The Effect on Vandalism of Perception Factors Related to Housing Design, Case of U.A.E Cities

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Abstract

Current literature on vandalism recognises three main reasons for the increase in vandalism in certain housing areas: the design of the housing environment, social characteristics of the residents, and system of management. The physical design features such as the extent of available public spaces and the height of multi-storey blocks of flats are considered to be important. Some studies point to other factors related to the perceptions invoked by the design of public spaces in housing areas, in particular the perceptions of visibility through dwelling windows, the accessibility by the residents, and property ownership. However, there is a lack of research on the effect of perception factors on vandalism. This study attempts to overcome this deficiency in data regarding the problem of vandalism in U.A.E. cities.

The study results showed that there is a relationship between vandalism and perception factors invoked by the design of public spaces in housing areas. The perception of visibility appeared to exert a robust effect on vandalism and the perception of accessibility was found to strengthen the effect of the perception of visibility. The study provides some insight into the possible effect of the perception of property ownership and density of youngsters on vandalism.

Keywords: vandalism; perception; housing design; housing management; U.A.E.

1. Introduction

Vandalism is generally defined as the wilful or malicious destruction, injury, disfigurement, or defacement of property (Miller, 1973 and 1980; Coleman, 1985). Graffiti is included as a type of vandalism in a community since it degrades the social status of the community and diminishes the value of the property. It involves loitering, littering, and shoplifting of materials required for graffiti including paints and markers as well as other related crimes in the community (Hualiang et al., 2012). Most studies on vandalism focus on its association with other problems such as different crimes, and involve the use of similar measurement methods to investigate the effect of the design variables on these problems (e.g. Coleman, 1985; Hillier and Shu, 2000). In this study, vandalism is considered as a distinct type of social problem differing from other social problems such as crime in terms of the type and age of perpetrators, targets of the acts, and motives for the acts.

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The widespread occurrence of vandalism in western countries has paralleled the extensive construction of large and multi-storey housing projects due to the huge shortage of housing after the Second World War. In the United States, graffiti vandalism is an increasingly expensive problem. The state and central governments have taken measures to minimise the harm caused by graffiti in terms of property damage and fear of crime (Callinan, 2002). As was the case with western countries, vandalism has lately become widely rampant in U.A.E. cities (UAE Interact, 2008) with the widespread construction of large multi-storey housing facilities for the population of nationals and expatriate workers. Several housing areas within U.A.E. cities were selected in this case study.
Although this paper does not intend to provide a comprehensive literature review due to its scope and size; it does provide a brief outline of some relevant literature on the possible causes of vandalism. The literature highlights three variable categories that may have an effect on the problem of vandalism: housing design variables, including building design features and perceptions invoked by building design; social characteristics of residents and management systems (see Fig.1.).

Several studies have focused on the relationship between vandalism and building design. The main factors emphasized in these studies are the area of public spaces, height of blocks of flats, size and location of parking garages and street pattern (Attenburrow, 1978; Burbidge, 1981; Power, 1982; Coleman, 1985; Hillier & Shu, 2000).

Most of the observations made on the effect of design features on vandalism are based on subjective observations; in fact, some investigators have been criticized for their lack of rigor or inconclusive results. An outstanding example of lack of rigor is the work by Coleman (1985) in the book 'Utopia on Trial', which was heavily criticized for the lack of validity of the measurement methods and failure to account for social factors (Hillier, 1985). Inconclusive results were reported by Hillier and Shu (2000) who investigated the effect of some design variables on crime and vandalism and showed a weak correlation between the studied design features and vandalism.

The observations regarding the relationship between the design features and vandalism point towards the contributory role of certain intermediate factors. These include the perception factors invoked by the building design from surrounding public spaces, particularly the perception of visibility through dwelling windows, the perception of accessibility by residents of the surrounding dwellings, and the perception of property ownership (whether public or private). The perception factors are independent of the design features mentioned earlier; for example, some high-rise apartments may invoke a perception of absence of visibility if none of the dwelling windows overlook public spaces, while others may elicit a perception of high visibility.

