Morphological Adaptation Types of Small-industrial Clusters to Traditional Urban Tissue
- The 2000s' Gold Jewelry Manufacturing in Seoul CBD, Korea

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Abstract
This study tries to explain how small-scale gold jewelry mills adapted themselves to Seoul's existing urban tissues, which were the residential area in the CBD. There are four manufacturing processes; designing and engraving, waxing and casting, and cutting and polishing. Firstly, three morphological cluster types could be identified in respect to the gold jewelry firms' location; circulation type, finger type, and agglomeration type. Secondly, the robustness of the urban form elements (land use, buildings, plots, and streets) varied respectively. Small gold manufacturing firms of the circulation and finger type could easily adapt themselves to the existing urban tissues without new building construction. However, a few plots in the agglomeration type merged. A few old buildings in the merged plots were destroyed and were built into a new big one in which all gold processes could be carried out. The distance between shop and factory was generally farther than with other types. Finally, the existing street patterns influenced the clustering adaptation of small gold mills. Most of the buildings of the circulation type and finger type were located along dead-end streets and back lanes without changing the street patterns.

Keywords: morphological adaptation types; traditional urban tissue; small-industrial cluster of gold jewelry; longevity of town-plan elements

1. Introduction - background and purpose
At the end of the fourteenth century (1394), Seoul was chosen as the new capital of the Joseon Dynasty. For the first 500 years of its 600-year history, Seoul had been so steadily developed that there seemed to be no significant changes. But in the last 100 years, the size of Seoul has grown approximately thirty eight times and its population has expanded approximately one hundred times. During such an enormous expansion, Seoul has also experienced drastic changes in its urban structures. Shortly after independence from Japan in 1945, Seoul was heavily damaged in the Korean War (1950-1953). Great post-war reconstructions totally transformed the city into a modern one. Because of the rapid economic growth and urbanization, Seoul has become one of the largest urban areas in the world.

As shown in Fig.1., most of the large rectangular buildings along the main arterials were built during the urban redevelopment era (1970s) regardless of the existing urban tissues. Those buildings had large outdoor spaces, which seemed to function as a buffer from the existing surroundings. They had destroyed most of the traditional urban tissues, which were composed of small buildings.

Fig.1. Map of Seoul CBD and Study Area

The study area is the black colored area adjacent to the Jongmyo Shrine. Gold manufacturing firms have sprouted up since the 1950's, prior to the rapid economic growth and urbanization. Since the 1960's, jewelry industry clusters have been organized around
the Jongro 3 Avenue area. The goldsmith industry of this area was so dominant that it amounted to 23.5% of the entire country and 42% of Seoul (Suyun Lee, 2002:27). As the study area is not located along the main thoroughfare (Jongro 1), it could be kept out of the large urban redevelopment projects. It showed the morphological characteristics of the traditional inner city area. (Fig.1.)

This paper aims to interpret how small gold industrial clusters were organized on the base of the existing urban tissues. Firstly, the industrial cluster types of small gold jewelry mills were identified according to the manufacturing processes. Secondly, the longevity degree of the town-plan elements was empirically tested. Finally, cluster types were interpreted in respect to the morphology.

The method of analysis was three-fold. Firstly, the outline of the study area was summarized and analyzed. Secondly, the characteristics of the gold jewelry firms were explained. Finally, the small gold cluster types were identified and explained.

2. Research Method

Data was collected by interview surveys. The preliminary interview was on the history of gold jewelry manufacturing from 21st September to 15th October 2004. The main interview was on the industrial cluster from 17th October to 3rd December. The interview method was direct questioning and recording. The questions were the foundation year, what kind of production process, main business linkages and so on. Thirty-five main factories were interviewed and 3 cases were deleted because of insincerity. Eighty-five sub-factories related to the main ones were surveyed and 7 factories were ruled out because of weak relationships.

