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## Vertical Mixed Use Communities, a compact city model

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**Abstract:** Cities have advocated more compact development patterns to address the need to accommodate a burgeoning urban population. One such compact model is the vertical mixed-use (VMU) development. However, its development and implementation are generally perceived to be complicated in terms of unfavorable regulatory and development controls, higher construction cost, staging as well as funding complexities. We examine the growth patterns and development trends of vertical mixed-use developments in Brisbane, looking for evidence that the vertical mixed-use model can promote sustainable futures for Australian cities. We also reviewed existing urban policies, codes and regulations. Our results indicate a slow but growing trend towards the development of VMUs within Brisbane CBD as a result of statutory policies, which encourage the integration of mixed-use zones within activity centres. Using Hoppenbrouwer and Low's framework we identified and profiled thirteen VMUs. Our results strongly suggest the rampant presence of single function vertical structures (86% of 418) within Brisbane CBD. Only 1.7% of the vertical structures identified accommodated three and 11.9% two uses. We then surveyed the perception of developers in terms of potential and significant barriers to VMU development.

### 1. INTRODUCTION

The regeneration of city centres has become an important urban development strategy to address the twin challenge of a burgeoning population and urban sprawl. Further fuelled by baby boomers entering the empty-nest stage, opting to downsize and settle in more convenient urban locations, governments, at various policy scales, are now pursuing the development of more compact and integrated settlements within its major urban centres (DIP, 2009; BCC, 2012). These policies are aimed at revitalizing urban centres through strategies that would bolster economic development but also tempered by the need to address society's social and environmental objectives. One strategy is the implementation of mixed-use developments, which, according to Freestone (2008), has already become a vital urban revitalisation tool. Niemira (2007) declared that the mixed use concept, while gaining great significance as an important public sector strategy to regenerate urban environments (Kelly, 2001; and Harbatkin, 2005), has also growing appeal to respond to the needs of a more diversified demographic, and presumably, to support the sustainable development targets and outcomes of various communities. Traditionally, mixed-use developments typically have horizontal configuration because regulatory and development controls seem to favour this (Rowley, 1996). Nevertheless, mixed-use developments that take on a vertical dimension, or vertical mixed-use (VMU) developments, are also gaining popularity as a feasible compact development model (Hoppenbrouwer and Louw, 2006). This is especially true when considered within the context of limited urban lands to develop, the need to diversify risk, the high cost of available sites and the premium value associated with lands in Central Business Districts (CBD) (Aygoren, 2004). VMU developments, however, have met uneven success. Some VMU developments seemed to work well, for example, the Honeysuckle Development in Newcastle and the showcase Subi-Centro project in Perth, while other examples were seen to be more problematic, especially in many of the newer blocks in master-planned brownfield and infill older centre sites. These areas experience high vacancy rates for their non-residential floor spaces with numerous for lease and for sale signs (Freestone, 2008). Anecdotal evidence also suggests that the development of vertical mixed-use structures is more complicated in terms of higher construction cost, staging and phasing and funding complexities (Rabianski et al., 2009).

While there is renewed interest in VMUs as a potential urban development alternative, anecdotal evidence suggests that VMUs are difficult to achieve. Real estate developers and financial institutions seem to also perceive VMUs as more complicated and associate them with a multitude of issues and challenges. To date, this concept is not very well researched in Australia. There are also few existing works available on vertical-mixed communities and more so on their feasibility and viability. Our aim, therefore, is to (1) explore the concept of mixed-use developments, both horizontal and vertical; (2) identify the challenges for developers in implementing this development model; and (3) examine the

concept of MUs and VMUs in a specific locality (in Australia) and the extent to which they contribute to achieving sustainable development.

This paper is structured in the following manner: Section 2 discusses Brisbane as being a case study context for this paper as well as the methodology used; Section 3 attempts at discussing the concept of vertical mixed use developments and the evaluation framework; Section 4 discusses the findings from the profiling of mixed-use and vertical mixed-use developments in Brisbane; Section 5 discusses major findings of the study; and Section 6 concludes and recommends some way forward.