Often, these perception factors are factored in during building design to account for 'natural surveillance' and/or 'resident control'. However, some studies have clearly shown that these perception factors are responsible for the occurrence of vandalism in areas with certain building design features, particularly those mentioned above (Ward, 1973; Burbidge, 1981; Commission for Architecture and the Built Environment, 2000). Despite the implicit and explicit recognition of this association, these perception factors have not yet been clearly identified and investigated as causal factors. Therefore, this study aims at overcoming this shortfall by investigating the effect of these perception factors as independent variables on vandalism.

In order to fully investigate the design variables including these perception factors, it was necessary to account for all other variables likely to influence the occurrence of vandalism (Fig.1.). Current literature emphasizes several variables associated with social characteristics of residents and management systems. Social characteristics of residents have been implicated as factors contributing to the problem of vandalism, particularly the density of youngsters and level of income (Baldwin, J., 1974; Shankland, 1977). Similarly, management practices may reduce the problem of vandalism through intensive management measures such as increased security, residents' awareness and prompt repair of vandal damage (Burbidge, 1981; Power, 1982). Prompt repair of vandal damage minimises the possibility of further incidents of vandalism since youngsters tend to commit acts of vandalism at sites of previous vandalism. Studies have shown that resident involvement in the management process as in a 'co-operative' system of management is beneficial towards preventing problems such as vandalism (Ward, 1983). Such management systems tend to be highly responsive to the problem through repair and confer upon residents a responsibility towards caring for their housing (DoE, 1975; Macey, 1982). Another aspect of the effect of management practices on the problem of vandalism is through promotion of families with social characteristics such as large numbers of youngsters or low-income concentration in some blocks of flats (Shelter, 1973; Shankland, 1977; Burbidge, 1981). This process is referred to in some literature as a process of 'social polarization', which occurs as a result of the movement of economically sound residents from older or unpopular areas of blocks of flats to better housing facilities, allowing for a greater number of less fortunate families with low income or with a high number of youngsters to move in. Concentration of youngsters in combination with building design that does not take measures for combating vandalism may promote vandalism, which would further perpetuate 'social polarization' and lowering of the rental value, thereby affecting the level of maintenance and turning such areas into vandalized ghettos.

The above brief analysis of selected literature highlights certain areas that need examination. Thus, the following were defined as the objectives of this study:

a. Redressal of the lack of rigor or comprehensiveness in previous research by examining the perception factors elicited by building design and other possible factors influencing vandalism.
b. Formulation of guiding principles for the design of housing and public urban spaces in housing areas with a view to minimising the problem of vandalism.
2. Design of the Research Project
The study proposes methods of measurement for vandalism and the abovementioned (1) variables likely to affect vandalism. These measurement methods were applied in three field areas and the data were analysed to assess the effect of each variable on vandalism.

2.1 Proposed Method of Measurement of Vandalism
The method of measurement adopted in this study was to survey housing areas and record all traces of vandalism by type, amount and position. This method is limited in that it would not account for vandalism that are repaired fairly quickly by the management or by the residents themselves. However, graffiti is a type of vandalism that can be considered as representative of the extent of vandalism and is not liable to prompt repair but only periodic routine maintenance. Graffiti is seen by many as the most anti-social and alienating type of vandalism because of the negative visual impact it generates. Further, this study showed that the occurrence of most types of vandalism increases in areas with graffiti. Therefore, this study focused mainly on measuring graffiti by area (square meters) as the indicator for vandalism. The researcher and an assistant measured graffiti covered areas by using a measuring tape. This was done at the same time the researcher measured the perception factors as described in (2.3).

2.2 Proposed Method of Measurement of Design Features
The design features elucidated in (1) were assessed according to their individual characteristics: extent of public space by area, height of blocks of flats by number of floors, size and location of garage clusters by number of garages and by distance from blocks of flats and street pattern by type.

2.3 Proposed Method of Measurement of Perception Factors
The perception of visibility through dwelling windows, perception of accessibility by residents of the surrounding dwellings, and perception of property ownership differ from design features because they pertain to the awareness of individuals in public spaces rather than the physical objects generating the awareness. Individual perception is generally assessed by questionnaires or observation; in this study, perception of being visible was assessed in terms of the building elements that a person at a specific point in a public space can see, e.g. windows. Measurements would differ with the movement of the person. This measurement approach is advantageous in that these factors would yield meaningful conclusions that would help define guidelines for the design of housing in terms of design elements that would reduce vulnerability to vandalism.

