

Theory and practices of mixed-use schemes (MUS) towards sustainable built environment: an international development perspective

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ABSTRACT:

The emergence of mixed-use schemes (MUS) or mixed-use development is linked to the transitional changes in towns and cities. It has been observed that mixing of different land uses came-out in the early development of settlements across small villages to large cities, way back in the prehistoric to present times. Specifically, mixed-use developments are part of the historical development of land uses ranging from small-scale diverse mixes uses to mono-functional planned areas.

It is evident in the literature that MUS has gained significant attention from planners, policy makers, environmentalists, academicians, investors, appraisers, and developers. This has also resulted in the emerging awareness of sustainable built environment, including the need for live-work-play facilities and amenities which MUS plays an important role.

This study provides an extensive review of the theoretical and conceptual aspects of MUS as a component of urban development strategy as well as to analyze the current practices and approaches in delivering such schemes in an urban fabric around the world. Then, the study focuses on the various activities and players in the development process within the real estate market perspective. Finally, it also examines the distinctive characteristics or salient elements within MUS definition through case studies of selected urban regeneration projects in the UK and Ireland, its relevance and applications in the context of international real estate development practices in creating functional and sustainable communities. With the results of validation and the findings from the literature, MUS is a physical development of a structure or group of structures having two or more integrated functional uses creating diverse of activities.

KEY WORDS: development process, built environment, mixed-use schemes, sustainable communities, urban regeneration

1. INTRODUCTION

There is a widespread and increasing support worldwide particularly from planners, policy makers, environmentalists, academicians, investors, and developers in the promotion of mixed-use developments or mixed-use schemes (MUS) as an urban development strategy. At the present time, MUS is adopted as a planning paradigm in the revitalization of liveable, attractive and sustainable urban centres (Rowley, 1996a); and the redevelopment of under-utilized and unproductive urban spaces, referred as 'brownfields' (FPD Savills, 2003a).

Away from the conventional and functional planning philosophy, MUS can increase choice, convenience, and vitality resulting in economic, social and environmental benefits (Coupland, 1997). Moreover, it is considered

an acceptable element in providing solutions towards sustainable development compared to ‘laissez-faire’ approaches (Walker, 1997) that weaken the economic strengths and diversity of city centres (Evans, 1997). It also become an urban development strategy in promoting higher densities and multiple land uses generate compatibility and synergy effects among various uses, and overcoming regulatory barriers relating to environmental impacts, noise and traffic (Hoppenbrouwer & Louw, 2005). As a result, the promotion of MUS development facilitates mobility and travel time reduction; crime prevention and security promotion, and improvement in the quality and attractiveness of towns and cities. It also recognized that through (a) increasing the intensity of land uses, (b) increasing the diversity of use, and (c) integrating segregated uses could facilitate good urban form which supports economic vitality, social equity and environmental quality (Grant 2002). Thus, it resulted in the increasing awareness of the “sustainable and compact city” including the need for live-work-play environment which has resulted in growing significance of MUS in key areas of urban planning, real estate and property management, and urban regeneration.

On the other hand, however, previous studies also emphasized that MUS is a widely used term and seldom defined and constitutes a vague and unclear concept that generates significant in both theory and practice with multi-faceted characteristics confusion (Herndon, 2011; Hoppenbrouwer & Louw, 2005; Coupland, 1997; Rowley, 1996a). Specifically, some major development players are reluctant to participate and invest due to the complexity of the schemes which require additional time, energy, expertise, and resources (Bennett, 1999). Consequently, funding MUS projects would certainly more problematic, difficult, costly, and complicated (Bell, 2004; Culp, 2003; Marsh, 1997). Some of the drawbacks from these schemes are related to location, size, viability, complexity, marketability and management (Rowley, 1996a&b). Furthermore, the Rowley (1996b) argues that these significant problems perceived in mixed-use property as an investment were caused by the multiple tenancies and covenants, inflexible building form and space, and the absence of a proven mixed-use development mechanism and record of performance (Jones Lang LaSalle, 2005). Wardner (2014) also identified the key factors that hamper the delivery of MUS projects. These factors are: higher risk profiles, difficult alignment of property cycles for each use, and high level of experience and specialization. Overall, factors influencing the financial success of a mixed-use development can be grouped in the categories of economic and market, financial, physical and public issues (Rabianski, et al., 2009).

Despite its ambiguities and drawbacks, it is apparent that MUS developments become popular and its planning and implementation continue to be regulated as a modern paradigm. Accordingly, MUS serves as the central theme to achieve sustainable built environment through densification and intensification of land uses towards the creation of compact cities, urban villages, and sustainable communities.

This paper provides an extensive literature review of the historical, theoretical, and conceptual aspects of MUS; the current practices and approaches in delivering such schemes; and the various activities and players in the real property development process. It also examines the distinctive characteristics or salient elements within MUS definition through case studies of selected urban regeneration projects in the UK and Ireland, its relevance and applications as an investment vehicle in an international real property perspective.

2. EMERGENCE OF MUS DEVELOPMENT

2.1 Historical Background

Mixed-use developments are part of the historical development of land uses ranging from small-scale diverse mixed uses to mono-functional planned areas. Mixing of different land uses emerged in the early development of settlements across small villages to large cities way back in the prehistoric to present times (Schwanke, 2003; Enani, 1998; Witherspoon et al, 1976). Whilst these developments were not called mixed-use during those early settlements, typical land uses such as residential, office and commercial grew organically which have the same characteristics of the current definition of mixed-use developments in modern towns and cities today (Miller & Miller, 2003). Mostly, these early developments were relatively small and surrounded by high protective exterior walls which create a compact settlement with high densities incorporating a mix of uses (Bell, 2004, Schwanke, 2003); and were integrated into the fabric of towns and cities in the US, Europe, Asia, and the Middle East (Enani, 1998). Thus, evolution of the concept of MUS is the result of compact land use

developments in areas rapidly expanding populations (Enani, 1998). *Table 1* provides a summary on the historical background to mixed-use developments, and highlights the key features which have characterised such developments over time (Schwanke, 2003; Miller & Miller, 2003; Coupland, 1997; Witherspoon, et al, 1976; Aston & Bond, 1976; Spreiregen, 1965).