## **2. CASE STUDY: BRISBANE CBD**

Brisbane CBD is an appropriate case study for this paper. The CBD is considered as the premiere regional activity centre for the Southeast Queensland (SEQ) region. Its urban form represents a concentration of medium to high-rise structures laid out in a typical grid fashion. This urban form is typical of Australian cities. It has a resident population of 12,800 individuals in 2009, covering a land area of 0.7 sq.km. The investigation of mixed uses, including VMUs, was undertaken within Brisbane CBD. The aim was to gather information on the distribution of single use versus mixed-use developments within Brisbane's CBD. Based on derived set criteria, an evaluation framework was developed. This tool was used to systematically assess, profile and audit vertical structures, including VMUs. Primary and secondary data were collected as inputs to the evaluation framework. The VMU model appears to be an opportunity to achieve this state- and city-level objective of achieving a more compact city. Therefore, understanding the trends and patterns of VMUs provides useful information of how these types of developments can further be advanced.

## **3. DEFINING MIXED-USE DEVELOPMENTS & VERTICAL MIXED-USE DEVELOPMENTS**

The concept of developing communities with a mix of uses is claimed to have been initiated back in the Greek agora and medieval market squares. At that time, people were only able to "live, work, and play" within the same local area because walking was the only means of mobility for them. This encouraged the development of a mixture of land uses adjacent to each other to provide for the diverse needs of the community. Since the middle of the twentieth century, the mixed-use concept is once again gaining currency as a key tenet in planning for compact cities, smart growth, new urbanism and transit-oriented developments (TODs). Within the context of achieving more compact settlements, a plausible and practical strategy to densify areas is to encourage a mix of land uses (Bell, 2004). To date, while various projects are claimed to espouse the concept of mixed-land use, there has been no consensus on how a mixed-use development is defined or what it comprises. This section, therefore, attempts to explore the multiple definitions of mixed-use developments, both horizontal and vertical, and develop a framework that can better describe the characteristics of mixed-use developments. This framework is then utilised to assess various vertical structures within an identified case locality within the Brisbane CBD in Australia.

In general, mixed-use developments may be categorised as either a horizontal or vertical. Horizontal mixed use refers to the mix of land uses spread across a district, block or compound. On the other hand, vertical mixed use pertains to the extent to which mix of uses is accommodated in one vertical structure.

To date, studies dealing with mixed-use developments are still limited and research on vertical mixed uses are much more scant. However, a number of studies have discussed various characteristics that define mixed-use developments. For example, Rowley's (1996) conceptual model of mixed-use developments, while essentially describing horizontal mixed use developments, pertain to a combination of urban texture (e.g. how fine the grain, density, and permeability), setting or scale (e.g. building, block, street, district), and location (e.g. town center, urban, suburban, greenfield), while also including the time dimension. The latter refers to the way users occupy mixed-use developments at varying times of the day. This concept was then adopted but also expanded by Hoppenbrouwer and Louw (2005) in generating their typology of mixed uses. Hoppenbrouwer and Louw's (2005) four dimension-based typologies include: point (e.g. a single space utilized as a shared premises with two functions; a particular facility may also be shared by a variety of activities and users on a regular basis), vertical (e.g. multiple uses in one structure), horizontal (e.g. multiple uses on the ground), and time (e.g., sequential use, different uses of a space throughout the course of the day and week). The aim of the typology was to assist researchers in

examining mixed-use developments in a more systematic way. Similar to Rowley, Hoppenbrouwer and Low's typology (2005) is organized by function (land-use), dimension, scale, and urban texture.

The number and type of function or use primarily determines how mixed-use developments are defined. Jane Jacobs (1961), under the premise of creating more liveable and diverse city spaces, called upon the need to develop districts that can accommodate a sufficient density and concentration of people; areas that can provide for different age groups through a diverse styles of buildings; short blocks with frequent intersections and corners; and districts which accommodate the mixing of more than two functions. Echoing Jacobs 40 years later, Aygoren (2004) suggested that as long as there are two main uses, this could already be classified as mixed use. Extending this definition to vertical mixed-use developments, the Adelaide City Council (n.d.) defined these developments as comprising a mixture of (at least) two or more land uses housed within a single vertical building. For example, mixed use developments can be described as such when at least one floor is allocated for a non-residential use, say retail or commercial, while another floor accommodates residential use (Anonymous 2009). However, Rabianski et al. (2009) admonished that not all buildings with two uses, for example, one that accommodates a retail space on the ground floor of an office building, or flats located above shops, or an area that has organically evolved into a neighbourhood containing a variety of land uses can be considered as mixed use (Goodchild, 1998). These developments, he reiterated, may be more appropriately referred to as multi-use (Rabianski et al., 2009; ULI, 1987). However, a number of studies, including that of the Urban Land Institute (ULI), suggested that for a development to be considered as mixed use, there must be an integration of at least three or more revenue-producing functions (Witherspoon, Abbett, and Gladstone, 1976; Bell 2004; Grant 2002; Rabianski et al., 2009).

