**Sustainability and within use office building adaptations: A comparison of Dutch and Australian practices.**

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## Abstract

Local Authorities worldwide are encouraging adaptation as a means of reducing building related urban energy consumption and greenhouse gas emissions. The City of Melbourne is promoting the retrofit of 1,200 CBD properties before 2020 with sustainability measures as part of their policy to become a carbon neutral city. Australian cities date from 1837 to the present day whereas some European cities have been inhabited for over two millennia. The concepts of adaptation and evolution of buildings and suburbs is well developed in Europe, though the scale of some of the post war developments has created different forms of building perhaps less adaptable or suited to change. The need to adapt buildings and to reduce environmental footprints becomes more pressing over time as global concentrations of carbon dioxide increase. Is it possible for Europeans to learn from Australian practices and vice averse? Through examination of office building adaptation in Melbourne and Amsterdam, it is possible to learn where similarities and differences exist and where new practices can be shared.

This paper addressed the questions; *What are the key attributes influencing adaptations in Melbourne and Amsterdam office buildings, and what are the similarities and differences?* Using the Melbourne CBD and Amsterdam as a case study, the research analysed 7393 commercial building adaptations in Melbourne and 98 office buildings in Amsterdam where adaptations were completed. The outcomes of this research show where similarities and differences exist and are relevant to all urban areas where adaptation of existing office buildings can mitigate the impacts of climate change and enhance the city for another generation of citizens and users.

**Keywords:** Amsterdam, Melbourne, office, sustainability, refurbishment, building adaptation, Australia, the Netherlands.

## Introduction

With the built environment contributing nearly half of all greenhouse gas emissions and governments look for to lessen the part cities play in global warming building adaptation is a sensible means of reducing building related greenhouse gas emissions. In Melbourne the 1,200 building program aims to retrofit 1,200 CBD buildings by 2020 with sustainability measures as part of their policy to be carbon neutral. Other cities are developing carbon neutral strategies and see adaptation as a means of meeting targets. It is possible to identify the nature and extent of adaptation, determine the relationship between adaptation and building attributes and hence the potential for sustainable retrofit through an examination of past adaptation practices. Amsterdam has yet to set out such a strategy and this paper explores the potential reductions that could result from sustainable retrofit of commercial buildings.

This paper addressed the questions: *What is the nature of the relationships between building adaptation events in the CBD classified as 'alterations and extensions' and building attributes, and secondly what are the similarities and differences between building adaptations in Melbourne and Amsterdam?* The emphasis was placed on the nature of the relationships between building adaptation events in Melbourne and Amsterdam and adaptation attributes identified as critical decision making factors. The research analysed 7393 commercial building adaptations in Melbourne and 98 office buildings in Amsterdam where adaptations were completed. The outcomes of this research show where similarities and differences exist and are relevant to all urban areas where adaptation of existing office buildings can mitigate the impacts of climate change and enhance the city for another generation of citizens and users.

## Drivers for adaptation

In Australia building adaptation is an "essential component of sustainable development" facilitating a glimpse of the past, lending character and identity to an area and providing footnotes to history (Department of the Environment and Heritage, 2005). Bryson (1997) noted the potential danger that cities may face periods where large numbers of obsolete buildings might blight the region socially. There is evidence that building adaptation increases value. An investigation of the impact of refurbishment on high density residential property in Hong Kong (Chau et al., 2003) found a 9.8 percent increase in property value compared to identical un-refurbished property in the same area.

In the Netherlands, the interest for adaptation is driven by a surplus in the office stock. By the end of 2007, the Amsterdam office market comprised approximately 6 million square metres office space (GLA[1]), of which 1 million square metres were vacant. As older buildings are left for preferred new buildings, the vacancy concentrates in the older stock and structural vacancy occurs. Estimates (DTZ 2009) consider 500 000 square metres structurally vacant, sustaining the suggestion of a stratification of the real estate market where old buildings in the office market sited in decaying locations are deprived or with little or no chance or likelihood that something will happen in the near future, especially something desirable. The 2008 financial and real estate crises have increased the problem.