Table 1: Historical Development of MUS

Period	Key Feature/Characteristic
Pre-historic, Reconnaissance and Medieval Times	<ul style="list-style-type: none"> • Early settlements have densely-packed buildings for trade, commerce, industry, religious and administrative purpose • The Greek's Acropolis and Agora show the characteristics of groupings and multi-use of structures having spaces for variety of functions for people to meet and move • The Roman's <i>forum</i> serves as the central feature area - a market-place which is surrounded by porticos (porches), shops and offices; including the <i>basilica</i> – a large aisled hall similar to a modern town hall or civic centre contained the administrative offices, law courts and space for public meetings • Medieval towns were compact and walled where the inhabitants often established residences and warehouses (factories) adjacent to the main administrative centre • Seaside resorts and other watering- places like <i>wells</i> and <i>spas</i> became popular having lodging houses, hotels, shops and other resorts function
Between 18 th and early 20 th Centuries (Industrial Revolution)	<ul style="list-style-type: none"> • Expansion of existing city centres where main streets tended to have a mix of both uses and building styles • From the traditional mix of trade and home to the incorporation of factory into the mix, as well as the spread of trade and industry into residential areas • The rise in trade and commerce led to the creation of purpose-built office buildings • Promotion of high-rise downtown models, town centre, and urban village models • Urban village models – promotion of the garden city concept • The shift from traditional town centres anchored by religious and civic institutions towards centres devoted to shopping • Downtown complexes – high rise and high density redevelopment • Extensive development of railroad infrastructures and electrical catenaries' structures for easy access into the downtown areas • Integration of office buildings with retail, recreational, and cultural facilities, including landmarks • Accommodation of pedestrian and vehicular traffic
Between 1950s and 1960s	<ul style="list-style-type: none"> • Downtown redevelopment with commercial uses as drivers, but eventually incorporated residential uses and moved beyond downtown • New town development – a 'cleaning up' mechanism for mixed areas to remove non-conformity industry. A method of planned dispersion to reduce city densities and populations as well as to reduce traffic congestion • Emergence of sizeable mixed-use towers featuring glass-box buildings with hardscape plazas • Primarily public-private initiatives towards large-scale projects to revitalize downtown commercial centres • Viability of a commercially oriented mixed-use development outside the commercial centre and mixed uses around a transit station • New suburban commercial developments from limited physical and functional integration of uses and pedestrian circulation and connections with uses including apartments, office space, retail facilities, movie theatres, hotels, recreational facilities, including subway transit station • Major development of mixed-use towers, with vertical stacking and integration of uses • Pioneering of the concept of dramatic interior spaces – large atriums and gallerias • Introduction of a 'resort village' type of mixed-use projects – narrow streets, irregular street pattern, automobile-free pedestrian zones, a mix of retail, lodging, and residential uses with prominently located public places • Distinctive features include substantial residential space, openness to surrounding areas, emphasis on hard-surfaced plazas and glass boxes, and incorporating podiums, platforms and underground space
1970s	<ul style="list-style-type: none"> • Greater internal orientation - enclosed and internally focused malls and large sky-lighted atriums and gallerias • Evolution of large scale shopping malls in downtown and suburban areas • Dominance vertical mix of commercial elements - office, retail and hotel uses • Deliberate adoption of planning policy and zoning of mixed uses as part of the urban centre renewal • Residential uses are not prominent - emphasis on a standard mix of uses that relies heavily on the office, retail and hotel configuration
1980s	<ul style="list-style-type: none"> • New emphasis on quality urban design – not only on the buildings but on the space between the buildings

	<ul style="list-style-type: none"> • Emphasis of creating a mixed-use districts rather than mega-structures • Adoption of the ‘town centre’ street system – a spiral design often likened to the chambers of a nautilus shell • Exhibited post-modern approaches with much more open designs • Smaller scale environments and locations - mostly concentrated in the suburban areas • Residential uses become the major components of the mix of uses • More openness and sensitivity to the total environment, greater use of renovation and historic rehabilitation of existing buildings • More infusion of entertainment and cultural uses into the mix
Between the 1990s and early 2000s	<ul style="list-style-type: none"> • Rapid growth of the mixed-use town centre and urban village concepts • New approach by arranging a variety of major commercial uses – office, cinema, hotel, and retail space in the configuration of a main street town centre • Mixture of enclosed and open spaces to create interesting mixed-use configurations • Customized retail forefronts with variations in setbacks, entrances, awnings, windows and signage creating a vibrant pedestrian environment • Streets and plazas are proportioned to balance spaciousness and ease of movement with an intimate human scale • Pedestrian is widely adopted making town centres more attractive and retain activity within the centres
Towards the 21 st Century	<ul style="list-style-type: none"> • Increasing importance of mixed-use town centres in planned communities and the growing number of urban villages fuelled by the growing diversity of housing markets • Integrating commercial and housing activity on a smaller scale that is pedestrian-friendly and linked to transit • Increasing importance of retail development on the form main street lifestyle centres • Increasing trends of low-cost and low-rise office buildings which are located in office campuses adjacent to mixed-use centres • Organised around pedestrian-friendly streets, blocks, and squares • Mixed-use development is a central theme to the principles of the following planning initiatives: Smart Growth, New Urbanism, Liveable Communities, Transit Oriented Developments (TODs), Traditional Neighborhood Developments (TNDs) and urban redevelopment or regeneration and renaissance, including infill and greyfield development • Continued preference for high-rise and high-density mixed-use projects in megastructures • Small-scale and low-rise development which minimizes layers of uses