- The Perception of Visibility and the Perception of Accessibility: The perception of visibility was measured in terms of a person’s perception of being visible from the surrounding windows at various locations in the public space. Similarly, the perception of accessibility refers to the person’s perception of being accessible by residents of the surrounding dwellings when present at specific points in the public space. This perception may be strongly experienced at one exposed point and weakly at another. Hence, these factors of perception depend on the location and distance of windows and doors as observed from different vantage points in public spaces. This is because potential vandals would find windows or doors of dwellings facing away or placed at an oblique angle to their position as encouraging factors. These perception factors were assessed according to the correlation of the position of windows and doors with the perception of visibility and accessibility. This measurement approach was designed to yield reliable results that could be easily interpreted by different researchers. The measurement was made as follows:
1. For a given vandalized location, the point of measurement was the centre of that location. For graffiti on walls, the point of measurement was a distance of one meter away from the centre of the graffiti area. For extensive vandalism in public spaces, the point measurement was taken at the centre of that public space.
2. The researchers obtained photographic images of all windows and doors that could be observed from the point of measurement. Consistent image settings were used for all measurements in terms of aperture size and lens angle, and all photographs, both on paper or digitally, were obtained at the same size.
3. The perception of visibility at a point in a public space was assessed using photographic images to measure the total area of windows, as appearing on two-dimension photographs taken at the point of measurement. The assessment was made either digitally or by measuring the area of windows from paper prints.
4. The perception of accessibility at a point in a public space was evaluated using a scaled plan to record the location of all access doors that were visible from the point of measurement. Each access door was scored according to the distance between the door and the point of measurement. To ensure the validity and reliability of the measures, a distance of 50 meters was judged to be the maximum limit for effective visibility and accessibility.

- The perception of property ownership: The perception of ownership is invoked by the characteristics of the built environment such as a wall that is clearly a part of an occupied dwelling or landscape features that are within fenced areas associated with a dwelling or a block of flats. It is claimed that the recognition of ownership in such parts would reduce the chances of vandalism.

This criterion was evaluated according to whether or not the nature and name of the property invokes
the recognition of ownership of a given aspect or part of a property. Properties with recognized ownership included single-family dwellings, blocks of flats or a group of dwellings within a fenced site. Properties with unrecognized ownership include commercial and educational buildings, semi-public ownership of utility facilities, and publicly owned municipality or government buildings.

2.4 Proposed Method of Measurement of Social Characteristics

Since the population census of the U.A.E is collected at the district level, it usually includes a large expanse of bigger housing areas that are much greater in size than the localities included in our case studies. Therefore, the social characteristics of residents in housing areas were evaluated using the information obtained from the management bodies of the blocks of flats as well as actual investigation. The social characteristics measured in this study are the density of youngsters and household income.

With regard to the density of youngsters, it was assumed that with the increase in the number of youngsters using public spaces, opportunities for acts of vandalism increase. Thus, the method of measurement should account for (or control for) the size of the public space. Therefore, in this study, the appropriate method for the measurement of the density of youngsters was considered as the number of youngsters per hectare (10,000 square meters) of public space. To ensure the validity and reliability of the measurements, youngsters were defined as children and teenagers between the ages of 8 and 16 years.

For assessment of household income, the average rental value of dwellings was considered as a good indicator of income level of a household.

2.5 Proposed Method of Measurement of Management Practice

In the U.A.E, the management systems of housing areas are relatively consistent; most are privately owned houses or blocks of flats. The blocks of flats are managed by owners, and streets and public spaces are managed by municipalities. Some blocks of flats are managed by investment organizations. However, vandalism does not only affect blocks of flats or houses, but also properties owned by municipalities or other authorities. Furniture in public spaces, electricity transformer rooms, and garbage collection facilities are also frequently vandalized. Therefore, a clear-cut analysis of the relationship between management practices and vandalism is difficult.

In this investigation, the effect of management practices such as vandalism removal and repair, vandalism surveillance, and anti-vandalism education was investigated at the micro level of blocks of flats via personal interviews with the managers of blocks of flats. The interview was also aimed at collecting data regarding the rental policies and practice and the nature of resident turnover to determine whether changes in the rental values of housing lead to social concentration of residents of certain social characteristics, particularly in older blocks of flats.