While there seems to be a lack of consensus on the number of functions before a development is considered as mixed use, there is, however, a general agreement among authors that the physical components of mixed-use developments must be coherently planned, and functionally and physically integrated (Witherspoon, Abbett, and Gladstone, 1976; Bell, 2004; Rabianski et al 2009; Sussna, 1991). ULI further argued that the mixed-use concept should extend beyond its 'use' and into the realm of 'planning, design and lifestyle.' Thus, planning and integration are key elements in developing mixed uses, which was further argued by Rabianski et al (2009). He further emphasized that developments may only be considered as mixed use if they are planned, displayed a pedestrian scale, public transport-orientated design, and portrayed a clear image of a sense-of-place.

Mixed-use developments can also be described based on the degree of mixing (texture) or grain, density, and interweaving of functions. Results of a survey on various developers, defined mixed use development as that which accommodated a combination of retail, office, residential, hotel, recreation or other functions in an integrated and planned development (Niemera 2007; Witherspoon, Abbett, and Gladstone, 1976). However, the Draft Brisbane City Plan emphasized 'residential use' when developing mixed-use developments. It mandated that at least 30 percent of the total gross floor area was allocated for residential purposes in combination with other uses, including commercial, retail or industry-based activities in vertical mixed-use premises (BCC, 2012).

Additionally, the scale of mixed-use developments influenced how mixed-use developments are defined. For example, scale can either be at the building, block, district, or city levels. Jacobs (1961) generally discussed mixed use at the neighbourhood scale, Grant (2002) and Anders (2004) stated that mixed use is typically assessed at a local scale whereas Coupland (1997) regarded that a building complex can be mixed use. While some experts categorised mixed-use according to scale (e.g., single unified development on a specific site, single building, neighborhood or district), the discussion on the scale of VMUs limited this discussion to the scale of a single building. Urban Land Institute (ULI) further classified VMUs according to mixed-use towers and integrated multi-tower structures (ULI 1987; Bell 2004).

For the purposes of this paper, the following definitions will be used. Horizontal mixed-use developments are those with two or more revenue producing uses or land use activities in a physically and functionally integrated horizontal precinct. While vertical mixed-use developments are those with two or more revenue producing uses or land use activities in a single vertical building or structure.

Up to now, implementation of vertical developments has been limited as they are still considered as a specialty niche market and generally perceived to target a specific socio-demographic customer segment (O'mara, 2007). It is only at present that vertical mixed-use developments are gaining popularity as an alternative development pattern to accommodate various uses, which include education, healthcare, government, utilities, hospitality, resorts and gaming, public/cultural, financial, retail, corporate offices, among others. Vertical mixed-use developments seem to be the preferred option, especially given the shortage of developable urban land, the high cost associated with CBD land and property, and the need to accommodate commercial and residential development by intensifying existing developments (McLaughlin, 2005).

#### **4. An empirical analysis on vertical mixed use developments**

The empirical findings of the study drew upon both primary as well as secondary data to be able to systematically analyze current developments within Brisbane CBD according to a number of criteria. While it is possible to consider a complex set of attributes to be used to evaluate VMUs, the authors adopted the expanded model of Hoppenbrouwer and Louw (2005). This included the four dimensions of mixed uses; the number of land uses it accommodates; the scale (e.g. number of floors – high rise; medium rise or low rise vertical structures); type of land uses, spatial structure of land uses within building, internal grain, age of structure, among others. In addition, the design, including style, active frontage, green building rating and diversity of residential units were considered. Thirteen Brisbane CBD structures were assessed based on the above-mentioned attributes.

Moreover, we collected data through an online survey and invited approximately 15–20 developer respondents. The survey inquired about their business profile in terms of developing mixed uses and the perceived potential and significant barriers in the implementation of VMUs in Brisbane. As of the writing of this paper, only 3 respondents were gathered wherein initial results are provided. The results are discussed in the following subsections.

##### **4.1. Brisbane CBD mixed use developments according to use and function**

In profiling the study, a total of 415 vertical structures of varying heights were identified to be present within Brisbane CBD. By classifying these developments according to the number of uses/functions, approximately 358 structures or 86.26% of all the structures were of single use, 50 structures or 12% of the total number of structures were of two uses and only 7 or 1.7% accommodated three or more functions.

