility across Europe. The analysis shows that the European planning scholars performs well in output the research in different cities.

In terms of the planning research, even though facing with the challenges to conquer, the planning exchange among schools and scholars are still active. To correspond a more connected and networked European planning academic field, the research outputs of European planning knowledge network sees the expansion in some cities which used to be not that active.

Same positive signs also showed in perspective of the globe. Four prominent rising regions, the east coast region of United State of America, the South America, the Australia, and the East Asia region are significant in output the European planning knowledge network. These regions emerging or continuously export the value of European planning, contribute directly to the domestic development and the whole world as well.

Chapter 5 Planning Knowledge Network and Communities

In responding to the assumption that the network is the possible form of producing, storing and delivering planning knowledge, this Chapter aims to find reliable evidences that prove such hypothesis's authenticity. Since only with the basic understanding of planning knowledge, could we gain further and profound recognition of the planning field in Europe as well as its influence on physical world.

The first task is to figure out a reasonable way which could realize the networking process for the planning knowledge. In this phase, both principles are discussed, as how planning fields self organizes the research activities conventionally, and how to model these activities to get the invisible network reproduced. Certain open source software and applications from internet are selected to assist our research.

Visualization is the priority task since the data are collected, and well managed. The visual work would have a direct impression, along with apparent and implied features to unveil.

Afterwards, the research try to apply those indicators listed in research design phase in Chapter 3 to measure the network. How the integral planning knowledge network performs, and what is the features are those planning scholars manifested.

Right after the visualization and analysis phase, understandings of the planning knowledge network in Europe are evident to us, and the assumption is proved to be truth. Based on this visual works and analytical findings, the research intend to figure out the constitution of such network.

Planning Community plays an important role between individual scholars and the integral planning knowledge network. No matter intentionally or unintentionally, one planning scholars are possibly conducting their research within certain clusters, as scholars gathered in this certain range to share, cooperate academically. Such planning communities are optically expected from this research.

As the second essential issues in this chapter, we focus on three questions. The first is which those planning communities are in Europe, what the typical planning community features are, and what the principles of organizing such planning communities are. In this way, planning knowledge network could be understood in further attempts.

To stress, as for process of study and visualizing the planning knowledge network, as well as planning communities, the 80988 * 20 sized data basis is crucial. It provides us the opportunity to visualize and measure the entities in quantified approaches. And such quantitative way of research is what we insist in the process. However, it doesn't mean the empirical resources is useless, on the contrary, this research values such empirical studies, practical recognitions as the bases for structuring the research, modelling the subjects. In a word, in this chapter, the visual work of planning knowledge network, the planning community and relevant statistic findings are the solid support to some empirical recognitions, and the integral assumptive mechanism in planning field of Europe.

5.1 Planning Knowledge Network in Europe

Generally, planning scholars use academic languages to manifest their values, academic advocates and knowledge, Europe is not exceptional. Hereafter, two questions are asked. What is the possible connections among scholars, and is that kind of relationship could be used to represent the connection of scholars, and establish the entire European planning knowledge network? Secondly, how such academic languages been figured, in other words, what are the forms of those academic languages as the key to realize the network? Such two questions are essential to be answered in the process.

Primarily, what is the possible and essential connections among planning scholars? As Cox put, academic cooperation is the discipline in either arenas (Cox,R., 1979). If we look into the ecosystem of planning research field, the research outputs would definitely stand out which evidences such relationship. These outputs represents the value and attitude that a planning scholar stands, as well as for scholar groups in cooperation. Totally, 69221 bilateral cooperation are established among are detected in the data basis, comparing to the number of 17729 involved scholars, it manifests each scholar holds at least 3.9 times of cooperation in doing the research with different scholars in the network. Moreover, the data basis shows 54289 research outputs out of 80988 are produced cooperatively by at least two scholars, counting 69% of the total research outputs. In fact, if considering some flaws of the incompleteness of acquired data, such proportion would be slightly higher than this one. Such figure strongly implies the dynamic and cooperative habitat in the planning academic field.

Therefore, the research tried to adopt the way of viewing such cooperative phenomena as the domain features of the planning knowledge network. Furthermore, the research stared to establish the network through those cooperative connection. On one hand, it is regarded a practical way of conduction research among scholars in planning field, on the other hand, it is comparatively understandable and quantifiable way of networking the planning knowledge in perspective of the research outputs.

How such academic research been figured in recognizable ways? According to the data basis, the findings show several recognizable types of shaping the planning knowledge. Journal articles, editorials, books, chapters in books, conference proceedings, working papers, reports, thesis, software, etc. Majorly, the first 8 types occupies the most share. Moreover, one certain form always contains similar categories of recorded information, this provides great opportunities for us to quantify them.

In general, from the conventional understanding point view of planning academic field, the cooperation is relatively a principal way of doing research, which is been authenticated through our research. And the certain forms of research outputs provides the access for us to measure such cooperation quantitatively.

With such two questions been answered, clues for us are much clearer: to establish the model for quantification the planning knowledge network, to visualize the network and to use indicators to find out the features and constitutions inside the network. The following paragraphs in this chapter are dealing with these three tasks facing us.

5.1.1 Conceptual Model

In order to visualize and quantitatively analyse the planning knowledge network of Europe, the first task is to find appropriate concept models in corresponding to the principal ways of conducting research in planning academic area.

The conceptual model regards each individual planning scholars as the essential constitution in the integral model. They positioned with different locations and are equally treated in the model. Afterwards, connection, which are built among scholars, are established to represent the research outputs, as recorded in the data basis.

To set up the rules and also organize the algorithms. Figure 15 displays the general idea of how we interpreter the empirical recognition to models and the scheme for research use as well. The conceptual model for planning knowledge network in Europe, illustrates the key items.

1) Scholars (as nodes): Inside the model, each node represents a single scholar. They are independent in the model, with the equal state in the primary stage. As connection differs, scholars are expected to develop into diverted capacities or roles in the integral planning knowledge network.

2) Cooperation (as links): Each link represents the cooperative relationship according to one journal article, one conference proceeding, one book, one report, etc. The cooperative relationship has no direction. Therefore the undirected way of algorithms are chosen. As each link represents a single cooperative activity, the model adopt multiple lines if there are more than one research outputs between either two certain scholars. For example, Scholar 1 and Scholar 2 have 3 cooperative activities, while Scholar 3 and Scholar 4 have 2. Scholar 2 gains totally 9 degrees of cooperation, while scholar 6 just got 1.

Furthermore, this research does not exclude the possibility of the uneven development of this model for further research in later studies. This include the planning communities and groups which are the issues derived from this model, and existing in the real planning academic arena. Therefore, it is also expected that the planning communities and groups would perform apparently while running this model.

3) Planning Communities (as clusters): Planning communities represents the agglomeration of scholars with common value, closeness in research interests and cooperative relationships. Different colours, position displays such clustered results, according to the model. Under the help of the open source software. As the calculation for these planning communities shown in the following parts, the planning community is tested to be one of the significant phenomena in the planning knowledge network.

4) Planning Groups (as core and stable constitutions in network and communities): As the research goes deep into the planning communities, the myth of planning communities

pointed out a key question. What is the organization of a planning community, moreover, what is the most stable and core part inside the planning community, as well as the planning knowledge network. Correspondingly, the term, planning groups, is used to represent such stable and core part in the planning communities and the network. Detailed study are displayed in the following paragraphs.
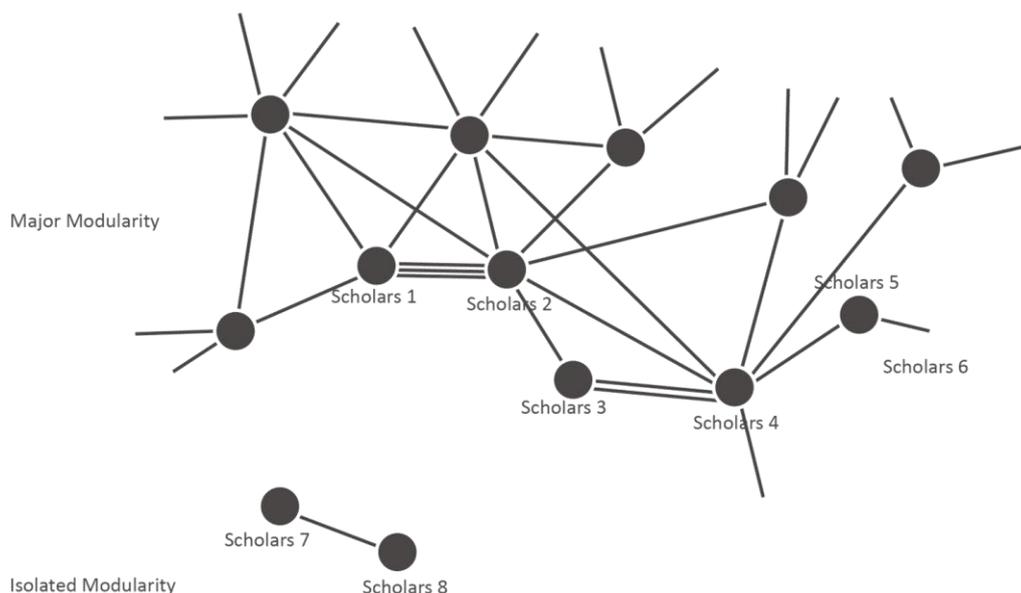
Figure 15. Conceptual Model for Planning Knowledge Network

(Source: Schemed by author, YE Qiming, 2015)

5.1.2 Simulation the Process of Networking

Counting on the basic understanding knowledge and premise work for modelling the planning knowledge network, the simulation process of networking is essential for recognition. Therefore, we use three scenarios phases to simulate how such connection been established, how the planning groups been formed, moreover, how the planning community came into been.

From individual scholars to cooperative network, the force that link them together are the research outputs cooperation. In other words, the process of networking could be described as the process of the planning scholars gaining academic cooperation among each other. Figure 16 simulates such three important phases.

1) Phase 1: Building Connections

Scholars positioned in the network randomly, with no connection with others at the primary stage. Afterwards, since as long as he/she has one or more research outputs been recorded as the relationship of cooperation, connection is built between such two scholars. Contribute to the number of connections, such differences would reflect on planning scholars in return, the

more cooperation, bigger in sizes. As the size of a scholar varies, according to the cooperative degree they collect, the power they enforced on the connections would be different. To explicit, the process of gaining cooperation from one scholars would influence on the connection to others. Therefore, the indicator of weighted degree would be used to reflect a more reasonable quantity, as well as quality of a scholars' connection state.

2) Phase 2: Forming Stable Planning Groups

As the research outputs cooperation accumulates, it is easy to identify small sized groups, right after the building connection phase. They are inter connected with strong ties between each two scholars. Generally, a planning group is consist of three to ten scholars. Within these groups, the possibility of bilateral or multilateral cooperation among scholars are frequently high. Conventionally, these scholars share same research interests and close in research orientations. In the following text, the research quantitatively examines the appropriate and stable formation of a planning group in general.

3) Phase 3: Defining Planning Communities

Based on the planning groups, new connection that established from outside of the groups would attract additional scholars to form a much larger groups, which we would like to use the planning community to represent. Planning community is consist of the planning groups, along with non-grouped scholars. Such structuralized form would also be tested later. If we regard the planning groups as the core value, the image or representative figures, then, the planning communities show how this planning research in certain field expand its influence in the academic arena of planning. According to the performance of the planning communities, more extensive understanding for European urban planning disciplines would obtained.
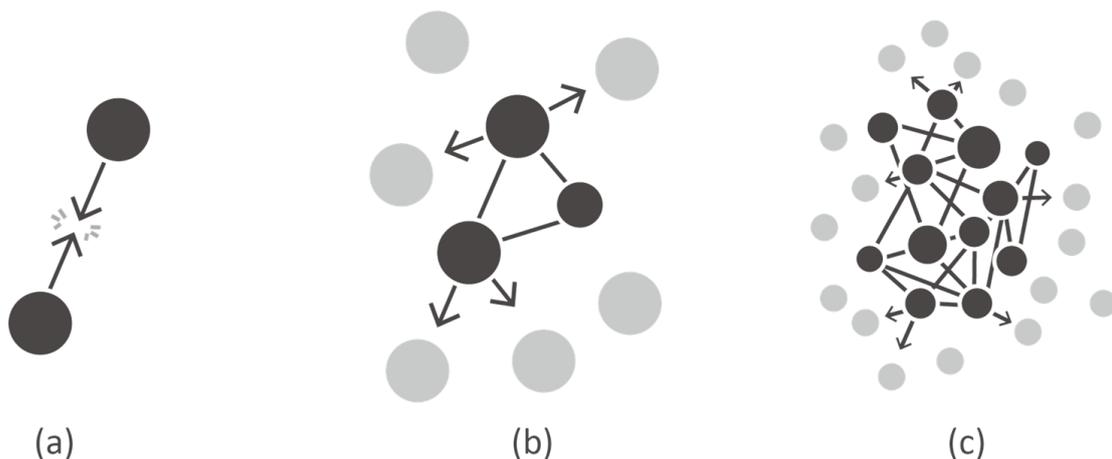

Figure 16 Process of Networking among Scholars: (a). Building Connections, (b). Forming Stable Planning Groups, (c). Defining Planning Communities

(Source: Graph Schemed by author, YE Qiming, 2015)

5.1.3 Visualization of Planning Knowledge Networking in Europe

The visual work for planning knowledge network in Europe is the consequence of the previous modelling and simulation process. With the help of Gephi as a professional social networking software (Cherven,K., 2015), we achieved the final visualizing work shown as in Figure 17

This visual work displays the overview of the planning knowledge network in Europe, constituted by planning scholars and their research outputs in 57 major European planning schools. 17729 relevant planning scholars are detected within the network, with 69211 bilateral connections are recorded. According to the network, the position, color and size should be emphasized.

1) Position

As been introduced in Chapter 3, the distance among scholars obeys the rule of Hooke's law (Ugural,A.C., 2003) and Coulomb's law (Coulomb,C.A., 1785), in physics. Therefore, the position of a scholar is determined by the research cooperation they get with nearby scholars.

It should be noted that such cooperation degree is weighted according to the connected scholar's connection state. The higher weighted cooperation two scholars earn, it would be more possibilities for them to position closely to each other. However, besides the practical weighted degrees of connections would affect scholars, the alien scholars nearby would also act the push forces on scholars who positioned close. Comprehensively, the final layout shows the balanced position for all scholars.

2) Color

The diverted colors implies the distinguish communities, which is calculated and categories in principles and algorithms of modularity also introduced in research design in Chapter 3. Unit color represents unit planning communities.

The type of color is generated automatically, no matter how it generated so many colors meets more than eight hundreds of request unique colors' needs, as well as the needs for distinguish the communities from nearby scholars, each planning community is unique and recognizable in one type of color. In fact, this is just for the visually distinguish. For each planning community, a code is labeled, which marked the community and provide access to find certain community easily through dataset, rather than by looking.

3) Size

The sizes of the planning scholars diverted from one and another. The size reflect the weighted degree one has in the network. The total weighted degree is the derived and recalculated consequence from the value of degree, of which is the net number of time on research outputs cooperation. Therefore, the higher total weighted degree one scholar earns, the bigger the size

would reflect.

What's important is that the weighted degree reflect not only the quantitative collection of research outputs cooperation, but also the quality of such cooperation. As such cooperation is established with higher degreed scholars, he or she would gain higher weighted degrees than those with the same amount of degree but connected with lower degreed scholars.

It is more reasonable to adopt the indicator of weighted degree to establish the following analysis rather than the indicator of degree.
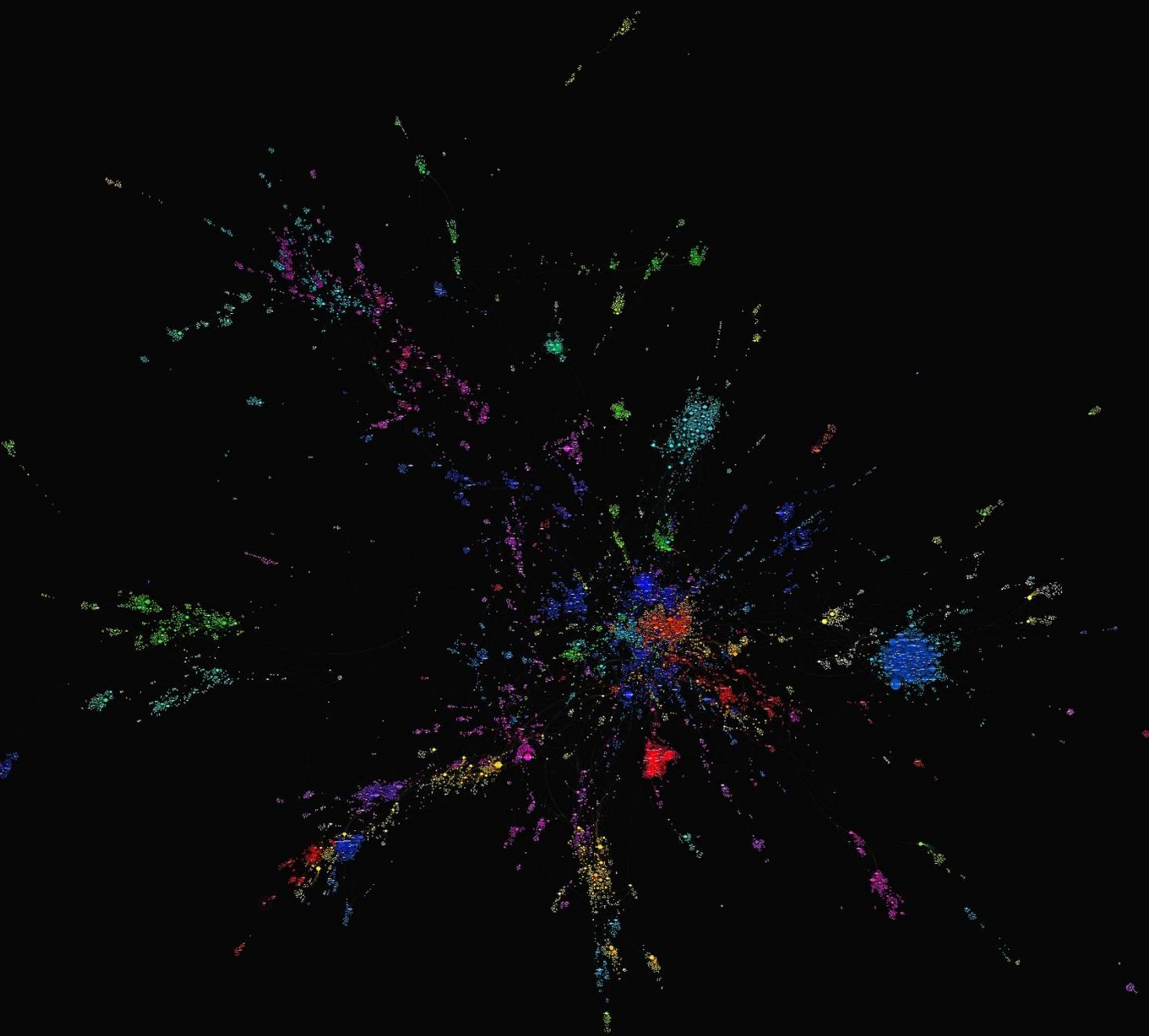
Figure 17. Planning Knowledge Network of Major European Planning Schools

(Source: Generated through Gephi, YE Qiming, 2015)

5.2 Performance for Key Indicators of the Network

5.2.1 Tolerance of the Network

The primary feature that such visualized planning knowledge network displays is the tolerance of the network. As the number of detected planning scholars from 57 European planning schools is 2023. However, through the records of research outputs, 17729 planning scholars or planning related scholars are presented eventually. On one hand, this phenomena shows the tolerance of the network the research unveils. On the other hand, it provides opportunities for further extension of the network.

It is expected to have a global wide planning knowledge network, with major planning scholars contribute knowledge and build up academic cooperation, thanks to the openness and tolerance of the network.

As the planning discipline is facing transformation, urban planning needs not only the profound understanding of itself, but also urgently requires the involvement of other disciplines. From this European planning knowledge network, it is glad to find out the involvement of scholars with other knowledge background.

5.2.2 High Involvement of scholars

The conclusion of high involvement of scholars in the network is drawn from indicators of Connected Components.

The degree of involvement in the whole network could be measured according to the indicator of connected components. The results show the 16852 scholars are highly involved in the network, which reached almost 95% of the integral network. While only 114 nodes are less involved with weakly connected. Such highly involvement implies the integration of the network (Robert Tarjan', 1972), on the other hand, it respond to the assumption that the European planning knowledge network's existence.

5.2.3 Tendency of Clustering

The conclusion for tendency of clustering is drawn from the indicators of average degree, average weighted degree, clustering coefficient, and completed triangle, see Figure 18 (a).

The tendency to form a cluster varies from scholars. Among the relationships, 16669 triangles are created, which implies the tendency to join a cluster for each certain scholar is 0.816, which is more than two thirds of total completion, according to the algorithms (Matthieu Latapy, 2008).