Source: Schwanke, 2003; Miller & Miller, 2003; Coupland, 1997; Witherspoon, et al, 1976; Aston & Bond, 1976; Spreiregen, 1965

2.2 Definition of MUS

MUS developments are commonly used terms and are not properly defined in planning literature which brings misunderstanding and misinterpretation. The first established definition set by the Urban Land Institute (ULI) applies in the context of most real estate development projects. According to ULI, mixed-use developments are relatively large-scale real estate projects with the following components (Witherspoon, et al., 1976 as cited by Bell, 2004; Schwanke, 2003; Leland Consulting Group, 1999): *three or more significant revenue-producing use; well-planned projects with significant functional and physical integration; and developments in conformance with a coherent plan.*

According to Enani (1998), the ULI’s definition does not describe a new urban form, but the modern mixed-use developments are distinct from early practice, and highly visible within the urban landscape which cannot be strictly defined. Enani (1998) also characterised mixed-use schemes in terms of its dramatic design, size, and impact of the developments. For example, such schemes would have major public spaces and amenities and incorporate development forms such as skyscrapers; and enclosed shopping malls to create exciting and dramatic urban built environments to revitalize downtowns and city centres. The ULI definition as cited by Enani (1998), clearly differentiates mixed-use schemes from other forms of land use, and also identifies common denominator characteristics of mixed-use projects with a number of minimum criteria. ULI’s definition implied the three salient elements of MUS such as (a) significant revenue- producing uses, (b) integration of the functional and physical components, and (c) conformance with a coherent plan. On other hand, to have a clearer definition of MUS, Rowley (1996) provides a conceptual model that explains the primary aspects and characteristics of MUS which include the following: (a) grain, (b) scale and setting, (c) location, (d) approaches for promotion and maintenance, (e) transactional quality, (f) tenure and occupation, and (g) time dimension.

Guided by the results from the review of previous studies, it can be concluded that MUS developments are “well-planned physical developments of a structure or group of structures having 2 or more integrated functional uses creating diverse types of activities. Specifically, these developments have the following major characteristics: comprehensive development plan, well-planned physical configuration (building) and mix of two or more functional or economic uses.” This definition is graphically summarized in **Figure 1** to highlights the considerations to meet the criteria of MUS and consequently to be appropriately recognised as mixed-use developments.

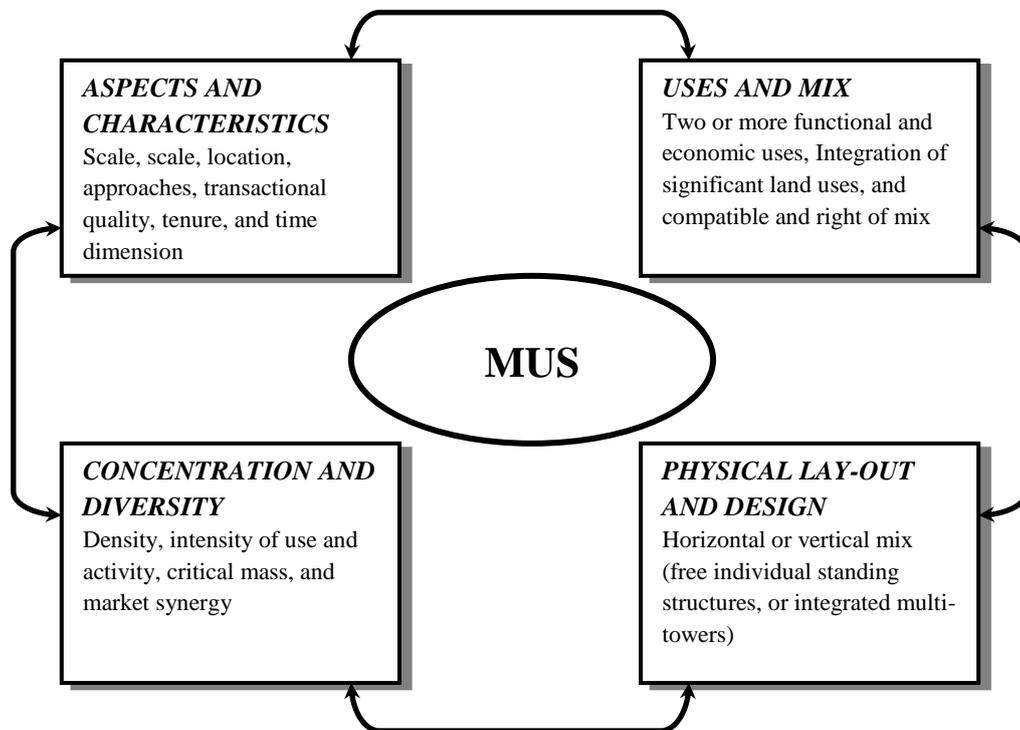


Figure 1: Key Requirements and Considerations for MUS Development

3. DEVELOPMENT PROCESS IN RELATION TO MUS

In general, real estate development process involves various activities - from the planning stage to the management and operation of the project. The development process encompasses the major development issues that relate to location and land acquisition; physical design; financing and marketing; regulatory and political; public involvement; and environmental compliance. The development of real estate is a complex and diverse process (Ratcliffe et al, 2004; Ratcliffe & Stubbs, 1996; Healey, 1991). It is complex in terms of the various agencies taking part in the development in a variety of organisational forms and legal entities; and diverse in terms of a wide range of sectors having different objectives and modes of operation. It involves professionals across the spectrum of the built environment, not only as players within the process but also in showing concern for the outcomes (Collier, 1995).