According to Searle and Bunker (2010), the state has generally played a central role in controlling and facilitating urban development in Australian cities. While current state- and local- level policies are advocating for more compact development patterns (DIP 2009; BCC 2012), majority of the developments within Brisbane CBD are still of single use. This places a challenge on both the public and private sectors on coming up with strategies that would encourage the development of more compact structures. In a number of cities overseas, policies that support VMUs are already in place. In Singapore, owners of 'white sites', for example, are given maximum flexibility within the stipulated guidelines to develop the site to any mix of permissible uses. 'White sites' refer to sites that owners can change the use or mix of uses whenever they deem fit without the need to pay a differential premium – a tax for changing existing use of land, and does not require the approval of Urban Redevelopment Authority (URA) – the planning authority of Singapore (Addae-Dapaah, 2005). In Hong Kong, major policies that support mixed use development include: two-tier bonus plot ration system and similar initiatives; categorization of development areas into local, district and metropolitan zones and prescribing core community facilities for them; granting of 100% site coverage up to podium level and ability to house various activities and amenities w/in the podium; emphasis on providing multiple pedestrian links from MILU developments; and facilitation for cross-subsidies from commercially profitable uses towards social facilities (Lau, Giriddharam and Ganesan, 2003).

##### **4.2. Spatial distribution of mixed uses**

The spatial distribution of vertical structures within Brisbane CBD according to use is represented in Figure 1. Single use developments (in yellow) continue to dominate the spatial landscape while still fewer but already significant are two uses (in blue). Very sparse are those with three or more uses (in red). Of the seven structures that accommodate three uses, two can be classified as horizontal mixed-use

development while the remaining five are VMUs. VMUs are perceived to be more complex and more difficult to implement. Their viability and feasibility are highly dependent on various perceived and actual barriers and challenges (Rabianski et al., 2009).

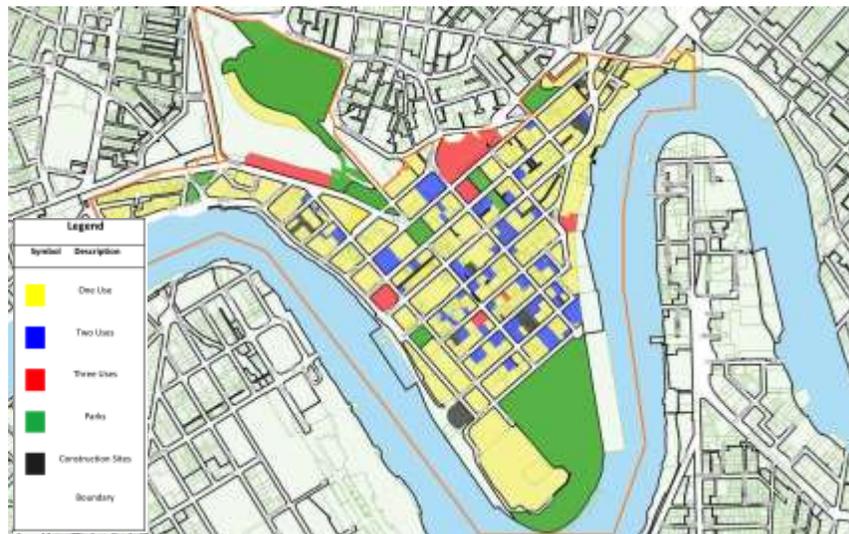


Figure 1. Mixed Use Developments within Brisbane CBD

Thirteen high-rise developments within Brisbane CBD were chosen for profiling with varying uses, from 2 uses to 3 and more uses. Seven of the developments were of 3 uses and the remaining 6 have two uses. Only 2 were horizontal mixed use developments while the rest were vertical mixed use developments. Thirteen mixed-use structures were of varying height, 3 were classified as low-rise buildings (~6 floors), another 3 were midrise buildings (6~20 floors) and the remaining 7 were high-rise structures (above 20 floors). Older, historic structures, built in between the late 19th century to early 20th century (e.g. The Bostonian Apartments) were generally low rise while the recently constructed buildings (e.g. Riparian Plaza) were generally high-rise developments. There is an expectation at present that developments are trending towards high rises.