Structural vacancy is first of all seen as a societal problem of economic and social decay. Uncertainty and social insecurity are visualised through vandalism and graffiti, break-ins and illegal occupancy. Though an investor may spread the risk of structural vacancy by building a diverse portfolio and only has to face building depreciation when selling, the owner of long term vacant office buildings also suffers a lack of income. Additionally, high vacancy hits building investors indirectly because of its negative influence on the market, though investors still tend to see the problem as somebody else's

[1] The numbers are rough, as there is no total overview of the office building stock. Numbers are based on real estate agents databases and Bak (2008) and comprise buildings larger than 500 square metres within municipalities with a stock of more than 10000 square metres.

problem (Remøy and Van der Voordt 2007). Adding up to this point of view, the investment market is layered; with new offices procured mostly by institutional investors who sell off older properties to smaller or private investors.

As a result of the 2008 financial crisis, the vacancy in the office markets world wide has been rising. The crisis has caused the Dutch government to realise that long term vacancy is a problem for the real estate market, and also represents a threat to a sustainable built environment. While new commercial office buildings are being developed, increasing the footprint of the urban area, older properties remain vacant, occupying an increasing part of scarce land. In this situation, the Dutch government has sensed the urgency of putting an end to new developments and adapting existing offices; either by residential transformation or by within use adaptation to fit new demands for offices. Thereby adaptations could contribute to a lower vacancy in the office market and at the same time add to the sustainability of the built environment, by reducing the need for new constructions and at the same time reducing the greenhouse gas emissions from existing offices.

Conversely in Melbourne CBD vacancy rates have remained low, increasing from 4.8% in July 2009 to 6.5% in July 2010 (Colliers International, 2010a, 2010b). In this market the drivers for owners is to increase their yields and returns. The forecast is for significant increase in net effective rental levels in the short to medium term, with overall tenant demand expected to strengthen as the economy further recovers (Colliers International 2010b). There are limited options for major tenants as the supply is choked. In addition, there are currently no new developments planned for the Melbourne CBD because of the strict requirement to obtain extensive pre commitment for lenders. Such circumstances put more pressure on existing stock and the potential for raising rental levels and yields and diminishing environmental impact through adaptation.

**Factors influencing adaptation**

Adaptation is defined: "*any work to a building over and above maintenance to change its capacity, function or performance' in other words, 'any intervention to adjust, reuse, or upgrade a building to suit new conditions or requirements"*( Douglas 2006).

Previous research grouped factors under economic, social, environmental, technological, legal and physical categories (Wilkinson et al. 2009, Remøy and Van der Voordt 2007). To sum up key factors, the local economy contributed to adaptation, along with attributes such as age, physical condition, heritage value, size and user demand (Fianchini 2007). Building quality and character were determinants of successful adaptation, while a later study found accessibility to be a critical success factor, along with layout and flexibility for a range of differing uses (Ball 2002, Fianchini 2007). As office buildings age they are prone to obsolescence and need adaptation to meet user needs (Barras 1996).

Physical attributes impact on adaptation and should be considered in decision-making. The technical issues for office adaptations were building size and height, depth, structure, envelope and cladding type, internal space layout and access, services, acoustic separation and fire safety (Gann & Barlow, 1996). Other attributes were site (e.g. car parking, orientation, external noise and external access), size (e.g. floor area, height, depth, floor shape, grids, and floor to ceiling height), structure (e.g. penetration for services), envelope (e.g. cladding and thermal issues), services (e.g. to meet new use requirements), acoustic separation (e.g. floors and partitions, flanking transmission) and fire protection (e.g. means of escape, brigade access, detection and alarms, prevention of spread of flames).

Location is important in adaptation, with older buildings occupying prime locations (Ball, 2002). Ellison and Sayce (2007) noted that within the paradigm of sustainability, location includes accessibility to the user group and transport nodes such as rail and bus transport systems add to the desirability of adaptation. For an extended discussion of building adaptation attributes see Wilkinson et al. (2009). Table 1 summarises adaptation attributes identified in previous research.

