This paper attempts to show how the concept of traditional Japanese cities related to the concept of ‘Shin, Gyo and So’, three levels of formality found in Japanese design. These concepts, along with other traditions, were abandoned in city planning when modern urban planning was introduced in the Meiji Period. ‘Shin, Gyo and So’ originally evolved in the art of calligraphy or Chinese character writing. ‘Shin’ refers to the extreme formality, while ‘So’ is the graceful curvy form stylized down from ‘Shin’. ‘Gyo’ style belongs in the middle of the above two styles, and can be translated as semi-formal. Since ancient times, this classification has been applied not only to calligraphically but also in the field of spatial design in Japan, such as flower arrangement and gardening.

Record of the urban design in Japan goes back to the cities planned according to the Chinese grid system in the 7th century. It is thought that the acceptance of the Chinese grid plan was the first among many influences gradually received from foreign countries according to the needs of specific periods. The traditional city space in Japan has represented the needs of various individuals to be in a specific place in the city. However, this system along with the feudal system and the introduction of a subsequent modern urban planning executed by the first Japanese modern regime in the 19th century.

The earliest examples of capital cities following the Chinese grid pattern are the cities of the 7th century and 8th century, such as Fujiwara-kyo, Heijo-kyo and Heian-kyo. These cities have a rectangular perimeters and orthogonal axes, and are regarded as ‘Shin’ or formal cities. The cities located further inland were developed along the water routes, and respond to the curves found in the rivers and waterways. These cities therefore are planned in ‘So’ style. The third type of traditional urban settlements in Japan is the castle town. These towns usually have a combination of the former two styles and may be called ‘Gyo’ cities. The center area in castle towns usually follows the curve of the castle moat, while the perimeter may be more rigid or relaxed.

All of the above styles have been modified over time. Most often, this change is toward a flexible street composition. It is thought that it is these modifications that give particular character to old Japanese towns.
Introduction

Japanese urban design can roughly be divided into two time segments. One first segment includes the cities constructed under the feudal system, which were influenced by the Chinese grid system introduced from in the 7th century. These include the cities with grid pattern, such as Heijo-kyo (now known as Nara) and Heian-kyo (now known as Kyoto). The second segment includes the cities based upon modern city planning ideas introduced after the Meiji Restoration in the 19th century. This paper focuses on urban design during the feudal period when Japan was isolated from other countries, before introduction of a modern city plan.

The essence of the traditional Japanese space design involves rich expression within limited spaces. Gardening and flower arrangements are some examples representing this. This may in part be due to the limited land area and delicate sensibilities of Japanese. The three words: Shin, Gyo, and So are used to distinguish the difference of expression of Japanese spatial arts. Originally, these words originated from the names of styles of handwriting Chinese calligraphy (illustration 1). Although the three sets of characters viewed in illustration 1 express a meaningful city in calligraphy, the expressions became completely different with the difference in the style of writing. ‘Shin’ is the style of handwriting of the Chinese character of a high rank; ‘So’ breaks it down in an elegant form and ‘Gyo’ points out the middle of this classification. Considered from a point of view of form, the lines of the letter ‘Shin’ are formed with lines perpendicular to each other, while the lines of ‘Gyo’ and ‘So’ are mainly composed of curves and intermediate lines. Similar classifications exist not only in calligraphy but also in flower arrangement and gardening in Japan. Thus the idea of 'Shin, Gyo, So’ is used to interpret the coexistence of formal and informal styles of Japanese architecture and gardening.

The present study explores the possibility that this concept of ‘Shin, Gyo, So’ used in Japanese gardening and flower arrangements, was also relevant to the traditional urban design in Japan. The relationship between this concept and the grid pattern system that originated from China is also of particular interest to this study.

