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## 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

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### INTRODUCTION

It is proposed by the theory of "compact city" that people should develop high-density cities with integrated urban land utilization, which has provided a theoretical background for the conceptual generation of the "mixed-use" (Wu *et al.*, 2012). The "new urbanism" theory suggests building new communities with mixed utilization for the further improvement of theoretical development of the mixed-use mode. While the related theoretical research is relatively less in China, though the production-living mixture has long-term been existed and developed in the habitation system here. As a basic social reproduction mode of traditional Chinese society, "socialized small-scale production" is integrated with production and consumption taking family as a unit to mix the natural economy and commodity economy. According to the local environmental characteristics and cultural background, it gradually develops into the regional economic modes such as "Wenzhou mode" and "Yiwu phenomenon". However, It lacks the policy management with the disordered urban structure and incomplete constructional design, resulting in the work-live mixed contradictions and serious urban construction problems. Therefore, the construction and control research on the mixed-use habitation mode based on the regional suitability is the key point to seek the mode law and mode promotion.

### MATERIALS

#### 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).

Table 1: Development context of the mixed habitation mode in China ( Mix, Live, Work)

Development stage	Initial period	Development period	Maturity period	Depression period	Re-development period
Historical period	Sui and Tang dynasty	Medium term of Tang-Northern Song	Ming and Qing dynasty	19th century-reform and opening	Reform and opening till now
Business feature	Commercial street appearing	Street shop opening	Different sizes combination	Management by the government	Diversification of private business channels
Space management	Strict work-live separation	Combination of shops and streets	Street widening Nodes appearing	Adjacent work-live regions	Combined work-live regions
Paradigm diagram					
Mixed state	A few family workshops	Maturity of shops in the front with bedrooms in the back	Spatial diversity with the improvement of infrastructure	Be restricted with the disappearing of business streets	Prosperity of the business and living street space

Table 2: Rural settlement structural analysis ( River Producing area Residential area)

Village type	Modern agricultural type		Modern industrial type	
Type of industry	Agricultural byproducts processing	Agricultural production	Industrial processing retail	Industrial production construction
Spatial feature of the settlement	Industrial encirclement type		Settlement encirclement type	Self-operation type
Sample name	Guanyan village, Suichang, Jinhua	Shezhong village, Nanxun	Dongtian village, Tongxiang	Hangmin village, Xiaoshan
Mixture texture				

## 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

Table 3: Comparison of settlement mode status with different mixed-uses

Village type	Rural areas	"Urban and rural" marginal zone	Urban
Spatial layout	Scattered distribution	Integration of the central concentration and marginal distribution	Integration of the specialized market, street and the living areas
Architectural form	Separate household with long depth	Juxtaposition of multiple households with long depth no longer than 6 layers	Single joint line type
Industrial form	Family hand workshop or store	Self-production and self-sales or ground floor shops leasing	Separate commercial blocks
Mixed mode	Bedrooms on the upper floor with shops on the lower floor and shops in the front with bedrooms in the back	Street type ground business mode	Business-live mixed-SOHO mode
Mode features	Work-live time consistency	Functional divisions with low layer of high density	Dense distribution and busy street transportation
Existed problems	Scattered form with the lack of constructional and transportation planning as well as the infrastructures	Small street room with environmental pollution and the lack of management	Prominent work-live contradiction in terms of the pricy and technical requirements

Table 4: Comparison of the classification of the single-household mixed residential mode

Mode type	Basic mode		Other mode		
	Shops in the front with bedrooms in the back	Bedrooms on the upper floor	Shops in the front with workshops in the back	"Rural fun" Tashakkori and Newman (2010)	Integration of the single -household type and unit type
Mixed feature	Mixture of small scale business and living	Mixture of big scale business and living	Mixture of manufacturing, sales and living	Mixture of agriculture, tourism and living	Mixture of business or manufacturing and commercial house
Paradigm feature	Shops in the front with bedrooms in the back, above the second floor is for living	Shops on the ground floor, above the second floor is for living	Shops in the front with workshops or garages, above the second floor is for living	The ground floor is for service, above the second floor is for guest room	The ground floor is for unit shops, the second floor is for business management room

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 suit of house for both work and living. Companies with bigger scale tend to rent another suit of apartment for living 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

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

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

Building technology	Technical measures	Specific practices
Building energy-saving	Water-cycling system	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
	Heating system	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
Noise control	Light sound insulation	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
	Variable sound absorption	The variable sound absorption construction can integrate the interior spatial decoration and deafening 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

## 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 Sapatinas, 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.

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