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REDESIGN – UPGRADING THE BUILDING STOCK TO MEET (NEW) USER DEMANDS

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Abstract
Financial and real estate crises and "new ways of working" reduce the need for office space. As a consequence, office markets become replacement markets without a quantitative need for new office buildings: new buildings drive out bad buildings. In the Netherlands, currently 14% of the office space is vacant, of which 60% is redundant or obsolete. Office users, guided by the government, consider sustainable office space important for their image and status. Besides they want to be accommodated in high quality buildings that fit with their current and future need for space, taking into account expected shrinkage or further development and expansion. Quite often, new office developments were the response to these demands. Public opinion and emerging governmental awareness of sustainability oppose the construction of new office buildings in locations with a high vacancy level, while office users, real estate developers and investors crave for new office developments. Can redesign of existing office buildings answer to the demand for new sustainable office space?
In former research we have revealed that location and building characteristics have a strong influence on office users' preferences and decisions to move to other buildings. Knowledge about these characteristics is important when determining the potential future use of the existing office stock. Based on foregoing research, we propose new use of existing office buildings and delve into the measures that need to be taken in order to adapt existing buildings to new use.

Keywords: offices, vacancy, user preferences, sustainability, re-use

INTRODUCTION

After some booming years for the Dutch office market, this market is now characterised by continuous overproduction and oversupply, resulting in an overall national vacancy rate of 14%. What is even more alarming is that 60% of all vacant office space is vacant for three or more years, pointing towards the obsolescence of this office space. Research by Remøy (2010) showed that obsolescence is a result of the current replacement market. Office users move from existing buildings to new developments, leaving buildings behind that are not taken up by the market, because quantitatively there is no new office demand. Vacancy concentrates in buildings with specific physical characteristics. These are buildings in mono-functional office locations or industrial and distribution areas, typically with few facilities and not well accessible by public

transportation, with poor external appearance, poor flexibility and less parking places than surrounding properties. Residential transformation is a way of coping with obsolete office buildings. Former research (Barlow & Gann, 1993, Beauregard, 2005, Heath, 2001, Remøy, 2010, Remøy & Van der Voordt, 2007) has revealed the possibilities for such (re)developments, including the risks and opportunities for the different parties typically involved. However, though across use adaptation can help solve the problem of vacancy and obsolescence in the office market, continued development of new office buildings will increase the vacancy level and contribute to the persistence of the vacancy problem.

Table 1 *Summary of building adaptation criteria retrieved from Wilkinson (2009)*

Adaptive reuse criteria for existing buildings	**Relevant studies**
Age	Ball, 2002; Barras & Clark, 1996; Fianchini, 2007; Geraedts & Van der Voordt, 2007
Condition	Baird et al., 1996; Boyd & Jankovic, 1993; Kersting, 2006; Swallow, 1997
Height	Gann & Barlow, 1996; Geraedts & Van der Voordt, 2007
Depth	Gann & Barlow, 1996; Szarejko & Trocka-Leszczynska, 2007
Envelope and cladding	Gann & Barlow, 1996
Structure	Gann & Barlow, 1996; Geraedts & Van der Voordt, 2007
Building services	Gann & Barlow, 1996; Szarejko & Trocka-Leszczynska, 2007
Internal layout	Fianchini, 2007; Gann & Barlow, 1996; Swallow, 1997; Szarejko & Trocka-Leszczynska, 2007; Geraedts & Van der Voordt, 2007
Flexibility (for differing uses and functional equipment)	Brand, 1994; Fianchini, 2007; Gann & Barlow, 1996; Van der Voordt & Van Wegen, 2005; Geraedts & Van der Voordt, 2007
Location	Baird et al., 1996; Ball, 2002; Bryson, 1997; Remøy & Van der Voordt, 2007; Van der Voordt & Van Wegen, 2005; Geraedts & Van der Voordt, 2007
Heritage	Ball, 2002
Size	Ball, 2002; Gann & Barlow, 1996; Geraedts & Van der Voordt, 2007
Accessibility	Ball, 2002; Ellison & Sayce, 2007; Fianchini, 2007; Gann & Barlow; 1996, Kersting, 2006; Remøy & Van der Voordt, 2007; Geraedts & Van der Voordt, 2007
Parking	Ellison & Sayce, 2007; Geraedts & Van der Voordt, 2007
Character / aesthetics	Ball, 2002
Acoustic separation	Gann & Barlow, 1996; Geraedts & Van der Voordt, 2007
User demand	Ball, 2002; Geraedts & Van der Voordt, 2007
Site conditions	Baird et al., 1996; Geraedts & Van der Voordt, 2007