However, in Japan after the Meiji Restoration in 1860s, introduction of Western ideas and technology started simultaneously. Japan achieved rapid development due to the explosive information and technical inflow and to modern organizational systems. Not only old organizations, but also old buildings such as rural castles which were connected to old political organization, were actively rejected and even destroyed during this period. However, these acts were symbolic as the spatial features of the traditional cities remained unchanged to some extent. Further alterations in spatial systems came later due to mass transportation systems that were built in most cities.
Pre Modern History and Technology of Japan

2.1 The Time of Import of Urban Planning From a Continent

It is well understood that the process of urban genesis in Japan is influenced by continental culture. Wheatley and Thomas (1978) studied urban development in Japan, and proposed that the process of urban genesis in Japan, as seen in Fujiwara-kyo, which had the orthogonal grid pattern, followed the example of the Changan, the capital city of Tang Dynasty. This trend continued till the 8th century, when bigger scale cities such as Heijo-kyo, Nagaoka-kyo, and Heian-kyo were built. This indicates that the rulers of the Yamato province had the technology and the political power to introduce the grid plan system in the 7th century. Next, the capital was located from A.D. 710 to A.D. 784 to Heijo-kyo (present day Nara), and then in Nagaoka-kyo from A.D. 784 till about A.D. 794. These two capital cities also had orthogonal grid pattern and were larger than Fujiwara-kyo. In A.D. 794, Heian-kyo (present day Kyoto) was established. The size of Heian-kyo was a rectangle of 4.5 kilometers from east to west, and 5.2 kilometers from north to south.

Takahashi points out that although Heijo-kyo, Nagaoka-kyo, and Heian-kyo were equipped with grid pattern streets, their plan was peculiar to Japan while still referring to the Changan castle town in China. For example the rectangular outline and the grid of Changan castle were carried out flatly from east to west, whereas Heijo-kyo, Nagaoka-kyo, and Heian-kyo had the rectangular outline which carried out flatly to north and south and the grid inside had a square shape. This means that Chinese grid plan system was adopted by the Japanese to suit local conditions.

2.2 Application of a grid pattern, at the time of the castle town.

In the second half of the 12th century, the warrior class captured power and made the government move to Kamakura in East Japan. Due to the military needs, this city was made defensible using its geographical features. It is surrounded by the mountains on three sides, while the sea protects it on the fourth side. In the second half of the 14th century, the two rival courts co-existed and supreme power was asserted by each other. From the second half of the 15th century, Japan entered the ‘Warring States Period’ when warlords constructed castles in their domains. As times became more secure and the castle sites moved from the mountains to the plains, castles towns themselves became urban centers, and warlords all over Japan constructed such new towns. Although these cities had orthogonal grid pattern, it was not necessary that the outline would be a rectangle. Moreover, in these periods, new cities were also erected at religious spots, ports, market sites, and transport nodes. Many of these cities also had streets with grid patterns. In the second half of the 16th century, Japan was reunited after a century of civil war. In this period, international exchange was also prosperous, and the magnificent castles such as Azuchi castle and Osaka castle were built, also making use of information and technology from overseas.

2.3 The Time of Unity and Progress of Various Towns

Tokugawa Ieyasu established Tokugawa Shogunate or the Edo period, and consolidated political power, which unified Japan at the beginning of the 17th century. This Shogunate continued for about 260 years to the Meiji Restoration, which made Japan into a modern state. In order to
maintain social organization, society was severely divided into social classes based upon people's professions. The samurai warriors were at the top of this social organization, followed by farmers, craftsmen and lastly the merchants.

Tokugawa Ieyasu's castle town was settled Edo, with his castle at the heart of it. Edo is located in the Kanto plains, the largest plain of Japan. This city is still functioning as the capital of Japan, Tokyo. In this period, Japan became free from warfare for more than two centuries and under such peculiar circumstances various towns such as castle towns and post towns were built in Kanto plain.

Survey of Previous Literature Relating to this Research

3.1 Previous research

Although many commentators have noted the special features of traditional Japanese cities, one of the earliest was the research of Ito et al (1963). The characteristic of this study is the formation of the concept of consciousness theory and spatial formulations. By taking such a technique, the study succeeded in identifying some rules behind the city space composition. The concept of 'Shin, Gyo, So' of the rank of cities was also mentioned in his article. But in this article, Takamatsu which is the castle town of the western part of Japan, was taken as a prime example as the city of 'Gyo' or 'So' and the classification of 'Gyo' and 'so' is not clearly undertaken.