To have a full understanding of what happens behind the scenes of a MUS project, there is a need to assess the stages of the process, the significance of specific events or activities, the contribution of various actors or key players, and the complex relationships that trigger the development to happen (Adams, 1994). There are a number of ways in which the development process can be explained as a sequence of events or series of stages or phases from the start to the completion of the project (Ratcliffe et al, 2004; Ratcliffe & Stubbs, 1996). Millington (2000) views this entire development process as a number of different stages of activity being carried on consecutively or simultaneously. It is also an activity that follows a series of stages running concurrently rather than in sequence (Collier, 1995). Thus, it is clear that a number of complex variables are involved; consequently the final output is the result of a series of interrelated decisions (Collier, 1995). There

are detailed approaches in identifying the different stages, phases or steps in the development process presented by various authors. Thus, the process of development can be summarised into four major stages, namely: (a) inception and initial planning, (b) appraisal and feasibility, (c) construction, (d) operation and management as shown in **Table 2**.

Table 2: Four Principal Stages in the Development Process

Process/Stage	Activity/Event
Inception and Initial Planning	<ul style="list-style-type: none"> • Project's objectives identification • Actors' objectives and interests identification • Preliminary Selection of development team • Identify major developmental issues • Initiation and Preliminary Development Concept • Initial consultation with concerned government agencies • Initial Site Selection • Market Research
Appraisal and Feasibility	<ul style="list-style-type: none"> • Financial Feasibility Study • Evaluation and land acquisition/purchase arrangement • Planning permissions approval • Detailed Physical Plan and Cost Estimates • Financing arrangement
Construction	<ul style="list-style-type: none"> • Commencement of the Project • Initial Marketing • Permits and approvals • Building contracts and bidding arrangements • Final Project Team Selection/Staffing program • Selection of various contractors
Operation and Management	<ul style="list-style-type: none"> • Operation of the completed project • Marketing of the completed project • Tenancy and Management agreements • Maintenance arrangements • Profit generation

MUS development requires detailed planning which go beyond the architectural and engineering concerns than most of real estate type properties (Schwanke et al, 2003; Witherspoon et al, 1976). It is further viewed that the success in MUS development requires a capable and diverse development team, thorough market analysis, a creative development strategy and program to meet the market demand. As shown in **Figure 2**, it illustrates the four major stages, including the key events and players in the development process of a MUS project. The initial steps in the process involve identifying the objectives, the site, and the potential for developing various uses on that site through a market research (Schwanke et al, 2003). Both financial and non-financial development objectives must be well defined as the planning and development continue leading to decision makings. These development objectives and programs are influenced by the various key players and stakeholders involved in the project which include developers, property companies, landowners, the public sector, and the financial institutions or investors. The development management constitutes many players or participants, but ultimately the project will be undertaken and controlled by the principal developer. In most cases, MUS projects involve several development partners and require highly specialised expertise, including significant and extensive experience. In addition, the development team is compose of engineers, contractors, financial analysts, market analysts, architects, financial institutions and property managers which are working closely with the principal developer.

Moreover, the other important part of the inception and initial planning is to clearly define the non-financial objectives, and to be translated, estimated, and justified its effects on the financial performance of the project. As soon as the initial investigation is complete, the development team needs to outline one or more project development programs which lead towards the next stage of the development process of analysing the feasibility of each program and develop a financing strategy based on the market analysis. MUS projects are difficult to finance compare to any single-use property development due to numerous issues of capital requirements, multiple uses, numerous owners and financing sources involved during its entire development

cycle (Schwanke et al, 2003). MUS projects require a substantial development costs which only a limited number of developers and financial institutions have the resources and interest in investing in such demanding projects. Having such a large and most complex undertaking, developers face with of risking substantial portions of their equity asset base. Consequently, require large financial commitment and partnerships, and multiple financing sources to make this project works.

Developers of MUS need to have a financial structure – matching a project’s funding needs and the financial alternatives available in the market which involve the mix of equity, debt, mezzanine financing; the mix of private and public financing; the use of construction and permanent financing; and the packaging of project elements (the right mix of uses). In addition, structuring of financing for MUS involves numerous partnership options: partnerships with landowners, developers, lead tenants, non/traditional equity investors, and public or private agencies. Furthermore, Schwanke et al (2003) provide a sample of the mixed-use financial model to measure the expected profitability and rates of return of such scheme, and eventually determine whether or not the proposed scheme meets the developers’ objectives and which elements (uses) should be altered to improve the scheme’s financial performance.

The finalisation of the location and design is also a critical issue in the feasibility of the MUS project. Like most of the complex decision making processes, design proceeds in response to the project’s structure, site, and scheme requirements which entail a collaborative process of strong project team (Schwanke et al, 2003). In addition, the most important location and site conditions affecting design, apart from market factors include the size of area, allowable density and land costs, topography and site conditions, access and proximity to transport networks, and the condition of the surrounding land uses. Because MUS requires relatively large sites, land assembly and acquisition also take long period of negotiations during the development process, and to some extent can be more difficult than for a single-use development. In most cases, this process is being facilitated by the public sector to acquire the land; otherwise the developers will first target the key parcels that can be assembled. The public-sector plays an important role in MUS development, and with this involvement can be both an impediment and a stimulant in promoting such scheme.

Alongside financial feasibility, Schwanke et al (2003) identify some of the basic issues or factors that influence the performance of MUS in relation to land cost, planning and construction costs, operating cost, and legal requirements which entails larger contingency funds than for single-use projects. Thus, these issues also mean that the process of estimating costs and revenues for MUS is more likely complicated than single-use property developments, consequently it is expose to greater miscalculations. In addition, there are key factors involve in the financial modelling as follows: (a) it has strategic locations but often expensive sites, (b) it requires initial planning costs resulting to a higher-to-normal proportion of development costs allotted to soft costs, (c) its land size requirement is much larger than single-use projects with either high and low land carrying costs, (d) it entails public participation and subject to a number of incentives to reduce land cost, (e) it caters to a higher densities, thus lowering the cost of land per square meter of development space, (f) it has higher structural costs than a single-use building with the same size, (g) a superior performance results to fast leasing, higher rents, higher sales and occupancy, and greater revenues.