3. Selection of Housing Areas for Case Study

Three housing areas were chosen for case studies in this investigation; these areas comprised more than 2600 dwellings of a variety of building forms. The areas are located in Dubai city, Sharjah city and Ajman city. These areas include blocks of flats of different heights and an area of single-family houses. Despite the limited scope of this study, the housing areas were chosen carefully to allow for the claimed effect of the abovementioned main variables on the problem of vandalism.

3.1 Al Majaz District Case Study

The first case study was held in the housing area at Al Majaz district, Sharjah, which includes 36 inhabited blocks of flats ranging from 2 to 16 storeys high, with 20 of them between 5 and 7 storeys high. The blocks of flats were built over the last 30 years and owned and managed by individual investors and occupied by tenants. Each block of flats is managed by a caretaker employed by the owner to clean the public areas and provide a minimal amount of security. Maintenance was done by outside contractors or employees. Each block of flats had shops at the ground floor with flats above. Flats in higher blocks and blocks which face the main street are also used for businesses such as offices or private clinics. Each block of flats covered the area of the plot and was surrounded by streets, walkways and car parking.
factory and under-construction site, and including 26,100 square meters of open public spaces. The total building footprint is 32,880 square meters, excluding the food factory and the under-construction site, with 1,264 flats with an average area of 131 square meters.

3.2 Al Nuamiya Towers Case Study

The second case study was conducted in Al Nuamiya Towers in Ajman (Fig.3.), which was built by a semi-governmental investment company and completed in 2006. The flats were sold directly on the open market. Although most flats are occupied by owners, sizable percentages (around 40%) are occupied by tenants. The project is managed by the investment company, with a project manager, maintenance team and caretakers for each block of flats. The area includes 15 inhabited blocks of flats in 17 storeys. The Six identical blocks of flats facing the main streets comprised shops at the ground floor and two 1 and 2 bedroom flats and 3 bedroom flats on the floors above. The remaining 7 blocks were also identical with 2 bedroom flats on all floors. Some flats on the ground floor that were adjacent to surrounding streets are used for business purposes such as estate offices. Each block of flats covers the total of its plot area and is surrounded by streets, walkways and car parking. The Al Nuamiya case study covered an area of 27,810 square meters (2.78 hectares), with 15,060 square meters of open public spaces. The total building footprint is 12,750 square meters, with 980 flats with an average area of 181 square meters.

3.3 Jumairah District Case Study

The third case study was conducted in Jumairah district, Dubai (Fig.4.). The area includes streets surrounded by single-family houses within fenced plots some of which are housed in groups of two and three in plots and others occupied by extended families. The area of the case study was located between Jumairah's main road and the seashore. Most of the 55 built and occupied plots of one or two-storey houses are owned by the occupants, while those along the main road and older ones along the seashore are occupied by tenants. Three walkways (Sikka) link the main road to the inner road and the area also includes a petrol station that can be accessed from the main road. The area covered in the Jumairah case study was 64,455 square meters (6.44 hectares), with 25,582 square meters of public spaces. The total occupied plot area is 38,873 square meters containing 78 houses and the average dwelling area is 250 square meters, while those along the main road and some older houses along the seashore are occupied by tenants. The area includes 55 built and occupied plots of one or two storey houses. There are three walkways (Sikka) linking the main road and inner road. It also includes a petrol filling station accessed from the main road. The area of the Jumairah case study is 64,455 square meters (6.44 hectares).

The total area of open public spaces is 25,582 square meters. The total occupied plot area is 38,873 square meters. The total number of houses is 78 and the average dwelling area is 250 square meters.

4. Data Analysis

This section deals with the analysis of the data collected in the three case studies mentioned above in (3) using the methods of measurement proposed above (2). The analysis was aimed at testing the claimed effect of the main variables discussed earlier in (1) on the problem of vandalism.