In general, we could draw a conclusion that, a scholar is relatively close to a certain inside the cluster. On the other hand, it means scholars inside the network have less chance to fight alone.

The average degree is 1.98, which means the average research cooperation is 1.98 times for the

integral planning scholars. While the average weighted degree is 4.056, which is over 2 times the average degree, indicating that the uneven distribution and agglomeration among planning scholars. Furthermore, this implies the privileges of being in a community, which would be proved in the following context. It evidences the existing of planning communities. Therefore, clustering is the inevitable phenomena in planning knowledge network in Europe.

5.2.4 Closeness of Scholars

The closeness relationship among scholars is drawn from the indicators of the average path length, Shortest Path, and the indicator of Closeness Centrality.

Whether the planning scholars are connected effectively to others in the network is another important question concerned by the research. According to the findings, the average steps for one scholar to reach another is 8.55 distance units. Comparing to the total diameter for the network of 27 distance units, it means even though two scholars are positioned in either side of the network, it wouldn't take them 27 steps to build connections to each other, with only 8.55 steps, they could reach to each other.

5.2.5 Unevenly Developed Network

The conclusion of uneven developed network is drawn from the distribution of closeness centrality distribution, eccentricity distribution, and eigenvector centrality distribution as Figure 18 (b), (c), (d) shows. The distribution of the average weighted degree is dispayed in Figure 18 (e).

The closeness centrality distribution shows evidently two major peaks, with the range from 1 to 2, and 7 to 10. It is believed to have major differences between these two types. The first type majorly focuses on those small communities, with planning scholars less than 5.

While the closeness centrality ranging from 7 to 10 targeted those large communities, with large number of scholars share relatively high and direct inter-scholars connection among each other. Such figures unveil the phenomena of the unevenly developed network. In both eccentricity distribution and eigenvector centrality distribution, the similar phenomena of double peak also evidence the uneven developed situation.

For the average weighted degree distribution, the biggest one and the smallest one displays too much differences. The critical point of weighted degree appears around 20, which means the large amount of scholars holds the degree below 20, with the highest degree of over 800.

Form the point view of this research, we value this unevenness in development as natural phenomena. The original reason for this could be due to the formation of planning community. As the planning community would gather the scholars together, and one of the main incentive for such process is the strong attraction from certain figures.

Those figures take the role of building cooperative relation with the new scholars, to sustain the

growth of the community. Therefore, it is inevitable for those figures to obtain higher degrees. Afterwards, as the community developed, it not only witness the growth of population, but also the raise in weighted degrees for those scholars, correspondingly, such rise would also reflected on those figures, as the similarly rises occur in individual weighted degree.

To conclude, such uneven phenomena is the consequence of the growth and development of planning communities. Few groups could have a balanced situation, while the majority groups are still on the way of development, which are always led by essential planning figures.

5.2.6 Community as the Principal Pattern

According to the previous conclusion, such unevenness is the results of development of planning communities. Therefore, we launched the calculation in modularity, to see how European planning knowledge network performed in establishing communities. Detailed modularity distribution results could be seen in Figure 18 (f)

Totally, 888 planning communities are obtained from the calculation results, with the integral modularity of 0.899. Considering the modularity has the default range between [-0.5, 1), 0.899 is significantly obvious in modularity. Technically, 75 planning communities contains more than 25 scholars, while 7 communities have the number over 500 scholars.

Hence, as the principal pattern of the whole network, community is quite important. For that reason, the following context would spare efforts on those planning communities in Europe from both the general feature to the typical cases.
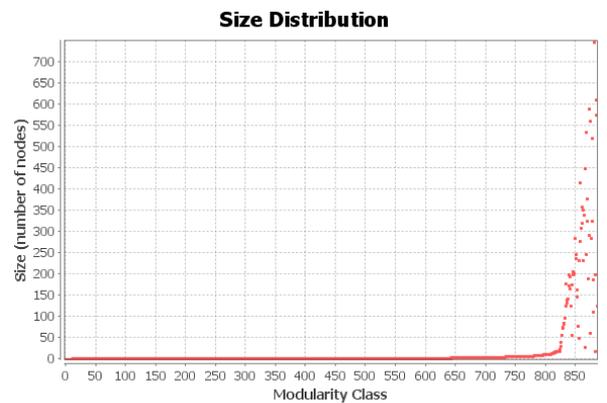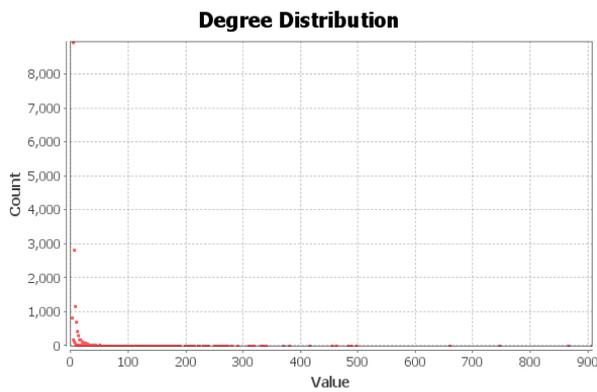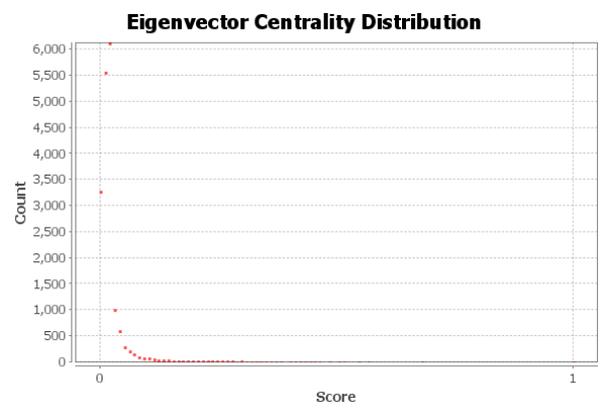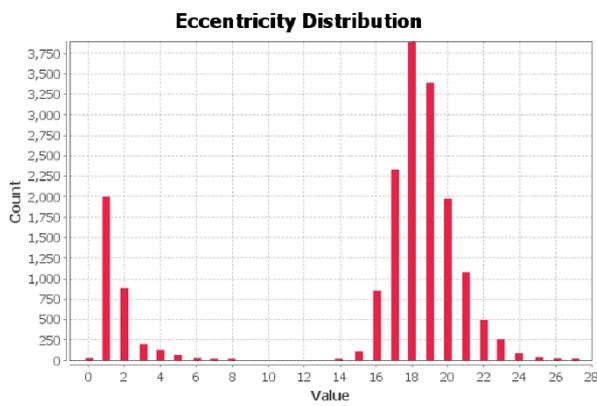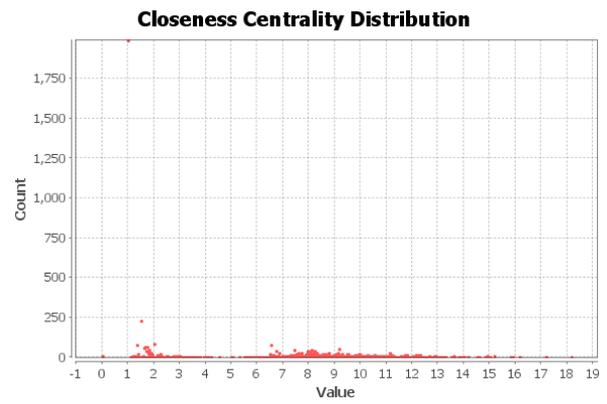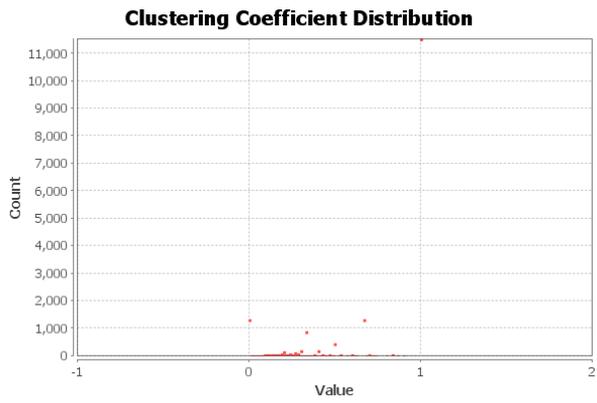
Figure 18 Performance of Indicators: (a).Clustering Coefficient Distribution, (b).Closeness Centrality Distribution, (c). Eccentricity Distribution, (d). Eigenvector Centrality Distribution, (e). Average Weighted Degree Distribution (f). Modularity-Size Distribution

(Source: Schemed by author, YE Qiming, 2015)

5.3 Planning Communities: Features and Cases

Totally 888 communities are defined in the European planning knowledge network. According to the results displayed in indicator of modularity. Demographically, the size of planning communities varies from 2 scholars to 747 scholars. In perspective of total weighted degree, it varies 2 to 10541, the average weighted degree varies from 1 to 53.

In order to gain profound knowledge of the planning communities, since the planning communities are the major domain patterns in the planning academic field, it forms the essential rule for the integral planning network in Europe. Therefore, the following research would get its focus on the planning communities, especially on the manifested performance in several aspects. Besides, major and typical communities would be studied, especially from the constitution, the organization and the common studied issues.

5.3.1 Features for European Planning Communities

1) Big and Small Communities Differ

In overall 888 communities, the number of communities that has less than 100 scholars is 840, which accounts for 95% of the total communities, and the total weighted degree for this communities are 3992 degrees, as 23% of total weighted degrees of the planning knowledge network. On the contrary, for the biggest 48 communities, with only nineteenth of the number for small communities, occupies 77% of the total weighted degrees, which is over 2.5 times of that than the small ones. It is expected, since the big communities contains large number of scholars.

From the point view of this research, it is really fascinating to know how these scholars been organized in those big communities.

2) Principal Communities and Various Constitutions

In terms of the constitution of those planning communities in the network, it is easy for one to define those major communities at the first glimpse. For those communities, it is possible to be figured out one or several dominant figures. However, such variation in constitutions lead to the different typologies as well as the ways to organize the academic cooperation.

3) Geographical Closeness

Another inevitable phenomena for those communities are the high relevancy in academic cooperation and geographical closeness. This phenomena takes place universally in European planning knowledge network, not only among principal communities, but with those small communities as well. It is understandable, as the language, culture, information, education system are similar and convenience in transportation, the academic cooperation seems acquirable. On the other hand, those physical or born with conditions would be the obstacles

for cooperation, in terms of the planning communities that has less connection, since most of the scholars adopt intentionally to cooperate with ones nearby.

Conversely, especially for those figures, a few cases manifest the features of cooperation that is trans regional, but for the majorities in those planning communities, nearby strategy is the probable option.

According to the facts, the planning communities are like to agglomerate especially in regions such as the London, Paris, Grenoble, North Italy, West Germany, and the joint region of Belgium Netherland, etc. It is mainly due to the richness in planning schools or institutes in these regions. On the other hand, the language, culture and research patterns are like to play such a stronger role, therefore, such geographical closeness lead to cohesiveness regionally in planning communities.

5.3.2 Top 20 Planning Communities in Europe

From the perspective of real samples of those planning communities, the research spare effort on who are they, how do they organize and what is the unique feature of those planning communities. However, it is impossible to study all 888 communities with the same approach, considering the time and technique limitations. Therefore, we focused on the top 20 planning communities, which includes 48.39% of all planning scholars in the network, and contributed 58.1% in total weighted degrees of the network. According to the findings presented in Table 2, some features are discussed in the following content.

1) Mixed Constitution

As a significant phenomenon, such top 20 planning communities are not constituted by a single planning school, though different in the extent of such mix. With 8 of the communities display a significant mixed feature. While for the rest 12 communities, the mix extent is not that high, the constitution includes at least two schools. Even one school would be split and involved into two or more different communities. Ascribe to such power to split planning schools and reunite parts into new communities, planning discipline is expected to develop in diverted dimensions.

2) Significant Leading Figures

It is easy to find out the leading figures in such top 20 planning communities. At least one or several figures that significantly present in each community. For those figures, they always play as the pillar role of the whole community. They connect most of the planning scholars, and have strong connection with other possible figures both in and out of certain communities. Therefore, such figure's contribution is inevitable, with the ability and efforts to construct the structure of the communities, and principally responsible for building up connection with other communities. Moreover, according to Milton J, Friesen's findings, the research tested those leading figures, as most of them are in the centre stage of being as the scientis' role or the

synthesists' role, and the latter one is superior to the first in numbers. (Friesen, M.J., 2013)

3) Comprehensive Research Orientation

In terms of the responsive issues, say the research orientations, such 20 communities are essential in leading the development in European planning academic field. From strategic planning, urban design, ecological urbanism, spatial computing, social studied, etc., are all included. Moreover, the communities inside are quite comprehensive, with scholars from almost all fields. It might be the reason why those communities are quite big and significant.

Table 2. The Information of Top 20 Planning Communities

Rank	Proportion of Scholar	Lead Schools	Major Figures	Community Type	Scholars' Number	Weighted Degree
1	4.21%	Technical University of Dortmund	Stefan Greiving, Dietwald Gruehn, etc.	MS[8]	747	10541
2	3.44%	TU Delft	Maurice Harteveld, Steffen Nijhuis, etc.	MS	610	4176
3	3.33%	Aalborg University	Per Christensen, Henrik Lund, etc.	MS	590	4432
4	3.24%	University of College London, University of Newcastle	Mike Batty, Nick Gallent, etc.	MI[9]	575	4758
5	3.16%	University of Leuven, University Gent, University of Antwerp	Frank Moulaert, Pieter Van den Broeck, etc.	MI	560	3788
6	3.02%	Polytechnic University of Turin	Patrizia Lombardi, Roberto Monaco, etc.	MS	535	5287
7	2.94%	University of Glasgow, Heriot Watt University, Sheffield University	Glen Bramley, Nick Bailey, etc.	MS	521	6006
8	2.54%	PACTE-Grenoble, University Joseph Fourier-Grenoble	Pascal Mao, Alain Faure, etc.	MI	450	3260
9	2.35%	HafenCity University Hamburg, Erfurt University of Applied University of Kaiserslautern	Jorg Knieling, Heidi Sinning, etc.	MI	416	2244
10	2.14%	University of Ulster	Stanley McGreal, Alastair Adair, etc.	MS	379	6640
11	2.02%	Aalborg University	Christian Nohr, Stig Enemark, etc.	MS	358	2490
12	1.99%	Polytechnic University of Milan	Alessandro Balducci, Valeria Fedeli, etc.	MS	352	2841
13	1.91%	University Joseph Fourier-Grenoble, University of Tours	Sonia Chardonnel, Elise Beck, etc.	MI	339	2591
14	1.84%	London School of Economics and Political Science	Andres Rodriguez Pose, HenryG Overman, etc.	MI	326	2949
15	1.83%	University of Liverpool	Richard Chiverrell, John Boyle, etc.	MS	325	2214
16	1.81%	Vienna University of Technology	Andreas Voigt, Jens S.Dangschat, etc.	MS	321	9316
17	1.75%	University of Antwerp	Vranken Jan, Timmerman Chris, etc.	MS	310	2490
18	1.65%	University of Amsterdam	Luca Bertolini, Thomas B Fischer, etc.	MS	292	2859
19	1.61%	University of Glasgow, Quessns, Birmingham, Cardiff	Terry Marsden, Michael Murray, etc.	MI	285	2425
20	1.61%	London School of Economics and Political Science	Susana Mourato, Giles Atkinson, etc.	MI	285	2202
Weighted Average	-	-	-	-	-	4175
Total	48.39%	-	-	-	8576	58.1%

(Source: Schemed by author, YE Qiming, 2015)

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[8] MS, Mainly Single, which means this community is mainly lead by one certain planning schools significantly

[9] MI, Mixed, which means this community is led by more than one planning schools

5.3.3 Typical Communities

In those Top 20 communities, we concluded six typical features that could well indicate the constitution, organization and the research orientation of the communities. Therefore, the research selected six typical cases to study, from the perspectives of the community structure, the relationship between planning communities and schools, and the regional cohesiveness.

In terms of the structure, the differentiation among scholars in size, roles and significances vary from planning communities in general. As in some case, the leading figure is quite significant, while the rest stayed planar. Other cases show the several equal leading figures rather than one in the communities. The extreme cases are expected to have an even and planar structure for all planning scholars in the community, which is been selected as a typical case. To understand each of these types directly, this research select Polytechnic University of Milan as the single cored case, see Figure 19. University of Liverpool is selected as the multi cored case, see Figure 20. Eventually, the case of Technical University of Dortmund is selected to present as the extreme case of planar community, see Figure 21.

One of the significant features displayed by those communities are the little influences in clustering planning scholars. In other words, the limitation of schools break down, and the research orientation domains. The outcome of such trend is manifest as the situation where those planning schools are split and reunited in several planning communities. Therefore, considering such two phases, Polytechnic University of Turin is selected as the split case, see Figure 22. While the case of the mixed community constituted by University College of London and University of Newcastle is chosen as the reunited one, see Figure 23.

Regional cohesiveness represent the integration and cooperative relations within the certain circumference a region. Antwerp, Brussels, Ghent and Leuven Cities in Belgium and Grenoble cities in France are the most typical cases among planning communities, which represents such cohesiveness within certain regions. Comparing this regional closeness phenomena with those of split and reunited communities, the regional cohesiveness doesn't necessarily requires the process of breaking down boundaries of planning schools, and re-clustering planning communities. Instead, the independence of the planning schools are stressed or at least not been separated. What is emphasized in these cases, is that the connection among planning communities are active within the same region. This research select Belgium regional collective planning communities as the case to study, see Figure 24.

In general, all of these cases share with the same principles, the mixed constitution, the leading figures, comprehensive orientation and geographical closeness, no matter how extent they are. Although the competitiveness among schools is been discussed for ages, from the point view of this research, we would like to view the power and competence of those communities as the new players in the arena. With the advance of regionalization or even globalization carried forward, there would be more connective cooperation among planning communities, along with significant agglomeration of certain communities happening at the same time.
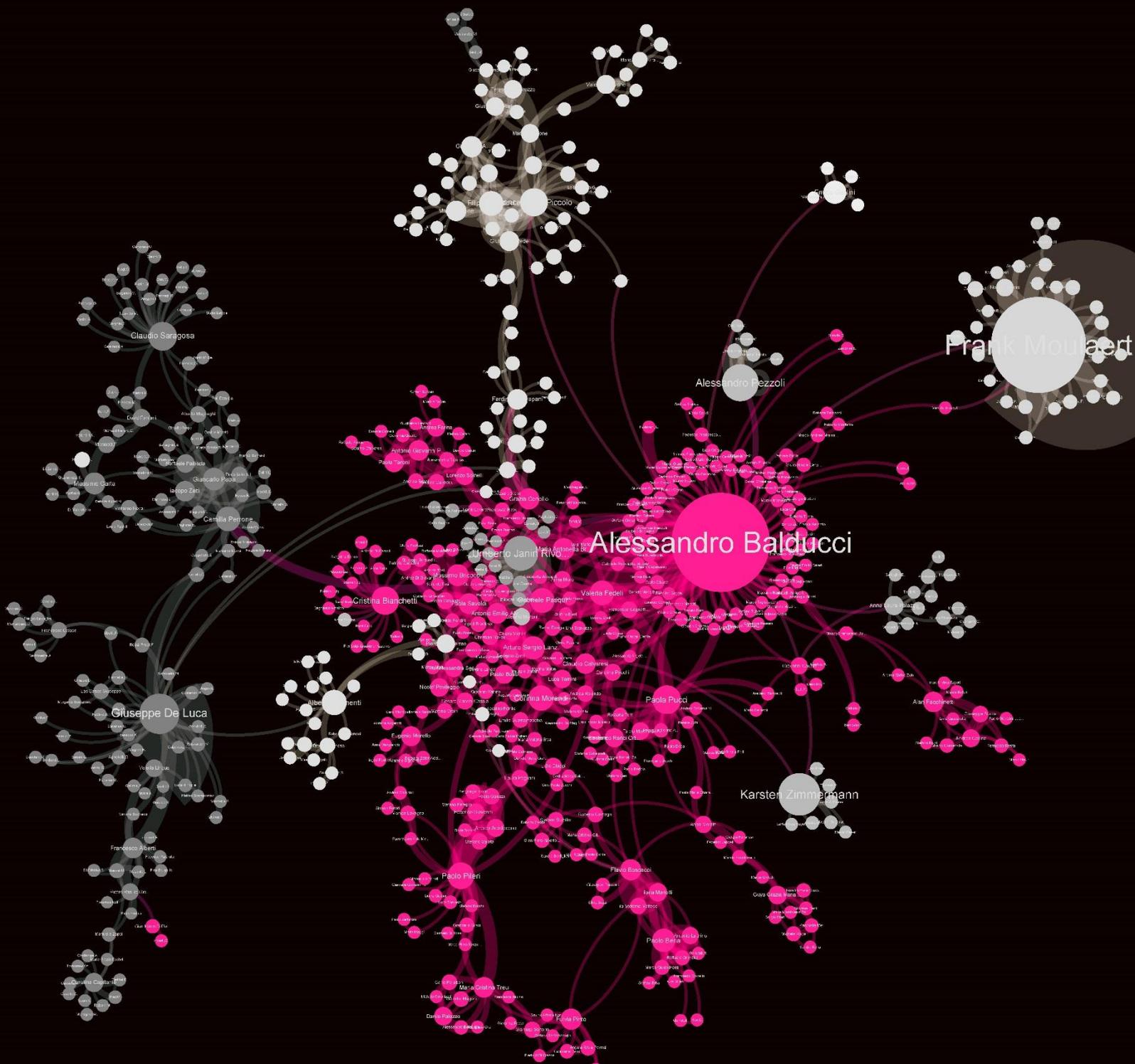
Figure 19. Typical Single Core Case: Polytechnic University of Milan

(Source: Generated through Gephi, YE Qiming, 2015)

1) Typical Single Core Case: Polytechnic University of Milan

Leading Figure:

Alessandro Balducci

Structural Figures:

Cristina Bianchetti, Paola Pucci, Flavio Boscacci, Valeria Fedeli, Eugenio Morello, Antonella Bruzzese, etc.