After the seminal work of Ito et al, various authors published studies about traditional urban space in Japan. At first, there were studies attempting to achieve quantitative descriptions of urban spaces. Funakoshi et al. (1977) investigated the approaches to some famous Shinto shrines, and made analysis of their spatial composition. Kamino (1980) collected the scenes that are visually characteristic in the traditional Japanese towns.

Later studies consider for the thoughts behind the design of the space. Maki (1980) mentioned discussed space composition of Japanese cities by considering the composition of streets from the Edo Period. Asaka et al. (1982) discussed the relation of spatial composition of cities from the ancient times to the present age using the information of old map or aerial photography. Shiommi (2003) showed the existence of the post town with the street bent intentionally at right angels. Ito (1966) pointed to the spatial composition of Japanese garden based upon the change of scenery as the viewer moves through the garden. Yoshimura (1982) study reinforces this concept.

The third type of studies focus on the morphology of cities by using historical records such as maps. Sato (1993) showed how most towns of Japan were designed systematically, using the provincial castle towns as his examples. He also showed how the urban design in these towns responded to surrounding landscape, and how this concept has progressed due to modern city planning. Takahashi (1993) showed the intentional changes were made in the original concepts learned from China. Whereas the research of Sato focused on rural castle towns, Takahashi focused on cities from castle towns to the settlements such as post towns.

Thus, the object of research has been shifting from studying the partial details and forms to an overall and systematic study of concept. However, whether the classification of ‘Shin, Gyo, So’ can be applied to the forms of cities has not been discussed adequately yet. There appear to be two main reasons for this. First, comprehensive comparison of the form of the cities of various kinds before the introduction of a modern city plan, is missing. Second, consideration of the planning about the streets describing a curve seen in cities on plains without geographical characteristic features such as seashore or mountains has not been fully explored.
3.2 Positioning and the Purpose of this Research

This research seeks to investigate the composition of city streets in order to consider a possibility that traditional urban forms have an equivalent of ‘Shin, Gyo, So’ order of design found in Japanese calligraphy. Examples of castle town and other towns will be used for this study.

More specifically, the response of urban form which are free from restrictions of geographical features will be considered. Therefore, the examples of cities in Kanto plain, that are old but correctly recorded, are considered. To do this, the reprinted edition of the ‘Jinnsoku-zu’ survey from the first half of the Meiji era is used as the primary historical reference. This document has been selected as it sought to accurately record the forms of cities before alterations were made by the modern city planning methods.

Research Method and Analysis

The ‘Jinnsoku-zu’ is used as a foundation of analysis of this research. This document is the first modern survey in Japan, undertaken by the army General Staff Office from 1880 to 1886, forming the oldest data recorded correctly form of the cities of Kanto plain. The ‘Jinnsoku-zu’ consists of about 900 maps and records of the whole Kanto Plain region. A scale of 1/20,000 is used in these maps, which also show the location of rows of houses with watercolors in addition to the geographical feature by the contour lines, thus enabling one to grasp the form of a street or a city.

The ‘target cities’ in the map recorded on the ‘Jinnsoku-zu’ were selected first. Next, the form of these cities was classified. Since it is based on the human body based measuring deices in use at that time, there is a possibility for error in these records. However, comparison is made based on the information within it for the purpose of this paper.

4.1 Basis of Selection of Target Cities

According to the information recorded on the ‘Jinnsoku-zu’, the forms of the cities in the Kanto Plain are roughly divided in to two types. One type is the linear city, which spread along a highway. Another group of cities are of the type that spread in two dimensions. This research focuses on the cities of latter groups. Although the cities and towns recorded on the ‘Jinnsoku-zu’ are of various sizes, the following criteria were used to selected the case studies for this research:

1. The footprint of the city is defined by three or more pathways.
2. The sum total of the length of the street where the houses were built on both sides is 1km or more.

