

Flexibility Survey of Bangkok Shophouses for Mixed-Use Development

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ABSTRACT

Shophouses are one of the popular residential typologies in Thai cities. Since shophouses cannot respond to the urban sprawl of Bangkok and changing lifestyles, their present rate of construction is decreasing. However, the mixed residential and commercial uses of these shophouses offer an opportunity for flexible and longevous buildings. This responds to a mixed-use and sustainable development for the city of Bangkok.

The study starts by evaluating the definition of a shophouse based on various studies and regulations. The paper will evaluate the potential of shophouses based on mixed-use development and flexibility aspects. Consequently, the study identifies residents' attitudes, problems and limitations which are documented through observation and survey of 102 existing shophouses in high, middle, and low density areas of Bangkok. In this paper, the concept of typological study is supported by the definition given by John N. Habraken¹ to analyze the spatial organization, physical, and stylistic characteristics of Bangkok shophouses to identify the level of control over the shophouses necessarily.

The users' survey results indicate that Bangkok mixed-use shophouses have the potential to be a good flexible typology. Residents acknowledge this potential although the deficient knowledge of present regulations and unclear leasing contract of control level deter the flexibility development of shophouses. Additionally, due to insufficient technical support and deficient knowledge of building materials for refurbishment, the current needs of users and quality of living are hardly responded and improved respectively. Thus, the urgency for clear responsibility and control of leasing contact, accessibility regulations, and government support policies for city mixed-use development and housing projects, and shift of approach towards user's comfortable installation are needed. Finally, the Open Building Support and Infill Concept is suggested to create more flexible and mixed-use Bangkok shophouses.

Keywords: Bangkok Shophouse, Flexibility, Level, Control, Mixed-Use

INTRODUCTION

The shophouses have been one of the well-known mixed-use building types in Thailand. The bi-functional use is a major characteristic; the lower floor is used for commercial purpose, while the upper floors are for residential purposes. The continuous rows of 3.5 - 6 m. in width by 12 m. or more in length and 2-5 storey-high buildings have been built along the roads with various design appearances (See Figure 1). In addition, they have been built along the streets for good accessibility and business opportunities.

The recent study shows that the tendency of new demands for shophouses is decreasing. The new housing demands are townhouses and single houses around the suburb while multistory living projects are increasing in the inner city, around and along the city mass transit systems.² Moreover, the study states that the city lifestyles of the young people have changed: clearly separated working and living place, intense working hours, high technology communication supports, single family preference, and minimum living space needs.³ These represent Bangkok's growth trends towards urban sprawls and homogenous habitat. As a result, the shophouses seem unlikely to slacken in surpassing the new life styles.

Although the shophouses may face many problems, they can still be revitalized to challenge the rising needs and city developments. Since shophouses are bi-functional buildings, an approach for revising shophouse design into mixed-use buildings can prolong their uses and can provide an alternative for activities among neighborhoods. With adaptable potentials, the shophouses can support a mixed-use development. Thus, this study will evaluate the potentials and existing problems of Bangkok shophouses towards the mixed-use building.

The study initially evaluates the definitions of shophouse from various sources: building regulation definitions and academic studies. Then the potentials of mixed-use development are studied. Accordingly, the researchers

conduct the survey of 102 existing shophouses based on Open Space Ratio (OSR) in high, medium and low density areas. In addition, the concept of typological study is used to analyze the spatial organization, physical, and stylistic characteristics of Bangkok shophouses.

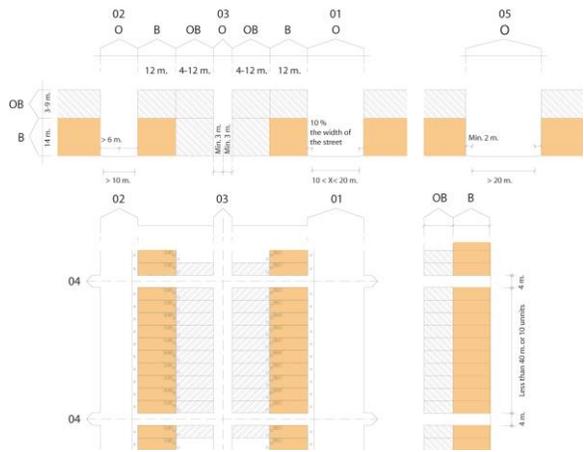
With different aspects from a conventional city, this study offers an approach for flexible and longevous buildings. This can also be an opportunity for comprehensive mixed-use and sustainable development for Bangkok city. Moreover, the study is done to address a possibility for building professionals and government agents in Thailand to revise the common practices towards more adaptive designs and to encourage people's involvement in the building construction, national housing and urban development policies.

