Journal of Applied Sciences

ISSN 1812-5654
Mechanism Management and Construction Control of the Mixed-used Live-work Paradigm: Take the Yangtze River Delta area as an Example

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Abstract: This study gives comparative analysis on the internal mechanism and historical context of the mixed-use habitation mode of China from two aspects of time and space. Through the feature analysis and mode comparison of the mixed space in different regions and units, the study attempts to discuss the diversity of the settlement organization and habitation paradigm of work-live mixture with the discussion of the construction development law of the mixed-use habitation paradigm in the Yangtze River Delta region, so as to build the mixed-use habitation mode with regional features.

Key words: Mixed-use, settlement, unit, paradigm, management, control

INTRODUCTION

FORMATION AND CONTEXT EVOLUTION OF THE MIXED HABITATION PARADIGM

Concept of the mixed habitation paradigm: As the core of mixed habitation, it aims to conduct integration construction from two aspects of time and space under the premise of arranging work and live in separate space unit, to realize the organization structure with the integration of commodity production, sales and live. In terms of the community, the low commuting of the mixed layout could facilitate interaction among neighbors and promote resource utilization, transportation and environmental protection (Witherspoon et al., 1976). In terms of the market, the endogenous power of the work-live mixed self-organization is adaptable to the variability of the market economy.

Evolution of the mixed habitation mode in China: The mixed habitation mode in China has been evolved from the strict work-live separation to the focus on family work. At present, it has been developed into the mixed mode with the integration of market and habitation, the mixed feature of which is developed from the homogeneous diffusion to hierarchical centralization (Table 1).

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**METHODS**

**Organizational characteristics of the mixed-use habitation**

**Mixed-use settlement mode classification**

**Rural mixed habitation mode:** Modern country has turned from the single agricultural type of industry to handicraft and business, whose production purpose has been turned from self-production for self-utilization to the participation of the market system with the formation of southern-featured rural mixed habitation integrated by commerce, nature and culture (Table 2).

**Mixed residential mode of the "urban" marginal zone:**
As for economy, it is featured in decentralized and miniaturized family-type hand workshop with the absence of labor division. As for spatial form, the functional mixed feature appears with the strong rural characteristic of each form element. The economic activities in the "urban" marginal zone becomes more specialized, intensified and organized after the industrialization. Its rural characteristic gradually disappears with the emergence of the form element similar to the urban areas.

**Mixed residential mode of the urban:** It focuses on the concentrative commerce and trade synthesis with large scale and intensive distribution. In addition, the unit-type mixed habitation of relative cheap offices is provided, namely the SOHO mode. However, there are prominent contradictions of the mixture such as the "duty mode", which refers to the single joint lines of commercial habitation. The business space extension of that will affect the living quality of people with the disordered street space and lack of privacy for the living space.

**Comparison of the mixed-use settlement paradigms:** "Urban and rural" marginal zone is the key to link large and medium-sized cities and rural areas with certain correlation and specificity existed among the three (Table 3). The existed problems of the "urban and rural" marginal type with initial contradiction of the mixed habitation and the urban type with prominent contradiction is gradually developed and changed with the interior spatial form development.

**RESULTS**

**Mixed-use unit spatial paradigm construction**

**Mixed-use unit paradigm types**

**Courtyard type:** Most of the existing courtyard type buildings are constructed and preserved in Ming and Qing Dynasties. Their existence of historical and tourism values has been separated from the original residence form, to be developed into the commercial and tourism
blocks. As an intermediary space, courtyard connects the privacy and public nature not only to extend the work-live spatial scope but also to avoid the interference between the two.

**Single-household type:** In the "urban and rural" marginal zone, residents have their own homestead to build their own houses, thus producing the single-household mixed spatial mode affected by social development and locational factors (Table 4).