3. Outline of Study Area

The study area is located in the CBD of Seoul. It was inside Seoul's city wall in the Joseon Dynasty. It faced onto Jongmyo shrine to the east, Jongro (main arterial road) to the south and Donwhamunro to the west. In Jongmyo, memorial services were performed for royal ancestors, which made the research area sacred. Since 1394, the research area has been part of the inner city of Seoul and has been composed of traditional urban tissues (Seungwoo Yang, 1994:88-154). (Fig.1.)

The study area is 6.75 hectares and composed of a total of 334 plots. The average plot area is 98.4m² and 77.2% of the investigated plots are related to gold jewelry manufacturing. As shown in Fig.2., the percentage of plots where buildings have remained since the 1970's, is 78.7% ((226+37)/334). The study area has been saved from brutal urban redevelopment. The traditional urban tissues have successfully lasted so far. Eighty-one percent of the buildings which were built before the 1950's were related to gold jewelry manufacturing. The older buildings are, the more they are related to the gold jewelry industry. The goldsmith industry has settled in old urban plots and adapted to them, which is the focus of this paper.

| Year built | Total plots (A) | Plots related to gold jewelry manufacturing (B) | Ratio (B/A) |
|------------|-----------------|-----------------------------------------------|------------|
| Before 1940's | 226             | 184                                           | 81.4%      |
| 1950's-1970's | 37              | 21                                            | 56.8%      |
| After 1980's   | 71              | 53                                            | 74.6%      |
| Total         | 334             | 258                                           | 77.2%      |

4. Characteristics of Gold Jewelry Manufacturing

The gold jewelry industry is very small. As it does not produce any pollutants, and all processes are handcrafted, it can remain so far in the CBD of Seoul. The gold jewelry manufacturing functions include the purchase of raw materials, designing samples, arranging for jewelry to be made from these materials, and marketing finished products.

The establishment of this industry is primarily engaged in one or more of the following steps; (1) order; (2) designing and engraving; (3) waxing and casting; (4) cutting and polishing; (5) marketing and sales.

Because generally buying raw materials has no effect on the micro-layout of the urban tissues, only 4 steps were considered in the paper except the buying of raw materials. Regarding the manufacturing processes,
the four steps (ordering and marketing, designing and engraving, waxing and casting, cutting and polishing) are very important. The order and marketing steps are generally combined. The four steps need highly skilled experts. Each step needs a small manufacturing studio, which the experts generally own. All processes should be combined as one manufacturing process in order to produce gold goods, and this makes gold jewelry manufacturing an industrial-cluster.

This paper focuses on how each manufacturing firm and marketing shop was geographically organized as an industrial cluster in the traditional urban tissue. Three types were identified according to how each of the four manufacturing steps were organized; circulation type, finger type, and agglomeration type.

5. Types of Adaptations

After interview surveys, many kinds of adaptation forms of industrial cluster to traditional urban tissues were found. The main factories are defined as the firms which receive orders and deliver goods to shops. According to the analysis the production proceeds from the main firms to shops and three types could be identified in this study as follows:

Type I: Circulation type
Type II: Finger type
Type III: Agglomeration type

Type I was named as circulation type. Conceptually, manufacturing firms are in a circular order according to manufacturing stages. The manufacturing stages are sequentially taken in several buildings. (order - design/engraving - waxing/casting - cutting/polishing - marketing/order).

Fig.3. Circulation Type Process (Type I)

Type II was given the name finger type. In the finger type, design and engraving firms are in the center of the manufacturing process. Firstly, core firms (design and engraving) take orders from the marketing shops, and then make the intermediate products. Secondly, they give the intermediate products to the waxing and casting firms, and take back the second-intermediate products. Thirdly, they give second-intermediate products to the cutting and polishing firms, and then receive the final products. Finally, they deliver the final products to the marketing shop. The design and engraving firms are the hub of all manufacturing processes.