DEFINITION OF SHOPHOUSE

The early shophouses were derived from the Chinese shophouses during King Rama V period. These shophouses were made up of only two-storey high, shared brick walls, wooden roof structure, and ceramic roof tiles. The ground floor was used for commercial activities while the upper floor was a space for residential activities. The front of the shophouses provided a pedestrian lane along the row. The shophouses were initially built along the roads to represent a modern development at that time.

Several studies have given definitions of a shophouse. Un Nimmanhemint defines the shophouse as a two-storey or more in height, continuous row of units, and multi-use based on different levels.⁴ In addition, Vira Suchakul points out the economic aspect in his definition which differentiates the shophouses according to their degree of uses between residential or commercial, and income generation from its uses.⁵ With Suchakul's definition, the shophouses can be totally used for residence, commerce, or both.

Another important advantage of shophouses is the economic aspect. Suchakul points that there are different kinds of tenancy and lease: for examples, own the building but lease the



- 01 = The width of the street is between 10 meters to 20 meters
- 02 = The width of the street is less than 10 meters
- 03 = The space at the back of each townhouse, minimum set back is 3 meters
- 04 = The space between two continuous townhouse groups, minimum distance is 4 meters
- 05 = The width of the street is more than 20 meters
- O = Open space area
- OB = Open/Built area
- B = Built area

Figure 1: A diagram represents zoning and thematic space of a typical townhouse (notation principle derived from SAR 73 and dimensions derived from the Minister of Regulation 55th, 2000). Drawn by the Author

land, own both land and building, long term lease, short term lease, sub lease, etc. In many cases, the owners or users can change the interior spaces as they wish except party walls and major structures, which affect the next units or the safety of the structure.

Furthermore, the regulation defines the shophouse as “a row of buildings more than two units and between each unit has a fire resistance wall.”⁶ This definition states only two main characteristics which are a row of buildings and a fire-resistant party wall between each unit. Its main concern focuses on the durable and fire-resistant materials for structure and party wall to control the spread of fire.

In addition, there are legitimate descriptions concerning shophouse’s physical characteristics

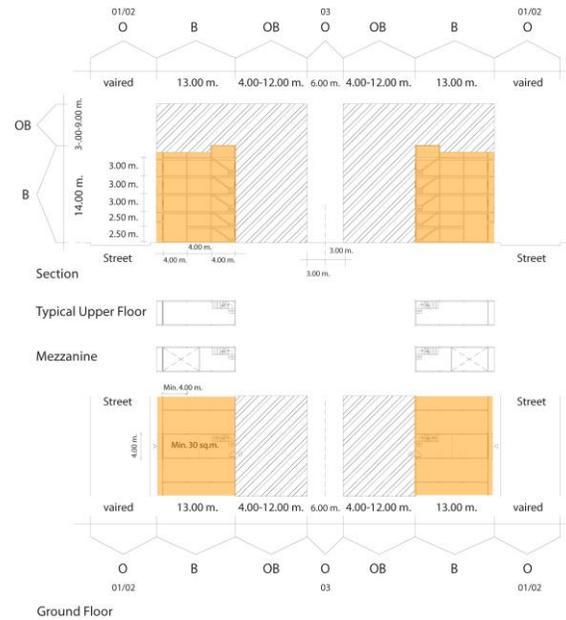


Figure 2: General dimensions and set backs of the shophouse (notation principle derived from SAR 73 and dimensions derived from the Minister of Regulation 55th, 2000). Drawn by the Author

and its built-form. For examples, the minimum width is 4 m. and length ranges from 4 – 24 m.; minimum first floor area is more than 30 sq. m.; 3 m. set back from the back of its property; 40 m. length limit for one row of shophouses and this row should not be more than 10 units (See Figures 1 and 2).⁷These legitimate descriptions merely focus on minimum acceptable standard of living and safety.

