

Transformative Physical Attribution of Mixed-use Project Development in Bangkok Metropolitan Area, Thailand

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Abstract

Mixed-use developments encompass both large-scale and mega projects, strategically located in various zones including the inner city, central business district, as well as suburban and nearby areas. These projects serve as critical indicators of the prevailing direction of urban development in the region. While the underlying concept of mixed-use project development is grounded in the principles of sustainability and the enhancement of overall quality of life within the urban environment, it is essential to underscore that these projects do not operate in isolation. They exist within the broader context of the pre-existing urban landscape and are intertwined with the local communities in which they are situated. The aim of this study is to examine transformative changes of uses in mixed-use projects within the Bangkok Metropolitan area, Thailand. These changes involve the attributes and coordination among different uses within the projects. The chronological study undertaken in this research employs a methodological approach aimed at unveiling the historical evolution and prevailing trends in the development of mixed-use projects. The research findings indicate a discernible pattern wherein a majority of these projects have expanded from the city center towards suburban and outlying areas. These suburban areas are notably targeted for future urban development initiatives. Importantly, these areas continue to maintain medium to high population densities and include zones designated for residential and industrial purposes, which in turn have substantial implications for land pricing and investment strategies. Considering these findings, urban planners are presented with a valuable opportunity to proactively prepare and adapt city planning strategies to align with this transformational shift in urban development patterns. Such proactive measures are essential to ensure that the city's growth and development remain sustainable, balanced, and responsive to the changing needs and dynamics of its residents and stakeholders.

Keywords

Mixed-use development; Transformation of use; City planning; Joint Venture development model; Market synergy; Thailand

1. Introduction

The rapid urbanization of Bangkok City has resulted in considerable urban-rural immigration, leading to high population density and elevated land prices. Because of this urban transformation, mixed-use developments have emerged as a prominent solution to address various urban challenges. These developments are characterized by their integrated approach to land use planning, emphasizing a coherent design, pedestrian-friendly layouts, incorporation of live-work-play elements, and efforts to alleviate traffic congestion and urban sprawl. In the next five years, there will be an additional 16 mixed-use development projects constructed and completed in the metropolitan area of Bangkok, totaling an estimated 3.85 million square meters of built space. It is evident that such development patterns within areas undergoing Transit-Oriented Development (TOD) represent an important facet of urban development's future. This underscores the potential for enhancing investment value and positively impacting the country's economy. Mixed-use projects typically constitute large-scale ventures with substantial investment commitments (Real Estate Information Center [REIC], 2023). Therefore, an in-depth examination of the internal components of these projects is imperative to effectively meet user needs and ensure the sustained success of such endeavors. The classification of mixed-use development by international institutes typically is characterized by three or more distinct revenue-generating functions, placing greater emphasis on the synergy between these varied uses within mixed-use projects. This delineation facilitates the interplay between different functions, thereby influencing positive outcomes that resonate with the evolving preferences and requirements of urban residents. This study adopts an internationally recognized definition of mixed-use development, encompassing 29 projects within the Bangkok Metropolitan area, documented since 1982.

The aim of this investigation is to understand shifts in the combination of functions within mixed-use developments of Bangkok, thereby clarifying trends in use integration and support within these projects. These results could hold substantial implications for prospective urban development in Bangkok, serving as valuable guidance for developers. The objectives of this paper are twofold: firstly, to scrutinize the evolving integration of uses within mixed-use developments, with a specific emphasis on the types and proportions of these uses, project scale, location, and contextual factors. Secondly, to analyze the interrelationships among these functional components, thereby furnishing developers with criteria for optimal use integration in mixed-use projects.

2. Theoretical Framework for Mixed-Use Project Development

2.1 Definition of mixed-use development

A mixed-use development refers to a real estate project meticulously designed to incorporate a combination of various functions, which may include retail, office spaces, residential units, hotels, recreational areas, and other amenities. This type of development is centered around pedestrian-friendly design principles and embodies the concept of a live-work-play environment. Its primary objectives are to optimize land usage, provide a range of amenities, exhibit architectural distinction, and contribute to the reduction of traffic congestion and urban sprawl (Niemira, 2007). The central concept of mixed-use development described by the Urban Land Institute (ULI) in 2003 remain relatively unchanged. Mixed-use developments are characterized by:

- (1) three or more significant revenue-producing uses (such as retail, office, residential, hotel/motel, entertainment/cultural/recreation) that in well-planned projects are mutually supporting;
- (2) effective physical and functional integration of project components (and thus a relatively intensive use of land), including uninterrupted pedestrian connections; and
- (3) development in conformance with a coherent plan (which frequently stipulates the type and scale of uses, permitted densities, and related items).

In Thailand, the Real Estate Information Center (REIC, 2023) described mixed-use development as being characterized by projects consisting of two or more functions spanning over 10,000 square meters of Gross Floor Area (GFA). This definition includes duo-use developments and mixed-use developments per ULI's definition. The duo-use development has differentiated the level of complexity and the synergy that can be achieved. However, often mixed-use developments with market support for three uses proceeded because of an overriding desire on the part of the developer or public officials to create large and diverse projects, with the objective of maximizing project impact. Therefore, this study focuses on mixed-use projects which consist of three or more uses due to the possibility that such development offers distinct advantages over other types of real estate.

2.2 Development potential and market synergy in mixed-use development

According to the Urban Land Institute (Urban Land Institute [ULI], 1987), mixed-use development is characterized by the presence of three or more significant revenue-generating components that mutually support one another. The synergy among components in a mixed-use project is crucial, as demonstrated in Table 1, which illustrates the degree of support between various uses within the project. For instance, retail spaces provide significant support to other uses, indicating that retail should be an essential component in most mixed-use developments. This is because retail can facilitate the generation of activities and foster connections between different uses within the project.

Table 1 General framework for estimating on-site support and synergy in a mixed-use development (ULI, 1987)

Main Use	Use providing support					
	Office	Retail	Hotel	Residential	Convention Center/Arena	Cultural/Entertainment/Recreation
Office		3	4	2	1	4
Retail	4		4	4	4	4
Hotel	4	3		2	5	4
Residential	2	3	2		1	4
Convention Center/Arena	2	3	4	1		3
Cultural/Entertainment/Recreation	4	3	4	4	4	

Note: Degree of support

1= Very weak or no support, 2= Weak support, 3=Moderate support, 4=Strong support, 5= Very strong support

Such projects exhibit a high degree of physical and functional integration among their various components and make efficient use of land, often featuring uninterrupted pedestrian pathways and a cohesive overall plan. The foundational principle behind integrating various programs or uses within a project often revolves around considerations of development potential and market synergy. The assessment of market synergy involves three key elements:

- (1) Direct on-site market support: This aspect typically involves the calculation of on-site market support using robust market data and analytical techniques. Accurate estimates for retail space are crucial, as this usage can significantly benefit from on-site activities.
- (2) Indirect benefits and amenities: Evaluation of indirect benefits among different uses and the overall advantage of amenities contribute to market synergy. Beyond the direct market support, amenities such as recreational, cultural, or entertainment facilities, as well as appealing public spaces, enhance the project's overall image and environment. This, in turn, makes both the marketing component and the entire project more attractive to potential markets.
- (3) Creation of a sense of place: The larger scale and size of mixed-use development play a crucial role in establishing a distinctive sense of place. This unique identity enhances the overall attractiveness of the project, contributing to its market appeal.