Relevant Scholars:

Umberto Janin Rivolin Yoccoz, Camilla Perrone, Giuseppe De Luca, Alessandro Pezzoli, etc.

Relevant Schools:

Polytechnic University of Turin, University of Florence, etc.

Type of Research Orientation:

Comprehensiveness and Cohesiveness

Summary:

The community dominated by Polytechnic University of Milan totally includes 352 planning scholars. Comparing with the detected school professional teaching staffs number of 59, it almost expanded its influence six time outside of the department or to other disciplines in the planning academic arena. In terms of the involved scholars, this community ranks the 12th place in the Top 20 planning communities in the planning knowledge network in Europe, counting by the weighted degrees.

The structure of this community is quite typical. As the leading figure, Alessandro Balducci is significant in the whole structure. Besides, some scholars has the directed connection with him, as well as some other structural figures. They together help to construct the basic framework of the planning community. These include Paola Pucci, Flavio Boscacci, etc.

Polytechnic University of Turin and University of Florence mainly play the important role of interacting with this planning community. Take the Cristina Bianchetti as an example. Due to the research cooperation with Polytechnic University of Milan is so active, she doesn't belong to the community of either Polytechnic University of Turin, but this community. It evidences the mixed constitution of scholars once again.

From the perspective of orientations in planning research. The comprehensive and cohesive feature are the principal ones that should be mentioned. As the orientation covers from Social Studies, Computing and Environment Studies, Design and Planning, Strategy and Policy, Economics, etc, scholar cooperate with each other across fields for some time. However, certain orientations performed more significant in Strategy and Policy, Sustainability and Environment, Design and Planning.
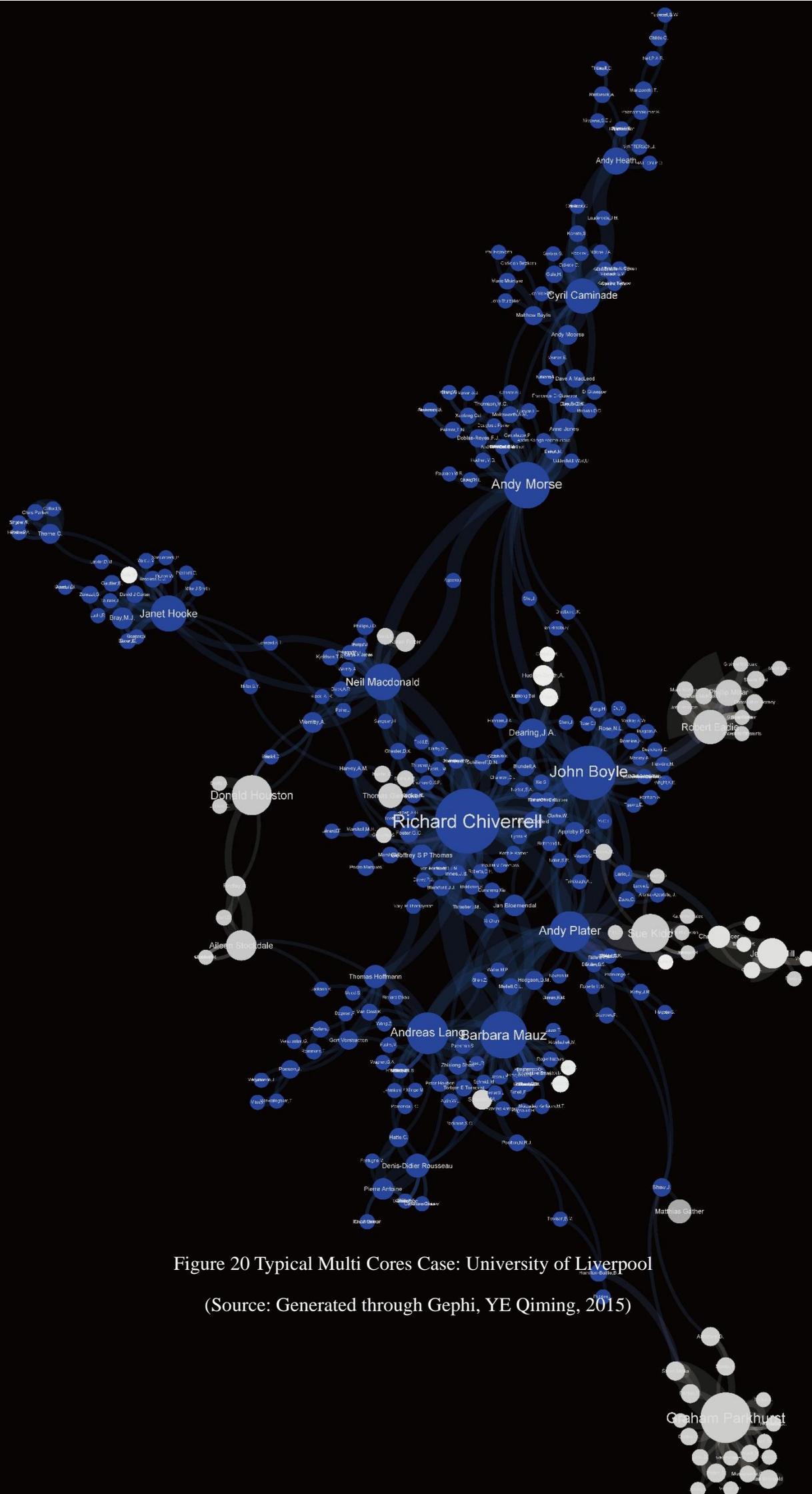
Figure 20 Typical Multi Cores Case: University of Liverpool

(Source: Generated through Gephi, YE Qiming, 2015)

2) Typical Multi Cores Case: University of Liverpool (First Part)

Leading Figure:

Richard Chiverrell, John Boyle, Andreas Lang, Barbara Mauz

Structural Figures:

Richard Chiverrell, John Boyle, Andreas Lang, Barbara Mauz, etc.

Relevant Scholars:

Graham Parkhurst, Sue Kidd, Robert Eadie, Donald Houston, etc.

Relevant Schools:

University of Liverpool (Second Part), University of Bristol, University of Ulster, etc.

Type of Research Orientation:

Technical Based Comprehensiveness

Summary:

In the case of planning community in University of Liverpool, situation varies from the previous one. 325 scholars are involved in this community, which is exact 5 times of the teaching staffs' number.

Typically in the multi cored structure, University of Liverpool is quite different from the case of Milan. The figures are also quite significant, such as Richard Chiverrell, John Boyle, Andreas Lang, Barbara Mauz, etc. They together take the responsibility of construction the network. The differentiation among those key figures is not that huge, therefore, the integral structure gives a look of multi-centred feature.

In terms of the constitution, this case shows more single school's domination. Even though the egocentric structure does not involve any planning scholars from outside of University of Liverpool, some connection are established between this community and the second communities from University of Liverpool, as figures like Sue Kidd.

Being different form the first case, as the Polytechnic University of Milan shows the comprehensiveness and cohesiveness in research orientations, this community is comprehensive but with a strong orientation of geographical base. In other words, the subject of research various from society to environment, while the background and technique perspective remains similar, as the geography domains. The power of link the different clusters together mainly relies on the cooperation from the key figures. While the rest scholars are connected to certain scholars rather than structure a solid and planar frame for the community. Meanwhile the structuralized of community is defined as the Geography Science and Environment Studies oriented one.
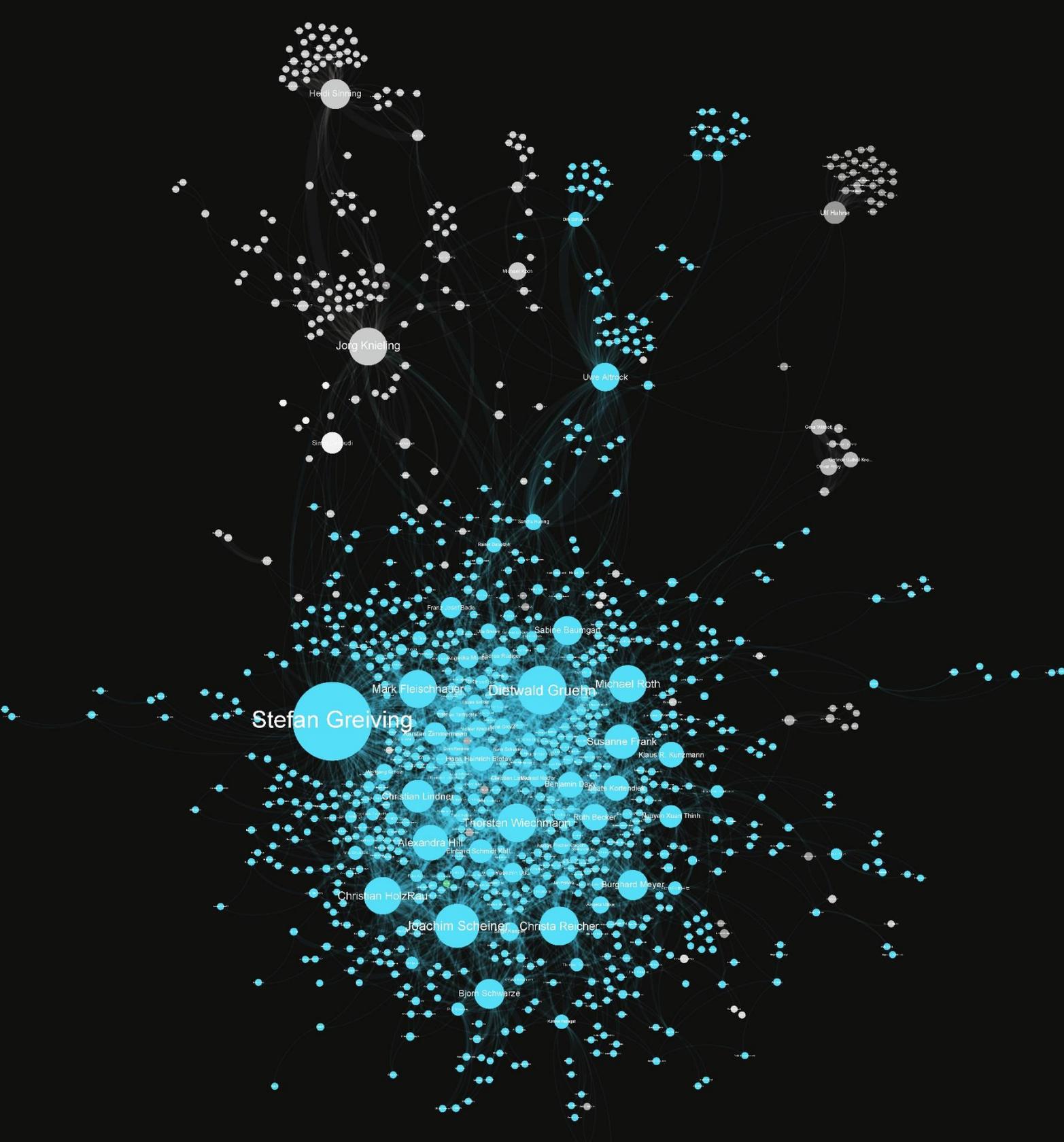
Figure 21 Typical Planar Case: Technical University of Dortmund

(Source: Generated through Gephi, YE Qiming, 2015)

3) Typical Planar Case: Technical University of Dortmund

Leading Figure:

Stefan Greiving, Diewald Gruehn, Christa Reicher, Thorsten Wiechmann, etc.

Structural Figures:

Stefan Greiving, Diewald Gruehn, Christa Reicher, Thorsten Wiechmann, etc.

Relevant Scholars:

Jorg Knieling, etc.

Relevant Schools:

University of Leipzig, University of Wesleyan, etc.

Type of Research Orientation:

Comprehensiveness and Cohesiveness

Summary:

Unlike the previous two cases with either the single centred structure, or the rarely connected among normal scholars. In the case of Technical University of Dortmund, the key figures are significant, like Stefan Greiving, Diewald Gruehn, Christa Reicher, Thorsten Wiechmann, etc. as well as the common planning scholars. Not only those key figures but also the rest of the planning scholars contribute to the framework. The performance of the community shows relatively high value in planarization and cohesiveness, which makes the network seems quite solid and unbreakable.

Stefan Greiving, as the major leading feature of the community, is slightly different in size comparing with other 42 structural planning scholars. With such a strong connection among scholars, a cohesive planning community is established.

As the major and unique feature, the planar structure of the network performed not impressive in associating with other communities. Less connection is built with scholars positioned outside of this one, since such strong community already absorbs the scholars form outside already. 705 external scholars are absorbed. For instance, Christian Lindner as the planning scholars in University of Leipzig, is involved in this community.

In terms of the research orientation, this community performs the same features like the case in Milan. Comprehensiveness and cohesiveness is the impression to conclude the wide range of planning fields covered by this community. Moreover, several major figures shows more preference and efforts in strategic planning, and the governance as well.

Figure 22 Typical Reunited Case: University of College London and University of Newcastle

(Source: Generated through Gephi, YE Qiming, 2015)

4) Typical Split Case: Polytechnic University of Turin (First Part)

Leading Figure:

Patrizia Lombardi, Ricoardo Roscellim Marta Carla Bottero, Giulio Mondini

Structural Figures:

Patrizia Lombardi, Ricoardo Roscellim Marta Carla Bottero, Giulio Mondini, etc.

Other Communities but Same Schools:

Francesca Governa, Egidio Dansero, Alfredo Mela, ect.

Relevant Scholars:

Loris Antonio Servillo, Alessandro Balducci, etc.

Relevant Schools:

Polytechnic University of Turin (Second Part), Polytechnic University of Milan, etc.

Type of Research Orientation:

Comprehensiveness and Cohesiveness

Polytechnic University of Turin is one of the special cases, which displays the phenomena of split the planning schools into different planning communities, similar phenomena also displays in the University College of London, London school of Economics and Political Science, etc. The total number of teaching staff in this community is 8, which is over half of the total number of planning teaching staffs in this university. While the total scholars involved in the community is 535.

Significant figures are quite recognizable in the community, such as Patrizia Lombardi, Ricoardo Roscellim Marta Carla Bottero, Giulio Mondini, etc. They are responsible for building up the whole community. What is interesting, is that the rest of the scholars are quite active in cooperating with the second part of Polytechnic University of Turin. In other words, this case displays a totally different phenomena as showed in the case of Liverpool, where the key figures are the essential structure of connecting other key figures. This could be one of the reasons that explains the consequence the planning school's splitting into two parts.

Form the point view of the academic orientations, besides Patrizia Lombardi as the sociologist in planning field, the rest of the structural scholars majorly focused on Environment strategies, Quantitative Studies and Urban Design. In general, it is also quite comprehensive when take the whole community into consideration. However, the difference between the community of first part and the second is not obvious, since the second part is also focused on social issues with geographical technological background. Therefore, the inter connection between theses scholars are the main reason for the splitting.
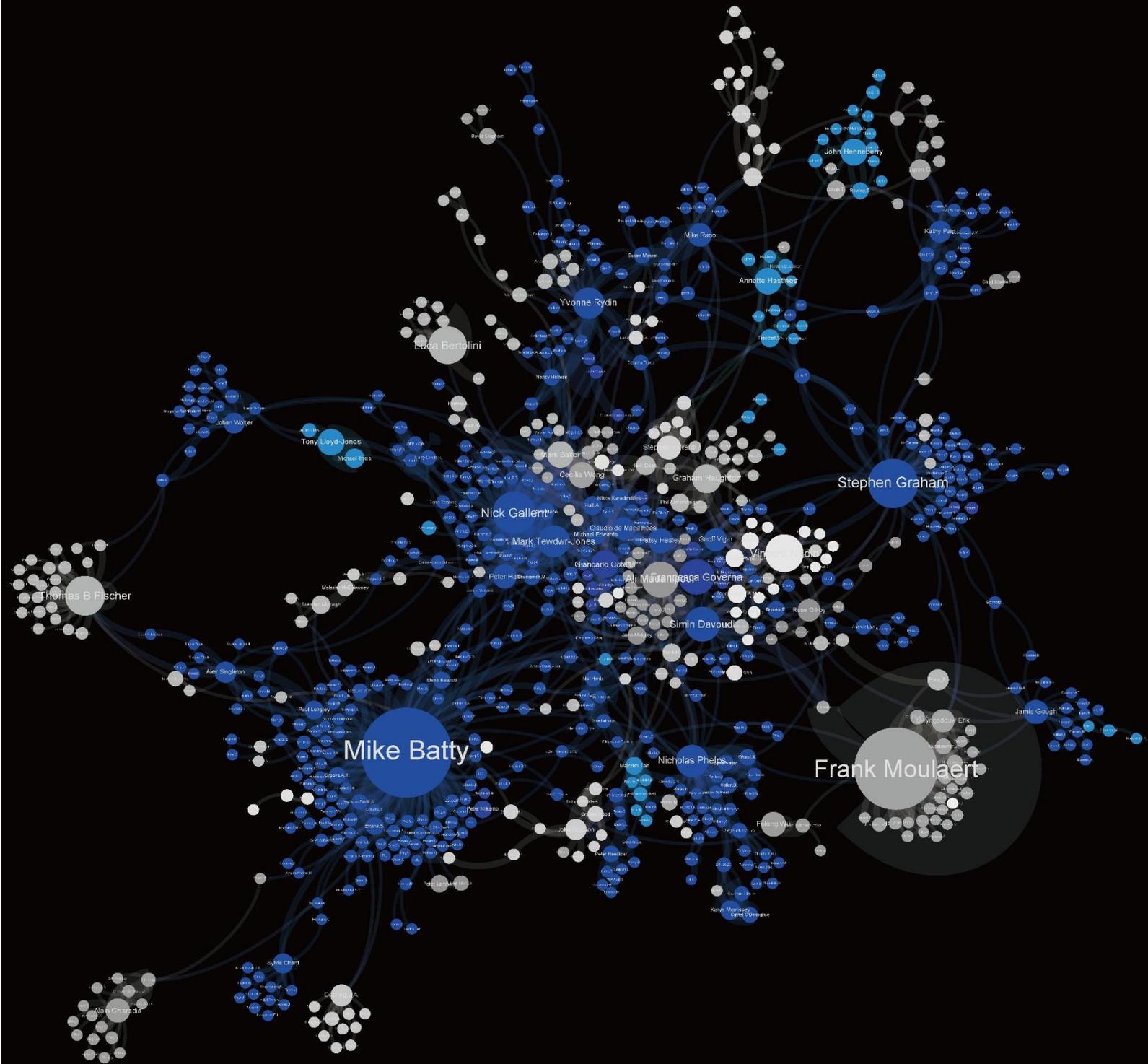
Figure 23 Typical Split Case: Polytechnic University of Turin

(Source: Generated through Gephi, YE Qiming, 2015)

5) Typical Reunited Case: University of College London and University of Newcastle

Leading Figure:

Mike Batty, Nick Gallent, Simin Davoudi, Mark Tewdwr-Jones

Structural Figures:

Mike Batty, Nick gallent, Simin Davoudi, Mark Tewdwr-Jones, etc.

Other Communities but Same Schools:

Ali Madanpour, Fulong WU, ect.

Relevant Scholars:

Thomas B Fischer, Frank Moulaert, etc.

Relevant Schools:

University College of London (Second Part), University of Newcastle (Second Part), University of Liverpool, University of Leuven etc.

Type of Research Orientation:

Technical Based Comprehensiveness

The reunited community of University of College London and University of Newcastle is the very typical case for how the limitations of planning schools been broken down, and the scholars from different schools but with the same background reunited for a new cluster.

This community consist of 575 planning scholars, with some significant figures, such as like Mike Batty, Nick Gallent, Simin Davoudi, Mark Tewdwr-Jones, etc. from both University College of London and University of Newcastle. The most relevant communities are the other parts from both universities. By examining the structure, one is hardly to tell the exact type, since it is not too single structured, even though Mike Batty has the larger size than others, nor too planar. However, it is in between the cases been studied before, as in a mixed state.