Timing and phasing are very important aspects before and during the construction phase particularly for mixed-use development which substantially affect the marketability of the project (Schwanke et al, 2003). MUS projects involve different land use markets and cycles which are sensitive to the change of economy – as a result of the lagged relationship demand and supply for physical space (Peiser & Frej, 2003; Schwanke et al, 2003). The cycles provide windows of opportunity for strong market demand and financing which improve the developers’ chances of success (Peiser & Frej, 2003). The cycles allow developers to find suitable and right mix of uses or property types within the window of time for which the market is favourable before it proceed with the final plan for the construction. And most importantly, it allows developers for as much flexibility as possible so that the various components and elements (uses) can be altered prior to construction without comprising the viability of other elements (Schwanke et al, 2003). On the other hand, phasing allows developers to address problems of timing and to build only as much as the market can absorb. This could be done either by parcel or by integrated structures depending on the variations of the projects capable to adopt different phasing strategies.

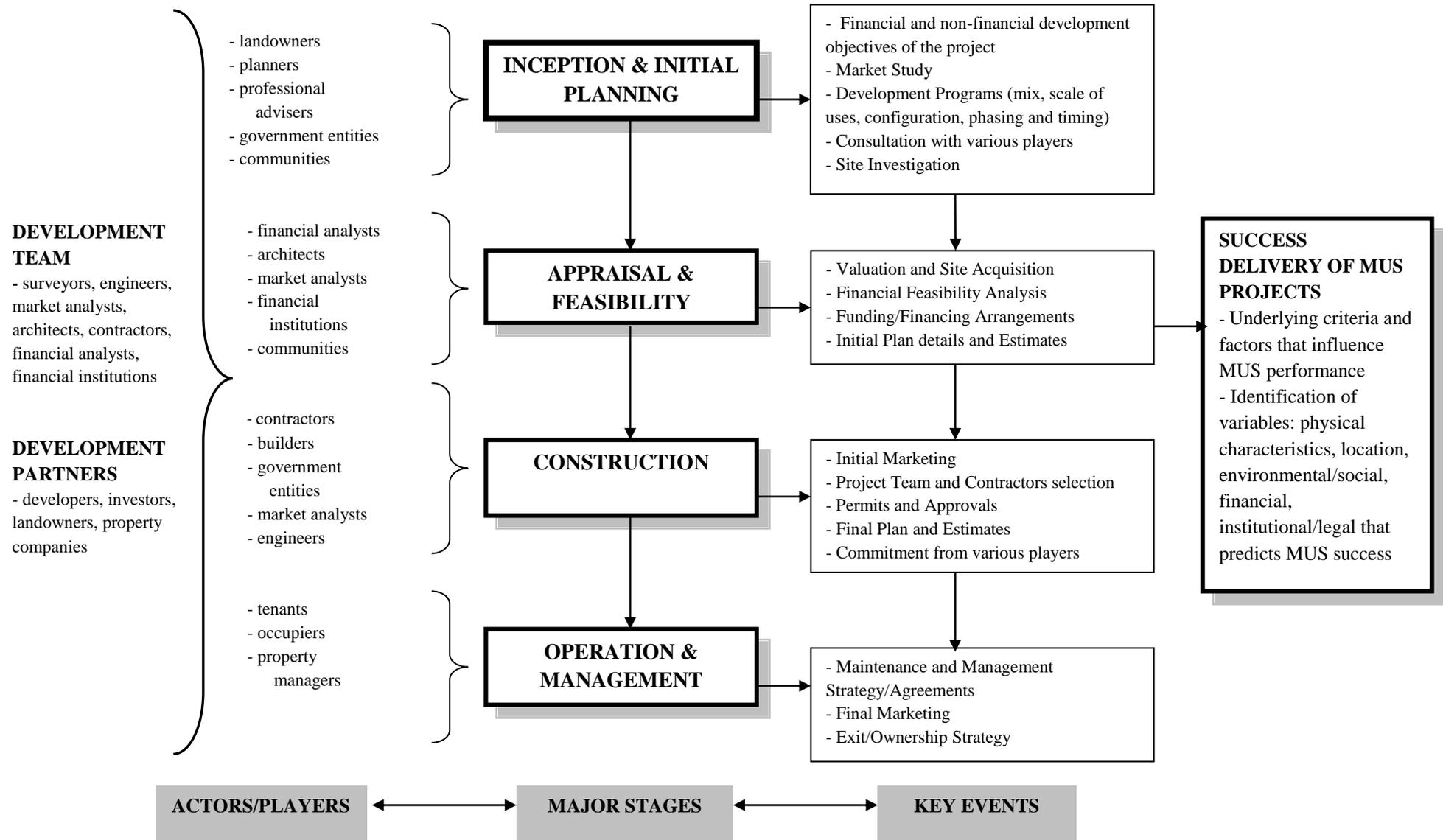


Figure 2: The MUS Development Process

In addition, Schwanke et al (2003) also examine some of the common practices in the operations, management and maintenance issues in MUS, particularly in terms of ownership, rights of use for common areas, assignment of responsibilities and allocation of costs, parking, traffic, provision of security and safety, responsibilities for promotion and marketing, liability for accidents or damages, and access to public and open spaces. It is also viewed that operating problems are much easier to address during the initial development planning stages than they are in the operating stage depending on the degrees of complexity, the nature of the problem, players or stakeholders involved, and the role of the public sector. Finally, maintenance agreements are created and structured to reflect long term benefits such as cost efficiency, operational effectiveness, and meeting individual stakeholder’s objectives.