All definitions generally explain its former and existing physical and usage conditions; and basic building safety. Neither of them determines a specific function of a shophouse. This offers opportunities for adjustment and modification according to the owner’s or user’s discretion and emerging conditions.

TOWARD MIXED-USE SHOPHOUSE DEVELOPMENT

Basic understanding of mixed-use development is a good combination of usage of a building or an area with safety conditions for the users to accomplish a good social, economic, and lively environment in an urban area. Alan Rowley points out the ingredients of mixed-use

development within an area, containing degree of mixed-use activities, scale of setting environment, locations for application, retaining or encouraging approach, degree of generating vitality through activities, ownerships, and longevity.⁸ These explain comprehensive picture in creating the mixed-use development.

Various characteristics of shophouses support the aspect of mixed-use development favorably. Due to physical conditions and regulations, the shophouses can contain various kinds of business: a suitable building scale to a comfortable environment ranging from 2 to 5 storeys in height; located in different commercial and residential land areas of the city; awareness of users and owners towards their multi-use building; and different types of ownership. However, there are a few regulations and designs for shophouses as the key component of urban development.

In order to promote the mixed-use development of Bangkok shophouses, building flexibility is one of the main components. The increasing and maintaining flexibility of the shophouses is needed.

FLEXIBLE BUILDING

The shophouses are simply built with building structures to fit all functions. This does not mean a flexible building. Therefore, it is important to understand what defines the building flexibility and how we can design to come up a flexible building. Niklas Israelsson states two main influences in building flexibility: flexibility factors and decision-makers in building.⁹ The flexibility factors consist of (1) awareness of stakeholders, (2) finance, (3) installation, (4) future planning, (5) production (manufacturing), and (6) material standard. The decision-makers in building construction are described as property owners, architects, contractors, authorities, project manager, users, and clients.¹⁰ The decision-makers have also a significant impact on the degree of flexible building.

In addition, Stephen Kendall and Jonathan Teicher point out that "levels of control" of

decision-makers are very important to understand and distinguish in order to make a flexible building. This distinguishes what elements, structures, and systems can be changed by each decision-maker. Thus, it allows the decision-makers to understand and foresee what they can do and make decisions upon the building parts when changes and needs occur.¹¹ According to Habraken, the level of control can be explained through the changing ability of agents over physical elements which indicate the power of control and ability to manipulate a space.¹² In terms of design, it draws a clear picture of what building elements on each level are subjected to be specific and flexible for others to changes.

The study mainly focuses on the building level, and the flexible factors are awareness, finance, installation, and future planning. It is also important to identify the levels of control of the shophouse. The results can clarify the conditions and point out what can be done to increase the capability of flexibility.

METHODOLOGY

The study involves a questionnaire survey of 102 shophouses along the roads in 27 different districts and densities of Bangkok. The density of each area is classified based on Open Space Ratio (OSR). In some areas which are defined as green or preserved areas, the shophouses are prohibited to be built; therefore, the study omits those areas. The target shophouses are bi-functional shophouses; however, the degree of mixed-use area varies.

The survey consists of two parts. The first part contains the questions related to the present ownership, types of business, physical conditions, and problems with living and changing in shophouses. This reveals conditions of flexibility according to the flexible factors. The second part, which is based on John N. Habraken's, is the typological study of the spatial, physical, and stylistic characteristics of shophouses. This explains the existing conditions of uses, physical components, and elements of appearances.