2.3 Mixed-use project development in Thailand

The concept of mixed-use development has its origins in the United States, dating back to the 1920s and has since expanded to other countries. This approach to urban development has played a pivotal role in shaping modern urban landscapes. Grant (2002) highlighted the negative consequences associated with traditional urban development, including issues such as urban sprawl, population density overload, urban pollution, and the presence of underutilized urban spaces. These challenges served as catalysts for the emergence of new urbanism, with mixed-use development being a key component of this movement.

Jacobs (1961) emphasized the importance of diverse land use in creating livable and vibrant cities, drawing from her successful case study in Canada. The Marina City complex (1959-1964), situated near the Chicago River, marked a notable milestone as the first large mixed-use project in the United States. This pioneering development seamlessly integrated office, retail, and residential spaces, thereby increasing user density and optimizing the functionality of each component.

By the 1980s, private developers began to explore mixed-use development models that combined shopping malls, hotels, and entertainment areas, primarily targeting tourists. This approach aligns with the principles of Transit-Oriented Development (TOD), which gained traction around skytrain stations in Bangkok starting in 1999. Over time, the concept of mixed-use development evolved to include a broader range of functions, including residential and community-oriented spaces, and in the years 2012-2015, it further diversified to encompass health services and business facilities.

Presently, mixed-use development is on the rise in the Central Business District (CBD) of Bangkok and the surrounding areas along expanding skytrain lines. Modern mixed-use developments typically incorporate a combination of retail, office spaces, hotels, condominiums, and service apartments (CB Richard Ellis [CBRE], 2018). This shift reflects changing preferences among the new generation, who prioritize the convenience of living, working, and leisure activities all within proximity.

According to a survey conducted by the Real Estate Information Center (REIC, 2023), the cumulative count of mixed-use projects in 2023 was 128 within Bangkok and its surrounding areas, encompassing a

total GFA of 14,461,558 square meters. Predominantly situated proximate to BTS stations within the CBD, notably in the Pathumwan district, these projects also have extended into suburban locales, indicative of TOD initiatives centered around skytrain and subway infrastructure in Bangkok.

2.4 Important factors of mixed-use development

The NAIOP Research Foundation (2007) revealed important factors of mixed-use development which accomplish project goals and worth of investment as follows;

- Physical:
 - o Appropriate site size and shape to hold all elements of the development.
 - o The chosen land plot should seamlessly integrate with mass transportation networks and offer an inviting pedestrian environment that is easily accessible to the surrounding area.
 - o The visual prominence of buildings should be enhanced through appealing landscaping and well designed circulation patterns.
- Design: the elements of mixed-use projects need to be designed considering different usages with seamless connection and balancing of day and night uses.
 - o The physical and structural configuration, which is partially dictated by the site, sets the framework for positioning the various uses, but the final positioning depends on the surrounding uses and the marketing needs of each individual use within the project.
 - o Positioning of uses must consider issues such as access and entrances, the address, identity and visibility, security, marketability, adjacent uses, ownership, and the importance of the component to the project's success.
 - o Each component within a mixed-use development should undergo meticulous design to ensure practical functionality and sustainability, with a focus on achieving a seamless integration that conceals any discernible disparities.
 - o Achieving design harmony with the surrounding environment, whether through walkways or landscaping, is crucial. Designers must carefully consider the density relationship between the mixed-use project and adjacent developments to create a cohesive urban fabric.
- Financial: Mixed-use projects require huge investment because of the large project scale.
 - o The development of mixed-use projects typically requires a longer development timeline than single-use projects, making it more challenging to secure funding.
 - o It is necessary to secure higher levels of capital and limit the number of development firms with potential, as well as financial institutions with resources, to undertake mixed-use projects.
 - o Investment partners increasingly are recognizing mixed-use development as an investment opportunity but still perceive it as a high-risk endeavor, particularly for large-scale projects.
- Economic and market: The economic considerations primarily revolve around the dynamics of the property market. It is imperative that each function allocated within the site independently garners substantial market demand. This requirement commonly is articulated as securing a sufficient or baseline demand within the market for each designated use. Moreover, the functions must harmonize and complement one another. They should not only support each other but also foster synergy among themselves (as shown Table 1). When such synergy is attained, it augments both the investment worth and the market valuation of the project.

- Public issues: The policy and public aspects crucial for the success of mixed-use development projects include the need for comprehensive development plans that emphasize transportation and well-supported infrastructure. Additionally, development plans should focus on the economic benefits of integrated development. Successful mixed-use development projects require supportive state or public policies that prioritize transportation, infrastructure, economic benefits, flexible zoning, sustainability, and community engagement. These policies should encourage the creation of vibrant, integrated, and sustainable urban environments that benefit both residents and businesses.

Based on the literature review conducted in sections 2.1 to 2.4, several critical issues were identified that shape the analytical framework as follows: how to define types of use combinations, how to divide the period of mixed-use development, importance of location and uses, importance of design harmony integrating the use components, importance of property owners and investment, and importance of supportive uses with market synergy. These issues can be condensed into four analytical factors: the proportion and variety of uses, the period of development, the physical layout encompassing location and site dimensions, and the developer's investment approach (see Figure 1).