4. CURRENT PLANNING PRACTICES AND APPROACHES FOR MUS PROMOTION

Changes in the planning approaches to towns and cities have impacted on development patterns and trends which are influence by economic, political, social, regulatory, property and design. Furthermore, it is viewed that the dominant trends of growing urbanization, rising land values, increasing traffic congestion, and new smart growth initiatives lead to more mixed-use developments in both prime locations and peripheral urban areas (Schwanke, 2003). Consequently, these MUS projects are shaped by a variety of trends as shown in *Figure 3*. such as planning/regulatory mechanism, urban regeneration and infill development, urban form and design, urban transit development, and other variety of other issues.

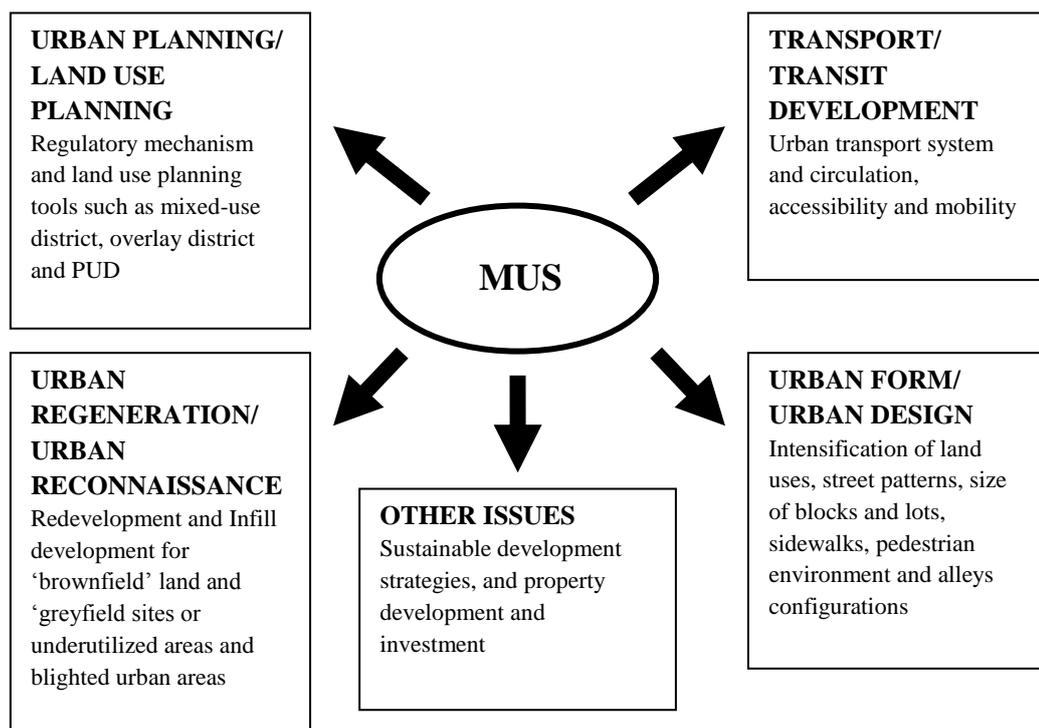


Figure 3: Trends and Practices in the Promotion of MUS Development

Specifically, due to rising land costs and the limited space for development in the major urban centres, it affects developers’ attitudes towards development which leads to the proliferation of higher density and mixed-use projects. As the real estate sector expands, more private firms are willing to handle large, complex and financially demanding mixed-use projects. On the other hand, government also play an important role in the promotion of this type of MUS projects. Current government regulatory systems such as the PUD ordinances, land-use assembly, financial investments/incentives, mixed-use zoning and other control measures allow communities to approve a mix of uses which reflected both large-scale planning and multi-use environments. Moreover, the public sector’s involvement has brought new planning tools as listed in *Table 3*, away from the traditional way – zoning. These planning tools are moving toward a well-planned development comprising of

different land uses at a proper scale and providing incentives for better design, amenities, affordable housing and other public purposes.

Table 3: Planning Tools for the Promotion of MUS

Planning Tool	Guideline
1. Mixed-Use District	<ul style="list-style-type: none"> • It allows different types of uses to locate in the same district provided that these uses are compatible and reasonably related • It encourages creation of vibrant, pedestrian-oriented mixed-use communities and neighbourhoods
2. Overlay District	<ul style="list-style-type: none"> • Special regulations for promoting MUS development in a designated area • An overlay over conventional zoning districts which can be used as a stand-alone regulation in managing MUS in a designated area
3. Planned Unit Development	<ul style="list-style-type: none"> • It encourages developers to propose planned mixed-use developments for sites they choose in the community, and plans are approved upon meeting specified community standards • It eliminates the need for developers to undergo re-zoning process
4. Specific Plan	<ul style="list-style-type: none"> • It indicates the detailed plan of a particular area, in terms of location, size, and building uses • MUS is promoted by locating different uses close together in the plan
5. Performance Standard	<ul style="list-style-type: none"> • Regulation of development based on predetermined measures related to development's impacts on the nearby properties, local public service capacity or on the environment • It does not require separation of uses provided that it meets established performance standards

Source: Schwanke, 2003; Witherspoon et al, 1976

Several strategies are identified from the literatures that advocate MUS development. These strategies and approaches have strong interrelationship between inter-relationship between MUS with urban issues such as transport, urban form and design, and regeneration. It is observed that an integrated urban strategy between transportation and land use planning encourages sustainable living, thus changes in transport systems and in land use patterns are interdependent. It also shows in the literature that lower density is more costly to operate public transport systems, thus requires densification within transport nodes or within PUDs and TODs; and providing corridors of viable public transport linkages. It is viewed that urban pattern characteristics such as urban concentration, land use intensity, land use heterogeneity, and land use connectivity are linked to MUS developments which have direct impact towards urban form and design.