4.1 The Effect of Design Features on the Problem of Vandalism

The main design features identified earlier, in (1), are extent of public space, height of blocks of flats, size and location of garage clusters and street pattern. This section discusses two design features of housing, the extent of public space and the height of blocks of
flats. The limited scale of these case studies only allows for testing of these variables. Public space refers to all spaces that are accessible to the public, including streets, pavements, public green areas and walkways. Previous reports have claimed that the extent of public space has a direct relationship with vandalism; in other words, it is assumed that an increase in public spaces increases the chances of unrestrained acts of vandalism. The assumption considers public spaces as an independent variable with no relation to the social characteristics of residents, particularly to the density of youngsters. The relationship between such variables and vandalism will be examined in later sections. No correlation (correlation coefficient, 0.3) was noted between the size of public area and the total amount of graffiti as an indicator for vandalism (see 2.1 above) in each of the case studies (Fig.5.). However, this cannot be considered as a meaningful conclusion since the size of the sample in this analysis (three cases) is too small.

Similarly, no correlation was noted between the height of blocks of flats and vandalism. The analyses also included the testing of the relationship between blocks of flats of different height and vandalism in the surrounding areas.

**Fig.5.** Correlation between the Size of Public Space and Vandalized Graffiti

**4.2 The Effect of Perception Factors on the Problem of Vandalism**

The effect of the perception of visibility, the perception of accessibility as well as the perception of ownership on vandalism was assessed in terms of their effect on graffiti. In the case studies, 67 vandalized locations were identified (39 in Al Majaz, 17 in Al Nuamiya and 11 in Jumairah). Graffiti was measured in each location and plotted on scaled plans. Measurements of the perception of visibility were made using photographs, as in (3.2) (Fig.6.).

The analysis of the perception factors should account for a few considerations: individuals in the public space could be simultaneously influenced by several perception (or awareness) factors and help identify the effect of these factors on vandalism. Fig.7. shows the correlation between the perception of visibility and graffiti. The photographic images obtained to assess the perception of visibility were digitally transferred on to Autocad software using which areas of windows were measured in terms of Autocad unit of area. The graffiti measurements were categorised into six classes of visibility. The bar chart shows the total graffiti of all fieldwork locations falling within each visibility class. Fig.6. shows that with the increase in the perception of visibility, graffiti decreased.

Similarly, Fig.8. shows the correlation between the perception of accessibility and graffiti. The distance between each vandalized location and every door visible from that location was measured and scored according to the distance: the greater the distance between the location and a door, the lower was the score for the door. Graffiti measurements were categorised into six accessibility classes. The bar chart shows the total graffiti for all the fieldwork locations according to the different accessibility classes. Fig.8. shows that with the increase in the perception of accessibility, graffiti decreased. However, at this point of the analysis, the individual effect of each of the two perception factors on vandalism is not clearly apparent since most vandalized locations in the case studies had overlapping measurements for both factors. To evaluate the effect of each of the two factors, the same data used in the above analysis (Figs.7. and 8.) enabled further detailed analyses. An insignificant correlation (correlation coefficient, 0.19) was noted between the perception of accessibility and graffiti in vandalized locations having very low or no visibility score. Furthermore, a relatively higher negative correlation (correlation coefficient, -0.93) was noted between the perception of visibility and graffiti in vandalized locations excluding those with very low or no accessibility score. These data suggest that the perception of visibility has a significant correlation with graffiti (as an indicator for vandalism) and that the perception of accessibility is significantly correlated with graffiti only when accompanied with the perception of visibility (i.e. it strengthens the effect of the perception of visibility).

**Fig.6.** Examples of Photographic Measurements of Visibility (Mushtaha, E. et al., 2016)

In terms of recognition of ownership, it is assumed that when ownership of a property is not clear or
unrecognized, vandals would feel undeterred or that they are not trespassing. The case studies include four vandalized locations of unrecognized ownership: at the back of the mosque in the Al Majaz case study, at the side and back of shops in the Al Nuamiya case study, and on the electricity transformer building in the Jumairah case study. Two of these locations had high vandalism scores as well as high visibility scores. These were unique findings in this investigation. Although the number of such locations is limited in the authors' studies, these findings may support the beneficial effect of perception of ownership on vandalism to some extent and warrant further investigation.

4.3 The Effect of Social Characteristics on the Problem of Vandalism

The main social characteristics that have been linked to vandalism in current literature are density of youngsters and household income.