In terms of the academic orientation, this community has a very significant direction. As most of the scholars are into the field of geography or spatial computing, they are technologically based. However, unlike the rest communities, these group of scholars not only focus on the technic part of planning, but more efforts are spared on the strategy, the social dimension, the policies and governance that is behind or highly relevant to the technologies in planning. In other words, they are technical based but comprehensively oriented.

It could be the reason why they are so frequently connected, and form a new community, rather than staying in the communities of totally technological oriented. Such conclusion could also get evidenced through looking at the research outputs of those scholars in the community.
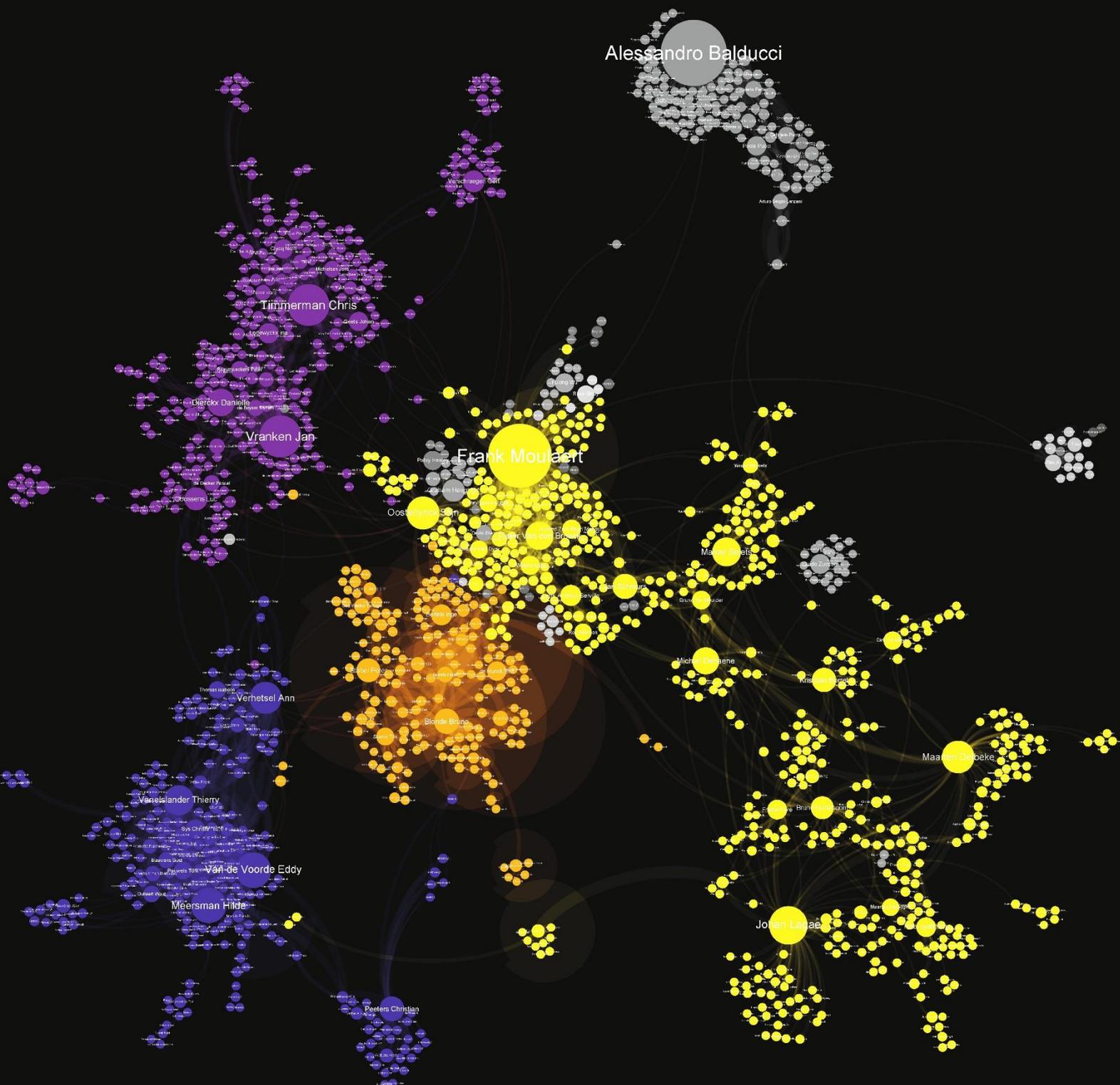
Figure 24 Regional Collective Case: Belgium Cohesive Planning Communities

(Source: Generated through Gephi, YE Qiming, 2015)

6) Regional Collective Case: Belgium Cohesive Planning Communities

Leading Figure:

Frank Moulaert, Oosterlynck Stijn, Vranken Jan, Timmerman Chris

Structural Figures:

Frank Moulaert, Oosterlynck Stijn, Vranken Jan, Timmerman Chris, etc.

Relevant Scholars:

Guido Zucconi, Graham Haughton, Fulong WU, Alessandro Balducci, ect.

Involved Universities:

University of Leuven, University Gent, University of Antwerp

Type of Research Orientation:

Comprehensiveness and Cohesiveness

Summary:

The collective communities of Belgium regional planning scholars is mainly consist of University of Leuven, University Ghent, and a few parts of University of Antwerp. Totally 560 scholars are involved in this community. Such case is quite unique as the boarder planning schools is broken down, and the research issues re-organized the scholars into different communities. Four communities are structured within this collective regional cluster. The illustration shows the communities in four different colours. However, even they are separated, the connection among communities are still active.

The research tries to find out the reason that makes such boundaries gone, and the power that unite scholars together, forming new clusters of academic cooperation. The results shows that like the rest of the communities that is regionalized, the environment is suitable for eliminating the limitations and agglomeration. As in this case, planning scholars in those communities speak the same language, share the same background of Belgium, and they are geographically interacted. This provides opportunities for splitting and reunited through the integral region. There is no need to emphasize the advantages of reuniting different groups of scholars, but at least the goodness for development in different orientations is definitely significant.

In terms of the research orientations, such regional collective communities are quite comprehensive integrally, but cohesive separately according to different geographical positions. For instance, the community where the leading figure is Frank Moulaert, the popular issues is social oriented. However, within such community, scholars are diverted in original schools background, Like Pieter Van der Broeck comes from University of Leuven, and Oosterlynck Stjn comes from University of Antwerp.

5.4 Bigger Communities: More Chances to Grow

5.4.1 General Trend

It is needed to study the relation between weighted degrees and number of scholars, considering the planning communities varies from small ones to big ones. It would be helpful for defining the proper size for effectively gaining weighted degrees.

As the weighted degree in Y axis, number of scholars in X axis, and use the average weighted degree to category the scholars. The regression result shows highly relevancy according to our simulation, with 95% confident intervals and 0.835 in R square.

From the simulation results, it is slightly increase before the scholars' number around 400, see Figure 25 (a). As been displayed, since the scholars' number rises, the speed of rise in weighted degrees turns faster.

To view those planning communities as a whole, the shadow area shows in Figure 25 (b) manifests the possible reason as due to the lower speed in weighted growth in small communities' area. Such assumption would be testified when the research splits the entire 888 groups, and studies their trends integrally. Therefore the general trend for the planning communities could be generalized as the bigger in size, the more chances to gain in cooperation, not only for planning communities, but also for the included planning scholars.

5.4.2 Trends after Split

Afterwards, the research studied the trends for each categories separately: size of planning communities ranging between 1 to 4 scholars, between 5 to10, and over 11 scholars. From the simulation, it is expected to find out the different performance in trends.

As the results of simulation present, the R square value reaches over 0.8, with the confident intervals of 95%, for all three tests, which means the regression performance are quite convinced. In order to compare with the three results easily, we unified the coordination into the same form, as X 12000 degrees, Y 800 scholars. Hence, by comparing the regression curve, the conclusion could be attained.

In general, the speed of rises in weighted degree turned faster while the community size increase, as showed in Figure 25 (c), (d), (e). The slope uplifts obviously, which on one hand unveil the fact that when community gets bigger, the weighted degree would increase much faster than expected. On the other hand, for planning scholars individually, the self- achievement would be easier if they are involved in bigger groups, since the average weighted degree also rises in a much faster speed than the speed of increasing in community size.

However, it also witness the slightly slow down when the size of planning community reaches a certain level, estimating over 500. However, as the samples are rare, this hypothesis is not convinced to get supports.
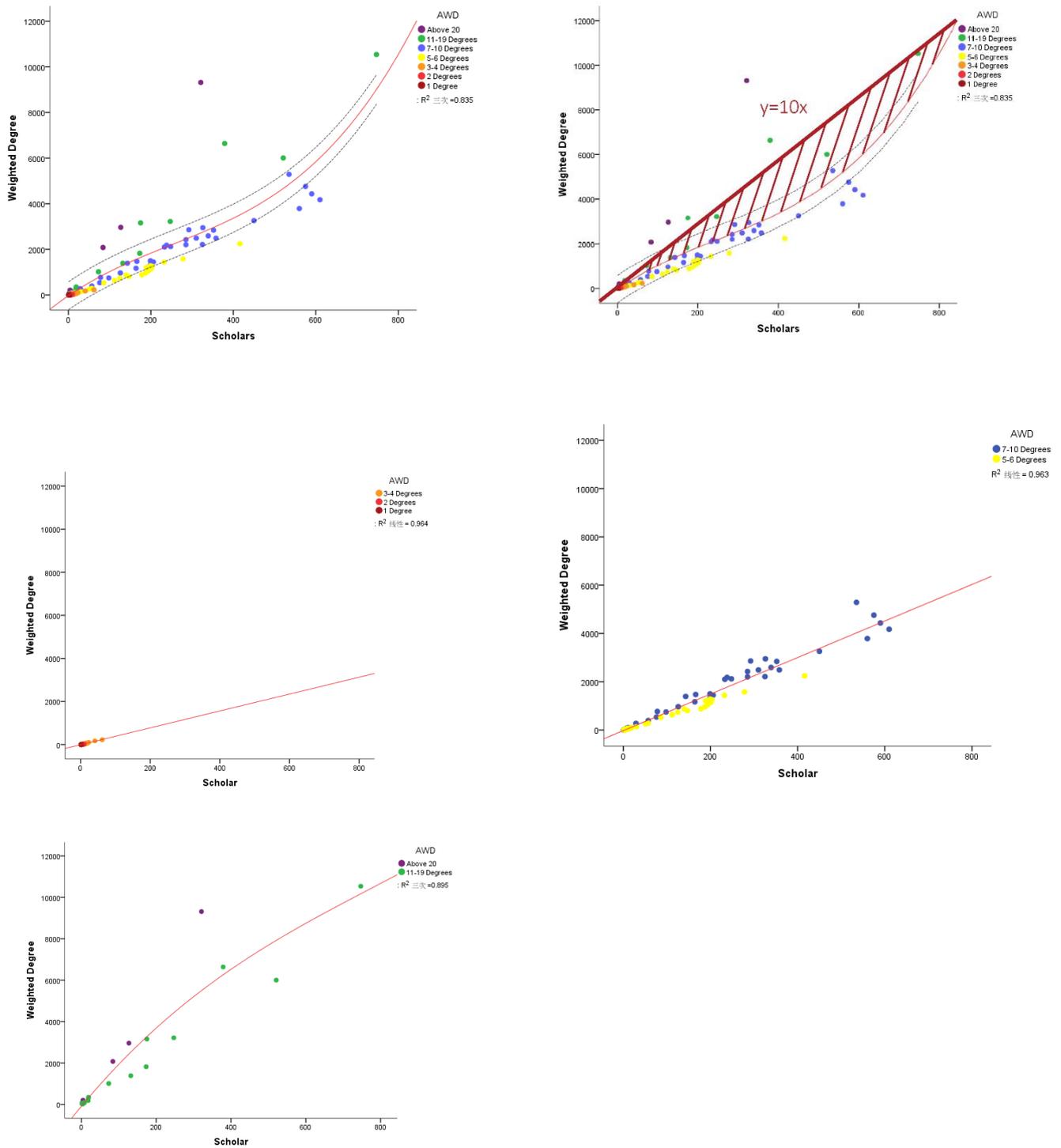
Figure 25 The Regression Simulation between Weighted Degrees and Number of Scholars:
(a) General Trends for All Communities, (b).Shadow Areas for All Communities, (c).Trends
for Communities with Scholars' Number below 4, (d). Trends for Communities with Scholars'
Number between 5 to10, (e). Trends of Communities with Scholars' Number above 11

(Source: Generated through SPSS, YE Qiming, 2015)

5.5 Planning Groups: Fundamental and Stable Structures

Comparing to previous studies on the proper size for obtaining weighted degrees effectively, here the research would like to discuss about the stability of a planning community, in order to find out the most stable size and structures. In this way, the results would help the planning scholars and communities to adjust better ways of academic cooperation in planning knowledge network.

5.5.1 Stability: the Smaller the Better

In order to find out the stable size for the communities, one of the indicator, the Stable Index 1 and 2, is essential to evaluate the stability of a structure. As mentioned previously, the stable index describes the relative stability comparing to the integral planning knowledge network. The most important key idea is to measure the ability to obtain as much as the triangles ideally. The more completed triangles one community earns, the more stable it would be, considering maintaining and fostering such academic relations takes a long period of time. The difference between Stable Index 1 and 2 is the thresholds of stability. Since the Stable Index 2 requires much higher degrees of stability, less communities could reach the standard in that case. By comparing the distribution of these two indicators for all communities, it is quite clear to get the results of what size is more suitable for stability.

The simulation puts average weighted degree as the X axis, while the Stable Index 1 or 2 at the Y axis in the coordinator. Therefore, given the same value in X, if the community gets higher value in Y axis, then such community is more stable. Similarly, given the same value in Y, if such community get higher mark in X axis, then the community would get better performance in weighted degree for each planning scholars. The various colours represent different sizes of community, as colour getting warmer, the size getting smaller.

The consequences as displayed in Figure 26 (a), (b) display the result that as the size of communities increase, the average weighted degree will rise, while the stable index would decrease. In other words, the smaller sized community is more stable than those in large numbers of scholars. The bigger communities are required extremely high standard to keep stable, therefore, the unstable situation would happen more often. However, the cost of such instability makes it possible for the communities to gain more connection.

According to the results, is it possible that such bigger communities would also have the same structures in side? This question is raised for the research, in order to find out the stable structure in general, rather than for small communities.

5.5.2 Stable Structure: Planning Groups

With the aim of looking for the most stable structure not only for planning communities but also for the planning knowledge network, the research decided to look into the structure of the communities.

We crack the big communities into groups as small as possible. Therefore, those weak or even non-existed connection within a community would be break down into solid and hard-to-separated units. In the research, the term 'planning groups' is used to represent such units.

By adopting the similar simulation approaches, we draw the conclusion that, as the planning groups turning smaller, the stability performs better, as showed in Figure 26 (c), (d). It corresponds the findings from the planning communities once again.

In general, as the fundamental constitution of the planning communities, the planning groups are the most stable structure in the communities. As the sizes increase for both planning communities and groups, the stability decrease, with the rise in acquiring weighted degree totally or individually.
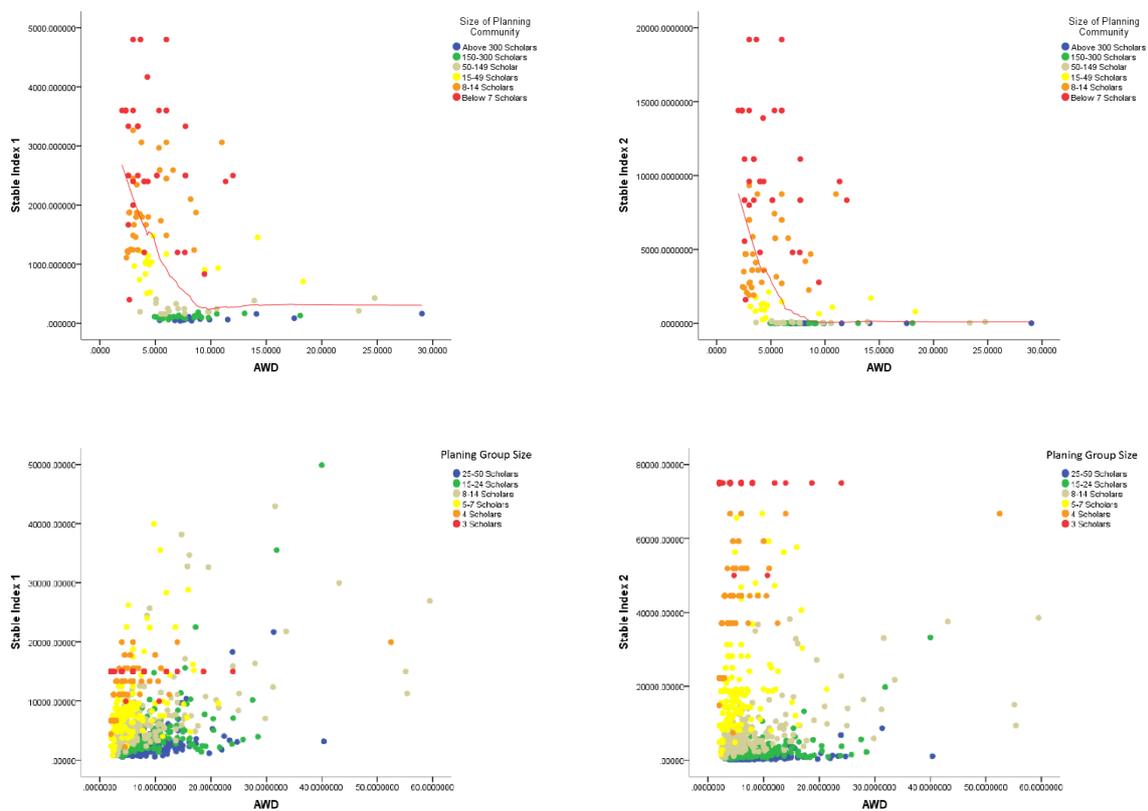

Figure 26 Stability Simulation Results: (a). Stability for Planning Communities in Stable Index 1, (b). Stability for Planning Communities in Stable Index 2, (c). Stability for Planning Groups in Stable Index 1, (d). Stability for Planning Groups in Stable Index 2.

(Source: Generated through SPSS, YE Qiming, 2015)

5.6 Chapter Summary

In this chapter, the research looks into the planning knowledge network directly. As to respond the assumption, the first task is to unveil the structure of the network. The research established a model, using the research outputs as the connection among scholars to establish the network. Based on the acquired data, and with the help of Gephi (Cherven,K., 2015), 17729 scholars are involved and present in the figure. Followed by that, the analysis for the network focus on the features that the network performed: the tolerance, the high involvement, tendency of clustering, closeness of scholars, uneven developed, and the community as the principal pattern.

The following part spares efforts on the most important structure of planning knowledge network, the planning community. Firstly, the research focuses on such 888 communities, along with the geographical closeness and mixed constitution as the features of them. Secondly, the research studies the top 20 planning communities out of 888, to draw further conclusions for significant planning communities. With the aim to explicit the findings, 6 typical cases are selected to be studied. They represents the cases of the single cored communities, the multi cored communities, the planar communities, the split communities, the reunited communities and the regional collective communities.

Afterward, two major issues are concerned. To find out the appropriate size for any planning communities in terms of gaining cooperation and stability. Based the data from the 888 communities and the 1701 planning groups after cracking the communities, the research simulated the relationship between size, stability and weighted degrees. The results show that the communities with bigger sizes, are more effective in gaining academic cooperation, while performs pool in stability. On the contrary, the communities with less scholars, referred to as 'planning groups', are difficult in obtaining external cooperation comparing to big communities, however, it is more stable. Therefore, the planning groups are the primary stage of the community, as well as the most essential core structures of the planning communities. It is from such three stages, that this chapter achieved to study the planning knowledge network in Europe.

From both the visual and analytical studies, the research shows an overt image of the European planning knowledge network. Planning communities which are the essential constitution of the network, is believed to have dominated the planning academic arena in Europe. Actually, the simulation of relationship among size, stability and weighted degrees implies how such top communities grows from planning groups to big communities. The process of such communities grow, corresponds the growth path of the European planning knowledge network.

Chapter 6 Planning Knowledge to Responsive Urban Issues

Planning knowledge network as the source for producing, storing and delivering planning knowledge, is fundamental. However, the research forms and responsive issues are two elements for such knowledge to get shape and gain influence. Therefore, based on the findings for planning knowledge network, in this chapter, the research would discuss about the research forms and issues of the planning knowledge.

By looking into the research forms, it is expected to find out some structural patterns for planning research in Europe, including the possible implied factors behind those forms. Moreover, how this make a difference for us to recognize the cities, as the planning knowledge give a new meaning for the cities, is also within our concern.