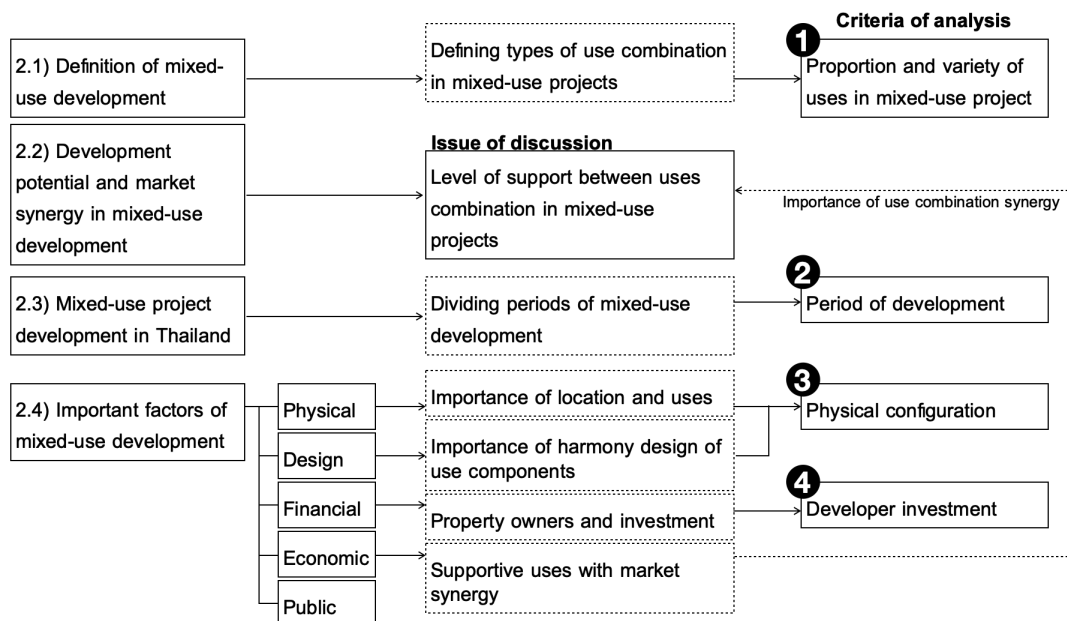


Figure 1 Theoretical framework for the study

3. Methodology

3.1 Research framework

This study was conducted using a qualitative research approach that focused on a collective case study methodology. More specifically, the study employed a chronological research approach to gather data systematically (Salmi, 2010). The physical attributes of the case study projects were meticulously documented, encompassing details such as developer company information, the variety and distribution of functions, project scale, location, and contextual factors. Subsequently, a comprehensive analysis was conducted to ascertain the factors influencing the development of mixed-use projects, including proportion and type of uses, period of development, physical configuration of project, and developer investment. The study presented three findings regarding the evolution of physical layout, proportion adjustment, and the combination of uses, observed across

four stages of mixed-use development. Subsequently, the discussion section endeavored to elucidate the transformative challenges arising in mixed-use development, aiming to identify trends in change and criteria for function selection within such developments. The research framework is summarized in Figure 2.

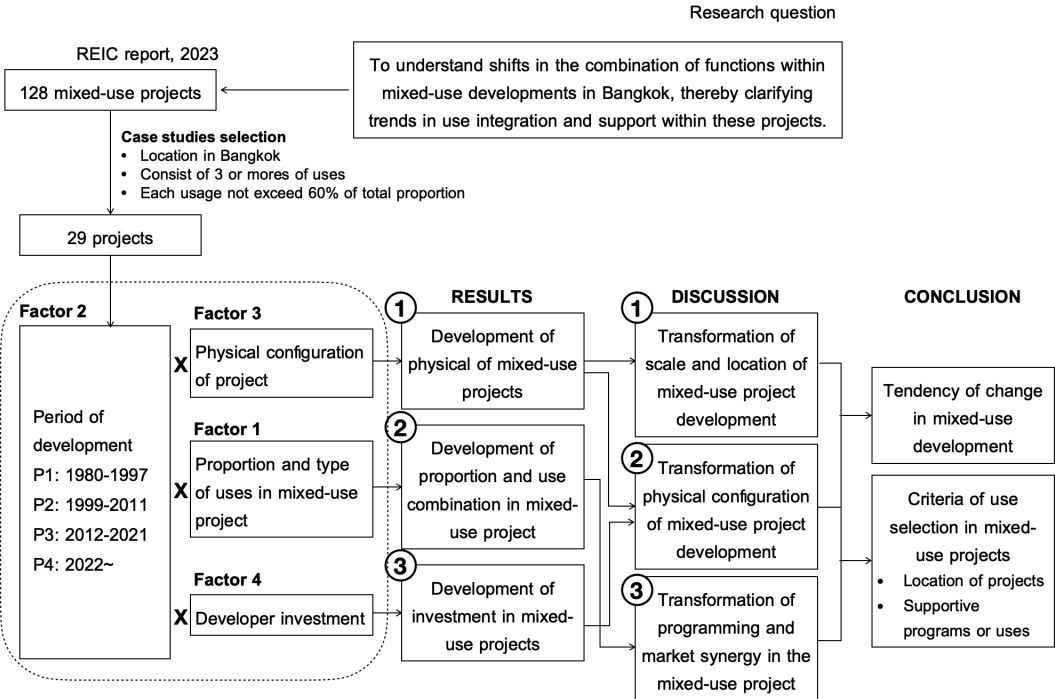


Figure 2 Research framework

3.2 Research factors

(1) Period of development

The mixed-use developments represent a form of real estate development influenced by rapid urbanization that are driven by economic and societal transformations. In Thailand, several key events have impacted real estate development, both positively and negatively. Negative factors include the Tom Yum Kung Crisis (Asian Financial Crisis) (1997), the Subprime Crisis (2008), the Chao Phraya Flood Crisis (2011), Loan-to-Value (LTV) policy (2019), and the Covid-19 pandemic (2020-2021). Conversely, positive factors encompass the inauguration of the first mass transit rail stations (1999) and the First-Home policy (2011-2016). These events have shaped the trajectory of real estate development, highlighting the intricate interplay between economic, social, and policy factors within the Thai context (Thai Real Estate Association [TREA], 2020). The initial development of mixed-use projects in Thailand commenced around the 1980s.

Therefore, the timeline of mixed-use development project evolution in this study, as derived from significant critical points of social and economic situations impacting real estate development, can be categorized as follows:

Period 1: Before crisis =1980-1997 (Before financial crisis in Asia, Tom Yum Kung Crisis)

Period 2: Fluctuation =1998-2011 (Mass transit development (Figure 3), Subprime mortgage crisis, and 2011 Chao Phraya flood)

Period 3: Recovery after disaster =2012-2021(After 2011 Chao Phraya flood)

Period 4: New normal =2022 - Present (After Covid-19 pandemic)

The expansion of transit development in Bangkok reflects the increasing density and growth of urban areas, which in turn influences land prices and real estate development. Consequently, the study of mixed-use project development should take this growth into account.