Knowing that the construction industry is responsible for 30% of all energy use, waste production and transportation by road, resulting in a substantial carbon footprint, multinationals and governmental corporations lead the way in an increased demand for sustainable

accommodation. For instance, the Dutch government's building agency demands that all new governmental real estate purchases and leases must be CO2 neutral from 2010 on, and aim at reducing energy use by 25% before 2020 (RGD, 2011). Internationally, cities worldwide like Sydney, Cape Town, Vancouver, Aguascalientes, Nagoya, Copenhagen and Amsterdam aim at becoming climate neutral or CO2 neutral by 2020 or 2030. Building adaptation is a sensible means of reducing the carbon footprint of the construction industry, as the site and a substantial part of the building materials are (re-)used for a longer lifespan. Several studies (**Table 1**) have been conducted that show physical criteria for the adaptation of office buildings. These studies considered both transformations from offices into housing, and within use adaptations of offices. Research by De Jong (2005) and Van den Dobbelsteen (2004) has proved that adaptation of existing buildings has a sustainable advantage compared to demolition and new construction. Though this far adaptation is not taking place on a large scale, building adaptation could be the egg of Columbus! In this paper, we propose new use of existing office buildings as a means for sustainable office development. Can existing office buildings be adapted or redeveloped to cope with the demands of future office users? We will discuss this question, based on literature and results of former research.

NEW WAYS OF WORKING

The quantitative demand for office space is determined roughly by two factors; the number of office employees at work in a specific office market, and the number of square metres used per employee. The number of employees in a market is determined by demographics, macro-economic conditions and the employment market. The number of square metres per employee on the other hand is determined by the way an organisation works. The organisation's view on what kind of work space best supports its activities, its use of new technologies, demand for flexibility, and finally its demand for a specific appearance, are all important factors of an accommodation strategy (Van Meel *et al.*, 2010). The last decade office accommodation goes towards open, flexible, non-territorial office space with desk-sharing and a variety of activity based workspaces, resulting in less square metres per employee than office concepts based on cellular offices (Van der Voordt, 2003).

According to the expectations of real estate agent and advisor DTZ (DTZ, 2011) the demographic trend of an ageing population and less employees together with less square metres used per employee will result in a higher vacancy rate in the years to come. While at the end of 2010 the Dutch office stock in use was 40 million square metres, DTZ expects that by 2030 the office stock in use will be 30-32 million square metres. If this holds true and the stock stays the same, the vacancy will more than double from 7 million in 2010 to 15 million in 2030. That equals one third of the current office stock! A possible trend-break could be that the current oversupply of office space will lead to lower rents in the office market, so that the price of office space will generally become lower. However, research by Keeris and Koppels (2006) has shown a stratification in the office market, where rents in the top segments increase, while only rents in the lowest segments decrease. This layering of rents shows that the preferences of office organisations for high quality office space are not influenced by the availability of cheap office space in other market segments. The vacancy in the low quality segments is expected to increase, while the demand for high quality offices will last.