The second part of this research would focuses on the changing responsive urban issues during years in Europe. Since the research issues represent not only the reflection of cities' development in certain dimensions, but also how planning academics think of cities.

6.1 Forms of Research

6.1.1 Overview of Research Forms in Europe

According to 80988 pieces of research outputs from 2023 planning scholars in 57 major planning schools, which are recorded and obtained as the basic data. The basic forms for the planning knowledge are journal articles, reports, chapters, conference proceedings, books, thesis, working papers, editorials, and reviews. In some circumstances, for certain research outputs, the planning knowledge could have more than one form. Such occasion happens usually in the process of transforming the unpublished research output into published ones. However, no matter what form of a research output is, either published or not, it is considered as part of the planning knowledge, since the value of the knowledge couldn't be valued through forms or whether it is published or not. That is the reason of this research to cover any forms of the planning knowledge regardless of the forms.

To give a glimpse at the distribution of different research forms for the planning knowledge outputs, Table 3 summarize the numbers and proportions that each form contributes. As the primary form for planning knowledge, the journal articles constitute 58.77%, exceeding the sum of the rest forms. Followed by articles, with 9522 records and 11.76% proportion, reports rank the second place of the total research outputs. Chapters and books together contribute 16.86%. Conference proceedings, which including the published proceedings or some unpublished ones, contribute 9.49% to the overall planning knowledge in Europe.

Furthermore, the conclusion could be drawn that the absolute published ones takes 76.3%, while the uncertain part takes 23%. However, this explains the data basis for this research is more tolerant, as one of the unique and essential features for this research, the unveiled value form those unpublished planning knowledge are taken serious consideration in this research.

Table 3. The Research Forms of Planning Knowledge Outputs

Form	Published	Number	Proportion
Journal Article	Y	47594	58.77%
Report	Y / N	9522	11.76%
Chapter	Y	7693	9.50%
Conference Paper	Y / N	7683	9.49%
Book	Y	5959	7.36%
Thesis	Y / N	1421	1.75%
Working Paper	N	572	0.71%
Editorial	Y	333	0.41%
Review	Y	211	0.26%
Total		80988	

(Source: Data Collected by Author, YE Qiming, 2015)

6.1.2 Reports with Direct Request

Comparing to the articles, books or chapters, the forms or reports are always adopted a more direct way to respond the request or consults from the practitioners. For instance, the reports for the local government, the reports for research institutions, or the reports for enterprises that are probably have a direct and immediate effect on the cities' development in a practical perspective. Therefore, this research looks into such reports with special request from actors that directly related to cities' development.

Among the 9522 reports, a total number of 1050 reports are the consults or request form the governments, commissions, associations, enterprises, etc. The United Kingdom are the one of the major resources for those king of reports. Take London as an example, 255 reports are recorded, and according to the claimant of these reports, the Royal Town Planning Institute, Royal Geographical Society, Office of the Deputy Prime Minister, Department of Communities and Local Government of London, Institute for Public Policy Research of United Kingdom, and European Public Real Estate Association, etc. are highlighted.

In perspective of the overall 1050 reports, it could be concluded that three major kinds of claimant are involved. The first is the request from the association, with the major orientations in social orientation, public affairs and civil rights, etc. The second part is for the enterprises, with a very market driven orientation, the more focuses are paid on projects' consults, the evaluation of market and some technical consults as well. The last but not the least part is the reports for government systems, including municipalities, the federal governments, the commission of Europe, and the department from those different levels of government, etc. For these kind of reports, the issues are more focused on governance, public policies, warfare, social problems, transportation, territorial topics and financial problems, etc.

6.1.3 Research Outputs in European Cities

In terms of European cities, the research outputs are calculated into article records[10] and non-article ones according to this research. As shown in Table 4, the Top 30 cities in Europe with total amount of 45826 recorded research outputs, contributing to 56.6% of the total 388 recorded cities. To be detailed, the article forms constitute 71% of research outputs, comparing with that number of 23% for overall cities, the Top 30 cities are more active in article forms outputs. On one hand, it could be resulted from the recorded data. On the other hand, given the fact that such data basis is quite completed, the higher rate in article forms implies more awareness of the publication issues. However, with the large number in both article forms and non-article forms, the top 30 cities are quite active in both ways.

Among them, London ranks the first place, with research outputs of 6819 records in total numbers of both forms, as well in the number of non-article form separately. The records of non-article form contributes to 43% of the total research outputs, which is considered to be quite a high ratio. Same cases are found in cities like Delft (44%), Berlin (55%), Bordeaux (69%), Rome (68%), and Zurich (51%), etc. In these cases, the phenomena of such relatively high proportion of non-article forms evidences the diverted forms of producing planning knowledge among those cities, furthermore, it implies the exchange in or across the academic arena is quite active.

Contrary to that, cities like Vienna (91%), Milan (89%), and Antwerp (94%), etc. perform much better in article forms of research output. As the conventional channel, the article forms are more recognized and adopted to store and express the planning scholars' academic values.

New York, as one of the non-European cities in the top 30 list, ranking the 30th place with a prominent performance in research outputs. The recorded 199 are all from the non-article forms, majorly in forms of books, chapters, and conference papers.

6.1.4 Non-Article Forms of Research Outputs in European Cities

The research looks into the non-article parts of these top 30 cities, to find out what exactly those non-article forms are, as shown in Table 5. The order shows the ranking in amount of the non-article research outputs of the top 30 cities. Thereafter, the research figures out the exact number and proportion of research outputs in different forms like reports, conference proceedings, books and chapters, etc.

London (52%), Paris (31%), Amsterdam (46%) performs quite significant in the form of reports, as both in amount and in proportion. Considering the discussed special meaning for reports, such cities see the quite active and massive interactions between the academics and the claimants from outside of the academic arena. The average proportion for reports in non-article

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[10] Article, here is referred to as the collective categories of forms that exclude articles, editorial, reviews.

forms is 39% for all 30 cities, which evidences such needs once again.

In terms of the conference proceedings, Paris (37%), Delft (48%) are quite significant in holding the conference, therefore, the conference proceedings become one of their major sources of non-article forms of research outputs.

While, books and chapters are also very important and are the mainstream forms adopted by planning scholars in the top 30 cities. The average proportion for these forms reach almost 40%.

In general, as the conventional ways of storing and expressing the planning knowledge, forms of articles are still the largest occupation in total research outputs forms. However, the records also witness the high proportions in non-article forms for major European cities.

Reports, as the major form of the request to those governments, associations, institutions, and enterprises, etc. to request for planning knowledge supports, are significant and occupies a relatively high proportion in non-article forms. London, Amsterdam, Berlin, etc. are such prominent cases. While, on one hand it differs from cities, and countries, as the systems are quite different, with the institutional degree also varies. On the other hand, the high proportion in reports, shows the active interaction of the planning scholars, the academic arena with the direct cities' development practitioners. From the perspectives of the conference proceedings as one of the important non-article forms, the high proportion for conference proceedings implies the institution, organization or the planning schools in those cities are active in holding the conferences, or any forms of academic exchange activities. Besides the conferences that held by planning schools and institutions of all kinds of planning communities, the international conference such as AESOP, ISCARP, and WPSC, are also the major contributors to those cities' research outputs in conference proceedings.

Table 4. Total Research Forms for Top 30 Cities

City	Total Records	Article Records	Proportion of Article Records	Non-Article Records	Proportion of Non-Article records
London	6819	3904	57%	2915	43%
Milan	5111	4562	89%	549	11%
Vienna	4403	3992	91%	411	9%
Paris	2997	1807	60%	1190	40%
Amsterdam	2572	1504	58%	1068	42%
Antwerp	2425	2289	94%	136	6%
Florence	2060	1584	77%	476	23%
Naples	1812	1557	86%	255	14%
Liverpool	1366	1197	88%	169	12%
Coleraine	1293	909	70%	384	30%
Tours	1274	812	64%	462	36%
Delft	1158	649	56%	509	44%
Palermo	1114	916	82%	198	18%
Oxford	1078	652	60%	426	40%
Cardiff	1067	705	66%	362	34%
Dortmund	1067	847	79%	220	21%
Berlin	947	424	45%	523	55%
Sheffield	847	690	81%	157	19%
Leuven	840	581	69%	259	31%
Bordeaux	831	257	31%	574	69%
Lyon	786	415	53%	371	47%
Venice	786	589	75%	197	25%
Reading	644	445	69%	199	31%
Rome	617	198	32%	419	68%
Edinburgh	587	316	54%	271	46%
Brussels	489	265	54%	224	46%
Zurich	341	166	49%	175	51%
Madrid	296	174	59%	122	41%
New York	199	0	0%	199	100%
Total	45826	32406	71%	13420	29%

(Source: Data Collected by Author, YE Qiming, 2015)

Table 5 Non-Article Research Forms for Top 30 Cities

City	Non-Article outputs	Reports	Proportion	Papers	Proportion	Books/Chapters	Proportion
London	2915	1523	52%	229	8%	1163	40%
Paris	1190	374	31%	446	37%	370	31%
Amsterdam	1068	487	46%	80	7%	501	47%
Bordeaux	574	117	20%	225	39%	232	40%
Milan	549	138	25%	59	11%	352	64%
Berlin	523	151	29%	57	11%	315	60%
Delft	509	80	16%	244	48%	185	36%
Florence	476	60	13%	153	32%	263	55%
Tours	462	122	26%	187	40%	153	33%
Oxford	426	115	27%	72	17%	239	56%
Rome	419	82	20%	96	23%	241	58%
Vienna	411	278	68%	54	13%	79	19%
Coleraine	384	241	63%	82	21%	61	16%
Lyon	371	102	27%	112	30%	157	42%
Cardiff	362	24	7%	181	50%	157	43%
Edinburgh	271	126	46%	83	31%	62	23%
Leuven	259	144	56%	31	12%	84	32%
Naples	255	15	6%	74	29%	166	65%
Brussels	224	83	37%	30	13%	111	50%
Dortmund	220	120	55%	23	10%	77	35%
Reading	199	184	92%	6	3%	9	5%
New York	199	84	42%	18	9%	97	49%
Palermo	198	61	31%	27	14%	110	56%
Venice	197	127	64%	24	12%	46	23%
Zurich	175	120	69%	40	23%	15	9%
Liverpool	169	114	67%	36	21%	19	11%
Sheffield	157	89	57%	19	12%	49	31%
Antwerp	136	84	62%	9	7%	43	32%
Madrid	122	12	10%	48	39%	62	51%
Total	13420	5257	39%	2745	20%	5418	40%

(Source: Data Collected by Author, YE Qiming, 2015)

6.2 Issues of Research

In this part, the research focuses on the content of such research outputs, the responsive issues to cities' development. In our point of view, the responsive issues represent the academics' focuses of the significant phenomena, cities' development problems, as well as expressing their views, solution and values. It shows the attitude of a planning scholars towards cities and planning. On one hand, it directly reflects such phenomena or problem as a common issues facing the planning academics or practitioners. On the other hand, it carries with the attitudes, solution and raises the awareness in planning academic arena to the issues. Therefore, to study the responsive issues of European planning knowledge is quite essential to build up the profound knowledge on the planning knowledge network, and the trends of planning academic filed in Europe.

Several questions are concerned within the topic of responsive issues. What are the appropriate categories of the research issues, what is the key focus of them, and what are the trends for such issues?

To begin with the research issues study, the research categories the 80988 into different orientations, according to the traditional recognition of planning disciplines in sub-branch perspectives, as well as to the institutional organization of departments of the major 57 planning schools. Based on a process of adjustment and compromise, eventually 7 orientations are confirmed as the basic research frame for this part.

The 8 orientations includes: 1),Social Studies, Economic, 2),Law and Industries Studies, 3), Ecologic and Environment Studies, 4),Planning Theory and Urban History, 5),Strategic, Spatial Planning and Policy Studies, 6),Art, Culture and Design and 7),Technology, Engineering and Transportation.

The primary task for the research is to define the key words that represents the value and content of each orientations. The process of selecting key words is with the help of the research engines as they could provide the most relevant keywords for those orientations. However, such keywords would be searched as with several languages and patterns that appears in the data basis, in order to find out as much completed as the records, and this would be applied to the rest of the orientations as well.

6.2.1 Social Studies Orientation

1) Social Studies Keywords

As Commission Sueur put in 1998, the France alongside with United Kingdom are the pioneer countries to set up specific urban policies to deal with social exclusions at that time (Commission Sueur, 1998). The social issues turned into a topic ever since. However, as the European society moving forward to a cohesive and integrative place, the social challenges facing with Europe have never eased. Urban planning, as the discipline which is highly involved with the diverted society, are developed faster in this branches. Therefore, keywords for this categories are quite diverted.

The keywords for social orientation are: demography, society, female, elder, children, health, disease, food, community, welfare, safety, security, housing, social exclusion, segregation, education, equality, liberty, fairness, justice, employment, etc.

2) Trends for Social Studies in European Planning Research

According to the overt records, 9904 research outputs are social issues oriented, with social studies, society, housing and community among the top 3 hottest topics from the year of 2000 to 2013, as Figure 27 displays. Especially for society, the speed of rising is the fastest. Traditional topics such as the security, employment, welfare vibrates around 20 to 50 degrees. However, it also sees the prominent growing in food, education, and health issues. In general, the issues in social studies are in a steady growth. New topics such as food and health have attracted more research focus.
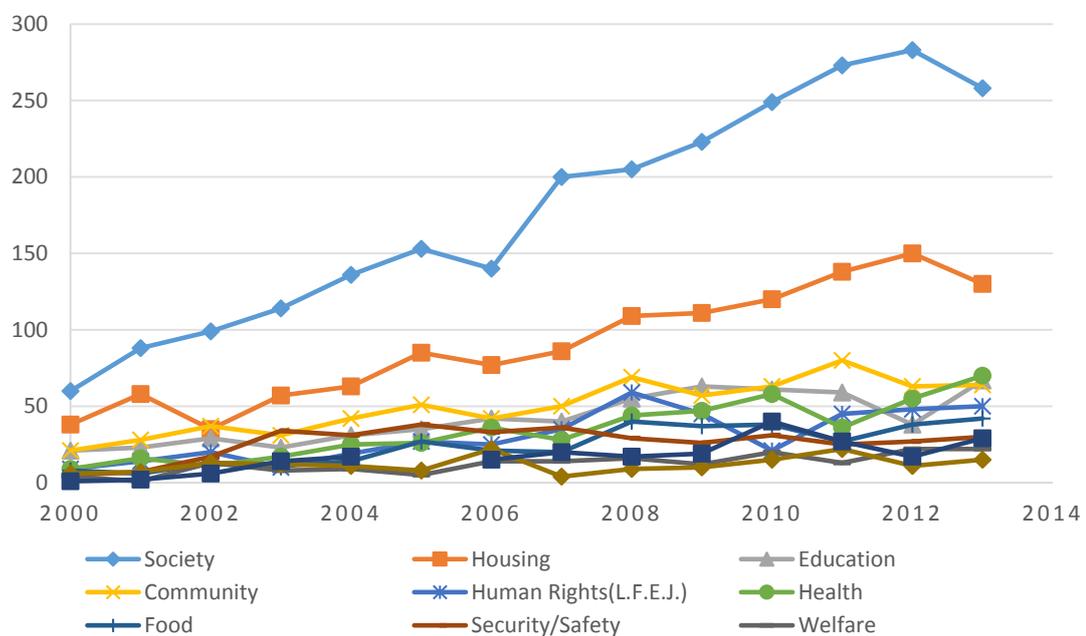

Figure 27 Responsive Issues Trends for Social Studies in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.2 Economy, Law and Industries Studies Orientation

1) Economy, Law and Industries Studies Keywords

As cities been recognized as the complex organization through social, economic and ecological aspects (Jacobs,J., 1961), the topic of urban economy has been discussed in the context of cities' development. However, even at the early stage, the public did not realize the importance of the economy, since it has little influence on the policy making in cities' development (Cheshire,P.C., etc. 2007), the trends of development in economy proved itself significant in intervention the development of a city. Industry as the strength to promote the cities' development, influences

with the cities' economy and employment growth, has a strong connection among spaces, economy and labors (Glaeser,E.L.,etc. 1991). Moreover, conventionally, the planning always faces with puzzles of what could be the appropriate industry for the cities or regions. Therefore, considering such significance, the industry is also included in the responsive issues study. On the other hand, urban planning and the regulations, laws are somehow inter supportive. British is the first country that introduce the legislation into planning system, which is now popularly seen in European planning schools (Zilai,T., 1999). Similarly, Juergensmeyer, J.C. evidences the importance of relevant thinking between urban planning issues and the regulations (Juergensmeyer, J.C., etc. 2013).

The keywords for economic and law studies orientation are: economy, financial, budget/ expenditure, income, tax, law/regulation, obligation, agreement, industry, creativity, innovation, agriculture, business/enterprise, commercial, and manufacture, produce, etc.

2) Trends for Economy, Law and Industries Studies in European Planning Research
As for the trends for economy, law and industries, issues in this orientation maintains 7176 pieces of research outputs, in which the innovation, law and regulation, and the industries are the most targeted topics in the research outputs with this orientation, as shown in Figure 28.The integral trends is quite positive, with innovation the highest degrees in this field. However, industries are also increasing in a remarkable speed in recent years. As European are facing with the uneven developed situation, combining with the transformation of the industries, the related topics, such as the financial, economy and innovation are concerned more often. The peak in 2008 could be seen as the responses to the global economic crisis.
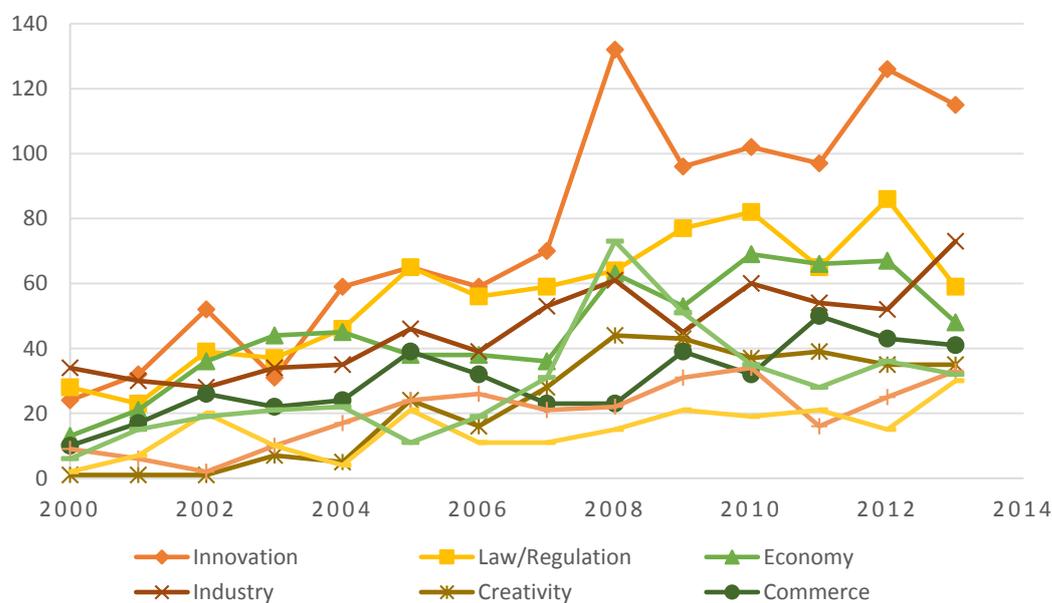

Figure 28 Responsive Issues Trends for Economy, Law and Industries in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.3 Ecologic and Environment Studies Orientation

1) Ecologic and Environment Studies Keywords

Urban ecologic and environment studies is the combination of urban studies and the ecological and environmental science. Like Douglas, I., a lot of planning scholars regard that there are important linkages between the functioning of cities and their ecosystems (Douglas,I., 1983), the studies which treated the cities like an ecological life being is popular. Therefore, studies for cities to function more ecological has always been a goal for certain planning scholars. Facing with the problems of climate changes, the probable energy crisis, some planning scholars use research outputs to express their point of view. For those researches, not only the problems are reflected, more importantly, the solutions are also presented, as Nancy B. Grimm thoughts that the cities maintain both the problems and solutions to sustainability challenges in perspectives of such an increasingly urbanized globe (Nancy B. Grimm, etc. 2008).

Given that fact of that, the keywords for ecologic and environment studies are included multiple hot topics in research: ecology, environment, biology/animal/botany/biodiversity, soil, climate, weather, warming, precipitation, temperature, water, water manage, sustainable, solar, energy, SEA, wind, biomass, air, sea, ocean, pollution, sewage, footprint, capacity, carbon, and CO2, etc.

2) Trends for Ecologic and Environment Studies in European Planning Research

The overall number of research outputs that orientate in ecologic and environment studies in Europe is 15309. As so many topics involved in this orientation, the research displays the most remarkable ones in Figure 29, sustainable, environment, air/ocean/pollution, etc.