FLEXIBLE CONDITIONS OF SHOPHOUSES

Attitudes towards Shophouse Living and Awareness of Flexibility

The quantitative results of the reasons why people opt to live in the shophouses are shown in Figure 3. The top 5 quantitative results are beneficial business locations (68.6%), working and living in one place (68.6%), accessibility to city transportations (55.9%), community atmosphere (40.2%), and flexible uses (26.5%). According to the question about the reasons for staying in shophouses, the 5 main grounds are:

- Beneficial business locations
- City transportation connection
- Working and living in one place
- Cheaper price compared to other residential types
- Community atmosphere

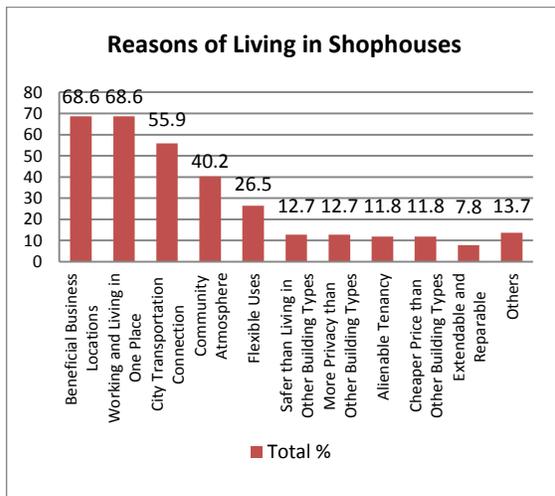


Figure 3: Reasons of living in shophouses

The particular results are benefits gained from their uses and locations (beneficial business locations, working and living in one place, accessibility to city transportation, community atmosphere, and flexible uses), safety and privacy, economical benefit from property tenancy (alienable tenancy, cheaper price than other residential or commercial building types), and expandability and reparability.

The results for both quantitative and qualitative reasons confirm that the users and owners acknowledge the shophouses'

potentials as multi-functional buildings in all dense areas. In addition, both quantitative and qualitative reasons give the utmost importance to the location of the shophouses as it gives accessibility to the public and city transportations. Moreover, they also indicate that the shophouses encourage a unified community atmosphere among the residents. This is the effect of organizational unit - the linear continuation of multi-units, and the widely open front of the shop on the ground floor. This allows people to meet each other on the streets and around the neighborhoods.

Even though, flexible use of shophouses is one of the most quantitative reasons (26.5%), it has less impact value among the top 5 reasons and disappears from the qualitative reasons. Moreover, the result shows that the extendibility and reparability have the lowest percentage (7.8%). These results suggest that although the shophouses are flexible in uses, they are still inefficient to changes.

Ownership and Shophouse Repair and Adjustment

The survey shows that there are 5 types of ownerships: own both building and property with average of occupancy in 19 years, own building but not as property with average of occupancy in 24 years, long-term building lease with average of occupancy in 10 years, short-term building lease with average of occupancy in 6 years, and building sub-lease with average of occupancy in 1 years.

The comparison between repair and adjustment, and non-repair and adjustment in shophouses is shown in Figure 4. The results show that there is a slight difference in repair and adjustment (52.94%) and non-repair and adjustment (47.06%) of both owned building and property. For non-repair, the reasons are described as unnecessary, unworthy to repair, and recently repaired.

The results from long-term and short-term building leases are similar; repair and adjustment have corresponding rates of 34.78% and 33.33%, and non-repair and adjustment have 65.22% and 66.67%

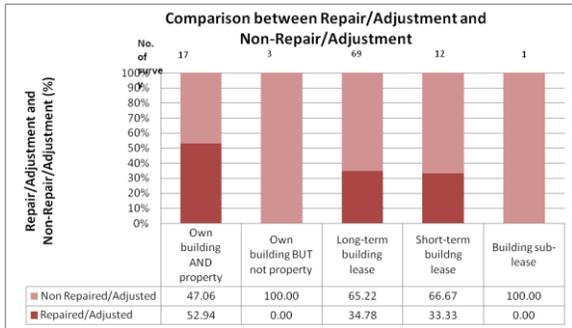


Figure 4: Comparison between repair and adjustment, and non-repair and adjustment

respectively. The reasons for non-repair and adjustment in long-term building lease are leasing status, recently repaired, no budget, business interruption, and satisfying conditions. Both long-term and short-term building leases show that the individual rating for non-repair and adjustment is more than repair's and adjustment's ratings with about two thirds of the total survey. For owned building but not as property and subleased building, the results show that there is no repair or adjustment of shophouses.