In addition, the city of Edo which spread over wide plain, and the cities located in the seashore and a mountain slope that are considered to receive the influence of geographical features, had also been excluded from the object of this study.
4.2 Classification

Next, the cities selected were classified according to the following standards:

- Cities consisting of line segments mainly intersecting perpendicularly.
- Cities based on a non-parallel long axis although the composition elements of streets are line segments.
- Cities based on the streets of a line segment, with special external forms.
- Cities where grid and the irregular streets were used together.
- Cities where the streets had irregularities in the intersection of a grid.
- The cities composed mainly with curved streets.

4.3 Results

4.3.1 The cities which consist of line segments

Examples of this category include Takasaki, Koga, Ishioka and Isezaki Streets in these cities mainly intersect perpendicularly. Almost all streets in these cities consist of a combination of line segments and the grid that gives the cities their form. Although the outlines of these examples are line segments, but they do not form a rectangular shape, but rather an irregular form. When these cities are compared with the city group planned by the grid system, the internal street composition is also seen to not complete the grid pattern.

4.3.2 Cities based on a non-parallel long axis

The composition elements of these cities classified into this category include a line segment. Kawagoe and Tatebayashi are the examples of this category of cities.

4.3.3 Cites with streets with a line segment, and special external forms.

Tsuchiura, Gyoda and Shimodate are the examples selected for this category. Tsuchiura town is based on five square shapes and Gyoda has composition based on non-parallel three line segments.

4.3.4 Cities where grid and the irregular streets were used together

Yuki (illustration 4), Maebashi and Iwatsuki are used as examples of this type. Yuki and Maebashi include crooked streets, which penetrates a grid like structure.

4.3.5 Cities where the streets had irregularities in the intersection of a grid.

Hachioji, Ashikaga, Mobara and Chiba are examples of this category of cities. Cities composed mainly with curved streets
Sawara (illustration 5), Mitsukaido and Tochigi are the examples selected for this category.
Illustration 4

Illustration 5
Discussion

5.1 History of cities

5.1.1 History of cities which consist of line segments with perpendicular intersections.

Takasaki, Koga, Ishioka and Isezaki were taken as examples of this category. Takasaki and Koga were important castle towns with the characteristics of a post town. On the other hand, Ishioka and Isezaki, were provincial castle towns and Ishioka developed after the Edo period. Isezaki was improved during the early stages of the Edo period.

5.1.2 History of the cities based on a non-parallel long axis although the composition element of a street is a line segment

These cities were built, or were extended, in the time of ‘Warring States Period’ before the formation of Tokugawa Shogunate. Thus the arrangement of streets in such cities was due to the special military needs.

5.1.3 History of the city with a special form element

Shimodate and Tsuchiura are towns said to date from the Edo Period, when and construction and maintenance of these full-scale towns was made.

5.1.4 History of cities where grid and the irregular streets were used together.

Two of the cities selected in this classification for this study have the same historical background. The town of Yuki was built at the end of the 16th century and after that time it was under direct control of Edo Shogunate for about 100 years till the end of the 17th century, when it became castle town. On the other hand, the castle towns of Maebashi was put under a deputy official’s rule till the end of the Edo Period, although in the early stages, it was known as provincial castle town. Thus both of these towns have been a castle town only for part of their history.

5.1.5 History of the cities where the streets had irregularities in the intersection of a grid.

These cities have a common feature, which is not found in the castle town. Hachioji had been constructed as post town at the Edo period, while Ashikaga had grown to be a prosperous town according to the development of textile trade at the Edo period. Although Mobara had a special character as a banner bearer’s town and Chiba was established as a castle town before establishment of the Edo Shogunate, it is no longer a castle town now.
5.1.6 History of the cities composed mainly with curved streets

Each of the cities classified in this category has the common feature of not being a castle town but the city that grew along a river or water transport route.

5.2 Considerations about City Form and its History

The cities investigated in this paper have been classified into castle towns and commercial towns, and usually have the characteristics of both these types. Of these, the towns that were originally designed as castle towns consist mainly of line segments, while those cities, which were not designed as castle towns have streets that tend to be irregular, even when they intersect on a grid.