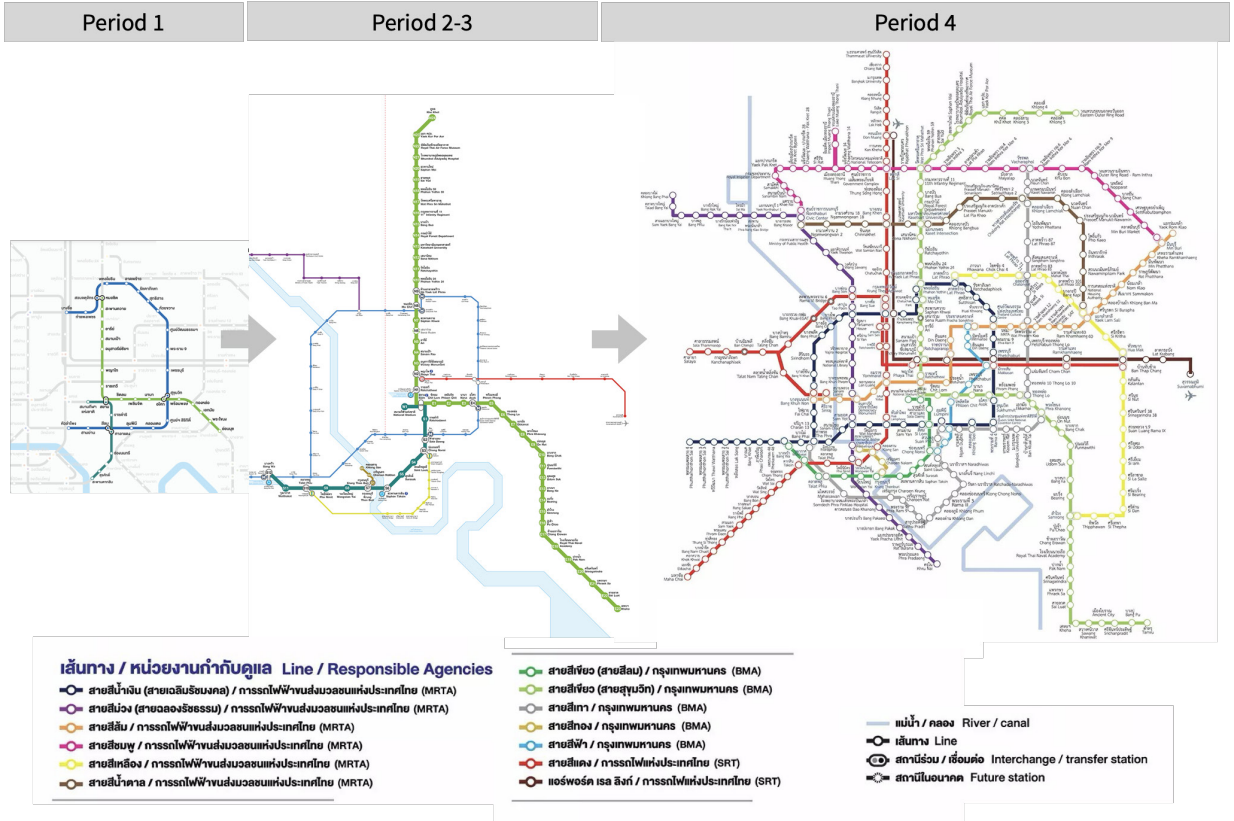


Figure 3 Mass Rapid Transit Network in Bangkok Metropolitan Region
(Adapted from The cluster of logistics and rail engineering, 2022)

(2) Proportion and type of uses in mixed-use project

In a mixed-use development project, the main proportion and programming serve as essential determinants of the project’s characteristics. A mixed-use development project involves using land in a blended and integrated manner, combining various types of land uses within the same physical project. The commonly encountered types of uses include commercial spaces, offices, and residential areas (whether they be condominiums, townhouses, or landed houses), hotels, or other activities. In each of these categories, the usage must not exceed 60% of the total proportion. The components of a mixed-use development project, following the principles of architectural review, must consist of a minimum three usage types to be considered a mixed-use project according to the initial concept.

(3) Physical configuration of project

The physical and structural configurations of mixed-use development is classified into 3 types: mixed-use towers, integrated multi-tower structures, and mixed-use town center. The configuration of development depends on land condition and context (Blackson, 2012). Moreover, many mixed-use developments often combine several physical configurations, such as a multiuse megastructure and a single tower on a platform, or several freestanding multiuse megastructures, as a combination type (Levitt, 2003). Therefore, this study categorized the physical configuration of mixed-use projects into 4 types;

- o Mixed-use Tower: This group consists of vertically oriented buildings with a shared vertical structural system that overlaps.
- o Integrated Multi-Tower Structure: In this group, buildings are a mix of both vertical and horizontal orientations. The project includes a combination of building bases and tall vertical structures within the same development.
- o Mixed-use Town: This group consists of scattered buildings of various types within the same project, utilizing pedestrian connectivity as a means of interlinking usage.
- o Mixed-use Combination: Involves a combination of the Integrated Multi-Tower Structure and Mixed-use Town formats, with a mixture of building bases and tall vertical structures but distributed across several buildings. Thus, a new classification, Mixed-use, has been proposed based on these findings.

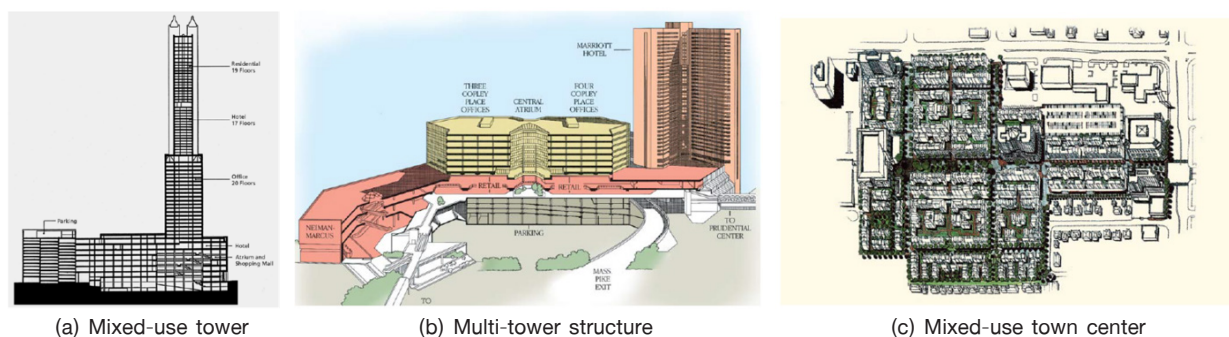


Figure 4 Physical configuration of mixed-use development (Levitt, 2003)

(4) Developer's investment approach

According to reviews, developers of mixed-use development projects can be broadly categorized into two main types: solo development and joint venture development. These categories can be further subdivided into developers from the private sector and developers from the public sector. Drawing from the study of mixed-use projects in the Bangkok metropolitan area and its suburbs, the classification of developers can be summarized as follows:

- o Private Sector Solo Developers: This group consists of developers from the private sector who undertake mixed-use projects independently, without the involvement of public sector entities.
- o Public Sector Solo Developers: In this category, developers from the public sector are responsible for initiating and executing mixed-use projects on their own.
- o Joint Venture Developers (Private-Public or Private-Private): Joint Venture development involves collaboration between private sector and public sector or two or more private entities. These entities pool their resources and expertise to jointly develop mixed-use projects.

3.3 Scope of study and methodology

3.3.1 Scope of study

In the context of international standards, mixed-use development is defined as a project that incorporates three or more distinct revenue-generating uses (Levitt, 2003). Each use category must not account for more than 60% of the total project area. This study uses these criteria for case selection, as they facilitate the efficient and rapid development of the site's potential. By offering several uses and product lines simultaneously, mixed-use may support a faster absorption schedule, thus increasing the present value of investment. Therefore,

from 128 mixed-use projects in Bangkok Metropolitan Region as reported by REIC (2023), only 29 projects were selected for detailed review in this study.