The density of youngsters is measured as the number of youngsters per hectare (10,000 square meters) of public space, as mentioned in (2.3).

In each case study of the present work, a slightly significant correlation was noted between the density of youngsters and graffiti per hectare of public space (Fig.9.). This indicates that the density of youngsters has a moderate effect on acts of graffiti within the study areas. However, the case studies in this analysis are too few to allow for the control of the influence of other variables and provide results of a higher degree of confidence. In regard to household income, the claimed relationship implies that youngsters of lower income household are more likely to commit acts of vandalism. Further, the correlation between the level of household income and graffiti for each case study was investigated in terms of the average monthly rental values and graffiti per youngster (square meters; i.e. the total graffiti area in square meters divided by the number of youngsters in each case study), respectively (Fig.10.). The analysis yielded a correlation coefficient of 0.44, which indicates a weak correlation. As was the case with the correlation between the number of youngsters and graffiti, the numbers of case studies in this analysis are insufficient to enable control of the effect of other variables and yield fairly confident results.

4.4 The Effect of Management Practices on the Problem of Vandalism

As pointed out earlier (2.5), the manner in which management practices affect vandalism was determined at the micro level of blocks of flats via personal interviews with the managers of blocks of flats in the Al Majaz case study. Information regarding the effect of management policies such as vandalism removal and repair practice, vandalism surveillance practice, and anti-vandalism education and vandalism was gathered in these interviews. The cumulative results of the interviews indicated that measures of vandalism removal and repair as well as surveillance practices were implemented at varying degrees in different blocks of flats. Areas where these measures were actively implemented showed favourable results in checking vandalism in the area. However, the positive effects of the prompt execution of these measures on curbing vandalism need to be verified by further investigation over a long period of time in investigations spanning a greater number of locations.
5. Conclusions

The introduction set two objectives for the study. The first was to redress the lack of rigor and comprehensiveness in some of the previous research. In this regard the literature tends to emphasize physical design features such as the extent of available public spaces, the height of multi-storey blocks of flats, as well as other independent factors related to perceptions invoked by the design of public spaces in housing areas, particularly the perceptions of visibility through dwelling windows, the accessibility by the residents, and property ownership. The study identifies a lack of research into these factors and attempts to investigate their effects on the problem of vandalism in U.A.E. cities as follows:

The perception of visibility was found to be inversely associated with vandalism. Similarly, the perception of accessibility contributes to preventing vandalism by strengthening the effect of the perception of visibility.

Recognition of ownership was not found to have any effect on the prevention of ownership on vandalism.

Other factors found to be affecting the level of vandalism were the density of youngsters and household income. These findings justify further investigation of these issues.

The study sought to verify the validity of the widely claimed causal relationship between design features and vandalism. The evidence obtained in this study does not agree with these claims and show that the extent of public space and the height of blocks of flats do not promote vandalism.

The study was also directed at validating the causal relationship between vandalism and systems of management as claimed previously. The results obtained in this study suggest the existence of a moderate beneficial effect of management practices of removing or repairing the evidence of vandalism, and of surveillance in preventing vandalism.

The second objective of the study, which suggests a guiding principle for the design of housing and public urban spaces in housing areas that may contribute to reducing the problem of vandalism, a number of general guidelines useful to planners and architects can be derived from the conclusions of the study set above.

The findings of this study will aid planners and architects in designing public spaces within housing areas and the surrounding buildings so that they invoke a high degree of the perception of visibility, accessibility and property ownership. Having windows directly viewing public spaces reduces vandalism seen from dwellings.

The conclusion also suggests that public spaces within housing areas should be designed to invoke a high degree of the perception of accessibility by locating dwellings' main doors and blocks of flats' main entrances directly onto these public spaces.

Furthermore, the conclusion suggests that the design of housing should invoke recognition of ownership of properties around public spaces, clearly seeing walls and fences as part of dwelling units, while providing vandal-proof designs for walls and fences of non-housing parts such as service rooms and garbage collection areas.

However, more large-scale investigations are warranted to validate the findings of this study and enable the identification of design solutions that add to the perception of visibility, accessibility and ownership in order to reduce the chances of vandalism of public spaces, particularly in blocks of flats and around buildings with no recognizable ownership such as utility facilities and public and semi-public buildings.

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