QUALITY AND OBSOLESCENCE – EXPERT-BASED PROPERTY ASSESSMENT

In property investment, quality is thought to improve investment return and reduce risk (Baum, 1993, Baum & McElhinney, 1997, Bottom *et al.*, 1998, Salway, 1987). Baum refers to obsolescence (categorised as aesthetic, functional, social, legal, economic and environmental obsolescence) as a result of changing quality and as a source of risk for investors. Following Baum, the quality of office buildings could be determined in terms of occupier utility and hence utility for investors. Applied to the currently unbalanced Dutch office market, we expected to discover differences of quality between office buildings functioning well in this market and office buildings with a high level of structural vacancy.

The relationship between quality, obsolescence and investment returns and risks can be studied using so-called expert-based appraisal techniques (Baum, 1993, Bottom *et al.*, 1998, Duffy & Powell, 1997, Salway, 1987). In studies by Duffy and Bottom, (Bottom *et al.*, 1998, Duffy & Powell, 1997) inflexibility was found to be an important indicator of depreciation in commercial buildings, whereas other studies (Healey & Baker, 1987) also included the quality of internal finishes, entrance hall and the external appearance of the building. Baum related depreciation to obsolescence in a series of studies, using both terms to imply low quality (Baum, 1991, Baum, 1993, Baum & McElhinney, 1997). Depreciation may result from tenure-specific or property specific factors. Baum speaks of site value and building depreciation, where building depreciation is a result of physical deterioration and building obsolescence. Building obsolescence, representing a decline in utility of the building, is again one of the major causes of long term vacancy. The investment return and risk are both factors that need to be considered when investing in office buildings. Though hedonic analyses are often used to determine the relationship between the physical characteristics of office buildings and locations and the rent prices of offices as an indicator for the value of office buildings, few studies focused on the risk of vacancy as a threat to the value of investments. However, as the vacancy rate in European cities has been rising the last years, the risk of structural vacancy in office buildings is becoming a more important factor in the equation than it used to be. Obsolete office buildings have reached the end of their functional and or economic lifespan; hence interventions are needed in order to upgrade these buildings for continued or new use. Knowledge about office user preferences is necessary to know which buildings can successfully be upgraded for renewed use.

QUALITY AND OBSOLESCENCE – USER-BASED PROPERTY ASSESSMENT

From studying physical characteristics that contribute to the quality or the obsolescence of a property, the characteristics are known of office buildings that are vacant in the current market. Using a Delphi survey (Remøy *et al.*, 2007), office accommodation advisors stated that office organisations prefer office buildings and locations with certain characteristics (**Table 2**) that enables the organisation to reach their goals. The results from the Delphi survey showed that vacant office buildings can be described by characteristics that are not preferred by office users. However, we did not interview the office organisations or its employees during this study. Bottom et al. (1998), presented an approach combining the former discussed expert-based

appraisal technique with a user-based appraisal technique, best described as a post-occupancy evaluation (POE). The advantages of using POE are recognised in facility and property management (Preiser, 1995, Preiser & Vischer, 2005) because of the possibility of providing feedback information for proactive management. Combining expert-based and user-based property assessments could further help to understand mutations in the office market, revealing which adaptations should be made to enhance the lettability of office buildings.

Table 2 *Physical property characteristics that influence office user preferences*

Building characteristics	**Location characteristics**
1. Car parking	1. Accessibility by car
2. Exterior appearance	2. Status
3. Layout flexibility	3. Accessibility by public transport
4. Space efficiency	4. Facilities
5. Comfort	5. Safety
6. Interior appearance	6. Business cluster
7. Recognisable user	
8. Technical state	
9. Building facilities	
10. Year of construction	
11. Security	
12. Energy performance	
13. Routing	
14. Bike parking	
15. Commodities logistic	