#### **4.3. Common land uses/functions within mixed use developments**

According to Piell (2009), the temporal base function of a vertical mixed-use development is affected by the type and number of uses. Examining the types and degree of diversity of land uses, it was determined that across the 13 mixed-use structures, the most common use was retail and residential. This confirms what Grant (2002) identifies as some of the common uses that are predominantly integrated into mixed-use developments. These are: residential, retail, office space, commercial, and institutional (Grant 2002) in which the physical components are functionally, physically, and commercially integrated (Sussna, 1991). With the 13 assessed structures, only 7 out of 13 were open 24 hours, one was open after 5PM, while the rest were generally open only on weekdays during regular office hours (8AM to 5PM). If the aim is to encourage both day and night time traffic as well as a 24-hour vitality within the development premises, it is suggested that more activities, those typically undertaken after office hours, should be considered and accommodated (Aygoren, 2004). By doing so, this reinforces the goal of "having activity and energy close to 24/7 as possible," which, according to Kass (in Aygoren, 2004) can be achieved by providing for entertainment and shopping. All throughout the week, retail use can drive day to nighttime traffic while residential encourages evening traffic. However, according to Matthews and Turnbull (2007), commercial land uses can also generate not only positive but also negative externalities. Thus, there must be a tradeoff to be made, and perhaps, an optimal consideration, wherein the benefits must outweigh costs. At present, costs associated with VMU developments dominate existing literature.

### **5. BARRIERS AND CHALLENGES OF VMUS**

In Brisbane, the development of VMUs is still not as common as current policies would like to pursue. It is therefore critical to examine factors that encourage or discourage mixed-use development. A number of challenges have been identified which has limited their development. Based on literature, barriers can be

categorised into: technical, financial, design, community and regulatory barriers. These were then posed to developer respondents within Brisbane. Only 3 developer responses were collated as of this writing, providing an initial perspective on the challenges associated with developing VMUs. This is discussed in the subsequent subsection.

### 5.1. Financial/Real estate perspectives

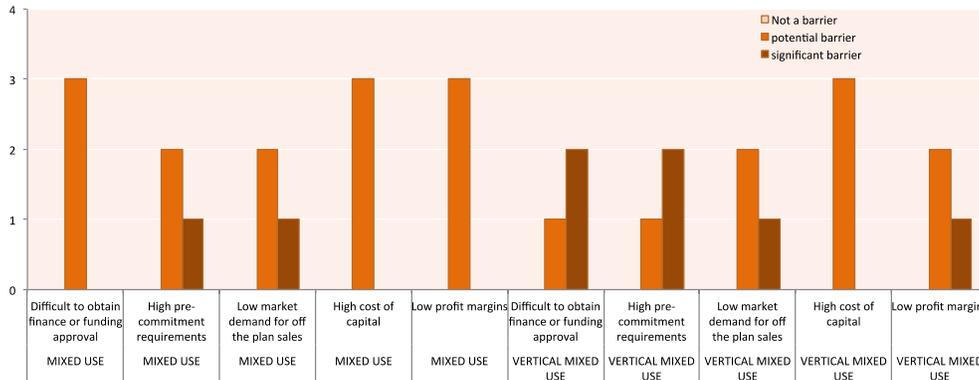


Figure 2. Financial barriers to mixed use and vertical mixed use developments

Some studies suggest that mixed-use developments offer a more resilient income stream (Northedge, 2005), however, developer respondents strongly perceived that the ‘financial aspect’ of a mixed-use development posed both significant and potential development challenges (see Figure 2). In particular, developer respondents agree that it is still too difficult to obtain finance or funding approval for mixed-use developments and more so for vertical mixed-use developments. This is because most investors’ attitudes to mixed-use developments continue to be negative (Bell, 2004). Re-affirmed by Gose (2004), this is due to the perceived high pre-commitment requirement. Compared to single use buildings, it is believed that VMUs are less attractive, harder to redevelop, and do not attract superior rents or rental growth (Bell, 2004). In addition, vertical markets were considered as a specialty niche, which only cater to a specific customer segment (O’mara, 2007) and overall, VMUs were perceived to be incapable of providing better total returns (Bell, 2004). Additionally, initial planning costs were assumed to be higher with mixed-use developments because of the associated complexity, the need to integrate varied uses and the cost of land that would be suitable to serve a range of uses was considered to be generally higher than sites suitable for just one land use.