The reasons for non-repair and adjustment from overall ownership can be explained in two issues. First, the contract or lease terms and conditions set limitation for repair or adjustment of the shophouses. Based on the results, there is almost 20% higher rate of repair and adjustment of owned both building and property than those long-term and short-term building leases. Second, there are investment conditions which are related to the type of leasing contract. This determines the chances of repair and adjustment. Because some of the shophouses have recently been repaired and adjusted, the users will fix and adapt some parts of the building with considerable financial condition.

Problems of Shophouse Living and Repairing

The problems of shophouses, as shown in Figure 5, can be grouped into 7 categories: noise, smell, smoke, vibration, daylight and ventilation, lack of usable areas, safety, and sanitary system. The quantitative results show the 4 main problems such as noise from cars

(54.9%), smoke from cars (33.3%), vibration from cars (31.4%), and lack of parking areas (25.5%). These have significantly resulted from the locations of the shophouses as they are built along the streets. As a result, the problems related to building quality are insufficient daylight (22.5%) and insufficient ventilation (18.6%). According to the question about the main problems, the qualitative results show the 5 top problems which are:

- Lack of living area
- Lack of parking area
- Lack of toilet
- Insufficient lighting
- Noise from cars

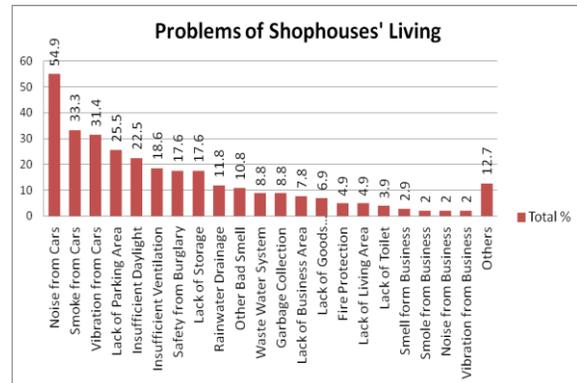


Figure 5: The problems in shophouse living

According to the results, the location is the major factor leading to the daily environmental problems. This presents a contrast between the economic benefits from public access and facing the environmental problems. The second prioritized problems drift towards the quality of living, which are insufficient daylight, insufficient ventilation, lack of safety from burglary, and lack of storage. However, the qualitative results show that the users prioritize the living quality problems more than those problems in building systems or business opportunities.

Furthermore, the survey accordingly asks the users about repair and adjustment barriers. The results on Figure 6 show the following top 5 barriers: Do not want to repair (56.9%), Lack of knowledge to repair and adjust (24.5%), Lack of technical support (21.6%), Old building, afraid of damage from repair (12.7%), and Not enough space to expand (12.7%). According to the question about

priority of the reasons for repair or adjustment, the top 5 reasons come out:

- Do not want to repair
- Impervious laws
- Lack of knowledge to repair and adjust
- Lack of knowledge on building materials
- Poor ventilation after improvement or adjustment

The main barrier in both quantitative and qualitative reasons is "Do not want to repair".

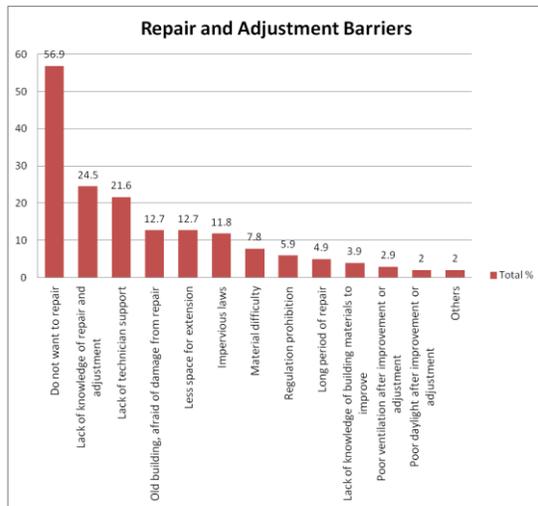


Figure 6: Repair and adjustment barriers

This is somehow related to ownership issue as mentioned in previous topic. Another reason is associated to locations which are beyond users' and owners' abilities to improve or adjust the shophouses. They can only respond to the problems connected to their own building level or their properties.