Manufacturing firms related to the production processes work as follows:

Fig.4. Finger Type Process (Type II)

Type III is entitled agglomeration type because all manufacturing processes were amalgamated into one building. In this type, the processes are divided into two parts; marketing and manufacturing. Some small buildings are combined into a relatively large firm so that all manufacturing processes can be done in one building.

5.1 The Circulation Type (Type I)

Ten circulation types (39 buildings) were found. Three characteristics were identified. Firstly, the circulation type is composed of small studios because each production process is simple. Secondly, each studio is not on a subcontract relationship but on a horizontal one in the production process. Mutual relationships last until the final product is made in the production loops. Thirdly, studios are almost next door to accelerate production efficiency. The production goes clockwise in seven out of ten cases.

The average distance between the working studios is 18.3 meters. Considering that the building frontage ranges from 8 to 9 meters, two or three studios are adjacent to each other to form a loop circulation. This means that several neighboring studios work together as one workshop. Short distance makes the process faster. It also reflects that the communication between studios is very essential.

According to Figs.2 and 5., most buildings were built prior to the 1950s (30 out of 39, 76.9%). There are four buildings (10.3%) that were built between the 1950s and 1970s, and among 39 buildings there are five (12.5%) that were built after the 1980s. Thirty workshops out of 39 are still using old existing houses without new construction and have maintained their independent status in the production process.

Five out of ten circulation type examples have formed at dead end streets and most of them are utilizing pre-1950s building structures as studios.
Fig. 6. shows the formation of the workshop on dead end streets. The rest of them (five examples) have formed along each side of the shared streets. Fig. 7. shows that according to the production processes they have been adapted into the existing street network very well.

Originally all of the buildings were residential houses. Jewelry shops along the thoroughfare were needed near workshops for the supply of jewelry products. As time went on, residential houses changed into workshops for gold products without changing the urban tissues (buildings, plots and streets). The workshops were located either at a dead-end street or along the street to fit their industrial production process. The street pattern was the most lasting element of all because it belonged to and was managed by the government. As such, land use is the most changeable element, and the least resilient element among urban form elements (land use, buildings, plots, and street pattern).

5.2 Finger Type (Type II)

In the finger type, the designing and engraving studio has a central role to take orders and to carry out other essential production processes. Because most skillful master craftsmen can engrave the ordered design on a frame and the engraving process is the base of all processes. Engraving firms distributed the rest of the processes to small studios. Overall processes were accomplished through close cooperation between leading mid-size designing /engraving studios and small firms. Eleven finger types were identified which comprised a total of 49 buildings.

The distance between the studios is 13.2m on average, which is relatively shorter than in the circulation type (18.3m) in order to achieve more communication and closer relationships. The distance between the leading studio and the shop is 75.9m, which is relatively farther.
Eight out of eleven designing and engraving studios, the hub of the production processes, were built prior to the 1940s, and the rest were built between the 1950s and 1970s. There were none built after the 1980s. A long-term relationship among these production studios can be construed. However, seven marketing studios out of eleven were built in the 1980s. And the distance between shop and production cluster is 75.9m. This shows that marketing is not geographically related to the production clusters and that the marketing shops should be near a thoroughfare.

Most clusters of manufacturing firms were adapted into existing buildings through changing the land use from residence to industry. But marketing buildings were replaced by new ones, and sometimes the plots were agglomerated for new big marketing buildings. Seven examples (63.6%) were located at a dead-end street, and the inconvenience in transport at a dead-end street acted as an advantage in location, due to the close procedural relationships. The rest of the examples (36.4%) were located next door and onto the street (Figs.9., and 10.).

5.3 Agglomeration Type (Type III)

In the agglomeration type, all the production processes begin and are completed within a large integrated manufacturing factory. As all the production is done within a building, the distance from manufacturing to shop is not a problem. A total of eleven examples were found, and nine examples have on average 101.7 meters between manufacturing and sales and the longest distance of all types except in two cases; one example is a neighbor and the other is in the same building.