**Table 1 Summary of building adaptation attributes.**

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

**Research question and method**

This paper addressed the questions; *What are the key attributes influencing adaptations in Melbourne and Amsterdam office buildings, and what are the similarities and differences?* Using the Melbourne CBD and Amsterdam as a case study, the research analysed 7393 commercial building adaptations in Melbourne and 98 office buildings in Amsterdam where adaptations were completed. The research was undertaken in stages. Stage one identified adaptation criteria which formed the fields for the database, which was used to analyse the relationship between the adaption criteria and the adaptive reuse of the building. Databases were assembled for Melbourne and for Amsterdam and comparisons were drawn.

The database for Melbourne was assembled and populated from sources including Cityscope (RPData 2008), PRISM (DSE 2008) and through commercial data produced by the Property Council of Australia ( Property Council of Australia 2007; 2008). Adaptation events were extracted from building permits received by the Building Commission in Victoria. Empirical data was gathered by visual building surveys. The database included attributes in table 1. The research adopted a census approach and examined all adaptation events in the CBD from 1998 to 2008. For a detailed analysis of the research method see Wilkinson et al (2010)

The database for Amsterdam was assembled from different sources as well, using the transaction and supply databases of DTZ and the building stock database of Bak (2008) to extract a sample of buildings for the study. The buildings were randomly sampled, including buildings that were all originally constructed as office buildings and which were adapted between 1997 and 2007. Empirical data was gathered by building surveys and by studying construction drawings and documents on renovations and adaptations.

**Results Melbourne**

Principal Component Analysis (PCA) highlights dimensions in cross sectional data to uncover, disentangle and summarise patterns of correlation within a data set ((Horvath 1994. Heikkila 1992). PCA was used to reduce the dimensionality of office building attribute data relating to adaptation (Hair et al. 1995). Initially all variables are entered into the PCA to produce a smaller number of components. The next decision is the number of factors to retain and was based on the Kaiser criterion where factors with Eigenvalues exceeding 1.0 only are retained. The factors were rotated using an oblique 'Oblimin' rotation method with a final result being a table of identifiable factors which includes the loadings of individual building attributes. The contribution of a variable to each factor could be; completely positive (+1.0), completely negative (-1.0) or somewhere between.

**Table 2 Factor loadings - 'Alternations/Extensions' Melbourne**

| **Attributes** | Factors | | |
|---|---|---|---|
| | **Physical Size** (Factor 1) | **Land** (Factor 2) | **Social** (Factor 3) |
| Number of Storey's | **0.958** | 0.048 | 0.050 |
| GFA | **0.958** | -0.009 | 0.037 |
| Property Council of Australia grade | **-0.822** | 0.023 | 0.115 |
| Site boundaries | **0.775** | 0.203 | -0.009 |
| Typical Floor Area | **0.743** | -0.053 | 0.061 |
| Site access | **0.737** | -0.057 | 0.297 |
| Aesthetics | -0.203 | -0.144 | **0.485** |
| Parking | 0.427 | -0.005 | 0.423 |
| Street frontage | 0.225 | **0.886** | 0.015 |
| Vertical services location | 0.041 | **0.861** | 0.030 |
| Property location | -0.625 | **0.695** | 0.125 |
| Historic listing | -0.177 | 0.175 | **0.823** |
| Age in 2010 | -0.476 | -0.123 | **-0.632** |

Assigning meaning involves interpretation of the pattern of the factor loadings (Hair et al. 1995). The threshold cut off was set 0.5 as recommended by Tabachnick & Fidell (2001). After a list of individual factors had been assembled where each factor contained high loading building attribute variable suggested correct factor names could be assigned. The Melbourne analysis examined the most extensive level of adaptation 'alterations and extensions'; 5,290 adaptation events from 1998 to 2008. Thirteen separate attributes were aesthetics, vertical services, parking, street frontage, historic listing, number of storey's, age in 2010, Typical Floor Area, GFA, and Property Council of Australia building quality grade, site boundaries, site access and location. The PCA produced thirteen attributes in three factors with Eigenvalues exceeding 1.0 and contributed 74% of the variance. Table 2 illustrates the factor loading produced by the PCA.