The study area follows guidelines from the NAIOP Research Foundation (2007) regarding key factors in mixed-use project development. It is crucial that the selected land plot integrates seamlessly with mass transportation networks and provides an appealing pedestrian environment with easy access to surrounding areas. Therefore, the study area should be adjacent to mass transit networks such as BTS, MRT, BRT, or major highways. Based on this criterion, the study area is divided into four zones (Klinmalai, 2014):

- (1) Central Business District (CBD): extends up to 10 kilometers from the city center.
- (2) Urban Fringe Area: located between 10 to 20 kilometers from the city center.
- (3) East Outer Ring Road Area: located in the eastern part of Bangkok and connected to Motorways No. 9 and 7 (On-nuch and Bangna district).
- (4) Suburban Area: extends 20 to 40 kilometers from the city center and represents part of the Bangkok Metropolitan Region (BMR, e.g. Pathumthani and Samuthprakarn provinces).

3.3.2 Study methodology

This study employs a qualitative case study methodology involving multiple cases to identify spatial and temporal patterns in mixed-use development for the Bangkok Metropolitan area. The primary objective is to investigate the transformation of physical changes in mixed-use projects and to gain insights into the future trajectory of mixed-use development through a chronological lens. The key questions explored include how physical elements (such as location, scale, configuration, cost, and investment) evolve over time and what potential combinations of uses are possible within a project.

The research begins with a review of existing literature on mixed-use development, followed by the establishment of criteria for case study selection (see section 3.3). A total of 29 mixed-use projects were chosen as samples for the study. Secondary data on these projects were collected based on four factors of analysis: the period of development, physical configuration, the proportion and type of use combinations, and developer investment.

Next, the data for the projects were grouped into four periods of development, each separated by major socio-economic events that impacted overall real estate development. For each period, the data were analyzed to identify common characteristics using calculations such as averages, percentages, and density. This allowed for comparisons to be made across cases from different periods of development.

Finally, the research findings were presented through three key areas of discussion, which led to the study's conclusions. These findings provide insights into the trends in mixed-use development and offer a framework for the characteristics of mixed-use development across four zones of the Bangkok Metropolitan area. In particular, the study highlights the prime locations and potential use integrations that lead to successful market synergy of mixed-use development. This outcome is valuable for developers' considering investments in mixed-use projects.

4. Results

4.1 Development of physical of mixed-use projects

Data were collected on mixed-use real estate projects starting from the year 1983. The first mixed-use real estate project in the metropolitan area of Bangkok was initiated at that time. Data were gathered from the

past to the present, with a focus on significant time periods and locations. A total of 29 projects were included in the comprehensive overview and their details are presented in Table 2.

Table 2 illustrates that the most active period for developing mixed-use projects occurred from 2017 to 2021, or Period 3. The 11 projects for this period expanded to areas outside the CBD, including the urban fringe and suburbs of Bangkok, covering a total land area of 14.93 acres. The physical structures of these projects consist of towers and integrated multi-tower designs. Among these, Jin Wellbeing Country stands out as the largest-scale development in this period. However, Period 4 anticipates even larger-scale projects, nearly three times the magnitude of Jin Wellbeing Country, predominantly situated in the east outer ring road and suburban areas.

Table 2 Development of Mixed-use projects in Thailand

	Project Name	Physical	Year	Site size (Acre)	Est. GFA (Sq.m)	Location
Period 1: 1980 - 1997						
1	Central Ladprao	Int.	1983	16.8	310,000	Urb.
2	MBK Center	Int.	1985	9.2	140,000	CBD
3	Central World	Int.	1989	25.6	830,000	CBD
4	Fortune Town	Int.	1991	5.2	194,655	Urb.
5	Emporium	Int.	1997	4.4	200,000	CBD
Period 2: 1998 - 2011						
1	Charmchuri Square	Int.	2008	8.4	274,459	CBD
2	Park Venture	Tow.	2011	2.0	81,400	CBD
Period 3: 2012-2021						
1	T77	Town	2015	16.4	N/A	East.
2	FYI Center	Int.	2016	3.6	100,000	CBD
3	King Power Mahanakorn	Tow.	2016	3.6	135,000	CBD
4	Summer Lasalle (phase 1)	Town	2017	24.4	278,400	East.
5	Magnolias Ratchadamri Boulevard	Tow.	2018	2.4	98,167	CBD
6	ICON SIAM	Int.	2018	20.0	750,000	Urb.
7	Singha Complex	Tow.	2018	4.4	60,000	Urb.
8	Samyarn Mitrtown	Int.	2019	5.2	222,000	CBD
9	Whizdom 101	Int.	2019	17.2	350,000	Urb.
10	Jin Wellbeing Country	Town	2019	56.0	111,853	Sub.
11	Sindhorn Village	Town	2019	22.4	N/A	CBD
12	I'm China Town	Tow.	2019	1.2	40,000	Urb.
13	Artisan Ratchada	Int.	2020	3.2	121,000	Urb.
14	The Parq	Tow.	2020	9.6	132,397	CBD
Period 4: 2022 ~						
1	Siamese Rama 9	Int.	2022	5.2	N/A	Urb.
2	The Unicorn	Tow.	2022	2.4	27,500	Urb.
3	Mega City Bangna	Com.	2022	160.0	400,000	East.
4	Dusit Central Park	Int.	2023	9.2	400,000	CBD
5	Bangkok Mall	Tow.	2023	40.0	1,200,000	East.
6	The Forestias	Town	2023	159.2	4,160,000	Sub.
7	One Bangkok	Com.	2026	41.6	1,930,000	CBD
8	New Wereng Nakhorn Kasem	Town	2027	5.6	144,506	Urb.
Overall Average project size				41.65	721,210.15	

Note: Int.=Integrated multi-tower, Tow.=Tower, Com.=Combination, CBD=Central Business District, Urb.=Urban Fringe, East.=East outer ring road, Sub.=Suburban

4.2 Development of proportion and use combination in mixed-use project

From Table 3, it can be observed that in Period 1, there are three main programs, with Retail being the predominant one, and commonly supplemented by convention centers. Transitioning into Period 2, there is an increasing presence of residential programs, but the primary programs remain Retail and Office. In the third period, development is seen in almost all programs across various projects, with a growing emphasis on hotels and residential spaces. In the fourth period, all four types of programs are present and distributed relatively evenly in proportions. Furthermore, the incorporation of additional programming in mixed-use projects extends to multipurpose areas such as convention centers and event halls, contributing to the revenue streams of the project. Additionally, these supplementary spaces encompass elements pertaining to well-being, culture, entertainment, and innovative workspaces, aligning with the lifestyle preferences of urban dwellers.