EXAMPLES OF SUCCESSFUL ADAPTATIONS

Studies of the Amsterdam and Melbourne office market (Wilkinson & Remøy, 2011) revealed that adaptations of existing office buildings reduce the risk of obsolescence. The adaptations included in this study all considered larger interventions, registered as building permits. 100 office buildings in Amsterdam were studied and 1500 adaptations of Melbourne office buildings (could be multiple adaptations of the same buildings). A total of 18 building attributes were found to be important drivers for commercial office adaptations in Melbourne and Amsterdam (**Table 3**), of which five were shared (number of storeys, GFA, typical floor area, age and aesthetics). Of the five attributes found important only in the Amsterdam study, namely facade material, long term vacancy, entrance spatiality, provision of sanitary and pantry facilities and the number of elevators in the building, this data was not collected in the Melbourne study and therefore no further comment can be made as to whether this data would have been found to be important; this is an area of possible further research. The final six attributes found to be important only in the Melbourne study were “Property Council of Australia building quality grade”, site boundaries, site access, vertical services location, property location and historic listing, which were not part of the Amsterdam study. One could also make the argument that “Property Council of Australia building grade” (a Melbourne attribute) could be a proxy for the level of amenities provided in a building such as number of elevators and sanitary

accommodation (two of the Amsterdam attributes). The importance in both studies of the number of storeys and total GFA of the building, show that the size of the building is important for the possibility that building adaptation will lead to increased future value of the office building. Typical floor area is an indicator for the flexibility of the layout and is an attribute that is not adaptable; hence its importance is also quite easily comprehended. The level of amenities in the building was found to be important both in the Amsterdam study and in the Melbourne study. Since adaptation of these services easily implies high building costs, the importance of the attributes for adaptations are easily explained.

Table 3 *Criteria for adaptations in Melbourne and Amsterdam. (+) implies that when the value of the attribute increases, adaptation is more likely.*

Important Building Adaptation Attributes	**Melbourne**	**Amsterdam**
Number of storeys (+)	X	X
GFA (+)	X	X
Property Council of Australia building quality grade (-)	X	
Typical floor area (+)	X	X
Site access (+)	X	
Parking places (+)		X
Street frontage (+)	X	
number of elevators/m2 (+)		X
sanitary and pantry facilities/m2 (+)		X
Spatiality of the entrance (+)		X
Historic listing (+)	X	
Age in 2010 (+, old buildings are more likely adapted)	X	X
Long term vacancy (+)		X
Facade material (+)		X
Facade quality / aesthetics (+)	X	X

EXAMPLES OF SUCCESFUL TRANSFORMATIONS

Table 1 showed a list of adaptive reuse criteria for existing buildings. These criteria, all physical characteristics of the property, correspond to both within use adaptation (retrofitting of the office function) and transformation from offices into new functions. Table 4 shows criteria that were found to enhance the transformation potential of office buildings, based on a cross case analysis of 14 completed transformations (Remøy, 2010; Remøy & Van der Voordt, 2007, 2009). The only location characteristic that could be said to be a veto-criterion for residential transformation is noise level on the facade and level of fine dust in the air. If the legal standards are not met, then residential transformation is not feasible. The other location characteristics are less critical, depending on the target group for housing and the combination of characteristics.

Table 4 *Criteria for high transformation potential (from offices into housing) retrieved from case studies (Remøy and Van der Voordt, 2007)*

Attributes	Criteria for transformation
1. Location	No serious health risk (pollution, noise, stench) Noise load on facade < 50 dB, according to Dutch building regulations Functional mix and facilities nearby Zoning plan permitting future modification e.g. with mixed use including housing No serious crime risk (vandalism, burglary, attacks)
2. Building	
Appearance	No "office building look", attractive identity and entrances A high spatial/visual quality
Facade	Replaceable or adaptable, not load-bearing Daylight admittance at least according to building regulations for housing Operable windows Acoustic and thermal insulation according to building regulations for housing
Flexibility / adaptability of the structure	Extendibility, horizontally or vertically Acoustic and thermal insulation according to building regulations for housing A structure that can accommodate floor plans for different target groups Preferably no load-bearing walls, but columns Sufficient escape routes according to housing legislation Free ceiling height > 2.60 m
Installations	No installations integrated in the load-bearing structure Possibility to add service ducts (possibility of cutting holes in floors for shafts)