Despite the major barrier, the quantitative and qualitative results can be concluded in 2 main issues: deficient knowledge of regulations, and knowledge and technical aspect of building improvement and adjustment. These reveal that both regulations and building technical problems have an impact on the shophouses' flexibility.

STUDY OF SHOPHOUSE TYPOLOGY

The study of shophouse typology is abided by Habraken's concept. It views the type in 3 characteristics: spatial, physical, and stylistic.

Spatial Characteristics

The spatial characteristics have been observed according to 4 zones based on the shophouse's structure (See Figure 7). The results show that the relationship between the front and the back of the shophouse can be divided into two types of usage. Firstly, on the ground floor, the first two zones are totally for business activities. The third zone, where stairs are normally located, is an undetermined functional area (working area, living room, stairs, and toilet), but mostly for working area and stairs. The fourth zone is typically the service area of the building. This part is normally an extended area after moving in.

Secondly, on the upper floors, the private area is on the first zone, and it changes towards the public area at inner zones. If the balcony is used, circulation is provided; thus, disturbance of privacy is avoided. The public area, stairs and bathrooms are on the third and fourth zones. Bathroom is normally placed on the same side where the stairs are located.

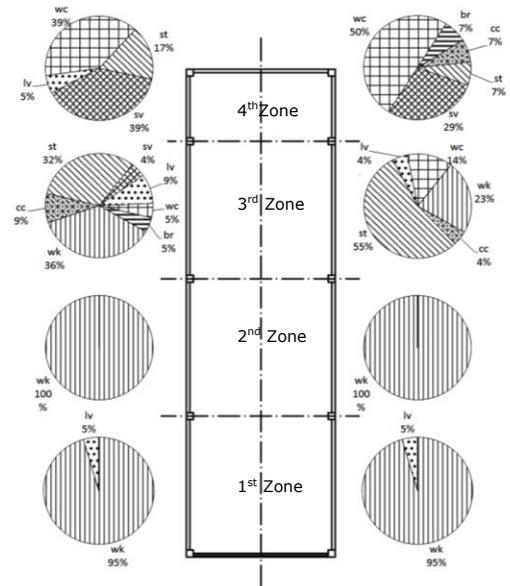


Figure 7: The diagram of the functions or ground floor in the shophouses in high density area (OSR 3 - 4.5). (wk = Business area; lv = Living area; br = Bedroom; wc = Toilet; sv = Service area; st = Stairs; cc = Circulation)

The results of using each floor show that the ground floor is clearly contributed to commercial activities. A double volume with

difference in size is a special characteristic of the first-two zones. It produces a welcoming atmosphere for a commercial space. The mezzanine floor and roof deck are variously utilized. The roof deck is generally used as service area and for planting a tree. It is the mainly extended area. The second and third floors are used for privacy more than the ground floor and the roof deck, and used for living more than the ground floor and the mezzanine.

The shophouse planning is not pre-determined. It provides empty floors and lets the users determine the uses by themselves when they first move in. This does not respond to building flexibility concept. By studying the spatial characteristics, the patterns of shophouses' uses offer a better interpretation for planning or designing mixed-use shophouses with efficient modification in the future.

Physical Characteristics

The physical characteristic applies form dominance and dependence on the level of control (hierarchical control) to analyze adjustment, and transformation of physical elements under the limitation of the higher levels. Figure 8 illustrates the hierarchy of control of the shophouses' physical elements. The elements on Level I affect the ability of adjustment on Level II. The physical elements on Level II affect the physical elements on Level III.

The main elements are Levels I and II. The physical elements on Level I (columns, beam, floor, roof, party walls, and stairs) are initially given to the users and owners by the designers or developers who determine the overall spaces of a shophouse. The physical elements on Level II (floor finishing, and internal walls) can be adjusted by users and owners under conditions of the elements of Level I.