Alteration and extension adaptations involved the most extensive works and the highest number of events, illustrating that owners are more likely to engage in this adaptation than others. It is indicative of high levels of confidence in Melbourne; that these adaptations will recoup the investment through higher rental yields, increased capital values and lower vacancy rates than if the building was adapted to a lesser extent or not at all. Each factor was allocated a name (table 3).

**Table 3 Summary of PCA Factors 'Alterations and extensions' in Melbourne**

| Factor number | Factor name | Factor variables |
|---|---|---|
| 1 | Physical and size | Height (number of stories)<br>Gross Floor Area (GFA)<br>Property Council of Australia Grade<br>Site boundaries<br>Typical floor area<br>Site access |
| 2 | Land | Street frontage<br>Vertical services location<br>Property location |
| 3 | Social | Historic listing<br>Age in 2010<br>Aesthetics |

Factor one: Physical size

The attributes number of storey's, Gross Floor Area (GFA), Property Council of Australia Grade, site boundaries, typical floor area and site access are strongly loaded and explain 44.9% of the original variance. Factor 1 has six attributes and three relate to the physical dimensions/size of the property in terms of floor area and height (i.e. physical attributes). Of the remaining attributes, two relate to site boundaries; (the degree of attachment to other buildings) and site access (number of entry/exit points to the building). These attributes are 'physical - size' related. The final attribute Property Council of Australia Grade is strongly and negatively loaded and relates to quality.

Factor two: Land

Three variables street frontage, vertical services location and location (table 4) are loaded strongly on factor 2, explaining 19.8% of the variance. In this factor the attributes are influenced by land/design factors. The street frontage or width of the land parcel and the location of the property relate to land attributes. The location of vertical services influences the flexibility of the space plan to adapt to different configurations of the floor plate.

Factor three: Social
The attributes historic listing and age are very strongly and moderately loaded on factor 3 and explain 9.3% of the variance (table 2). Age is negatively loaded and this can be interpreted as buildings age they are more likely to be adapted. The attributes can be described as social. Aesthetics, which is weakly loaded, relates to appearance and indicates that buildings having a poor appearance; being outmoded or outdated are less likely to be adapted. It is included in this factor given the relationship to age and historic listing.

**Results Amsterdam**

The PCA method used to analyse the Melbourne case was also applied in Amsterdam. The Amsterdam analysis examined 'alterations and extensions' that were so extensive that a building permit was needed, studying 98 buildings where adaptations had taken place. The attributes that were studied were typical floor area, the number of elevators and sanitary and pantry facilities related to the typical floor area, GFA, number of storey's, spatiality of the entrance, parking, year of construction, long term vacancy, Facade material and Facade quality. The PCA produced a total of 11 factors where the first four were significant with Eigenvalues exceeding 1.0 and contributed 71.79% of the variance. The sample size of the Amsterdam analysis is rather small and in literature categorised as rather poor (Comrey and Lee 1992, Field 2006). Therefore, the attributes to include in the analysis were chosen carefully, as to not exceed the number of variables recommended per participant in the sample (Kass and Tinsley 1979). Table 4 illustrates the factor loading produced by the PCA.