**Pedestal type:** The commercial size on the ground floor is large as the base of the living building for maximum commercial development. The necessary structural framework is needed only for the connection of the commercial house mode, namely the pedestal type mixed spatial mode. However, there exist two problems. The first is the transportation. As the residential entrance is located on the top of the commercial house, it arouses difficulty for excavation. The second is the safety. The big goods and visitors flow rate could cause great interference for living.

**Embedded type:** In order to make use of the commercial values in the south-north street, a line of 1 to 1 layers of commercial buildings are constructed along the street to form the occlusion or adjacent relation with the living part, which is called the embedded mixed spatial mode. It can be divided into the following two forms: Cross type. The structure of the cross part is generally processed in two ways. The first is to follow the living spatial structure as the commercial auxiliary space. The second is to follow the commercial spatial structure to form big commercial space. Adjacent type. It occupies more space with the separation of work-live spatial structure. It is appropriate for large commercial space.

**Unit type:** The unit type new mixed residential mode appears along with the urban development. Some small scaled companies and freelancers take one suite of house for both work and living. Companies with bigger scale tend to rent another suite of apartment for living as such as the SOHO emerging in recent years whose advantage lies in the decreasing of personal or company expenditure with the increasing of the diversity of urban population and industrial structure. However, it is likely to lead to security incidents for living in urban residential areas.

**Comparison of the mixed-use unit paradigm (Table 5):**
With the development of social settlement structure, mixed-use habitation building has turned from the traditional courtyard type or single-household type to the modern embedded type and unit type with its mixed space developing into the separate, intensive and variable space and its construction activity organization extending from "family" to the professional market level.
Table 5: Comparison of the mixed-use unit spatial mode

<table>
<thead>
<tr>
<th>Type</th>
<th>Courtyard type</th>
<th>Single-household type</th>
<th>Pedestal type</th>
<th>Embedded type</th>
<th>Unit type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable place</td>
<td>Rural areas</td>
<td>Rural areas and &quot;urban and rural&quot; marginal zones urban areas</td>
<td>&quot;Urban and rural&quot; marginal zones and</td>
<td>&quot;Urban and rural&quot; marginal zone and urban areas</td>
<td>Urban areas</td>
</tr>
<tr>
<td>Mixed features</td>
<td>With courtyard in the commercial house as the space</td>
<td>Mixed spatial combination and form diversity</td>
<td>Commercial space as the base of the living space</td>
<td>Part or complete occlusion of the commercial and living space</td>
<td>Variability of the work-live space</td>
</tr>
<tr>
<td>Advantages</td>
<td>Increasing spatial levels and releasing mixed contradictions</td>
<td>Regional applicability</td>
<td>High land utilization rate</td>
<td>Take the advantage of the commercial value of the south-north street</td>
<td>Reduce the office site expenditure</td>
</tr>
<tr>
<td>Major problems</td>
<td>Large occupation of the land</td>
<td>Work-live contradiction in privacy and technique</td>
<td>With excavation difficulty and safety problems</td>
<td>Complexity degree of the land utilization rate</td>
<td>Interference and security problems</td>
</tr>
<tr>
<td>Diagram paradigm</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Table 6: Optimization of the building energy-saving technology and noise control technology of the work-live mixed mode

<table>
<thead>
<tr>
<th>Building technology</th>
<th>Technical measures</th>
<th>Specific practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building energy-saving</td>
<td>Water-cycling system</td>
<td>The planted roof can be applied to reduce the roof runoff and guide water storage. 2. The cisterns or roof tank can be taken to pass through the pump to the roof. 3. Solar water heater can be used by residents by heating the water</td>
</tr>
<tr>
<td></td>
<td>Heating system</td>
<td>The biogas in Jiangnan region should be used for the heating system to improve people's quality of life and reduce building energy consumption. 2. Solar and biogas combined heating can be applied to work-live synthesis</td>
</tr>
<tr>
<td>Noise control</td>
<td>Light sound insulation</td>
<td>The light partition wall can replace the thick wall with the adoption of measures to enhance the sound effect. 2. the air layer should be set between the two light walls or the porous material padding can be applied</td>
</tr>
<tr>
<td></td>
<td>Variable sound absorption</td>
<td>The variable sound absorption construction can integrate the interior spatial decoration and deadening effect. For example, the sound absorption streamers can be installed on the top of the building with the adjustment of sound absorption curtain to absorb the volume</td>
</tr>
</tbody>
</table>