It is also evident that MUS developments are one of the major themes of various planning agendas such as quality growth, liveable communities, compact cities, and most importantly in regeneration or redevelopment of urban areas. Urban regeneration planning programmes have led to comprehensive planned MUS projects aimed at revitalising and diversifying city core areas that are often blighted and neglected. It is observed that mixed-use developments are increasing in revitalizing urban centres for three basic reasons: public policy direction, market demand, and transportation advantage. Local authorities and developers play important roles in the promotion of MUS through urban regeneration. It is argued however that this type of scheme is not get much favourable attention from the private sector (developers and investors) mainly because of its negative perceived performance characteristics compared to single-use developments. Despite the perceived potential and positive outcomes for such developments, there are also barriers and obstacles that need to be addressed and investigated. These include but are not limited to planning policy, financing and funding, partnerships, and tenure and ownership.

5. CASE STUDIES IN THE UK AND IRELAND

The case studies provide tangible and realistic examples of MUS developments in the UK and Ireland. Notably, majority of these MUS cases are regeneration or redevelopment initiatives in Belfast, Lisburn, Dublin, and London. In particular, there are several urban regeneration projects in Northern Ireland and England that reflect mixed-use types of development with a range of components such as housing, retail, office, leisure, parking and hotels. The revitalisation of regional cities like Belfast city has faced several stages

to improve the negative image brought about the troubles in the early 1980s. Some of these projects received several recognitions for their contribution in revitalising Belfast city centre. On the other hand, two projects selected in Dublin city are demand-led driven redevelopment which relied on the fiscal incentive mechanism introduced by city government (Hemphill, 2001; Berry, 1996). The geographical locations of the 10 cases are shown in **Figure 4** and general features and components are summarised in **Table 4**. The case studies indicate that the physical characteristics, the site condition, financial and legal aspects have direct influence to the success and performance of MUS development.

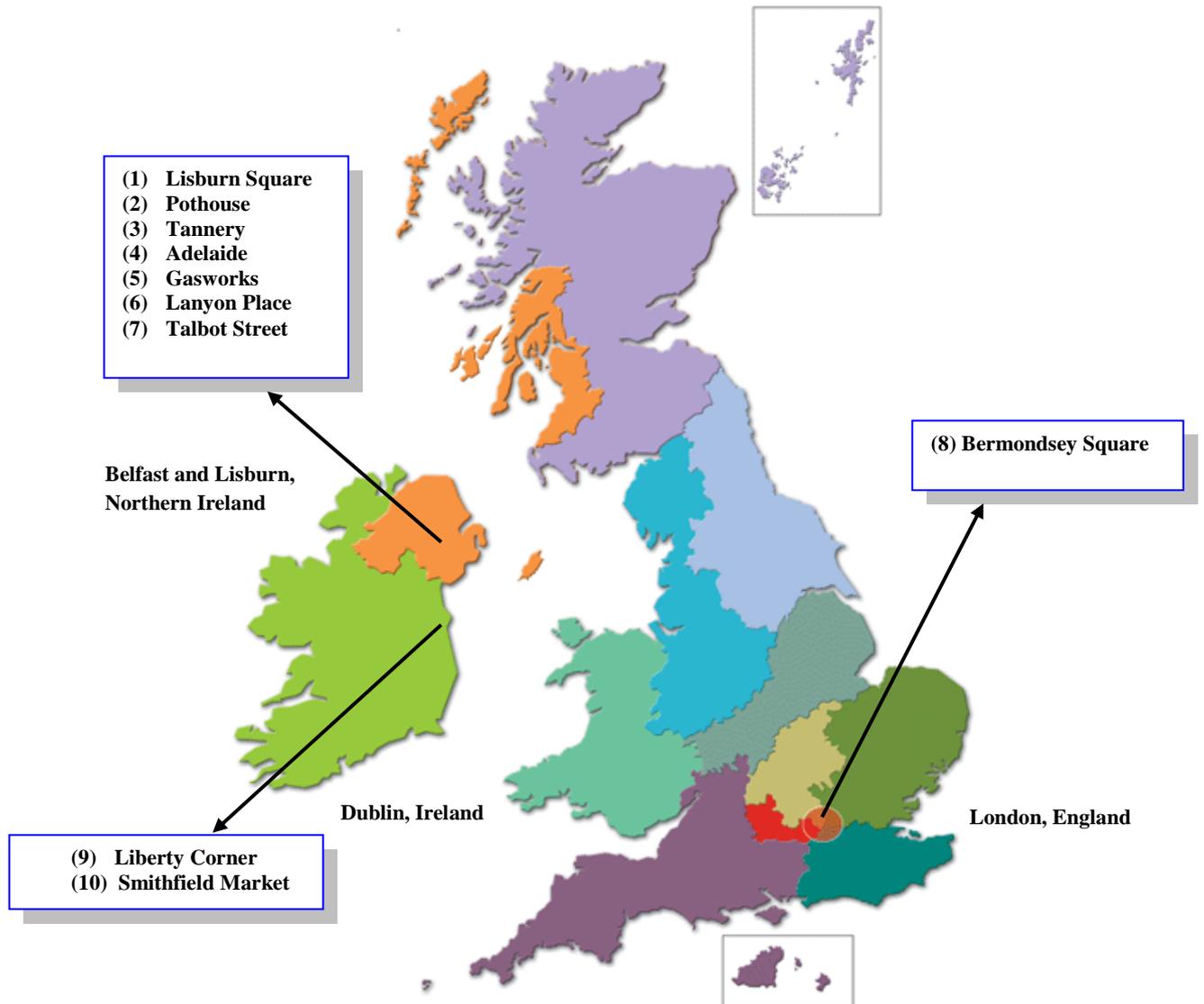


Figure 4: Locations of the Ten Case Studies

6. SUMMARY AND CONCLUSION

MUS is part of the evolution of mixing of land uses from prehistoric to medieval times as demonstrated in the development of small-scale diverse mixed uses to mono-functional planned areas. These early land use development created a compact settlement with high densities incorporating mix of uses and integrated into the fabric of towns and cities all over the world. This historical development provided an extensive and clear scenario of the various views of the early planning initiatives on the mixing of land uses. Thus, these initiatives brought new ways of reviving towns and cities around the world wherein MUS developments played a vital role. It also shows that the current concept of mixed-use developments is the product of early planning initiatives such as the regional shopping evolution in the post-war period, including the success of European towns and cities and downtown development in the US.