Table 3 Development of estimated proportion of use in mixed-use project

	Project Name	Estimated proportion of programming				
		Retail	Office	Hotel	Residence	Other
	Period 1: 1982-1997					
1	Central Ladprao		✓	✓	-	Convention center
2	MBK Center	60%	20%	20%	-	Event hall
3	Central World	40%	25%	25%	-	Convention center
4	Fortune Town	✓	✓	✓	-	
5	Emporium	56%	18%	26%	-	
	Period 2: 1998-2011					
1	Charmchuri Square	19%	60%	-	21%	
2	Park Venture	15%	40%	35%	-	
	Period 3: 2012-2021					
1	T77	✓	✓	-	✓	School
2	FYI Center	✓	✓	✓	-	
3	King Power Mahanakorn	21%	-	23%	56%	
4	Summer Lasalle (Phase 1)	✓	✓	✓	-	
5	Magnolias Ratchadamri Boulevard	-	✓	✓	✓	
6	ICON SIAM	25%	-	35%	40%	Event hall, Museum
7	Singha Complex	10%	60%	-	30%	
8	Samyarn Mitrtown	30%	30%	10%	20%	Event hall, Co-working space 24hr
9	Whizdom 101	20%	30%	-	50%	
10	Jin Wellbeing Country	✓	-	-	✓	Health center
11	Sindhorn Village	25%	-	40%	30%	Art museum
12	I'm China Town	45%	-	45%	10%	
13	Artisan Ratchada	✓	✓	-	✓	
14	The Parq	✓	✓	-	-	
	Period 4: 2022 ~					
1	Siamese Rama 9	✓	✓	-	✓	
2	The Unicorn	✓	✓	✓	✓	
3	Mega City Bangna	✓	✓	✓	✓	Entertainment, school
4	Dusit Central Park	30%	25%	20%	25%	
5	Bangkok Mall	✓	✓	✓	✓	Event hall
6	The Forestias	10%	15%	15%	60%	Health center
7	One Bangkok	30%	30%	20%	10%	Hall/Museum
8	New Werng Nakhorn Kasem	✓	-	✓	✓	

Note: "✓" = use exists but no information of usage area was provided in the project details.

Utilizing the framework for estimating on-site market support as delineated in Table 1, which illustrates the degree of support between main and supporting uses, an analysis of the developmental proportion of uses within the project was conducted (refer to Table 3). Additionally, Table 1 delineates the scores reflecting market synergy among the providing uses of projects. A higher score signifies a heightened potential for project success. The findings of the study reveal that the initial period yielded a high market synergy score through the integration of office, hotel, and convention center with retail as the primary use.

Conversely, during Period 2, particularly in mixed-use projects where the primary use is office space, there was a decline in the synergy score. This trend was notably observed in the dominant project of this period, Emporium, wherein retail space was designated as the main use. In the third period, ICON SIAM attained the highest synergy score despite its primary use being residential. This achievement was attributed to the incorporation of an event hall and museum, falling under the category of Cultural/Entertainment/Recreational use, thereby creating greater market synergy.

Moving into Period 4, characterized by a highly competitive market situation, the majority of projects garnered elevated synergy scores, indicative of the developers' increased experience in this market. Notably, the project with the highest score was One Bangkok, encompassing diverse uses, even though the main use pertained to office areas.

Hence, the careful selection of a primary use is crucial to attain a high potential for market synergy. Notably, retail space holds particular importance as it has the capacity to attract a substantial market from on-site uses. In contrast, other primary uses such as office, hotel, and residence require a strategic combination with supporting uses, such as cultural, entertainment, and recreational spaces, functioning as amenities that generate indirect benefits among various uses.

Table 4 Development of size and location of mixed-use projects

No.	Project Name	Score of market synergy within the project (Degree of support)						Total Degree (points)
		Retail	Office	Hotel	Residence	Conv.	Cul./Rec	
	Period 1: 1982-1997							
2	MBK Center	Main	4	4	-	4	-	12
3	Central World	Main	4	4	-	4	-	12
5	Emporium	Main	4	4	-	-	-	8
	Period 2: 1998-2011							
1	Charmchuri Square	3	Main	-	2	-	-	5
2	Park Venture	3	Main	4	-	-	-	7
	Period 3: 2012-2021							
3	King Power Mahanakorn	3	-	2	Main	-	-	5
6	ICON SIAM	3	-	3	Main	1	4	11
7	Singha Complex	3	Main	-	2	-	-	6
8	Samyarn Mitrtown	3	Main	4	2	1	-	10
9	Whizdom 101	3	2	-	Main	-	-	5
11	Sindhorn Village	4	-	Main	2	-	4	10
12	I'm China Town	3	-	Main	2	-	-	5
	Period 4: 2022 ~							
4	Dusit Central Park	Main	4	4	4	-	-	12
6	The Forestias	4	2	2	Main	-	4	12
7	One Bangkok	3	Main	4	2	1	4	14

Note: Conv. = Convention Center/ Arena, Cul./Rec.= Cultural/Entertainment/Recreational, Main = primary uses
Degree of support 1= Very weak or no support, 2= Weak support, 3=Moderate support, 4=Strong support,
5= Very strong support

4.3 Development of investment and project cost of mixed-use projects

The mixed-use projects entail high costs and inherent risks; ensuring a secure investment becomes imperative. The Joint-Venture development model emerges as a viable solution for mixed-use projects, wherein the collaborative partnership allows for the shared allocation of budgetary resources and expertise in project management. By pooling resources and knowledge from both participating entities, the Joint-Venture model mitigates financial and operational risks, fostering a more robust and sustainable development approach for mixed-use projects.

An illustrative case is Dusit Central Park, initiated by Dusit Thani PLC, a seasoned player in the hospitality industry (Table 5). Recognizing the potential in expanding into the retail development sector, Dusit Thani PLC strategically collaborated with Central Pattana PLC. This partnership capitalizes on Central Pattana's extensive expertise in retail, thus synergizing the strengths of both entities. Through such collaborations, organizations like Dusit Thani PLC can leverage the specialized knowledge of their partners to successfully navigate new markets and diversify their portfolio.

Central Pattana PLC is recognized as a trailblazing developer that initiated mixed-use project development in Bangkok, incorporating retail, office, hotel, and convention center components from Period 1 onward. Central World stands out as the largest mixed-use project within Central Pattana PLC's portfolio, situated in the CBD. Simultaneously, Magnolia Quality Development Co., Ltd has assumed a prominent role, particularly from Period 3-4, with their most significant project, The Forestias, located in a suburban area (Table 5).

Table 5 Developer investment of mixed-use projects

	Project Name	Project cost (MB)	Developer investment	
			Main Developer	Joint-Venture
	Period 1: 1982-1997			
1	Central Ladprao	5,000	Central Pattana PLC.	-
2	MBK Center	2,000	MBK PLC.	-
3	Central World	N/A	Central Pattana PLC.	-
4	Fortune Town	N/A	C.P. Tower Growth Leasehold Property Fund	-
5	Emporium	15,000	City Mall Group Co., Ltd. and City Realty Co., Ltd.	-
	Period 2: 1998-2011			
1	Chamchuri Square	N/A	Property Management of Chulalongkorn University	-
2	Park Venture	5,000	Univentures PLC.	-
	Period 3: 2012-2021			
1	T77	1,000	Sansiri PLC.	-
2	FYI Center	5,000	Frasers Property (Thailand) PLC.	-
3	King Power Mahanakhon	21,000	King Power International Group (51%)	Pace Development Corporation PLC.
4	Summer Lasalle (Phase 1)	N/A	Piruch Buri Co., Ltd.	-
5	Magnolias Ratchadamri Boulevard	11,000	Magnolia Quality Development Co., Ltd.	-
6	ICON SIAM	54,000	Siam Piwat Co., Ltd. (51%)	Magnolia Quality Development Co., Ltd. (24.5%) Charoen Pokphand Group Co., Ltd (24.5%)
7	Singha Complex	10,000	Singha Estate PLC.	-
8	Samyan Mitrtown	9,000	Frasers Property (Thailand) PLC.	-