To mitigate, Niemira (2007) suggested factors that can influence financial success, such as having a major draw (employers, a university and/or entertainment facilities) and developing the project as part of a master-planned site in an urban location. Rabiński et al. (2009) mentioned a strong local economy as a prerequisite. And more importantly, undertaking market analysis for each of the proposed uses will assist in clearly defining demand and supply (Niemera 2007; Rabiński et al., 2009) and each use must attract an adequate or threshold demand independent of the other uses, in case the development is not completed or a particular use later closes (Niemera 2007). Moreover, the success of a mixed-use project must be measured not only in terms of financial return to the developer/operator but also the consideration of social benefits to the community, as well as the increasing market value of the property and influence in terms of financial value of surrounding parcel

### 5.2. Design

Compared with the ‘financial’ aspect, developer respondents generally did not perceive ‘design’ as a significant or potential barrier to mixed-use or to vertical mixed-use developments. However, some respondents thought that, for VMUs, there is a need to ensure design flexibility to accommodate changing functions over time, which has been suggested by Cahill (2005) who stated that VMUs must be designed with flexibility in mind. The key to buildings in the future is that they should be adaptable, so you don’t have to demolish a building when it no longer makes sense for one use. Other barrier mentioned was, because VMUs integrate a number of uses in one building, one also mentioned safety and security

challenges brought about by these different uses and the possibility of compromising the quality of each individual component.

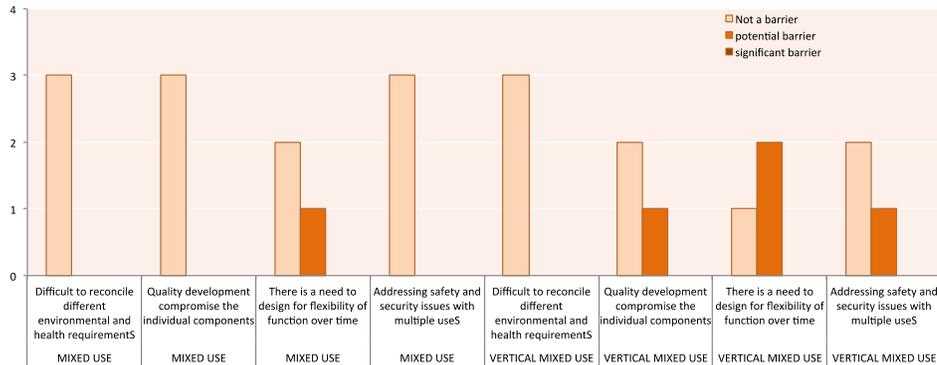


Figure 3. Design barriers to mixed use and vertical mixed-use developments

To be able to address safety and security issues, Rabiński et al (2009) suggested that space design must ensure separation of residential and commercial parking areas but also cautioned that this would increase cost of development. In addition, they also recommended the provision of screened loading and dock areas, separate access for residential and office users from retail customers (Titcher and Lari, 2005; Garris, 2006; Rombouts, 2006; and Zelinka, Smart, and Kunz, 2006) as well as putting forward special design and construction features that would reduce incompatibilities between uses and pedestrian-friendly design that prioritized people over cars. The latter seemed to expound on Jane Jacobs' 'eyes on the street' concept (Jacobs 1961), which supposed that a 24/7 environment will encourage more people (Aygoren 2004) and would, according to Niemira (2007), increase incidence of passive surveillance. This has been repeatedly mentioned as a key element of success for mixed-use development (Kelly, 2001; and Harbatkin, 2005) while also claimed to offer diversity and vitality in developments (Grant 2002). In addition, Jacobs (1961) mentioned that street activities contribute to community vitality. Thus, it is also essential not to overlook the role of street features within mixed-use developments, including the inclusion of active frontages for high-rise developments. In terms of the 13 assessed structures, all were generally observed to have active frontage design. Active frontages not only improve ground level attractiveness but also encourage pedestrian vitality and overall vibrancy of the place.