Based on the results from the analysis of physical characteristics, it does not only reveal the physical relationship under the hierarchy of control concept, but it also defines the level of control of the decision-makers in the shophouses. Considering the right over a

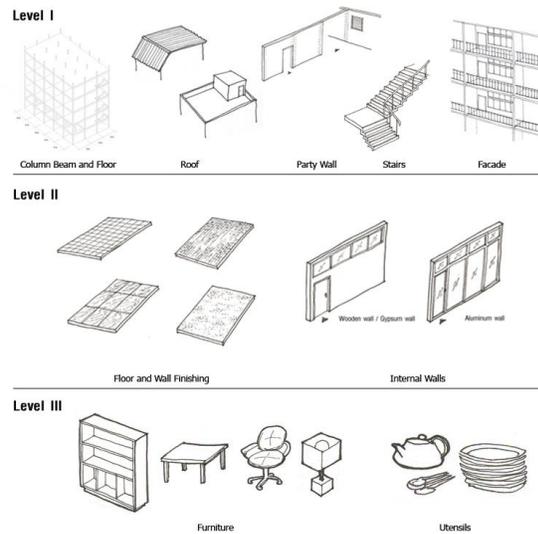


Figure 8: Hierarchy of control of the physical elements

shophouse, the users and owners own spaces and elements inside the unit. Those shared elements among units, which are determined by the designers, are unchangeable (columns, beams, roofs (continuous pitched roof) and party walls). The physical elements in the shophouse unit such as floors, stairs, and roof (flat roof) belong to the users or owners; therefore, the users and owners are free to modify them. However, these elements are rarely altered due to safety and financial condition. The external wall (façade) and the internal wall with less safety concern are easier to be modified by the users and owners.

However, when the two or more units are owned by one party, the physical elements on Level I and Level II can be totally modified when the ownership, level of control, is clearly defined in the owner's rights. This control does not apply to the leasing condition. However, if the users or owners have the right under the leasing contract, they can modify them later.

Stylistic Characteristic

The stylistic characteristic focuses on the façade elements which are windows, terrace, shop signage, and shading devices. These elements of façade are initially designed by the designers or developers in order to determine a space and an appearance. The facade can be

viewed in two different levels: ground floor and upper floor. On the ground floor, the wide opening is required to attract and welcome the public for the business purpose. Since it expresses the business and living style identity of the buildings to the public, the façade elements of upper-floor are totally controlled by the users and owners (See Figure 9). As a result, it presents variations of shophouses. On the other hand, with the material used as party wall (100 mm. brick walls with cement plaster finishing in compliance with the fire resistance requirements), it is difficult to adjust the facade as it requires a skilled labor to alter it.



Figure 9: The same façade design with different alterations of the shophouses. The advertising billboard covers the whole façade units; some units are painted in different colors; windows are changed for different purposes.

The typological study provides understanding of the existing condition of the shophouses. From this study, it reveals the patterns of spatial uses, and level of control of the users and owners over the physical elements and façade elements. In this perspective, it offers a guideline for decision-makers to separate the responsibility and control on the building.

SUGGESTIONS

The most important issue regarding the flexible limitation is deficient knowledge of present regulations. Therefore, the government agency like Bangkok Metropolitan Administration must provide an understandable and convenient public accessibility of information on regulations. These will guide the users and owners to repair and adjust the shophouses accordingly. It also means to say that a more flexible shophouse can be developed.

The lack of knowledge on building materials and technician supports are also other important barriers in modifying the shophouses. Easy installation techniques and building material uses should be developed such as dry process, light-weight material, and DIY installation. This is also a chance for the building professions such as manufacturers, suppliers, contractors, and designers for a new market approach towards more economic benefits and sustainable development.

The leasing contract is a constraint in flexibility, and building lease terms are uncertain in terms of adjustment conditions causing the ambiguity of investment. Therefore, the degree of building adjustment and the responsible party, tenant or landlord, must be clearly stipulated in the leasing contract. An alternative is to apply the idea of level of control as a contract agreement to classify the control of physical elements. This can help tenants to have better criteria for decision making.