**Table 4 Factor loadings - 'Alternations/Extensions' Amsterdam**

| Attributes | Factors | | | |
|---|---|---|---|---|
| | Services (Factor 1) | Physical / size (Factor 2) | Status (Factor 3) | Social (Factor 4) |
| Typical floor area/sanitary and pantry facilities | **0.891** | 0.131 | -0.040 | -0.028 |
| Typical floor area | **0.880** | 0.197 | 0.018 | 0.003 |
| Typical floor area/number of elevators | **0.871** | -0.189 | 0.066 | 0.005 |
| Gross Floor Area (GFA) | 0.171 | **0.866** | 0.030 | 0.036 |
| Height (number of storey's) | -0.143 | **0.773** | 0.035 | 0.209 |
| Spatiality of the entrance | 0.075 | **0.764** | 0.066 | -0.173 |
| Parking | 0.105 | 0.057 | **0.777** | 0.000 |
| Year of construction | -0.192 | 0.077 | **0.734** | -0.103 |
| Long term vacancy | 0.153 | -0.028 | **0.703** | 0.135 |
| facade material | -0.037 | -0.127 | 0.174 | **0.873** |
| facade quality | 0.030 | 0.223 | -0.212 | **0.768** |

The alterations that were studied in the Amsterdam case all included extensive adaptations and alterations. Minor alterations without impact on the exterior of the building or alterations that do not affect the functioning of the building (i.e. fire safety, air quality, major routing) are not registered. Major alterations are expected to lower vacancy risk as lack of aesthetics and functionality of an office building are found to be important indicators of long term vacancy (Remøy 2010). The factors recognised in the Amsterdam study were described by a name given meaning by the variables included in the factor (Table 3).

**Table 5 Summary of PCA Factors 'Alterations and extensions' in Amsterdam**

| Factor number | Factor name | Factor variables |
|---|---|---|
| 1 | Services | Typical floor area<br>Typical floor area/number of elevators<br>Typical floor area/sanitary and pantry facilities |
| 2 | Physical / size | Height (number of storey's)<br>Gross Floor Area (GFA)<br>Spatiality of the entrance |
| 3 | Status | Parking<br>Year of construction<br>Long term vacancy |
| 4 | Appearance | Quality<br>Aesthetics |

<u>Factor one: Services</u>
The attributes typical floor area and number of elevators, sanitary and pantry facilities per typical floor area explain 29.5% of the original variance. The first attribute is related to size while the latter two describe the level of services in an office building. The number of elevators and facilities influences the possibility to adapt an office building, as it affects the flexibility of the space plan and also has a high impact on the costs of adaptations.

<u>Factor two: Physical/size</u>
The three attributes height, GFA and spatiality of the entrance all relate to the size of office buildings. The variables loaded strongly in factor 2, explaining 16.8% of the variance. The first two variables are easily comprehended as they describe the sheer size of buildings. Entrance spatiality is a measure of the entrance floor area / entrance height. This attribute is often strongly related to the GFA of the building as large scale buildings tend to have large floor areas reserved for the entrance(s), without significant extra height assigned.

<u>Factor three: Status</u>
The attributes parking, year of construction and long term vacancy are loaded strongly on factor 3 and explain 14.4% of the variance. This factor with the three quite different variables can be classified as 'status', though status again is a social construct and so the factor could also be named social. Other variables that were loaded on this factor in initial analyses were graffiti and type of street furniture. The factor shows that older buildings with sufficient parking facilities and high vacancy levels are likely to be adapted. In these cases, adaptation is a possibility of upgrading a property for new tenancy.

<u>Factor four: Appearance</u>
The attributes Facade quality and Facade material are strongly loaded on factor 4 and explain 11.2% of the variance. The attributes can be described as appearance, and like factor 3 this factor could also be referred to as social. Both variables included relate to appearance, indicating that buildings having a poor appearance; being outmoded or technically outdated are less likely to be adapted.

**Similarities and differences**

Amsterdam could learn from Melbourne's climate initiative. In a market with low vacancy rates, adaptations are carried out on a large scale to meet the goals set for 2020. Since the 1990's, the Amsterdam office market was expanding. 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 to compare, Melbourne shows a market with far lower vacancy rates, more and better documented adaptations and a goal for future development, whereas Amsterdam has a lot to learn. Looking at the characteristics of the buildings that have been adapted in both cities though, there are more similarities to be found (see table 6 where X denotes that the attribute was found to be important).