### 5.3. Technical

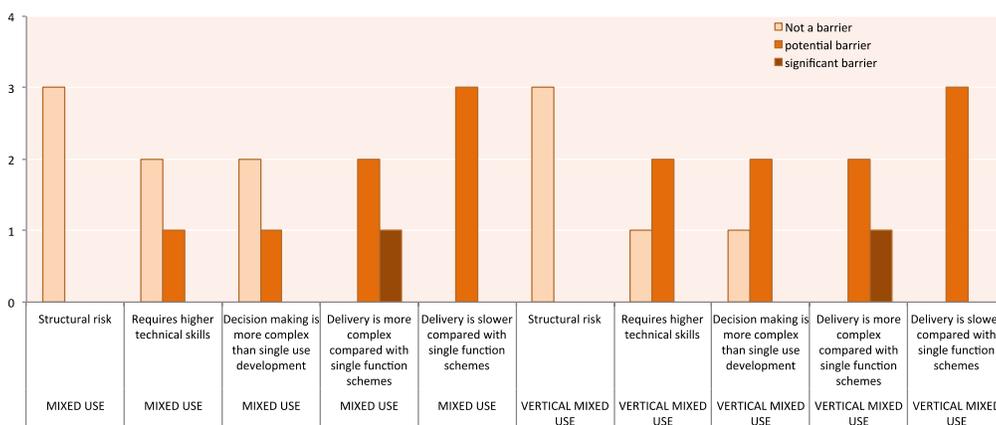


Figure 4. Technical barriers to mixed use and vertical mixed use developments

Related to design is the perceived 'technical barriers' of mixed-use developments. Judging from the responses, developer respondents perceived that delivery is slower and more complex for mixed-use as

well as vertical mixed-use developments compared with single use developments. This is evidenced in existing literature. For example, residential uses in mixed-use buildings must be designed and constructed to meet commercial standards for handicapped accessibility, fire safety and mechanical requirements (Rabianski et al., 2009). Also, design of easements through residential units must provide commercial access for conduits, wires, shafts, and ducts (Titcher and Lari, 2005). While all developer respondents believed that structural risk is not an issue, there is agreement that the required higher technical skills for vertical mixed-use developments is a significant barrier to developing VMUs, and therefore, perceiving the decision-making process to be more complex than in single use developments. Asked if mixed-use project development changes the decision-making process, lenders, investors and developers agree that the development model has changed from a situation wherein one person was the expert on all facets of the single-use development to the need for a committee, group of experts to plan and execute the project. They further mentioned that mixed-use development generally moves the industry away from specialization in a property type to a more sophisticated consortium of planning and development. It is claimed that the phasing of mixed-use development is more complicated than for conventional single use development, but this can also create additional value and outperform standard single-use developments (Rabianski et al. 2009).

#### 5.4. Community perception

At the concept or feasibility stage of a project, perceived barriers may take a technical, design or financial form. However, once the project is completed, its success or failure is said to depend largely on (1) what stakeholders, including the community and end users, perceive as barriers; and (2) the extent to which these barriers are effectively addressed, often with the use of present technologies, in finding the most cost-effective and long-term solutions. O'mara (2007) further expounded on this prerequisites and suggested that to ensure success in creating vertical markets, it is critical to have a better understanding of the needs of its end users, knowing when to listen to client needs, and also, finding the most effective way to solve their problems. In the survey, four types of barriers were identified in relation to community perception. Amongst these four choices, developer respondents perceived that a significant barrier to mixed-use development would be 'community resistance to co-location of uses'. On the other hand, for the vertical mixed-use development, 'conflicting activity patterns within a building (different uses/users)' was deemed as a significant barrier.

#### 5.5. Regulatory

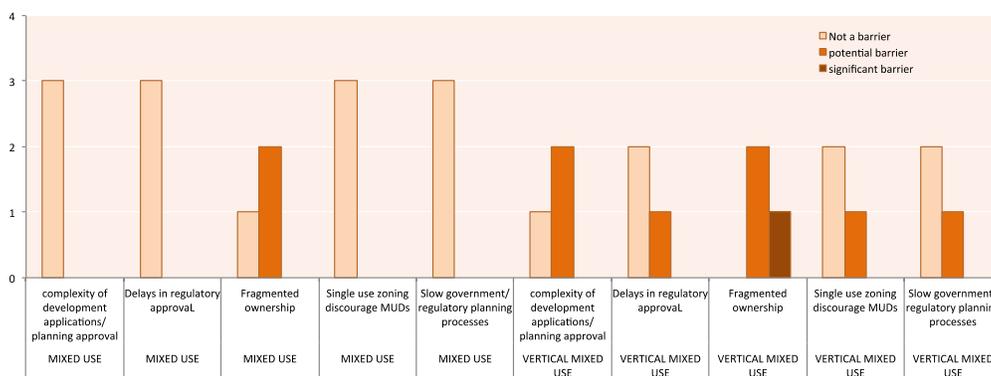


Figure 5. Financial barriers to mixed use and vertical mixed use developments

At the policy level, Southeast Queensland (SEQ) is geared towards developing more compact centres in order to develop its land more efficiently and to cater for the anticipated population growth. Under the South East Queensland Regional Plan 2009-2031, SEQ, by 2031, is expected to add approximately 754,000 dwellings with 156,000 in Brisbane to accommodate the expected rise in resident population within the region (DIP, 2009). The South East Queensland Regional Plan 2031 has set out a number of desired regional outcomes (DRO) wherein DRO 8.1 prescribes a compact urban structure of well-planned communities, supported by a network of accessible and convenient centres while DRO 8.8 encourages mixed use activity centres (DIP, 2009). In addition, the new City Plan is a statutory document that sets out

a vision to guide the growth of Brisbane City. One important aspect of this is the integration of mixed-use zones. Mixed-use zones will concentrate in the inner city where there will be a greater focus on commercial, office, retail, administrative, and some residential developments (BCC, 2012).

