VISUAL ANALYSIS OF THE RELATION BETWEEN CONCENTRATED DISTRICTS OF KNOWLEDGE-BASED INDUSTRIES AND THIRD PLACES IN OSAKA CITY

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Abstract. Recently, as the changes in the economic structure, service industries have become an important factor of the urban regeneration. Especially, Knowledge-based industry is garnering attention as an engine of urban economics. Urban present condition such as location of Knowledge-based industry visualization and analysis are main issues for people as well as policymakers, urban planner and designers. This paper presents analysis of the spatial characteristics of the distribution and spatial concentration of Knowledge-based Industry, specifically Business-support Services. Furthermore, this paper is intended to describe examination of the visual relation between spatial conditions and configuration by visualization using GIS and space syntax analysis. This paper shows that business support services are likely to concentrate in specific places. Results of this study show that each type of business support services is concentrated in different districts. Results show that creative design industries are located near the park, riverfront, and such third places with high integration and connectivity with the street by space syntax analysis. Results show that concentrated districts of creative design companies at inner block show relatively high local integration values and connectivity. This study elucidates how industrial concentration and spatial configuration can be ascertained visually.

Keywords. Spatial analysis; knowledge-based industry; third place; GIS; space syntax.

1. Introduction

As the economy grows, service industries have become an important part of the urban economy. Concomitantly with changes of industrial structure, the location of knowledge-based industry is garnering attention as an engine of urban regeneration. Knowledge-based industry is based on high technology or a highly skilled workforce in service industries. Therefore, human capital is the main factor
supporting knowledge-based industries. It is necessary to examine the distribution and spatial characteristics of knowledge-based industry where they are concentrated.

According to Richard Florida in The Rise of the Creative Class, creative capital based on human capital and urban-regional growth demonstrate that people, not businesses, are the engine of regional economic growth. Florida defines a ‘Creative Class’ as a group of well-educated people who have technical knowledge or specialty or artistic talents. Florida argues that they have similar tastes, a tolerant attitude and similar life styles. They also have needs for a sense of place, cultural diversity, amenities, activities of recreation, and such (Florida, 2002).

Oldenburg in The Great Good Place explains a third place that is not work and home and defines that third places are informal gathering places in which people gather, neither at home nor at work. Oldenburg explains the third places provide a place to connect with people in communities as well as a place to exchange ideas and news (Oldenburg, 1999).

In other words, to attract knowledge-based industry, these imply that we need human capital and a place to attract creative class. For this reason, a place-explo-ration based on spatial characteristics and visualization of urban present conditions is the main issue for urban policymakers and urban designers in urban planning and regeneration. As described herein, we regard the Knowledge-based industry to business support services, specifically so-called creative design (Economic Affairs Bureau, 2012), as a group of the creative class to elucidate characteristics and the relation of the concentrated districts and the third places by space syntax analysis. This study is an effort at visual analysis to ascertain the relation between concentrated districts of business support services and third places. Results suggest a visual methodology of integration analysis. Furthermore, visualized spatial information portraying the present urban industrial condition and spatial information can be provided.

2. Definition of the Knowledge-Based Industry and Creative Design Industry

2.1. KNOWLEDGE-BASED INDUSTRY

Knowledge-based industries are defined as described herein.

- Corporations that perform technology-based activities and which produce high-technology goods and services.
- A corporation that has a highly skilled workforce and which provides technical or highly skilled services such as finance, insurance and communications.
2.2. CREATIVE DESIGN INDUSTRY

This paper defines creative design industry, which is adopted as a “New Growth Strategy” of Japan, which are fashion, content, design, food, culture related industries. This study adopts a business-supported services system according as a Japan Standard Industrial Classification.

3. Spatial Scope and Overview of the Central Three Wards

For this study, we conducted a survey of a targeted area of central Osaka City: Kita Ward, Chuo Ward, and Nishi Ward. Table 1 and Figure 1 present an overview of the target area.

Table 1. Data characterizing the three wards.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Kita Ward</th>
<th>Chuo Ward</th>
<th>Nishi Ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>10.33 km²</td>
<td>8.88 km²</td>
<td>5.20 km²</td>
</tr>
<tr>
<td>Household</td>
<td>67,199</td>
<td>44,462</td>
<td>48,563 (2012.1.1)</td>
</tr>
<tr>
<td>Population</td>
<td>113,135</td>
<td>78,446</td>
<td>85,278 (2012.1.1)</td>
</tr>
<tr>
<td>Population density</td>
<td>10,952 people/km²</td>
<td>8.836 people/km²</td>
<td>16,400 people/km²</td>
</tr>
<tr>
<td>Main facilities</td>
<td>Osaka Station, Nakanoshima</td>
<td>OBP</td>
<td>Utsubo Park</td>
</tr>
</tbody>
</table>

Figure 1. Osaka City: Gray Area shows the Spatial Scope of this study area.
4. Method of Analysis

This paper proceeds as follows. We start by defining and classifying business support services, specifically creative design industry. Furthermore, we explore concentrated districts of the creative design industry and analyze their spatial characteristics. We also analyze visual relations between the clusters and third places using GIS and Space syntax analysis.