In terms of development process, the study has attempted to draw the major stages and activities in a MUS project - from the various key actors or players in the planning stage to the operation of the project; and the linkages between these stages, and the several agencies and the activities involved in the overall process in the delivery of MUS projects. The viability and feasibility of MUS projects are influenced by the factors: (a) physical, (b) financial, (c) economic and market forces, (d) and public concerns.

On the other hand, the ten case studies presented in the study brought key issues that should be considered in maximising the potentials of mixed-use development. These issues include: (a) the size of the site has an effect on the overall design and internal configuration of the scheme, particularly in the component use allocation, scale, and critical mass; (b) the scheme should provide sufficient mass and synergy to contain income generating uses; (c) office use as a main element of the scheme provides is the driving force for mixed-use development, creating synergy with other component uses such hotel and parking; (d) inclusion of residential use to the scheme is promising; (e) the city centres provide a conducive environment to support the scheme where the market demand is stronger coupled with established infrastructures government planning instruments to facilitate the implementation of MUS through regeneration programmes; (f) promoting public-private partnerships and community involvement is encouraged for large-scale developments; and (g) environment quality is also perceived to have an influential contribution in the occupancy level of the scheme as a whole. Overall, this investigation also aims to bring out the salient attributes from these cases that strongly influence the performance and success of MUS development worldwide.

Finally, it can be concluded that MUS developments are *“well-planned physical developments of a structure or group of structures having 2 or more integrated functional uses creating diverse types of activities. Specifically, these developments have the following major characteristics: comprehensive development plan, well-planned physical configuration (building) and mix of two or more functional or economic uses.”* The key considerations for MUS developments are grouped into four, namely: (a) uses and mix, (b) aspects and characteristics, (c) physical lay-out and design, and (d) concentration and diversity.

Table 4: General Features and Components of the Ten Case Studies

MUS Case Study	Total Site Area (square metres)	Use Distribution (percentage)	Development Phase/Period	Cost and Funding (£ million pounds, 2008)	Development Team	Scale and Configuration/ Synergy of Uses
Case 1 (Lisburn Square, Lisburn)	5600	Retail (49), Residential (23), Office (7), Parking (21)	Single phase 1999-2001	Total cost (22), Total value (30) Private investment	Lisburn City Council and a Private developer	A free standing complex structure with 3 floors and a basement; Compatibility of retail and residential
Case 2 (Pothouse, Belfast)	380	Office (50), Leisure (5)	Single phase 1994-2004	Total cost (7), Total value (10) Private investment	Laganside Corporation and groups of private developers	A free standing single structure or a building with 6 floor and basement Compatibility of leisure and office
Case 3 (Tannery, Belfast)	1716	Retail (13), Residential (16), Parking (71)	Single phase 2001-2003	Total cost(14), Total value (19) Private investment	Private developer	A free standing single structure or a building with 7 floors, a basement and roof deck; Compatibility of residential and multi-parking facility
Case 4 (Adelaide Exchange, Belfast)	3720	Retail (1), Office (68), Parking (8), Leisure (9), Hotel (15)	Multiple phase 2005-2007	Total cost (25), Total value (35) Private investment	Private developer	A compact arranged cluster of free standing buildings within a block; compatibility of leisure and office
Case 5 (Gasworks, Belfast)	110000	Office (87), Parking (2), Hotel (11)	Multiple phase 1994-on going	Total cost (169), Total value (237) Public-private investment	Belfast City Council and groups of private developers	A cluster of blocks with single use buildings; compatibility of hotel and office
Case 6 (Lanyon Place, Belfast)	42000	Office (61), Parking (6), Leisure (3), Cultural (20), Hotel (10)	Multiple phase 1999-on going	Total cost (136), Total value (191) Public-Private investment	Laganside Corporation and groups of private developers	A loosely arranged cluster of free standing buildings within a block; compatibility of hotel, office and leisure/cultural
Case 7 (Talbot, Belfast)	897	Retail (7), Residential (37), Office (45) Parking (3), Leisure (6), Cultural (2)	Single phase 2005-2007	Total cost (15), Total value (21) Private investment	Partnership with various developers and investors	A compact arranged cluster of series of buildings within a block; compatibility of office , retail and leisure
Case 8 (Bermondsey Square, London)	7000	Retail (9), Residential (58), Office (33)	Multiple phase 2007-on going	Total cost (40), Total value (65) Public-private investment	Private developer	A loosely arranged cluster of free standing buildings with a block; compatibility of office and retail
Case 9 (Liberty Corner, Dublin)	3500	Retail (7), Residential (55), Office (1), Parking (5), Cultural (32)	Single phase 2004-2005	Total cost (21), Total value (29) Public-private investment	Dublin City Council and a private developer	A free standing single structure or a building with 7 floors , a basement and roof deck; compatibility of cultural and residential
Case 10 (Smithfield Market, Dublin)	18120	Retail (9), Residential (47), Office (10), Parking (15), Leisure (8), Cultural (6), Hotel (5)	Multiple phase 2002-2005	Total cost (380), Total value (532) Private investment	Partnerships with various developers/investors/con sortium	A mixed of compact arranged cluster and free standing buildings; compatibility of residential and retail, including leisure or entertainment

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