DISCUSSION

Mixed-use habitation mode development strategies and standards

Standard control over work-live mixed mode: As for work-living mixed construction, the composition in time and space is the key to improve the efficient spatial use. The specific standard control includes the following aspects (1) The efficient use of land resources: The east-west commercial and living houses along with the sunshine spacing land of the overlapping part shall be arranged appropriately. The general layout should be with deflection angle to deduct the sunshine spacing coefficient property (Gu, 2013). (2) Reasonable arrangement for the parking space. The compact parking mode shall be applied with the calculation of the parking space to build high-efficient parking lot; In case of no public parking lot near the large and medium-sized commercial and residential synthesis, the underground garage shall be constructed according to the requirement of the planning department. (3) Adequate fire protection measures shall be taken. The fire protection distance between the city commercial and residential synthesis buildings and the production buildings of class A and class B shall not be less than 50 m; the commercial buildings are divided into three parts of business operating, storage and auxiliary according to different functions with the clarification of the fire compartment. (4) Public toilets shall be arranged as needed. The distance of the highly intensive floating population areas, prosperous areas and general street public toilets shall be 300, 500 and 750 m or less, respectively. The public toilet distance scope in new and old residential areas should be 100-150 and 300-500 m.

In addition, some similar functions of the industry and residence can be merged into the same space. For example, the reception area of commercial cooperation partners and customers can be shared with the daily family visitor reception part and the kitchen area of the family can be extended appropriately to share the space with the dining room. With the changeable users' needs, the certain variability capacity is required for building space to meet the users’ needs. Sufficient storage space could directly affect the strain capacity of the work-live mixed buildings. Therefore, making use of the storage space could promote high-efficient spatial utilization in the mutual transition process of each function.
Policy guidance for the work-live mixed mode: Currently, the settlement, groups and unit mode based on the mixed-use are still in lack of rational guidance and control. The spontaneity is especially prominent in villages and towns, which deepens gradually with the social development and industrialization process, to expose many disadvantages of the traditional development mode. Therefore, policy guidance measures shall be taken as follows (Table 6).

Technical optimization of the work-live mixed mode: In terms of the technical processing of buildings based on the work-live mixed mode, it mainly includes two aspects (Antoniadis and Sapatitas, 2007). First, the construction energy-saving problem shall be solved by design. In single-household type unit buildings, the difference in work and live spatial function may lead to the different energy consumption requirement. The spatial energy consumption can be saved through the energy-saving design. Second, part of the functional interference problem can be solved through the architectural technology, so as to reduce the noise pollution in the living space.

CONCLUSION

Work-live mixed mode involves the impact from the architectural design, building technology and mixed operation. The so-called mixed mode not simply refers to a single work-live building unit, instead, it researches on the impact of the entire production and commercial behavior, phenomenon, as well as the mode and type formed by settlements, organizations and units on the building design.

Through the relevant theoretical research, literature survey and field research on the mixed habitation mode of the three settlement forms in domestic villages, towns and cities, this study analyzes the formation mechanism and existing contradictions of the work-live mixed mode as well as the development status at home and abroad with the research on the mode with long history and lasting vitality, thus uncovering the development law for work-live mixed mode and find out the optimizing strategies for relevant planning and design on this basis preliminarily.

ACKNOWLEDGMENT

This study is supported by the National Natural Science Fund of China (No. 51208466, No. 51238011), the Postdoctoral Fund of China (No. 2012M521173), Humanities and Social Sciences Project of Chinese Ministry of Education (No. 10YJCZH252), Social Sciences Planning Project of Zhejiang Province (No. 12JCSH02YB).

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