Table 5 Developer investment of mixed-use projects (continued)

9	Whizdom 101	30,000	Magnolia Quality Development Co., Ltd.	-
10	Jin Wellbeing County	4,000	Thonburi Healthcare Group PLC.	-
11	Sindhorn Village	39,000	Siamsintorn Co., Ltd.	-
12	I'm China Town	3,000	I Am Chinatown Co., Ltd.	-
13	Artisan Ratchada	6,000	BGY & TFD Properties Co., Ltd.	-
14	The Parq	20,000	TCC Assets (Thailand) Co., Ltd.	-
Period 4: 2022 ~				
1	Siamese Rama 9	10,000	Siamese Asset PLC.	-
2	The Unicorn	1,500	U City PLC.	-
3	Mega City Bangna	67,000	Siam Future Development PLC. (49%)	IKANO Retail Asia Co., Ltd.(49%) S.P.S. Global Trade Co.,Ltd. (2%)
4	Dusit Central Park	46,000	Dusit Thani PLC. (60%)	Central Pattana PLC. (40%)
5	Bangkok Mall	50,000	City Mall Group Co., Ltd. and City Realty Co., Ltd.	-
6	The Forestias	1,400	Magnolia Quality Development Co., Ltd.	-
7	One Bangkok	120,000	Kasemsubvadhana Co., Ltd. (TCC) and Frasers Property Holdings (Thailand) Co., Ltd.	-
8	New Werng Nakhorn Kasem	8,247	Asset World Corp PLC.	-

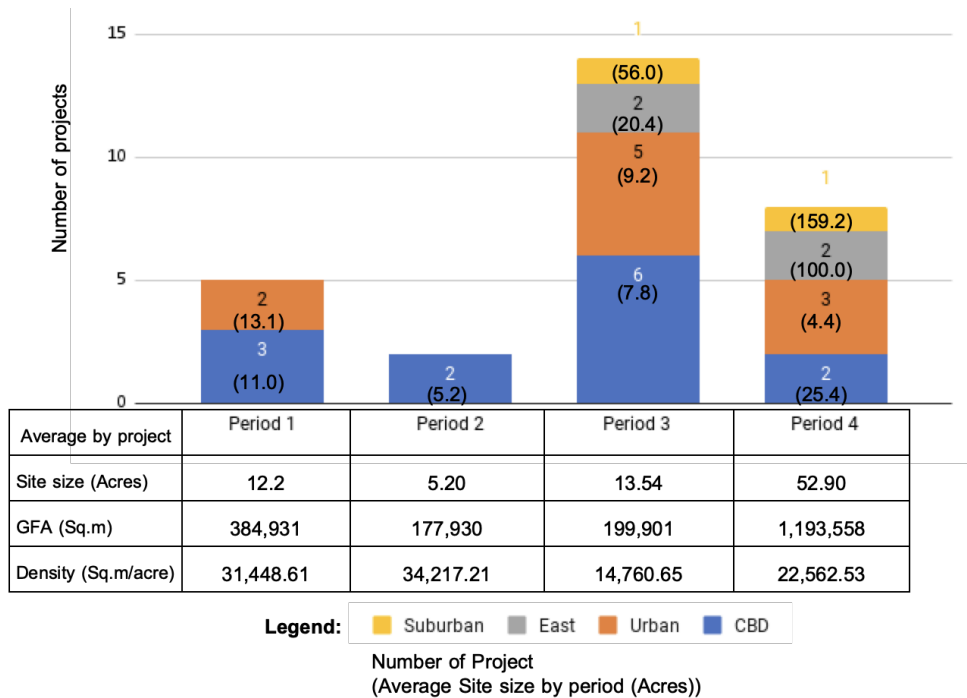
5. Discussion

5.1 Transformation of scale and location of mixed-use project development

An analysis of the physical transformation in projects over four time periods (as shown in Figure 5) reveals a trend of projects expanding further into suburban areas from Period 1 to 4, except for Period 2, which experienced economic contraction due to economic instability. This contraction led to projects being concentrated in the CBD with the three first mass transit lines (1999-2009).

Period 3 experienced the greatest expansion and the highest number of project starts, marking a boom in development. This was a time of economic and social recovery following the country's major flood disaster, during which the government sought to stimulate real estate development through several positive factors. These included the First-Home policy in 2012, the extension of mass-transit lines (BTS, MRT, BRT) to suburban areas since 2010 (DDProperty, 2020), tax reduction measures for real estate purchases (2015-2016), and the LTV policy reducing the loan-to-value ratio. These factors led to project expansion throughout all four zones in Period 3.

The CBD area continued to host the highest number of projects, though with an average land size of only 7.8 acres—these were much smaller than projects in other zones. Meanwhile, in Period 4, the average project land size in suburban areas increased by seven times compared to Period 3, with projects continuing to spread across all four zones and land sizes increasing due to the expansion of transportation connectivity in suburban areas.



Note: the amount in this table is an average of overall projects in each period
Figure 5 Graph of transformation of number and site size of mixed-use projects.

5.2 Transformation of physical configuration of mixed-use project development

The density of usage areas indicates the development potential within limited land sizes and project configurations. As illustrated in the table in Figure 6, mixed-use projects from Periods 1-2 were built predominantly with high-density integrated multi-tower structures, maximizing usage space within limited land sizes. Periods 2-4 presented a diversification in configuration styles, but the integrated multi-tower structure remained the most popular choice due to its ability to provide more usage area than traditional tower formats within similar land sizes.

The mixed-use combination, which blends integrated multi-tower structures with mixed-use town formats, emerged as a contemporary development style in the 4th Period. Despite its modern appeal, this approach entails greater budgets and extensive land requirements and typically is located in suburban areas.

