

## Spatial Network Analysis of the Creative Industry in Osaka City Using the Social Network Analysis with Big Data

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Industrial clustering is generally explained by the benefits of agglomeration economies such as networking of co-located companies, convenience of transportation, operational efficiency, and cost. Also, industrial cluster formation has been explained in terms of agglomeration economies and geographical advantages. However, agglomeration of the creative people so-called creative class have been emphasized rather than geographical benefits as a factor in the location of the industrial clusters in these days. According to Richard Florida, particular regional economic growth depending on creative class that holds the creative capital. Florida defines '*the creative class*' that as a group of well-educated and high skilled people who have technical knowledge or specialty or artistic talents.<sup>1)</sup>

In the meantime, the development of the computing capability to process and sensing technology and by analyzing the Big Data in recent years. Large amounts of data that generated and obtained from the spatial information, for example, the place where specific industries located on, can be used as valuable information by measuring the relationship between space and location decision behavior. As another example, we are expect to utilize to better create spatial atmosphere by measuring the flow of people for commercial spaces in building, or to make the energy-saving by better control building facilities by measuring the flow of people. A city's attractiveness is directly related to its ability to offer the basic services that support growth opportunities, to build economic value and to create competitive differentiation.<sup>2)</sup> Moreover, analysis of Big Data such as urban information may provide the new implications and insight in the city's attractiveness. So we can suppose that the agglomeration of the creative classes and creative industries in urban center can be the one of the ability a city's attractiveness above mentioned. Also, they tend to centralize particular place where have diversity and attractiveness. Thus, analysis of the spatial characteristics that distribution of creative class and industries can be considered analysis of the city's attractiveness by analyzing of the big data of the city.

Social Network Analysis can be used as one of the approach to analyze using like this Big Data. Although many of studies about industrial clusters, there are focused on organizational network structures, there are focus on the organizational inner networks or between the companies. And also, network analysis studies put the focus on the aspect of the network governance. It seems to be lacking of research about the spatial characteristics and distribution of the creative clusters in urban center as a network structure. Therefore, it is necessary to analyze the characteristics of the spatial network structure. It is important to assess urban particular place where are gathering of the creative people and to analyze creative businesses as a hotspot, and its spatial characteristics as a spatial network structure.

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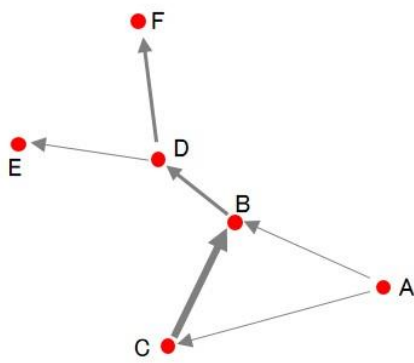


Figure 1. Composed of nodeset and linkset

Network theory in general deals with the study of graphs representing the relationships between discrete and entities. Components of the network are nodes and links. Each node represents the actors with specific attributes. Link means the consolidated relationships between the nodes. A network is composed of nodes and relationships among nodes. Defining a group of nodes that compose a network as a nodeset and defining the relationships among the nodes - or a group of links - as a linkset, the nodeset and the linkset on the left figure (figure 1) are as follows.

$$\text{Nodeset} = \{A, B, C, D, E, F\}$$

$$\text{Linkset} = \{(A,B), (A,C), (B,D), (C,B), (D,F), (D,E)\}$$

Network analysis techniques enable accessing and analyzing massive amounts of data from many different perspective which are often incomprehensible by traditional manual or pre-computed querying approaches.<sup>3)</sup> Also it can be interactive and visual exploration of network data and facilitates the detection of underlying patterns and structures of the network.

In this paper, we will summarize some of the basic concept and related studies that discussed about some network theory. And we refer to the precedent studies about social network analysis to provide for explaining some concepts. And then we made up two mode matrix of creative companies- location of creative industry from the address data and generated a network of creative industries and their concentrated area. Even if there is no relationship of a direct interaction between distribution of creative companies and creative companies, it can be set artificially relationships. Generated links represents the relationship of location of the inter-regional and creative industry. If the same type of business services is located at one or more positions in the same area, We regarded that there is interaction in the area between. This paper focuses on the agglomeration of creative industry at central 3wards in Osaka because there have high degree of the concentration of variety related creative industry in Osaka city (figure 2).