Comparing to the orientation in social and economic aspects, the ecologic and environmental issues are growing rapidly since the year 2000. The issues of sustainability reaches the degree of over 400. Besides, the sustainability issues, during such 13 years, the air/ocean/ pollution topics have increased almost 5 times. On the other hand, topics like biology related topics, climate related topics and topics entitled with environment grows steadily.

According to such findings, we also find clues that the sustainability issues are sometimes not quite constrained in the field of ecology and environment. As been studied from multiple angles, the sustainability is always associated with technology (Hunt,D., 1979), society (Barbour,I.G., 1978) and strategy (Kefalas, A.G., 1979). However, it is the hot topic that across orientations to tackle the problem of cities' development. Therefore, such kind of trends manifest the importance for those topics to be multi-polarized, with the tolerance for diverted orientations.
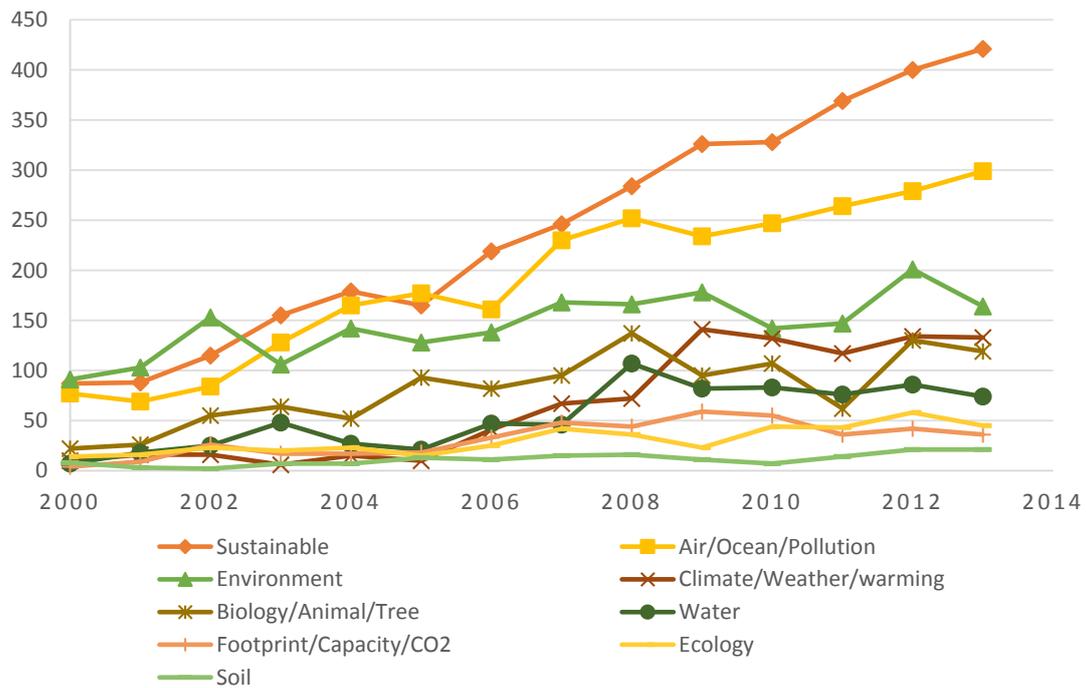
Figure 29 Research Issues Trends for Ecologic and Environment Studies in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.4 Planning Theory and Urban History Orientation

1) Planning Theory and Urban History Keywords

In the eyes of those planning scholars who are engaged in planning theory and urban history studies, the theory and history are as both the ways to understand the past and hypothesizing a different future for planning (Levy, J.M., 2009). Not like other disciplines, urban planning is quite young, with a still shaping theory of itself. Therefore, in the academic field, the study for planning theory is quite important and urgent (Taylor, N., 1998). On the other hand, the cities' development history is the process of applying such thoughts, however, Hegel G.W.F thought that it is quite important to know about the history through the phenomena directly to the very natural theory of it (Hegel G.W.F, etc. 2004). In a word, the history and theory is quite significant in establishing this discipline, as the urban planning is still shaping and defining itself. Therefore, it is appropriate to combine these two issues together to examine the performance of European cities.

The keywords for planning theory and urban history are selected not only from the historical iconic words, but also includes the figures who has been recognized as the essential planning theories. Hence, the keywords includes: history, world war, post wars, civil war, soviet, theory, industrial era, industrial revolution, contemporary/modern, 1950s, 1960s, 1970s, 1980s, 1990s, garden cities, Harlow New Town, cities of tomorrow, future cities, Howard, Le Corbusier, and Munford, etc.

2) Trends for Planning Theory and Urban History in European Planning Research

As the issues that concerns the development and history of the discipline, the research outputs records totally 2945 pieces that directly discuss such issues. As been always the hot topics for years, the contemporary topics experience a trough during 2000 to 2004, while such vibration turned dramatic again, with a prominent decrease in numbers from 2012 to 2013. Similarly, history studies have experienced a much longer slide down since the year 2010, see Figure 30.

Comparing to those disappointed facts, the studies for planning theory, which includes the study for planning ideologies, the prestigious figures, and pioneer practices as milestones, etc., is growing significantly. Follow such trends, it is possible for the planning theories to exceed the history studies by the year of 2015.

According to such manifested figures, it is possible to argue that the planning scholars who put efforts on history studies, are now getting more interested in theory studies. In fact, the history for urbanism and planning are shares a relatively high degree of integration. In other words, such phenomena describes the preference in studying the knowledge, figures and ideologies is more popular than describing facts in history, according to European planning research records.
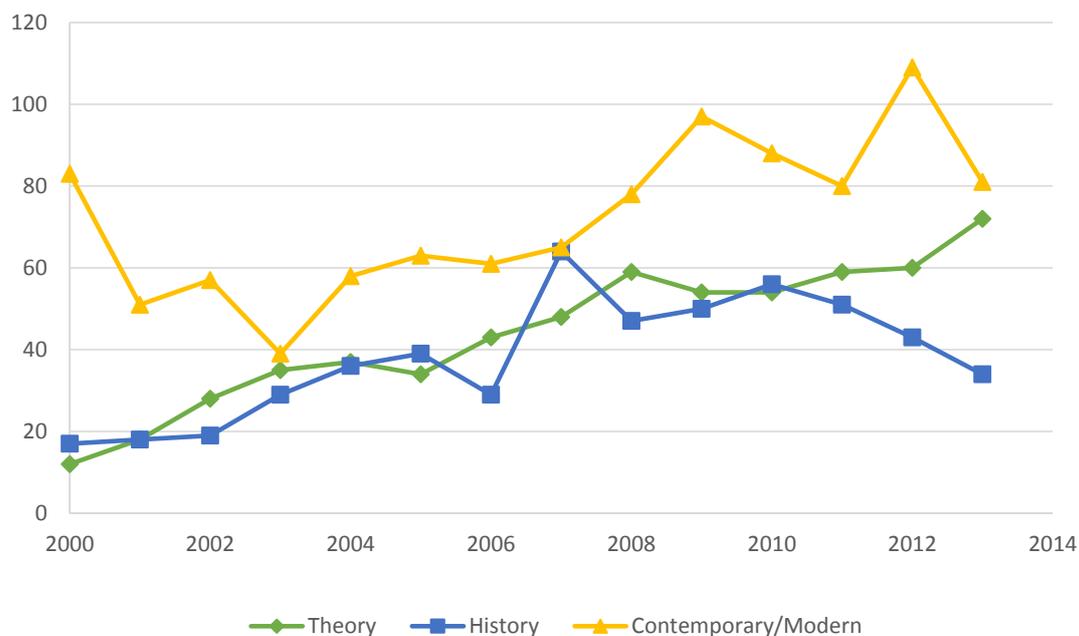

Figure 30 Research Issues Trends for Planning Theory and Urban History in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.5 Strategic, Spatial Planning and Policy Studies Orientation

1) Strategic, Spatial Planning and Policy Studies Keywords

As urban planning as the core of this discipline, different types of planning are involved in this frame, sharing similar ideologies. Therefore, as the united group for urban planning, the research tried to find evidences for categoring all the urban planning related branches together.

First of all, strategic planning is a hot topic origining from management, it had been introduced into urban planning practice field around 1968, and been defined as one of the official branches of planning in 1993 in San Francisico (Mariotti,E.,2000).

Since then, the argument around this topic never stops, as diverted explanation for this orientation are seen in the academic arena of planning. Lindblom regard the strategic planning as the rearrangement process of the intelligent in the society (Lindblom,C.E., etc. 1975). While more recent findings for this orientation focuses on the process, and the interactions among actors, while fully considering the conditions in certain cases (Balducci,A. 2011).

However, most planning scholars in the academic field don't deny the fact that the strategic planning could not function normally without the efforts of policy. The strategies would be effective only when the policies applied properly. Such policy is regarded as the effective practices to realize the ideologies, No matter match or not (Bonds,T.M., 2014), such relationship determines the combination of strategies and policies.

Comparing to the strategic planning, the spatial planning, which includes the territorial planning, regional planning and master planning, is more spatial problems oriented. It is defined as the process of practice the ideologies and theories into space, according to Chadwick,G.'s view (Chadwick,C., 2013).

However, the strategic planning and spatial planning is not contrary, even the boundary for spatial planning and strategic planning is blurred in the eyes of the practitioners. Since the strategic plan are more emphasized on the strategies, resources, process and actors, these two kinds are quite complementary to each other.

In a words, the strategic, spatial planning and policy studies are supportive mutually. Therefore, in this issues, keywords are selected as follows: strategy, actors, resources, negotiate, long term, participation, competitive, resilience, space, territory, urban design, master planning, zoning, land use, planning process, methods, governance, policy, and politician, etc.

2)   Trends for Strategic, Spatial Planning and Policy Studies in European Planning Research

The planning issues in strategic, spatial planning and policy studies is one of the hot orientation in European urban studies and planning practices. The total number for recorded research outputs reaches 16854 in this orientation. According to our way of category, this orientation includes the field of strategic planning, master planning, territorial planning, urban design, policy making and governance. Based on the features of each topics, the research get the trends for the hot topics in the orientation as Figure 31 shows.

Significantly, almost every topics are increasing rapidly, since 2000. With policy and governance, space, strategy, and process/methods ranking the top 4 places among all topics in this arena. The policy/governance issues reaches the value over 450 degrees, which is the highest even in the overt responsive issues in this research.

European has kept such good tradition of studying the policy and governance. The growth in such field is rapid, comparing with the situation that in 2004, only in United Kingdom and

France has the separated branches for urban polices, according to the information from AESOP (Fubini,A., 2004). However, in recent years, such rising trends slows down, as well as for the topics of strategy, the transformation is going on within the issues, as the divergence and recombination is expected in those issues.

The only two research topics that still keeps an obvious growth are spatial studies, and the process/methods studies. This could be resulted from the rising interests in technologies and sustainable development. In a word, such orientation is quite promising and still enjoys the high speed of rising.
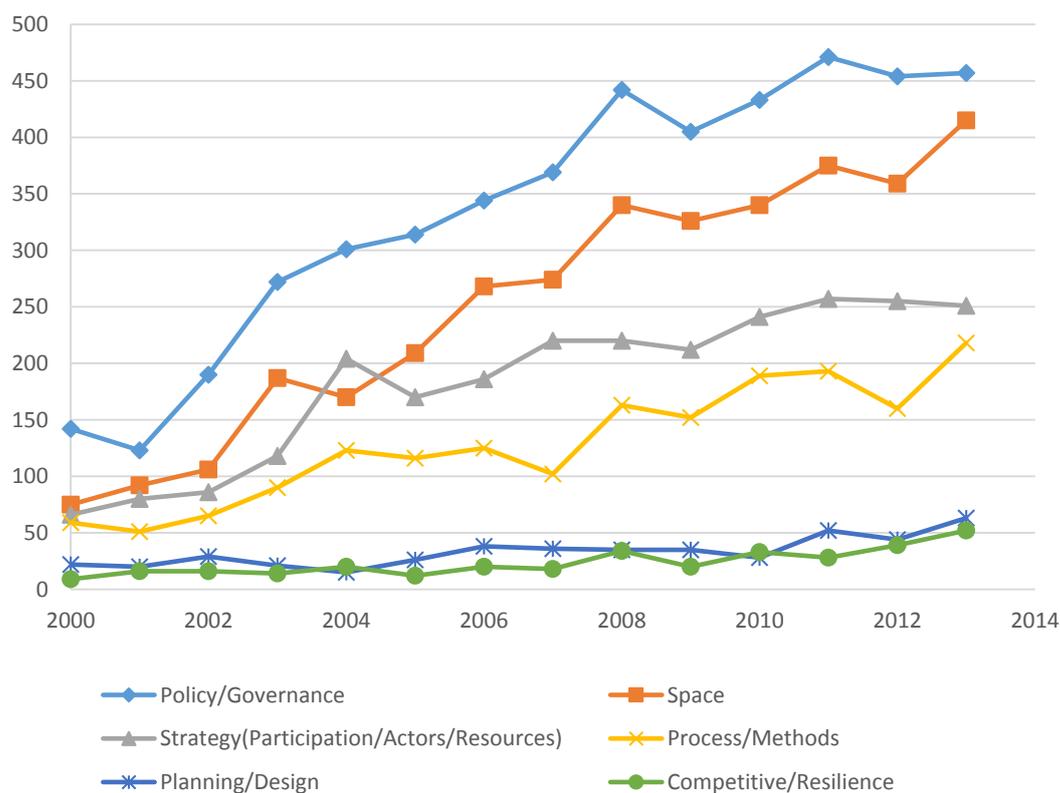

Figure 31 Research Issues Trends for Strategic, Spatial Planning and Policy in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.6 Art, Culture and Events Orientation

1) Art, Culture and Events in European Planning Research Keywords

As the contrary to urban planning, this research separates the design and aesthetic parts from planning to another divided orientations. Such arrangement on one hand is derived from the data basis, in which the art, culture and urban design research outputs constitute a relatively significant part in overall records. On the other hand, as Scheer, B. puts in his book, he would

like to prove the implied the relevance between the aesthetic and design (Scheer, B., etc. 2012) as a relatively identified manner. Moreover, such aesthetic related entities are using the art, culture as the carriers, which in turns, establishing the bridge between the art and culture. For cities, the patterns of urban design and rhythms of the art are correlated always. The art and cities are embracing each other, through the proofs of Snyder, G.J.'s findings (Snyder,G.J., 2015).

For that matter, the research would like to category them into one orientation, to exam the constitution of the research in this field. The keywords are: art, aesthetics, culture, games, EXPO, entertainment, opera, and movie, etc.

2) Trends for Art, Culture and Events in European Planning Research

The orientation in art, culture and events, mainly records the studies on urban activities, events and the intervention in soft ways, which obtains 4075 pieces of records. According to the findings, art, culture and aesthetic grew rapidly during the year 2000 to 2013, see Figure 32. It is quite understood for such an urbanized place in Europe. However, the research for events are not performed that well in rising during the years, less than 100 pieces of researches focused on such topics annually, not mention the entertainment.

In general, the art, culture and events for urban studies are still not the most majority issues. However, the rapid growth in culture/art/ aesthetic orientation is quite impressive, which represents the characteristic and style of Europe.
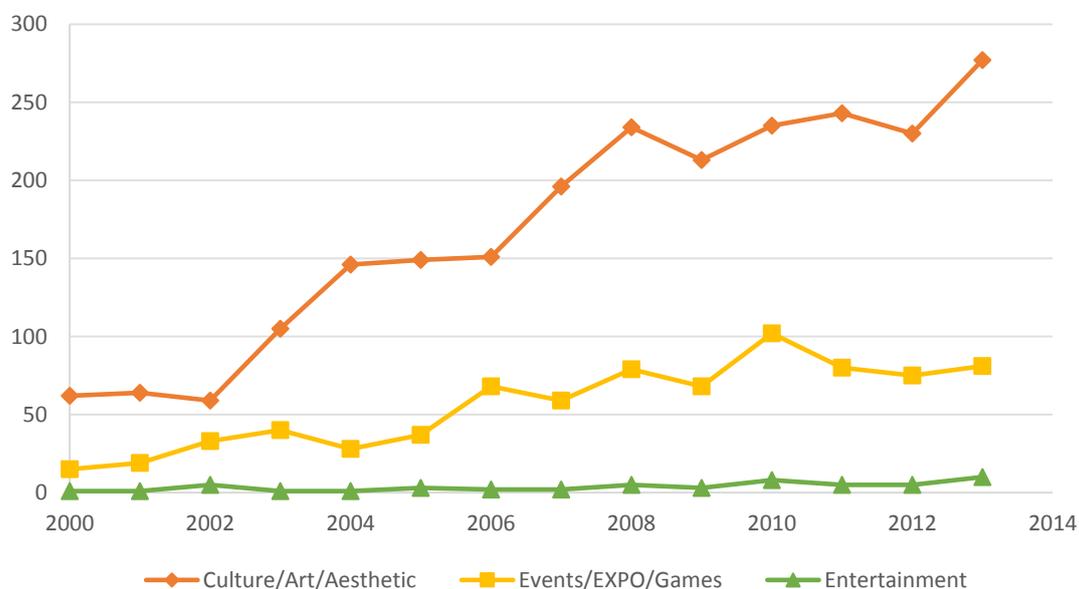

Figure 32 Research Issues Trends for Art, Culture and Events in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.2.7 Technology, Engineering and Transportation Orientation

1) Technology, Engineering and Transportation Keywords

This orientations are more focused on the software and hardware parts of urban planning, as engineering and transportation are related to new technologies, new algorithms, and new thoughts. Such applied technology from outside of planning academics share the same idea of involving the useful tools and ideas to promote the planning be smarter and performs better. For instance, the planning is highly associated with geo science, as the planning are dealing with spatial dimensions, which could be relied on geographical supports (Stillwell,J., etc. 2013).

Another vivid and commonly understood example is from how transportation are facing with the urban problems while involving the new methodologies to solve them, as the travel behavior as one of the major concerns for those transportation planners, they are facing with emerging problems from other aspects of the cities, like immigration, the employment, the real estates, etc. While these challenges are solved by a large amount of algorithms and simulations (Thomas F. Golob, etc. 2013). Similar examples could be raised as many as you could. According to such understandings for technology, engineering and transportation, it would be easier to define the keywords in this orientation.

The keywords for this orientation are: technology, software, hardware, algorithms, simulations, construction, engineering, project management, travel behavior, TOD, transport, traffic, cars, automobile, pedestrian, bikes, and sidewalk etc.

2) Trends for Technology, Engineering and Transportation in European Planning Research

Technology, engineering and transportation are the most IT related, computing science based and engineering oriented issues. Such orientation totally covers 4093 pieces of research outputs, with almost every topics sees the obvious rising. In Figure 33, the most remarkable topics are recorded as technology/simulation, engineering, and transportation.

Generally, the trends for them are significantly on the rise. As such three topics are with the similar paces in growing. Technically, transportation sees the obvious troughs and peaks during the 13 years, while the technology ranks the first place at this moment.

Such outcomes are quite understood, as the three of them are heading towards more integrative directions. The latest technologies that applied to urban planning are always helpful in engineering and transportation, while the transportation and engineering are regarded as the pioneer orientations to bringing new methods, algorithms and revolutionary thoughts.
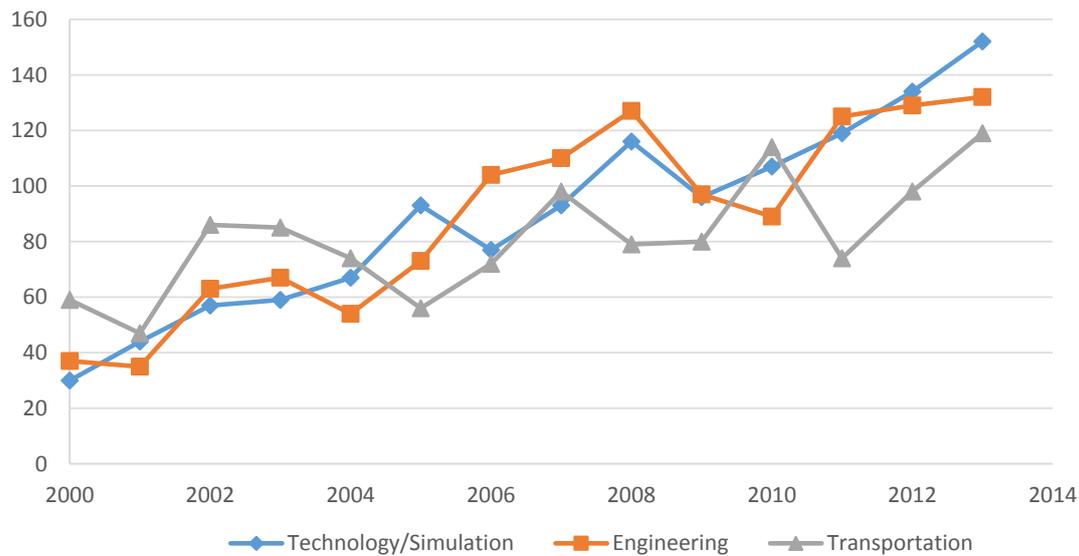
Figure 33 Research Issues Trends for Art, Culture and Events in 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

6.3 Comparison of Issues for All Orientations

6.3.1 Overall Trends for Responsive Issues

The Figure 34 collects the most remarkable topics among all topics from 6 major research orientation. The recorded trends for these research topics are similarly on the rise. However, due to the different orientations and content, the speed for growth varies from each issues. In overall perspectives, such topics could be categories into three classes, according to their rising speeds.