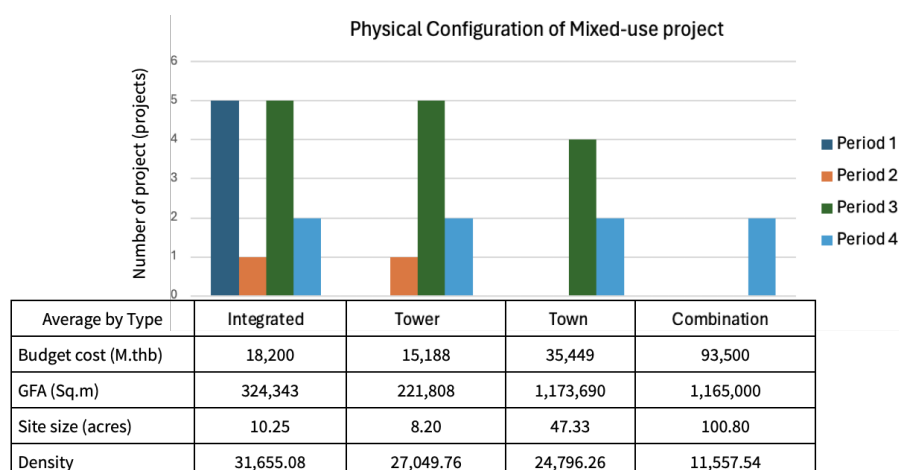


Figure 6 Variety of physical configuration of mixed-use projects and associated costs

5.3 Transformation of use combination and market synergy in the mixed-use project

According to Table 1, functions within a mixed-use development should harmonize and complement each other, fostering synergy and mutual support. These projects often require a large investment of time and resources, so favorable market and financial conditions are essential. Incorporating a variety of revenue-generating uses can help distribute income and minimize investment risk, while simultaneously enhancing the user experience and creating a vibrant environment.

In the analysis of use combinations and market synergy, identifying viable combinations is essential. Figure 7 illustrates that foundational uses in mixed-use projects across all time periods include hotel, office, and retail spaces. Retail space frequently is a primary use that supports other uses within mixed-use projects. Periods 3 and 4 exhibit more diverse use combinations compared to Periods 1 and 2.

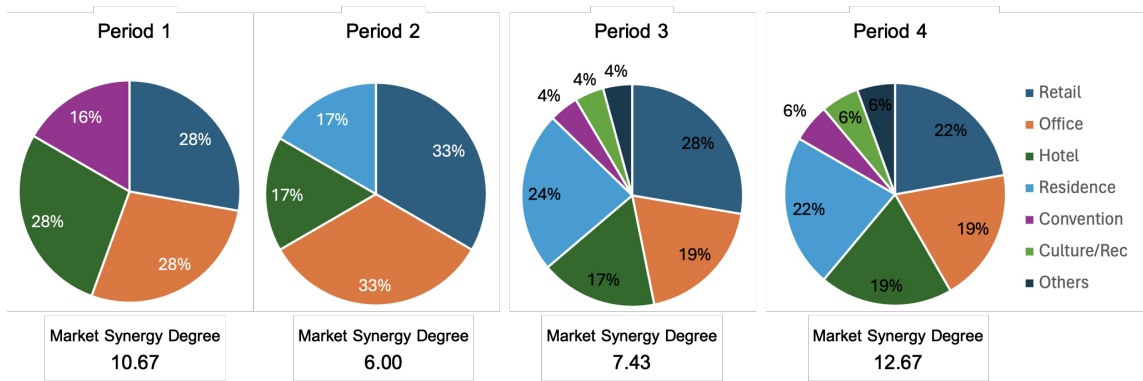


Figure 7 Transformation of use combination, on average, by project

From Period 2 onwards, the introduction of residential areas in mixed-use projects reflects the compact city concept, enabling users to live, work, and play within a single project. This approach promotes convenience and efficiency for residents.

Although different types of use integration potentially can increase the investment’s present value, this does not guarantee a high degree of market synergy. A high degree of market synergy stems from effective physical and functional integration among various project components, making efficient use of land and typically including seamless pedestrian pathways and a cohesive overall plan (refer to section 2.1 and Table 1). The degree of market synergy also depends on the primary use of the mixed-use project. For instance, Table 4 shows that during Period 1, when retail is the primary use in a combination of four uses, a higher degree of synergy is achieved compared to the more numerous uses in Period 3. The variety of uses in mixed-use projects has become more complex over time, incorporating additional functions such as cultural spaces and wellness centers. These new functions cater to emerging trends in urban lifestyle and provide distinctive features for projects.

6. Conclusion

Mixed-use development has been a significant trend in Bangkok and the surrounding metropolitan region due to its potential benefits as compared to other types of real estate. These benefits include increased present investment value, faster realization of a site’s potential, opportunities for creating appealing public spaces, and acting as a catalyst for further development within and beyond project boundaries. However, mixed-use projects often require a larger budget and scale compared to single-use projects, necessitating careful planning and

superior design for successful outcomes. As discussed above, the evolution of mixed-use development can be observed in terms of physical attributes such as location, site size, usage areas, physical configuration, use combinations (types and proportions), and market synergy between different uses within the project. The analysis was conducted across different periods to identify patterns of development and to suggest potential trends of change moving forward.

- (1) Location Distribution: Mixed-use development initially emerged in Bangkok's CBD and urban fringe areas. It since has expanded into suburban regions due to the influence of mass-transit transportation extensions. Despite this expansion, the number of mixed-use projects within the CBD continues to grow, reaching high levels of aggregation. This growth primarily is driven by the need for good accessibility and proximity to mass-transit stations.
- (2) Physical Configuration: The Integrated Multi-Tower structure is a popular configuration model in mixed-use development due to its ability to maximize usage spaces and achieve higher density within a project while optimizing costs. This model may continue to dominate the market. However, the Combination model is emerging as a potential trend for the future, aligning with the compact city concept by offering public spaces and specialized functions that enhance urban living and contribute to an improved urban environment.
- (3) Mixture of Uses and Their Proportions: Modern mixed-use developments are characterized by a diverse integration of uses, expanding from the traditional three to four types to now include up to seven types. These additional functions may consist of amenities such as museums, wellness centers, and schools, which contribute to the overall value and appeal of the development. This increased variety enriches the mixed-use projects and enhances the quality of life for residents and visitors.
- (4) Developer Investment: Mixed-use developments require substantial budgets, leading developers to consider Joint-Venture investment models to reduce risk by pooling resources for the project's completion. However, large budgets are not exclusively tied to joint ventures. Many mixed-use projects, with costs exceeding 100,000 million baht, have been undertaken by single developers working independently.

According to the findings, certain criteria can be recommended for mixed-use projects with respect to land size and suitable uses:

- (1) Land size selection: Mixed-use projects can vary greatly in scale, ranging from 5.2 to 159.2 acres, with an average size of 41.65 acres. For projects with limited land size, the mixed-use tower structure or integrated multi-tower structure is a practical choice, requiring as little as 8.2 to 10.25 acres but still allowing for the creation of extensive usage spaces. The Emporium project serves as an example of an integrated multi-tower structure within the CBD, achieving the highest density of usage area despite land constraints. Conversely, the One Bangkok project reaches a high density using a combination model, a modern approach that also has been adopted in suburban areas.
- (2) Use Combination Selection: The degree of market synergy can impact the success of use integration in mixed-use development projects. The primary combination of uses typically includes retail, residential, office, and hotel spaces. Retail space is the most supportive use and should be incorporated into standard mixed-use projects because it offers diverse activities and a vibrant lifestyle for users. Retail spaces can support office staff, residents, and travelers, enhancing the overall appeal and functionality of the development.

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Author Contributions

Conceptualization, methodology, formal analysis, investigation, data curation, writing - original draft, writing-review & editing, visualization, and project administration were undertaken by a single contributor, S.K.

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