In addition, the investment and financial condition is also one of the concerns of the users and owners. Although it has less weight as a main concern, it is still considered as a related issue to the main problems. With government initial support for small and medium business loans and new mixed-use and city compact development plans, the new Bangkok shophouses can be promoted and can accommodate new developments. Moreover, National Housing Authority of Thailand should initiate mixed-use development projects instead of the homogenous residence and homogenous building type as housing projects.

To support flexibility of shophouses, the control ability of decision-makers should be included. In this case, there are tenants, landlords, owners, designers, developers, contractors, urban designers, and urban planners involved therein. The level of control provides a clear picture of the physical elements under control of the users or owners. Therefore, they should be designed to support a comfortable adjustment for promoting flexible shophouses.

In order to enhance the flexibility of the shophouses, Support and Infill¹³ of Open

Building should be applied. The study of the typological characteristics can formulate the patterns and design to support the future shophouses in accommodating future changes, in increasing quality of living, and in dealing with daylight and ventilation issues. However, the new installation techniques and materials; and mechanical, electrical, and sanitary systems should be integrated.

CONCLUSION

The Bangkok shophouses are one of the well-known building types. Nowadays, the demands of the shophouses are decreasing. However, with the concept of bi-functional building, shophouses can be revised to become flexible buildings and mixed-use development can be eventually supported.

According to the results from the study, the shophouses have strong potential to become flexible buildings. The users and owners are aware of the flexible uses of the shophouses. On the contrary, the 3 main problems include deficient knowledge of present regulations, lack of skilled technicians and deficient knowledge of material usage, and unclear of physical control of leasing contract conditions. The investment and financial condition is a consequent issue in determining ability of adjustment to be made by the users and owners.

All of these flexible factors should be encouraged. Support from government agencies and policies promote the investment and easy understanding of regulations disseminated to the public. Parallel to a shift approach towards user's comfortable installation, for example, the dry process, light-weight construction, and DIY installation can ease the installation problems. At the same time, regulations on ownership and leasing contract, and the control ability of decision-makers must be clarified. Consequently, the Support and Infill by Open Building must be developed and applied. With an understanding of flexible conditions, it lays an initial step for developing and endorsing the flexibility of the Bangkok shophouses for mixed-use development.

NOTES

¹Habraken, N.John. *Type as a Social Agreement*. The Biannual Asian Congress of Architects, Souel, 1998, 5, accessed July 20, 2006, <http://www.habraken.org/html/downloads.html>.

²Sahattamrangsri, Surasit. "Land Allocation Permissions in Thailand within 10 Years (1997-2006)". *Government Housing Bank Journal*. No.50 (2007): 32, accessed June 2, 2008, http://www.ghbhomecenter.com/journal/journal-Detail.php?id_articleghs=1112.

³Kitasin, Samma. "Effect Factors to Demands and Supplies and Alternative of Real Estates". *Post Today*, November 7, 2006, accessed April 1, 2010, <http://www.reic.or.th/download/PostToday061107.pdf>.

⁴Nimmanhemint, Un. *Shophouses' Problems*. (The Academic Seminar, Faculty of Architecture, Chulalongkorn University, Oct 13-14, 1981), 43.

⁵Suchakul, Vira. *Bangkok Shophouses: Socio-Economic Analysis and Strategies for Improvements* (University Microfilms International Michigan, 1982), 4.

⁶Riensriwilai, Supin. *ASA Building Regulations V.1* (Bangkok: The Association of Siamese Architects under Royal Patronage, 2005), 207.

⁷Riensriwilai, 209-216.

⁸Rowley, Alan. *Mixed-Use Development: Concept and Realities*. (London: The Royal Institution of Chartered Surveyors, 1996), 3-5.

⁹Israelsson, Niklas., Begnt Hansson. "Factors Influencing Flexibility in Buildings." *Structural Survey* Vol.27, no 2 (2009): 145.

¹⁰Israelsson, 140-143.

¹¹ Kendall, Stephen. and Johathan Teicher. *Residential Open Building*. (London: E&FN Spon, 2000), 31-32.

¹²Habraken, John. N. "The Structure of Ordinary; Form and Control in the Built Environment." (Cambridge, MA: The MIT Press, 1998.), 7.

¹³ Kendall, 32-36.