Policy/governance and space belongs to the orientation of strategy, spatial planning and policy studies, and the sustainable studies from ecologic and environment, constitute the first class. Such prominent domination in the results for policy/governance issues could also be supported through the findings in Linda Fox-Rogers's latest research, as he figured out that the planning scholars are more tended to adjust the self-perception of traditional pluralist and managerialist for themselves (Linda Fox-Rogers, etc. 2015).The three topics with the fastest growing speed and amount could be seen as the hottest topics in Europe during a relative long time. By looking into the first class, the topic of sustainability is the fastest growing topic in the past 13 years. In addition, the numbers for studies in spaces is now catching up with the sustainable studies. The second class are mainly constituted by cultural, social and strategic studies, from three different but related orientation.

Transportation, biologic, innovation and housing are included in the third class. The rising trends for this class is slow but steady.

In addition, the findings are somehow indicates the integration for planning issues, towards to more resilient and tolerant directions, as the policy/governance, the sustainable studies, and spaces covers the traditional perceived planning disciplinary categories. Therefore, it is

encouraging to have not witness the division of social and technical streams according to Yiftachel's prediction in 1989 (Yiftachel, O., 1989).

6.3.2 Redefining of Responsive Issues

Regardless of such orientations set for the responsive issues, the research displays the inter connection among keywords, according to their connection. If either two keywords appears in the one research outputs once, they would build a connection. Figure 35 shows the closeness of those responsive issues.

According to the results, five major issues groups present. The purple color includes governance/policy, society, innovation, and economy, etc. Red ones represent the space, strategy, climate, environment, and fairness, etc. The green one represents the culture, air, contemporary, events, and history, etc. The yellow group contains the sustainability, technology, water, traffic, industry, and footprint, etc. While the blue one represent the education, process/methods, etc.

Some of the outcomes are quite expected, as the planning/ design are in group with engineering. Traffic and technology are close, etc. While some outcomes are new and meaningful.

For the red group, actually, it contains the most essential elements that is needed to make a strategy or the entities that the strategy cares about. Climate change as one of the urban issues facing the academics, are quite popular studied in perspectives of finding the effective strategies.

While for the blue group, the major concern is the planning, design and the way to do these. For example, food, ecology, health, children and education as the new emerging issues in recent years, are more mentioned in the context of design and plan, according to the research outputs. It just displays the combination of design and emerging social issues, which is quite different from the past.

While the Purple group are highly relevant with the governance/policy. Economy, competitiveness, welfare, security, housing, community, society, finance, and innovation are seen as the topics been issued by governance and policy. Such issues are more discussed in purpose of finding proper policies and governance to achieve the well-being of citizens.

For the last one, the sustainable issues, are more focused on how to generate appropriate life style to make the city life better. Not only technical oriented, but also social and economic related.

In conclusion, the integration just display a figure which redefined the responsive issues according to the cities' development and the recognition of the academics. Comparing to the conventional categories for orientation, the results shows more resilience and tolerance, with a strong target oriented features. It could be viewed as the transformation of the discipline, from the separated orientations towards more issues based and target orientated directions.
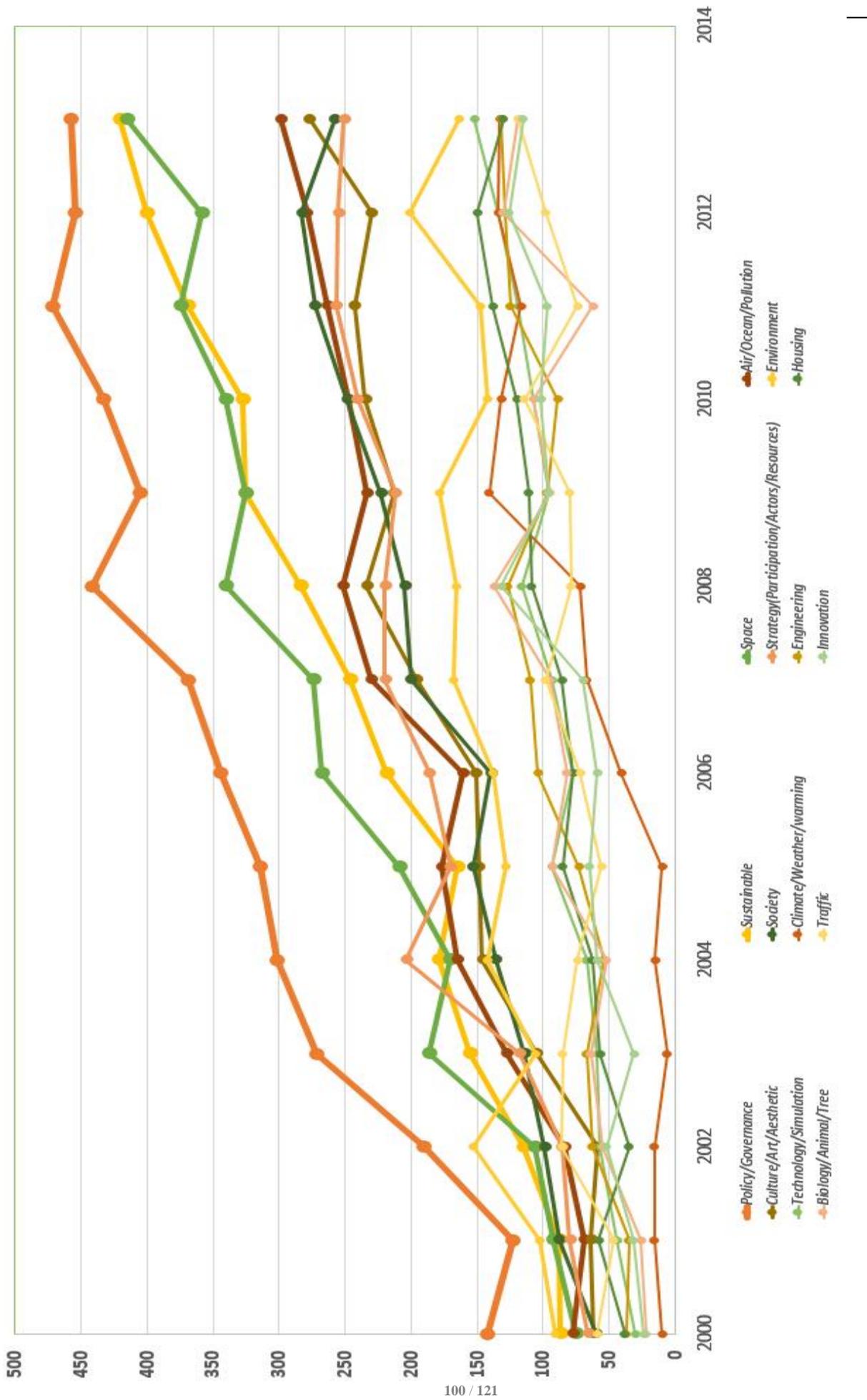
Figure 34. The Collective Trends for Major Research Issues in Europe 2000-2013

(Source: Data Collected by Author, YE Qiming, 2015)

Figure 35. Research Issues Integration and Grouping

(Source: Generated Through Gephi, YE Qiming, 2015)

6.4 Chapter Summary

In this chapter, the research mainly discuss about the research issues of the research outputs of European planning scholars. The forms of the research, as well as the issues, are the main focus.

Based on the data basis of the research outcomes, the research outputs are categories into journal articles, reports, chapters, conference papers, books, thesis, working papers, editorials, and reviews forms. As the journal articles constitute more 58.77% of the total research outputs, ranking the first place. While the form of reports occupies 11.76%, ranking the second place.

According to the findings, the reports are always the directed request from the practitioners of cities' development, such as government, institutions and enterprises. In that way, the planning scholars through the reports build up the connection to planning practices.

In terms of such research forms to locations, tables show the different situations in amount and proportions of research forms from European cities. London, along with several cities are prominent in outputs reports and conference papers, which illustrate the feature of applying such planning knowledge to practices outside of academic arena, and the ability of frequent planning knowledge exchange across borders.

The second half of this chapter focuses on the research issues. Comparing with the previous half, mainly discusses about what are the forms of these research outputs, this part address focus on what is the content and concern of these issues. The research categories the overall research outputs into 7 orientation: 1), social studies, 2), economy, law and industries, 3), ecologic and environment, 4), planning theory and urban history, 5), strategic, spatial planning and policy studies, 6), art, culture and events, 7), technology, engineering and transportation.

Dividedly, this research studies key issues in each orientation, comparing the amount of and distribution annually according to each key issues. Finally, a collective figure shows the trends for the prominent growing issues in Europe planning research, as the policy/governance, the space studies, and the sustainable studies ranks the superior places.

These results on one hand, shows the main trends of research issues' change during 13 years. On the other hand, it indicates the integration of social, technical and spatial design oriented fields in planning. As such a trend, a more competitive, resilient planning could be expected in Europe.

The integration of responsive issues shows the trends for redefining and grouping those topics in academics. More targets oriented and issues based directions are adopted by the research outputs. In other words, such regrouping trends display the response from academic field to the urban issues recently and in the future.

Chapter 7 Anchor Cities and Knowledge Exchange

As the responses for planning knowledge network in Europe, cities as the most suitable reflector are chosen to be described, measured and visualized in order to evidence or deepen the understanding for planning knowledge network.

Therefore, this chapter mainly discusses about the cities that highly relevant the network in two dimensions.

On one hand, the ability, which marks and recognizes the network through anchoring the knowledge output from the cities, is discussed. Such studies could reflect how the planning knowledge network effects on cities. In expectation, as these anchor cities are the physical reflections for the invisible network, the agglomeration of planning scholars could lead to the regrouping process within cities. If be true, the planning network would definitely have influences and reflections on physical world.

On the other hand, the direct planning knowledge exchange, empowered by the network among cities, are measured for unveiling the networks' direct knowledge delivery through cities. Since the study on such direction could probably lead us to find out whether the planning knowledge network has enforced the cities to obtain the features like producing or receiving planning knowledge.

7.1 Anchor Cities and Anchor Cities' Groups

7.1.1 Definition of 'Anchor Cities'

One of the best way to reflect the influences from European planning knowledge network, is to unveil how the planning scholars and communities would influence the cities. The research focuses on the cities, which are related to such network to be discussed. Since the connection of the network and cities are clearly recorded through different ways. The term of 'Anchor cities', created in this research, is to represent such kind of planning knowledge relevant cities as typical physical points in producing and receiving planning knowledge.

In terms of the definition, an anchor cities require a certain city to have the records of planning research outputs. Since such records evidence the cities' connection with the planning knowledge network. Take Europe as the case, there are totally 388 cities that could be regarded as the anchor city. In side of these anchor cities, European major cities are included, along with cities outside of Europe. This explains such European planning knowledge network is anchored worldwide, rather than only been limited in Europe.

7.1.2 Principle Model for Anchor Cities

The simple principle of anchor cities could be described as the relationship between cities through scholars and their research outposts. Figure 36 shows how the knowledge network

anchored by the cities. As two main types of nodes (cities, scholars), and links (research outputs with locations) constitute the model, it reflects the simple idea of where knowledge has been produced. Since the planning communities shows the geographical feature, the groups of scholars display the closeness geographically, which could be tested through the examining of the anchor cities and how it clusters in the following context.
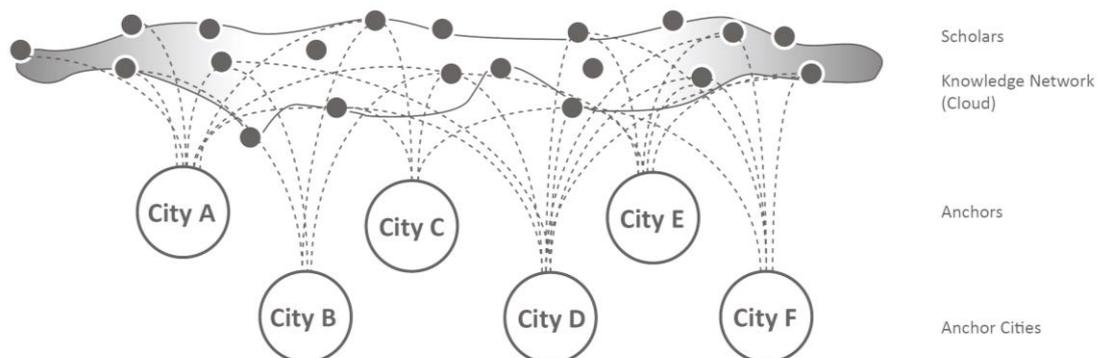

Figure 36 Principle Model for Anchor Cities and the Network Connection

(Source: Schemed by author, YE Qiming, 2015)

The data resources for this phase is generate from the same database in the previous phase when analyzing the planning knowledge network, but not all of them are recorded with locations. Somehow, the research outputs with location information are selected. In that way, most of the conference proceedings, books, book chapters, reports, etc. are covered in this analysis range. Moreover, it is according to those publications, that the anchor cities could be visualized.

As for scholars, one may build the connection between cities through only one publication, or none, or more. As for the cities, the more connection one get, especially from the scholars who have more places to be connected, it is more likely to have close relationship with other cities. In a word, the degree of connection between cities and scholars, and the closeness between each city are concerned in this phase.

7.2.1 Anchor Cities Groups

The principle for anchor cities to form groups is quite easy to get understood, as the planning scholars that production of knowledge outputs from certain cities, indicating the intrinsic links among scholars and cities. This connection is defined by planning knowledge, shows the closeness between certain groups of scholars with certain groups of cities. Since the Cities could share some common scholars, the cities tend to group and manifest common features. On one hand, this research would like to find out the anchor cities groups in order to unveil such implicated intimate relationship among those cities. On the other hand, this could provide evidence to the planning knowledge that support the cities and influence the cities.

As shown in the schemed model in Figure 36, anchor city A and anchor city B are linked through certain scholars in the planning knowledge network. Along with the agglomeration of shared scholars, as well as the increase in amount of planning knowledge between scholars and cities, the connection between the scholars' groups and the two cities are strengthened. Anchor city A and anchor city B would benefit from such scholars in the context of planning knowledge. Therefore, they would show up the intimate relationship correspondingly.

From the point view of the practical level, anchor cities actually share the experience or knowledge in cities' development. This includes planning skills, management, concepts, strategies, etc. With the help of such knowledge, anchor cities would adopt similar models in certain perspectives. However, such anchor cities' group could also be seen as the reflection of the planning knowledge network on cities. In other words, the planning knowledge network influence the cities through the shared scholars indirectly, but with the knowledge directly.

According to such principles for anchor cities group, this research exams the intimate relationships among cities globally. 388 anchor cities are related, with the total number of 17729 scholars build such bridges, in the case of European planning knowledge network.

As more connections with the certain groups of scholars, the more intimate relationship it would be among the anchor cities, with the help of Gephi (Cherven,K., 2015), the research established such illustration of anchor cities groups, as Table 6 shows.

According to the figure and table, the ability that cities obtained to mark the planning knowledge network is obvious. Through the shared scholars, the cities tend to cluster into different groups. Within the same anchor cities' groups, a certain city is likely to adopt similar ideals of planning knowledge, since they share some communal scholars. This give evidence to that, the planning knowledge network have influence on the cities, as in the way of link them through communal planning scholars, the it promotes the cities to share, and development in groups. Some important findings could be concluded.

1) Internationalization of Groups

According to the results of the anchor cities' groups, groups from United Kingdom maintains high participation of international cities. Especially in London, cities such as New York, Montreal, Hong Kong, and Seoul are involved. This means the planning scholars are active within these cities to be international oriented, with the mobility and engagement in United Kingdom as well as in other parts of the world.

2) United Groups

The group of Germany is quite united, as the major anchor cities of Germany are involved in the same group. This explains that the planning communities is quite communal for these cities. Planning scholars are quite active across the country. However, the range for these scholars are also expanded to nearby countries, like Austria and Switzerland. These three countries with three integrated groups are quite connective in planning scholars.

3) Integration of Regions

Belgium and Netherlands shares different languages, while due to the closeness in geography, the planning scholars are quite active in cooperating research activities in each other's' cities. This lead to the integration of these two groups together. As the Belgium groups which led by Antwerp involves Netherland cities, like Rotterdam, Leiden, etc., the domain is more obvious showed in are the evidence of the integration.

4) Division of Regions

On the other hand, some regions are divided into different groups as shown in United Kingdom, French, and Italy. This could be resulted from the diverted, richness but hard to be integrated planning schools in those regions. However, this phenomena provides possibilities for regions like these to have multipolar development for both the planning communities and the cities.

Table 6. Major Anchor Cities' Groups

Region	Leading Cities	Member Cities
United Kingdom	London	*Oxford , Newcastle, Istanbul, New York, Montreal, Hong Kong, Seoul, Aldershot, Athens, Cambridge*
	Liverpool	*Manchester, Beijing, Dordrecht, Toronto, Chichester*
	Sheffield	*Glasgow, Edinburgh, Madrid, Washington, D.C., Chicago*
	Coleraine	*Belfast, Dublin, Thessaloniki*
	Cardiff	*Farnham, Stockholm*
	Bristol	*Birmingham, Aberdeen*
Italy	Rome	*Naples, Palermo, Bari, Pescara*
	Milan	*Venice, Padua, Madrid*
	Turin	*Catania, Tehran*
	Florence	*Bologna, Pisa, Tokyo*
Belgium- Netherland	Antwerp	*Leuven, Brussels, Ghent, Rotterdam, Leiden, Nijmegen, Luxembourg*
	Amsterdam	*Delft, The Hague*
France	Paris	*Bordeaux, Besancon, Champs-sur-Marne*
	Grenoble	*Lyon, Reims, Geneva, Shanghai*
	Tours	*Nantes, Rennes, Lille, Toulouse*
Germany- Austria- Switzerland	Berlin	*Dortmund , Kaiserslautern, Hamburg, Kassel, Hannover, Stuttgart, Munich, Bonn, Cologne, Innsbruck*
	Vienna	*Wiesbaden, Prague, Graz, Innsbruck, Budapest*
	Zurich	*Bern, Karlsruhe, Frankfurt, Basel*
Denmark	Aalborg	*Copenhagen, Sydney, Oslo, Melbourne*

(Source: Schemed by author, YE Qiming, 2015)

7.2 Cities Knowledge Exchange

7.2.1 Principles for Cities Knowledge Exchange

Comparing to the anchor cities groups, which reflects the intimate relationship through planning scholars, the planning knowledge exchange shows the direct planning knowledge inputs and outputs for of cities. As some of the cities would be recorded as the planning knowledge produced places, while other cities are the research targets.

Based on the data basis, the direct relationship is established among cities. In total, there are 388 anchor cities that output the planning knowledge, while 248 cities are playing the role of input sides. However, most of the European major cities, are both output and input cities, according to the research.

This knowledge exchange shows how cities are able to hub the planning knowledge as well as how important it is to be studied, in terms of the planning academic value.

Correspondingly, the planning knowledge exchange among cities is another proof of the influences from planning knowledge network in Europe. Moreover, it shows how such planning knowledge been generated, delivered and applied among cities. Some critical features could also be found out, as such planning knowledge could display the preferences of self-concerned or geographically imitate relationships.

7.2.2 Top 50 Planning Knowledge Exchange Cities

From the perspectives of the globe, the outcome of the knowledge exchange among cities are displayed in Figure 37. This table shows both the planning knowledge input and output simultaneously, and is ordered according to the amount of knowledge output. The Top 50 cities that are significant in exchanging European planning knowledge, which shows some common features and trends, as well as some special cases be displayed. Such table reflects the sum ability and amount for output and input knowledge. Some features could be concluded from this Figure as listed below.

1) The Non-European Cities are with High Input Degrees
Among such 50 cities, 48 cities are from the European continent or the United Kingdom. While with Shanghai (ranking 47) and New York (ranking 43) are the cities from outside of Europe. Both of these two cities perform well in planning knowledge input. As Shanghai inputs 116 degrees of planning knowledge from Europe, while New York 72 degrees. However, New York shows more strength in output the European planning knowledge, with 25 degrees in output, comparing that with Shanghai. It is expected such non-European cities are mainly good at input the European planning knowledge, therefore, the major influences that the planning knowledge network show on such cities are the knowledge input. In other words, if they are valuable in planning research, the degree are probably higher than other cities outside of Europe.

2) Consistent with the General Trend of Input and Output for European Cities

For European cities, the trend of planning knowledge exchange is quite consistent with the trend of rising the amount of both input and output. If a city performs well with higher degrees in knowledge output, it is probably well performed in knowledge input as well. Such trends in general reflect the planning knowledge is not existed evenly in Europe. The knowledge input and output is correlated in most cases. For those big cities, like London, Amsterdam, Paris, Milan, etc. they are not only considered to be the hotspots for planning research, but also the major source for producing such planning knowledge, as several significant planning schools locating in the cities. However, it is right because the richness of planning education or research resources, that those cities could be more focused and studied with good performances in either in planning knowledge input and output.