Except for 'fragmented ownership' being seen as a potential barrier, developer respondents did not perceive of any other 'regulatory' barriers on mixed-use developments. On the other hand, 'a more complex development application or planning approval' is perceived to be potential barrier by two of the developer respondents while one respondent thought that 'delays in regulatory approval, zoning and slow government and regulatory planning process' were potential barriers in developing VMUs.

Rabianski et al. (2009) substantiate the responses of these developers, and state that VMU projects sometimes require multiple approvals from local regulators under a variety of zoning, conditional use permits and variance requirements. In addition, the need to comply with different building codes for each use, adds to the already complex planning process, planning, implementation and operation costs, as well as the total time required to build the project.

### **5.6. Discussions and policy implications of VMUs**

There is a growing trend towards encouraging mixed-use developments in Brisbane. Well-established rationale, including traffic congestion and commuting costs, reduced presence of polluting industrial employers in urban areas, changing consumer demographics, and a longing for community and a sense of place' have been identified as reasons for advocating VMUs. Although policy towards encouraging VMUs is in place, progress of implementation is rather slow. This can be explained by the existence of and the limited ways barriers have been adequately addressed. Survey results indicated that among the five dimensions that may pose as a challenge to VMUs, developer respondents perceived 'finance' as the most significant as well as potential barrier towards the implementation of VMUs. Recent literature on VMU corroborates this finding. However, strong support for VMUs continues as it is seen as a strategy that can support a stronger local economy (Rabianski et al., 2009), an alternative development model that can assist to diversify risk (Aygoren 2004) and a strategy that can provide a more resilient income stream for cities and communities (Northedge 2005). While obtaining financing for VMUs is considered difficult, policies to encourage lenders and developers to provide funding could assist in encouraging VMU. Rabianski et al (2009) correctly suggest the need for market analysis as critical as this would help determine demand and supply for each use, and to examine trends and forecasts to capture the influence of changing economic, demographic and psychographic factors of demand. At the same time, mixed-use development must be developed relative to its wider urban context. If this is considered at the outset, this can assist in winning community approval. Also, it is critical that while the development of VMUs must sufficiently allow placement of uses on the land in a way that integrates uses, it must also ensure that it does not result in overcrowding nor compromise security. Thus, access to different uses must strictly adhere to who can or cannot gain access to a particular space – while retail is accessible to customers, residential areas must only allow residents and their visitors for access. Such considerations have implications on policies related to social equality, economic vitality, and environmental sustainability, which are important elements of vertical mixed-use developments that must be identified, and needs further discussion.

## **6. CONCLUSION, RECOMMENDATION AND FURHTER STUDIES**

Understanding the development pattern of Brisbane CBD is integral to be able to determine up to what extent Brisbane is fully embracing vertical mixed-use developments. This study demonstrated that Brisbane's CBD predominantly consists of single use developments. From a policy perspective, there appears to be a push towards encouraging VMU development in both the state and local levels. While a growing trend in the number of vertical mixed-use developments has been identified, this growth, however, continues to be limited. While only indicative, results suggest that the key barrier is primarily financial. However, the extent to which this is perceived or actual requires further studies. In addition, it is anticipated that with the identification and integration of and encouragement of mixed-use zones in the Draft New City Plan for Brisbane, mixed use developments within Brisbane will likely increase. Several limitations to the study were identified such as: difficulty in collecting data on several mixed-use developments due to privacy issues; when contacting developers and management teams of developments, several are unwilling to assist in providing information to outside researchers. Due to this,

some of the developments audited could not be assessed against certain criteria. Furthermore, there was limited information gathered from observations conducted, as one could not validate these facts through surveys or interviews. If further studies are undertaken on vertical mixed-use developments, it is recommended to: (1) examine the extent to which current regulatory frameworks guide the development of VMUs; and (2) develop a follow up interview with developers to determine if VMUs can be considered as an effective tool to achieve a more compact city structure in the Brisbane context.

## ACKNOWLEDGMENT

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