This paper have two purposes. One is the analysis of the spatial network structures between the area where gathering distribution of the business services and creative compnies in Osaka city. The other is the presentation of a methodology about visualization of spatial network structure using a kind of urban information Big Data. We

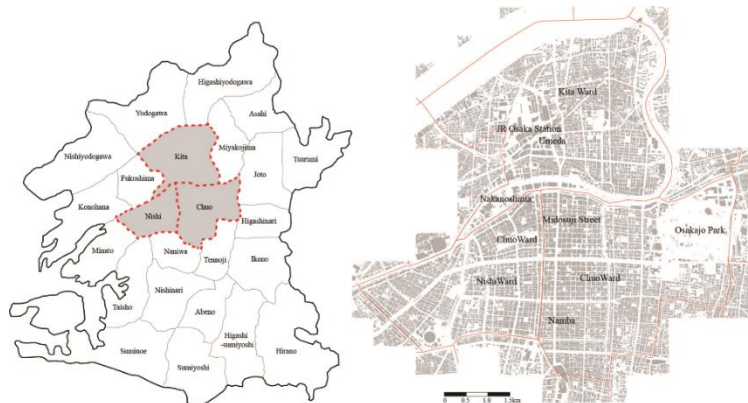


Figure 2. Osaka City: three wards(left grey area) and enlarged three wards

We can expect that this methodology provide a new view point of the spatial network structure of creative clusters and condition of location. Thereby providing better exploitation of the a factor of location decision and implication of the distribution of the creative industries. And it may provide an opportunity to understand the relationships between urban information and spatial structure.

In this paper, we performed network analysis by using Netminer 4. Netminer is software for Exploratory Analysis and Visualization of Network Data. It provides the integration of standard social network analysis (SNA) methodologies with network visualization or graph drawing techniques for

exploratory data analysis (EDA).

We used a node dataset about creative industries as a Big Data for analyzing to urban information . In this paper, we categorized creative industries according to classification of the Florida’s creative class. Florida describes the Creative Class as comprising 40 million workers in U.S.A. He breaks the class into two broad sections, derived from Standard Occupational Classification System codes: Super-Creative Core such as science, engineering, education, computer programming, research, with arts, design, and media workers forming a small subset. Florida considers those belonging to this group to “fully engage in the creative process”. The others are Creative Professionals: These professionals are the classic knowledge-based workers, which are business and finance, the legal sector, and education. They “draw on complex bodies of knowledge to solve specific problems” using higher degrees of education to do so<sup>4</sup>). In this paper, we regard the creative industries as a creative class, as a collective creative class. A node dataset was referenced from *the business mall*, the support site webpage of the Chamber of Commerce and Industry<sup>5</sup>).

We performed Spatial Network Analysis of the distribution of the creative industries in Osaka City with geographical data by using Netminer and visualization of them(Figure3).

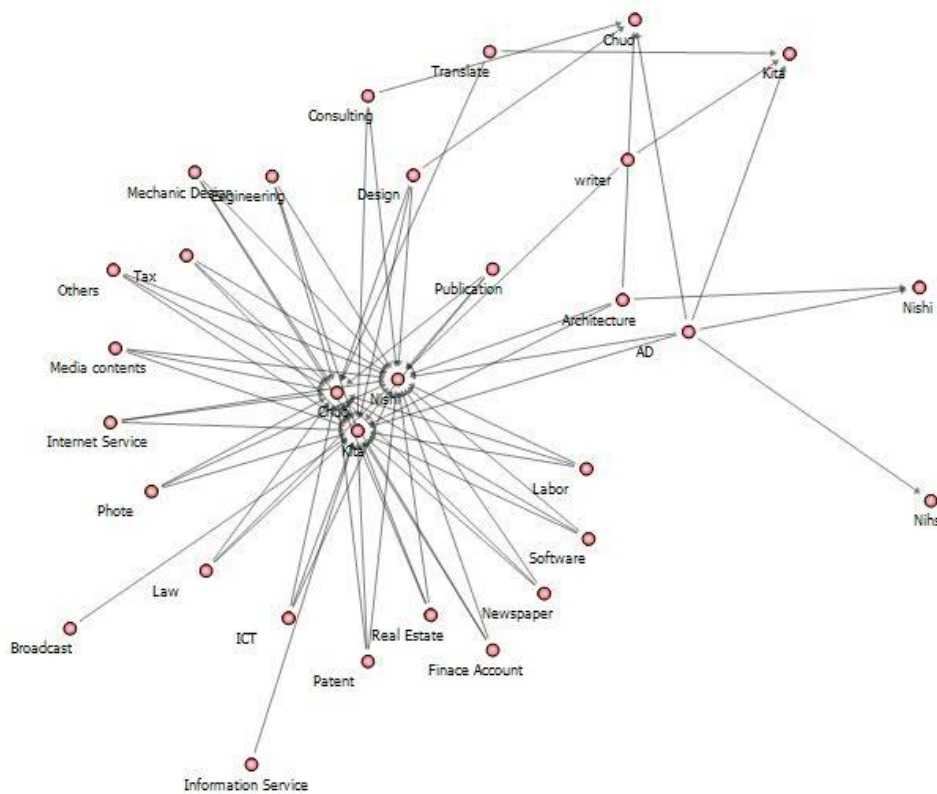


Figure 3 Spatial Network Analysis of distribution of the creative industries in Osaka

From now on, Big Data may be as important to interpretation of urban condition. It may lead to more accurate analyses. More accurate analyses may lead to more confident decision making. And better understanding that the location of the creative clusters in urban space. It will provide better accuracy information of the urban place and attractiveness for growth of the city.

**Keywords:** *Spatial Network Structure, Big Data, Creative Industries, Social Network Analysis*

Reference:

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