Few building characteristics make transformation into housing or other functions impossible: A building is more easily manipulated than its location. The characteristics of the structure and the floors are most crucial for the transformation potential. The scale of the structure must allow separations into usable spaces. While older office buildings were not built according to standard measurements, office buildings from the 1980s onwards often have a structure that is a multiple of 1.8 metres, such as 7.2 metres, and is well suited for accommodating housing. The floors of office buildings normally provide enough strength for residential transformation. Problems may occur though when manipulating the floors. A typical floor in an office building is made of pre-stressed hollow core slabs. If the steel in the floors is cut, the floors loose strength. Apartment buildings require a higher density of vertical shafts than office buildings. Penetrating the floors to create shafts for water, electricity and sewer is one of the problems of transforming offices into housing. Though several building characteristics represent potential risks for the legal, functional, technical and cultural feasibility and thus also for the financial feasibility of transformation projects, only one characteristic represents a veto criterion: free floor height >= 2.6 metres. The characteristics of the facade influence the transformation potential of office buildings significantly. Though the facade is often adaptable, all adaptations imply extra building costs, and hence influence the financial feasibility of a transformation. As the requirements for thermal and acoustic insulation are higher for housing than for offices, adaptations of the facade

are needed in most transformation projects. Finally, the image of outdated office buildings does not always trigger positive reactions from potential residents. Except for monuments or renowned buildings that have a specific image or are even able to provide a specific identity to a whole neighbourhood, most office buildings come with 13 in a dozen and have an image too strongly related to office work. In these cases, the facade is often replaced, even if it is technically well maintained and meets the requirements for housing.

The adaptive reuse criteria of within use adaptation to a certain degree correspond to those of transformation. On a location level, the legal requirements for housing are stricter than for offices. On building level, generally the functional adaptation demands more from the technical adaptations. However, many of the same requirements exist for modern offices and housing.

ADAPTATIONS FOR NEW OFFICE USE

While the possibilities for redeveloping and adapting existing office building for the same or new use have been revealed, the question that remains unanswered is: which office buildings and locations could and should be reused for new, sustainable offices that meet future demands and can increase the value of the existing, obsolete office building? Although adaptation of existing offices is a means of reducing the amount of new office developments, not all office buildings can be successfully adapted. If a property is environmentally or locationally obsolete, adapting the building to fit new office user demands will not offer any solace. Additionally, some office buildings have unfavourable measurements or inflexible layouts that cannot accommodate the demands of modern office organisations. In some cases, the existing office building is too small and too technically outdated to be adapted: the costs of interventions that are needed to make the building suitable for new office use will result in a second-best office building that will lose the competition with other buildings and therefore will remain vacant. Moreover, fighting the oversupply in the office market means that some office buildings need to be taken off the market. Departing from the forecasts by DTZ (2011) that if no new office buildings are added to the office stock, 25% of the office supply should be demolished or transformed for other use.

CONCLUSION AND REFLECTION

In an office market with high vacancy rates, remarkably few adaptations have been carried out to enable re-use for office functions. The Dutch office market was mainly driven by expansion, and the development accelerated from the 1980's onwards. The local and national government together with developers and investors viewed the office market expansion as an everlasting gold mine. As the market could not recover from the 2001 crisis before the 2008 crisis hit, the inevitable end of the growth is hard to face. Adaptations of existing buildings have taken place in this expanding market, but the Dutch office market has a lot to learn from other markets, where adaptations are well documented and the goals for future development are clear. Adapting existing office buildings to accommodate modern offices is a possibility of limiting office vacancy by ending the overproduction of new office space. However, if all office buildings are adapted, the quantitative oversupply of office space will persist. Therefore, redevelopment, functional transformations and demolition are inevitable in order to develop a balanced future

office market. Based on former studies, the characteristics of buildings that are best suited for functional transformation can be recognised. Furthermore, the characteristics of office buildings that are best suited for within use adaptation can be described based on the appraisal of the existing building. Following this train of thoughts, buildings that do not expose adaptation potential could better be demolished.

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