3) Non-Major European Cities with Better Performance in Input than Output

In those cases that planning knowledge input values that exceed the output values, such European cities mostly lacks the planning schools, which could be regarded as the major source of planning knowledge outputs. On the other hand, they are also been regarded as the planning research hotspot second to or even equal to those big cities. Therefore, such European cities, regarded as non-major European cities conventionally, also perform well in integral planning knowledge exchange. However, those cities with good performances in both high output and input, are the leading figures in European planning knowledge exchange.

4) Some Extreme Cases

Cases like Delft is one of the unbalanced cases, of which the input and output values varies extremely. As known to all, Delft is not a comprehensive or big cities as London, Paris, etc. While the total amount of planning knowledge exchange performed quite well, ranking the 9th place in the Top 50 cities. However, the gap between input and output amount is incredibly high. The value for planning knowledge output surpasses the input value 9 times. It should largely results in the contribution from TU Delft, which exports as much research outputs as possible in planning academic fields. And the fact that TU delft is quite active in organizing planning academic activities, while most of the knowledge is external oriented, moreover, scholars in Europe are not quite engaged in study the issues of Delft locally. That could be the explanation for such extreme gaps between input and output amount in Delft.
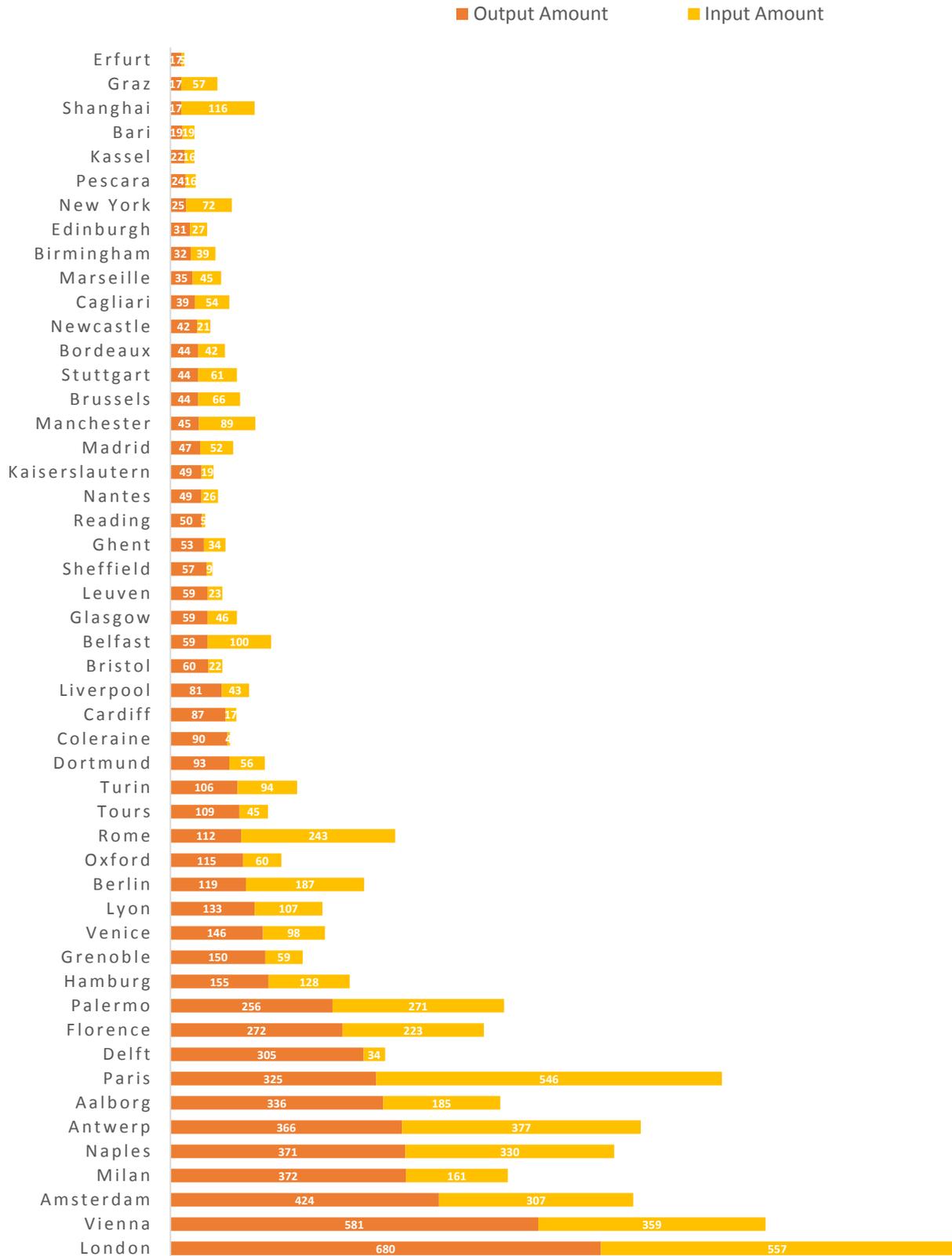
Figure 37. Global Wide Planning Knowledge Exchange among Anchor Cities

(Source: Schemed by author, YE Qiming, 2015)

7.2.3 Major European Cities Performance in Knowledge Exchange

As been shown in the Figure, the European cities are the obvious major part in the Top 50 Planning knowledge exchange cities. Therefore, the research focuses on those European cities in order to find out some more important features. Once again, we operate Gephi as the tool to group the cities with knowledge exchange in Europe, to figure out the clustering layout. Based on that, we added the geographical coordination to such relationship according to real location of the cities, in purpose of showing the possible geographical intimate relationship.

The outcome is displayed in Figure 38, as the size of cities shows the amount of knowledge exchange, with colors defining different groups of cities. Unexpected, there are significant features been unveiled from this figure. Furthermore, those European cities as the domain part in exchanging the planning knowledge shows the impact global wide.

1) Highly Geographically Relevance

This figure shows that the cities are highly involved in different groups according to geographical variation. Italy Group, Vienna Group, Belgium-Amsterdam Groups. West Germany Group, Paris Group, London-Berlin Group is obvious in the figure. This evidences the grouping results for planning communities, as the geographical feature is also strongly displayed. Crossing borders are also reflected displayed in the figure, as shown in the case of Belgium and Netherland, the South European Groups, or the case of Vienna. Regional differentiation limits the cities of been actively evenly connected as a planar network across Europe.

Similar to the planning communities, as had been discussed previously, the geographical closeness is resulted from the level of thresholds in exchange defined by different factors. The accessible distances, similar culture and languages, make such planning knowledge exchange become achievable. Even though in the case of Belgium Netherland, the language is different, however, the interactions are possible through international languages and frequent exchanges.

2) Exceptional: Berlin as an International Oriented Cities

Berlin as the capital of Germany, shows the planning knowledge exchange connection with London as well as with other Germany cities in terms of the amount. Such strong connection with London results in the separation of Germany groups. Since the West Germany tends to establish a strong connection with each other as a regional collective clusters, Berlin are tended to be the rest part which is finally belongs to the group of London, the group that is highly globalized. It is understood, that Berlin is not only the capital of Germany, but also important conference resorts and international hubs for planning academic knowledge exchange, such international tendency conquers the localization trends from western Germany.

3) International Planning Knowledge Port: London

London, as also the case of the capital and an international city, plays a significant role in connecting the cities outside of Europe, with European cities. Cities like New York, Washington, DC., Shanghai, Beijing, etc. are included with the same group of London. This is due to the international orientation of the planning schools and scholar that lives in London, They care more about the global issues, rather than European issues. As the result, London is highly connected with the cities world widely.

4) Italian Cities' Influence: Expanding in entire Southern Europe

Within the group of Southern Europe, Italian cities are significantly connected among each other, along with the Spanish cities, Portugal cities and the cities in meditation islands or along the coasts. Madrid, Barcelona, Lisbon and Porto, etc. are the cities that positioned outside of Italy, but influenced by the Italian cities' planning knowledge exchange. These cities located in the southern part of Europe, which shares the same culture and have access to each other's languages with little obstacles. This could be seen as the reason for the active knowledge exchange among cities in this region. However, as the relatively high capacity of planning knowledge exchange, Italian cities like Turin, Milan, Rome, and Naples, etc. takes the leading role in this trans-border groups. Same phenomena also shows in Belgium-Netherlands groups, where the two countries establish a communal network in planning knowledge exchange.

5) Vienna's Influence on Central and Central East Europe

As the primary cities in Central Europe, Vienna is quite significant in planning knowledge input and output. Even though a large amount of the exchange happens within Vienna itself, it has also influenced the cities not only in Austria, but also several cities in Central and Central East Europe, as long as some small cities in Germany Speaking countries, through the planning knowledge exchange activities from Vienna. It is another proof and reflection for geographical closeness.

6) European Planning Knowledge Exchange Belt

The agglomeration of cities form south to north Europe, including United Kingdom, manifest a highly correlated geographical belt. Form Palermo in Italy in the south, through the Italian cities groups, and passes Grenoble, Lyon, through the West Germany Region, Dortmund, then reached Belgium-Netherland regions, eventually ended up with London and agglomerated cities. This belt is quite obvious since it covers and links the entire five groups. For Paris, Vienna and Berlin, they are positioned in either side of this belt, with exchanges to this belt.

From the perspective of Europe, this belt is most responsible for the planning knowledge exchange. On the other hand, they are one of the most important major source and targets for planning knowledge globally. The planning scholars, as well as the cities no matter local oriented or internationalized would benefit from this belt in knowledge exchange.
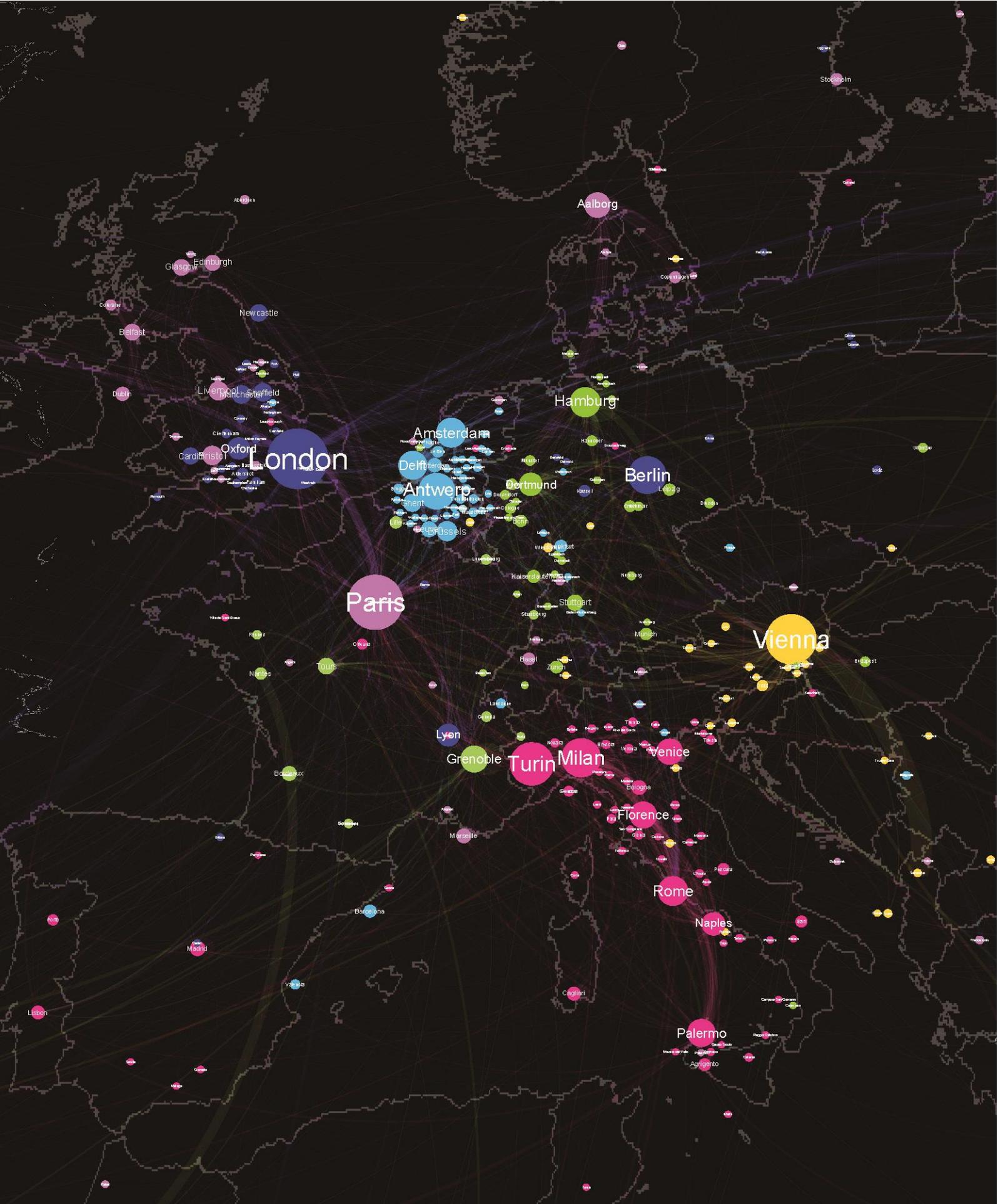
Figure 38 Global Wide Planning Knowledge Exchange among Cities

(Source: Generated through Gephi, YE Qiming, 2015)

7.3 Chapter Summary

In this chapter. The main topic is focused on the influences that the European planning knowledge network act on the physical world. The terms of 'anchor cities' and 'anchor cities groups' is invented to describe the cities that are recorded to mark the planning knowledge network not only in Europe, but globally.

In total there are 388 cities defined as the anchor cities, with the records of marking the cities, while establish the intimate relationship with other cities by sharing communal planning scholars, and communities. They are clustered into 50 anchor cities' groups. Part of the groups shows the international oriented features, such as London Groups, while the rest are more localized. The finding from anchor cities reflects and evidences the influences from planning knowledge network through the scholars. In such approach, the cities are redefined and clustered according to the closeness in shared planning knowledge, scholars, and communities. Hence, it is from an indirect way to reflect the influence of the planning knowledge network.

The rest part of this chapter focuses on a more direct way to unveil the influences from European planning knowledge network on cities. The knowledge exchange among cities shows the ability that the network enables the cities to produce and receive knowledge, which reflect the planning knowledge networks' influence once again.

Such Influence of European planning knowledge exchange reflects not only on European cities, but also cities outside of Europe. The outcomes of such knowledge exchange among cities perform the features of clustering, which is in accordance with the same principles of planning communities. UK cities groups, Belgium and Netherland regional groups, West Germany cities groups, Grenoble regional groups, and Italian cities groups forms the planning knowledge exchange cities belt, which is the giant trans-border hubs for European planning knowledge network and the carrier for planning knowledge exchange.

Chapter 8 Conclusion

From the both the literature study and the quantitative analysis of the research, the correlation and networked features among planning knowledge, responses of urban issues, and the influenced cities, are obvious. The following context conclude the 6 important collective findings for this research.

8.1 Glimpse of Planning Schools, Scholars and Research

This research looks into 57 major European planning schools out of 116 candidate schools in AESOP's full membership list. Such schools covers the traditional territory of Western European Continent and United Kingdom, including Germany, French, Italy, Netherland, Switzerland, Span, Belgium, Denmark, Austria and United Kingdom. 2023 planning scholars are studied, with 80988 pieces of research outputs been recorded. Such data and information is used as the database and references for frame the research. From the perspective of the globe, European research outputs keeps rising in Europe, as well as in other four regions worldwide, the east coast region of United State of America, the South America, the Australia, and the East Asia. These regions are the emerging or continuously rising regions for output European planning knowledge.

8.2 Planning Knowledge Network: Open, Involving and Communities Oriented

The research established an assumptive model, using the research outputs as the connection among scholars, according to the recorded data. Based on the data base, and with the help of open platform of social network visualization software, the visual work of European planning knowledge network is achieved. Totally, 17729 planning scholars are involved in the network. From this standing point, the planning knowledge network is quite an open system. Features of the network are acquired further according to the indicators performance, such as the tolerance, the high involvement, tendency of clustering, closeness of scholars, uneven developed, and the communities oriented. With different planning communities constitute the network, diversity is quite prominent.

8.3 Planning Communities and Groups: Typical, Effective and Stable Structures

As the most important structure of planning knowledge network, the 888 planning communities shows the feature of geographical closeness and mixed constitution. For big communities, typical features like the single cored communities, the multi cored communities, the planar communities, the split communities, the reunited communities and the regional collective communities are acquired. Such various features reflect the culture, organization and planning tradition, geographical closeness, research orientation of those planning schools.

The research studies the proper size for effectiveness in gaining cooperation as well as the stability. Based on the data from 888 communities and the 1701 planning groups cracked from

those planning communities, the research finds out that communities with bigger size, are more effective in gaining cooperation, while performed pool in stability. On the contrary, the communities with less planning scholars, referred to as 'planning groups', are difficult in obtaining external cooperation comparing to bigger ones, however, they are more stable. Therefore, the planning groups are the most essential core structures of the planning communities and the network.

8.4 Response to Urban Issues: Meanings in Forms and Trends form Issues

Totally, 80988 pieces of research outputs are categories into journal articles, reports, chapters, conference papers, books, thesis, working papers, editorials, and reviews forms. The journal articles constitute 58.77% of the total amount. While, the reports occupying 11.76%, indicates the directed requests to planning scholars from the practitioners of cities' development. Through such reports, the planning scholars build up the connection to planning practices and other actors in real world. To study the issues form according to cities, situation various from European cities. London, along with several cities are prominent in output reports and conference papers, illustrating the frequency of applying planning knowledge to practices and knowledge exchange across borders.

From the perspective of the orientation of such issues in Europe, the research categories the overall research outputs into 7 orientations: 1), social studies, 2), economy, law and industries, 3), ecologic and environment, 4), planning theory and urban history, 5), strategic, spatial planning and policy studies, 6), art, culture and events, 7), technology, engineering and transportation. Thereafter, key issues are calculated and compared. Finally, a collective figure shows the prominent growing trend for all issues in Europe, and the policy/governance, the space studies, and the sustainable studies ranks the superior places.

This results on one hand, shows the main trends of research issues' change during 13 years. On the other hand, it indicates the integration of social, technical and spatial design orientation in planning. As such a trend, a more competitive, resilient planning could be expected in Europe.

The integration of responsive issues shows the trends for redefining and grouping those topics in academics. More targets oriented and issues based directions are adopted by the research outputs. In other words, such regrouping trends display the response from academic field to the urban issues recently and in the future.

8.5 Anchor Cities and Anchor Cities Groups: Network Redefining Cities

The main topic focuses on the influence that the European planning knowledge network act on physical world. Anchor cities are defined as the cities that mark the planning knowledge network, as the output side of the research outputs. Anchor cities are not only constrained in Europe, but globally. According to the research, 368 cities are recorded as anchor cities, clustering into 50 anchor cities groups. Part of the groups shows the international oriented features, such as London Groups, while the rest are more local oriented.

Findings from anchor cities reflect and evidence the influences of the planning knowledge network through planning scholars and planning communities. In such approach, the cities are

redefined and clustered according to the closeness in shared planning knowledge.

The rest part of this chapter focuses on a more direct way to unveil the influence of the European planning knowledge network on cities. The knowledge exchange among cities shows the ability that the network enables the cities to produce and receive knowledge, which reflect the planning knowledge networks' influence once again.

8.6 Exchange Planning Knowledge: New Type of Network for Cities

Such European planning knowledge exchange reflects not only on European cities, but also cities outside of Europe. Due to the exchange in planning knowledge, cities are regrouped into 6 major clusters. UK cities groups, Belgium and Netherland regional groups, West Germany cities groups, Grenoble regional groups, and Italian cities groups forms the planning knowledge exchange cities belt, which is the giant trans-border hubs for European planning knowledge network and meanwhile the carrier for planning knowledge exchange. The displayed features also indicates the influence from geographical, preference in international or localization, the cultural and language, and most importantly, the reflection of the planning communities.

To conclude, at the end of this research, three assumptions are tested to be true. The open, multi-polar planning knowledge network serves not only as the platform for academic cooperation and connection, but also the collective resources of research outputs, which concerns the urban issues. The response of urban issues implies the integrated trends for social, technical, and spatial fields in European planning academic arena. Evidences also be found that more active relationship among the planning scholars and practitioners are established. Eventually, the planning knowledge influences on the cities through the presence of planning scholars and the exchange of research outputs. Cities begin to network and exchange knowledge, thanks to the influence from planning knowledge network. Through the research, structure, organization, and features for planning knowledge, planning scholars, urban issues, and the influenced cities are clear, with further profound findings discussed.

Acknowledgement

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