**Table 6 Similarities between Melbourne and Amsterdam analyses**

| Important Building Adaptation Attributes | Melbourne | Amsterdam |
|---|---|---|
| 1. Number of storey's | X | X |
| 2. GFA | X | X |
| 3. Property Council of Australia building quality grade | X | |
| 4. Site boundaries | X | |
| 5. Typical floor area | X | X |
| 6. Site access | X | |
| 7. Parking | | X |
| 8. Street frontage | X | |
| 9. Vertical services location | X | |
| 10. Typical floor area / number of elevators | | X |
| 11. Typical floor area / sanitary and pantry facilities | | X |
| 12. Spatiality of the entrance | | X |
| 13. Property location | X | |
| 14. Historic listing | X | |
| 15. Age in 2010 / year of construction | X | X |
| 16. Long term vacancy | | X |
| 17. Facade material | | X |
| 18. Facade quality / aesthetics | X | X |

Table 6 shows that out of a total 18 building attributes found to be important in commercial office adaptations in Melbourne and Amsterdam, five were shared (number of storey's, GFA, typical floor area, age and aesthetics). Of the five attributes found important in the Amsterdam study, namely façade 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 and this is an area of possible further research. The final six attributes found to be important 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) and that there is some correlation there.

**Conclusions**

Firstly the Melbourne results revealed three factors (table 3). Secondly the PCA correlated variables that previous studies identified as separate (Blakstad 2001; Kucik 2004; Arge 2005), which indicates the relationship between adaptation and building attributes is more complex than previously held. The research questions have been answered and the importance of a small number of attributes was found to influence adaptation to a high degree, 74% of variance in adaptation is explained by twelve attributes. The most influential variables or building attributes affecting 'alterations and extensions' adaptations are; physical / size (height, Gross Floor Area, Property Council of Australia building quality grade, site boundaries, typical floor area and site access), followed by land characteristics (street frontage, vertical services location and property location) and lastly by the social attributes (historic listing, age and aesthetics). Another finding is that attributes previously considered influential were found to have limited influence on adaptation in the study. It is possible to strategically plan and target policy making to optimise efforts to deliver the 38% reductions in building related greenhouse gas emissions and the objectives of the 1200 buildings program through the enhanced understanding of the pattern of commercial building adaptation.

In the Amsterdam analysis as well as the Melbourne analysis, 12 attributes were found to influence adaptation to a high degree, explaining 71.8% of the variance in adaptation. The Amsterdam study was based on far less observations than the Melbourne study. The most important characteristics influencing adaptations are services (typical floor area, the number of elevators and sanitary and pantry facilities related to the typical floor area), physical/size (GFA, number of storey's, spatiality of the entrance), status (parking, year of construction, long term vacancy), and appearance (Facade material and Facade quality). The Amsterdam study to a great extent agrees with the findings from Melbourne, though adding an extra factor. In Melbourne, the Property Council of Australia building quality grade was found to be an important attribute in the study, while there is no equivalent to this variable in the Dutch real estate market.

Though the relationship between building characteristics and adaptations is quite complex, we can conclude from both analyses:

- Physical building and size attributes are the most important attributes
- Services are the second most important attributes (In the Amsterdam analysis services is a factor, while in the Melbourne analysis, the location of vertical services is included in the 'land' factor)
- The land factor that was found to be important in the Melbourne analysis was not included in the Amsterdam study. A variable resembling "street frontage" was "visibility of the entrance", but this variable was discarded from the Amsterdam analysis at an early stage. The location of the property was also not included in the Amsterdam case. As the sample was collected from several different locations in Amsterdam, this variable added too many "unique" observations making an analysis with rather few cases difficult.
- Floor area influences the amount of adaption undertaken
- Appearance is important
- Social factors are important. The factors have different meanings in the two analyses, and looking at the Amsterdam analysis it has two social-related factors. However, the characteristics included are to a great extent similar.

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