This type requires a large-scale factory to integrate four or more production processes into a single house. It preferably uses new buildings rather than adapting into existing buildings. Six out of eleven examples were using new buildings on a big plot combined by
two or three small plots as shown in Fig.11. The rest of the examples (five) are operated in existing buildings. Except the two examples where the manufacturing and sales are next-door or in the same building, the rest of the nine examples have a long distance between firms and sales markets, which are connected through a street network.

The difference in the robustness of the urban form elements (land use, buildings, plots, and streets) can be interpreted by these cases. Buildings and, in particular, the land use are the least resilient elements. Although more enduring, the plot pattern changes over time. The street patterns tend to be the most enduring element (Carmona et al., 2010:77).

The agglomeration type was not overlapped between samples, and neither were Circulation type and Finger type, except 2 sets (C6-F1 and C8-F3) as shown in Fig.13. It was found that the main industrial linkage of sub-factories did not normally overlap. They had only one main business linkage with the main firms, and worked together like in a factory.

6. Conclusion

The transformation of Seoul's CBD was dominated by the urban renewal in the 1970's. The existing urban tissues from the fifteenth century have been effaced, destroyed, and replaced by large modern office buildings. However, there are some areas where the existing urban tissues are kept by changing their land uses from residential to industrial. In order to interpret how the adaptation to the existing urban tissues occurs over the established residential area, three conclusions seem to be justified.

Firstly, three morphological types, in respect of gold workshops' adaptation to the existing tissues can be identified; circulation type, figure type, and agglomeration type. In the circulation type, the manufacturing firms are located in a circular order according to manufacturing stages. In the finger type, the relational system of the manufacturing processes in the industrial cluster looks like a finger. In the agglomeration type, all the manufacturing firms are combined into a new building.

Secondly, there is a difference in the robustness of the urban form elements (land use, buildings, plots, and streets). Small-industries can be adapted to the existing urban tissues by changing the land use in the circulation and finger types, without replacing old buildings. But, in the agglomeration type, some plots merged. A few old buildings in the merged plots were destroyed and replaced by a new building. And the transformation of the street patterns was not found in this study. The land use is the most changeable element of all, responding relatively quickly to new impulses, which tend to efface in part the land use of previous periods. New functions in an older area do not necessarily give rise to new forms. Adaptation rather than replacement of the existing fabric is more likely to occur over the greater part of a built-up area established in a previous period (MRG Conzen, 1960:6-7).
Finally, the existing street patterns affected the adaptation of small-industrial cluster formations. Most buildings of the new industrial cluster are located in a clockwise direction, without changing one street pattern, along the dead-end street and back lane. Since the urban tissues have been formulated by Korean people, they still contain some inherent properties of traditional culture, whether it is tangible or not.

Actually there are many small industrial clusters in Seoul's CBD. However, there are no planning strategies with the exception of urban redevelopment. By investigating the morphological adaptation of small industrial clusters to the traditional urban tissue, the nature of the innovative process in urban planning of Seoul's CBD will be able to give some clues to urban design.

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Notes
1 Jongro is the main east-west directional thoroughfare in Seoul. However, the length of the research area is north-south in direction, while the width faces onto Jongro a little.
2 Three types of traditional urban tissues were identified; dead-end type, line type, and block type. Three types were mixed in the research area.
3 The 70's had great importance in the urban history of Seoul. Seoul started urban redevelopment in the 70's and its CBD was transformed dramatically.
4 Jewelry Manufacturing in the US - Industry Market Research Report (2008) IBISWorld Pub ID: IBIS1710483 http://www.marketresearch.com/product/display.asp?productid=1710483&g=1 accessed 25 February 2012.
5 Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms and associated institutions (e.g., universities, standards agencies, trade associates) in a particular field that compete but also cooperate. (Porter, M.E. (2000) ‘Location, Competition, and Economic Development: Local Clusters in a Global Economy’ Economic Development Quarterly, Vol. 14 No. 1, 16)

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