Next, the cities which were historically castle towns, and have since lost their castles, tend to have a form where the grid pattern and the irregular streets were combined.

Moreover, the cities that were developed near rivers or waterways, as well as the cities designed as commercial towns were composed mainly with curved streets.

5.3 Analysis of the shape of the cities composed mainly with curved streets

Next, the forms of three cites that were classified mainly with curved streets are examined in details to investigate the possibility that these curved streets were designed intentionally.

5.3.1 Mitsukaido

According to a market record in the first half of the 18th century, this town constituted of only one street that ran from north to south in the first half of the 17th century. Then the expansion of the river water transportation and the growth of marketplace induced the development of the town in the eastern district of the original street. In this town, the streets run in east-west and north-south direction and are intentionally built with a curved shape.

5.3.2 Tochigi

This city also developed due to the expansion of the river water transportation and its role as a post town in the Edo era. The river flows in the West Side in the city south from north.

5.3.3 Sawara

The history of development of this town is not clear except that urbanization here progressed during the Edo era. Sawara board of education reported that the streets in this town were regarded as having formed spontaneously. However, the main street runs from east to west and makes a curve on each side. Furthermore in the composition of this street itself, which intersects the river perpendicularly, has a relationship between the river and the curved street similar to the one that can be seen in Tochigi.
5.3.4 Summary of Analysis

As mentioned above, these three cities, which were not provincial castle towns, developed during the Edo period. In section 5.3 the analysis of the form of these three cities was considered. It is also considered that the curved urban street patterns were planned intentionally. The planning intent of these plans was different than that of the grid pattern planned that was learned by Japan from China in the 7th and 8th centuries, as well as modern town planning concepts that were introduced to Japan after the Meiji Restoration.

Conclusion

If the notion of ‘Shin, Gyo, So’ is applied to the traditional cities in Japan, the following conclusions can be derived:

Cities that can be called ‘Shin’ cities are the ones in which streets run in a grid pattern, influenced by the acceptance of the Chinese grid plan system. Heian-kyo and Heijo-kyo represent such cities. However, in the Kanto district in Japan, there also existed the cities that can be called ‘So’ and the ‘Gyo’ type of cities.

The cities of ‘So’ are usually planned for river water transportation, and tend to use elegant forms of curving streets abundantly.

The cities of ‘Gyo’ have characters midway between cities of ‘Shin’ and ‘So’. They have various forms that are made up of line segments and can be considered to have patterns transformed from the grid or curves. Castle towns are good examples of this type.

From the above classifications and considerations it can be concluded that the urban design of these cities also expresses the social status, through physical form and formality. As mentioned above, the social class system of Edo period set samurai class above the merchants. Considering from this viewpoint, the city with a samurai’s character is near to the form of a ‘Shin’ city, and the “So” city is the trade city by the river meant for merchants, who were placed at the base of the social hierarchy in Edo Period.

However, the ‘So’ form, although at the last of the ‘Shin, Gyo, So’ hierarchy, is also considered to be the more graceful form in Japan. Thus it can be said that the expression of these cities was not just that relating simply to class. Moreover the curved streets that are seen in ‘So’ cities provide the scene that changes with movement, much like in the gardens in Japan, as pointed out by Ito. Such commodity of spatial composition suggests the possibility that not only special spaces like an approach or a garden but also city spaces, which were the place of everyday life, had been designed according to the inclinations and desires of the residents of these cities. Such kind of spatial composition also contributed to the sensitivities of creating expressive special compositions limited spaces.

These cityscapes testify to the relationship between the inclinations of traditional Japanese people and the spatial composition of their streets and cities. Linear shaped cities in Kanto district as well as more informal cities in other regions in Japan are examples of this formality and spontaneity.

Thus in Japan, before modern city planning was introduced, there was a strong tendency of designing flexible streetscapes along the historical footprints of a town, as well as of using the grid plan system received from China.

Pictures and sculptures are art forms in which permanent preservation can be effected by individual intention. However, while urban spaces can be regarded as the largest form of art, they are the most difficult to preserve. However, we can be helped in this preservation effort if we understand the intent behind the design of these urban spaces.
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