4.1. CLASSIFICATION OF BUSINESS SUPPORT SERVICES

This paper divides service industries into three categories, as shown in Figure 2 below: business support services, life support services, and public services. Such a classification is done according to criteria we constructed on datasets which are ICT industry, professional, advertising, and other technical services such as finances, management consulting, and law.

![Classification of Service Industries](image)

*Figure 2. Classification of Business Support Services: Grey Highlighted Areas show the Scope of this Study.*

4.2. DATA COLLECTION

We extracted corporate information and address data of business support industry companies from TSR Information in 1980, Chamber of Commerce and Industry in 1990 and 2000. Present condition data were extracted from the web site of the Osaka Chamber of Commerce and NTT i-Town page. In addition, data for third
places such as cafés, bars, restaurants, and galleries were extracted from the NTT i-Town Page.

4.3. PROCESS OF ANALYSIS AND VISUALIZATION

The analysis has proceeded in three stages:

1. Visualization of the geographic distribution of creative design industry businesses such as architectural design and graphic design in present data (Figure 3).
2. Exploration and visualization of the concentrated districts, and density analysis of the creative design industry (Figures 4 and 5).
3. Visual relation between concentrated districts of creative design industry and the third places using space syntax (Figures 6 and 7).

5. Spatial Analysis

5.1. VISUALIZATION OF DISTRIBUTION BUSINESS SERVICE INDUSTRY

We performed density analysis using GIS to find distribution of the business service industries and present conditions of concentration. The analysis results are presented in Figure 3.

*Figure 3. Visualization of distribution of creative design industry and concentrated creative districts.*
5.2. EXPLORATION OF CONCENTRATED DISTRICTS OF CREATIVE DESIGN INDUSTRY

We performed density analysis using GIS to find concentrated districts of the creative design industries. Analysis results are shown in Figures 4 and 5. For example, in Kita Ward, most creative design companies are located at Tenma area near the riverfront. They are concentrated around Utsubo Park at Nishi Ward.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figures/fig4}
\caption{Visualization of concentrated districts of each type of business service.}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figures/fig5}
\caption{Kernel Density Analysis of the Business Services in Osaka City.}
\end{figure}
5.3. AXIAL MAP ANALYSIS AND RELATION BETWEEN CONCENTRATED DISTRICTS OF CREATIVE DESIGN INDUSTRY AND THIRD PLACES

The axial map shows a network of intersection of the axial lines represented by the longest line of sight, which is useful to characterize every street segment. Two syntax measures used were Integration and Connectivity in this paper (Figure 6).

![Axial map analysis of Osaka City: Axial lines in the map, where thick lines represent highly integrated street segments and thin lines represent segregated street segments.](image)

6. Results

Results presented in this paper point to important implications for revitalization of urban design. The results are as follows:

1. Spatial analysis shows that knowledge-based industries are likely to locate specific districts with different types of business classification.
2. Results show that Creative design clusters are likely to be located near the park, riverfront, and such areas. Creative design clusters were formed within a block or one or two blocks distant from main streets or between main streets. However, a high integration value and connectivity prevail in spite of the location.
3. Findings from space syntax analysis show that both the business services clusters and the third places have high integration values and connectivity. Furthermore, both have a positive correlation between integration values and connectivity. Results show that the streets near the park or riverfront at inner block in the concentrated districts of creative design companies show highly local integration values and connectivity from the results of local axial analysis (see Figure 7).

Figure 7. Overlap analysis of axial map analysis and third places: Map showing the relation between concentrated districts and third places.

7. Conclusion and Future Work

Accessibility for integrated urban information is a main factor for participation in urban design. Furthermore, the visualized analysis of a present condition is an important component for urban information. However, it is difficult for people to
follow-up urban conditions and information because of insufficient integrated and visualized information. From this paper, we were able to provide visualized information of those spatial characteristics, the relation between clusters and the third places, and their connectivity. These results show locations of attractive places and conditions of concentration in the CBD for knowledge-based industry.

These spatial characteristics can attract similar business services and third places such as cafés, bars, and cultural facilities such as galleries. This attractiveness enhances the reputation of the place, promotes the concentration of other business support services, and plays a role in fuelling place innovation.

Finally, we anticipate visualized information linked to the Google Earth showing results presented in this paper, and hope that it will encourage people such as policymakers, urban designers, and people searching for attractive places to participate in integrated urban design, and that it will help businesses to find optimal locations. These imply feasible open systems for the public in urban regeneration.

References

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