THE ROLE OF URBAN SPACE DESIGN CHARACTERISTICS IN INFLUENCING SOCIAL LIFE OF SWAHILI STREETS: THE CASE OF OLD TOWN MOMBASA

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Abstract
This paper is based on a study carried out in Old Town Mombasa, a Swahili city in Kenya, situated along the East African Coast. Its focus is on social life of the town's street system as a correlate of urban space design characteristics. Urban design elements within the streets have been disregarded resulting in spaces that do not adequately support human activities. The city has rich historical, architectural and cultural attributes that make it one of the significant civilizations of the world. Broadly, this paper seeks to establish urban design characteristics that have a relation with human activities in the streets. The study embraces both quantitative and qualitative research methods to investigate urban design elements along the streets. Multiple regression is used in data analysis whereas ANOVA at 99 percent confidence level has been used in testing the significance of the relationship between dependent and independent variables. Results of the study indicate that physical characteristics of the street space influence human activities at different levels. The characteristics are an indispensable consideration in the design of streets that support a vibrant social life in the city.

Key words: Urban space, characteristics, Mombasa, human activities, social life

1.0 Introduction

A street is the space found between built elements within a city and it includes public spaces such as pedestrian walkways, roads, sitting areas and public amenities (Krier, 1979). Streets thus serve the function of accommodating human activities. Gehl (1996) divides these activities into necessary, optional and social activities. Necessary activities refer to those that are to a large extent compulsory; activities in which those who are involved are required to participate. Examples of necessary activities include going to school or work, shopping, waiting for a bus and running an errand. Optional activities are those undertaken if there is a wish to do so and if time, place and exterior conditions are favourable. Activities such as taking a walk for fresh air, standing and meditating or sitting and basking in the sun are optional activities. Social activities are those undertaken subject to presence of other people in the public space. Examples of social activities include children at play, greetings and conversations, communal activities of various kinds and passive interactions such as watching and listening to other people.

The most common function of a street is to facilitate movement between places within a settlement. In this respect, a wide range of studies have unearthed the relationship between physical characteristics of a street and walking behaviour in diverse cultural settings. Baran *et al.,* (2008) establishes spatial properties of a street that significantly correlate with walking behaviour in a New Urbanist and Suburban neighbourhoods in North Carolina, USA. The study reveals that residents of streets with higher connectivity, indicated by the intensity of intersections with other streets, exhibit more walking behaviour. The study further reveals a positive correlation between the degree of accessibility of a street and walking. Min (1993), in looking at housing layout and space use in Swedish and Chinese neighbourhoods, investigates how spatial morphology of a street influences pedestrian movement. The study establishes that streets with a higher degree of connectivity of space are associated with a higher encounter rate of pedestrians. Alfonzo *et al.,* (2008) realizes various physical characteristics of a neighbourhood built environment that are associated with walking and non-motorized transportation in the city of California. The characteristics include a high population density, mixed land uses, sidewalk continuity and good pedestrian infrastructure. Moirongo (2011), in investigating the street spaces of the Central Business District of the city of Nairobi, identifies various urban space characteristics that influence human distribution therein. Some of these include constitutedness and scale of urban space, traffic circulation patterns and land use mix. These studies reveal that whereas cultural setting could be different, the influence of street characteristics on pedestrian movement is the same.

Most recently, as Southworth *et al.,* (2012) points out, space has had a powerful role in shaping social behaviour and contrary to the generic treatment of people by modernism, the differing needs of children, elderly, disabled and other subgroups

are now commonly considered in design and planning. Every city presents itself with unique attributes and should thus be treated uniquely in its definition of urban spaces. In this respect, Old Town Mombasa has its street system defined by unique environmental, economic, social, historical and cultural factors. Residents of the city are predominantly Muslims. Islam as a religion advocates for maximum privacy and respect for women, a principle achieved by a clear definition of privacy gradients as one moves from public spaces to private spaces. In Old Town Mombasa, it is common to find men meeting, discussing and socializing within streets. The dwellings are considered very private and are therefore designated for women. It is this way of life, as to whether it is a correlate of any physical characteristics of the street, that motivates this study.

The streets within Old Town Mombasa serve as settings not only for social interactions but also for commercial purposes. The streets provide spaces that are relatively cool and breezy when compared to the interior of residential units. Environmental conditions have therefore partly influenced the choice of physical settings for some of the activities within Old Town Mombasa.

2.0 Objectives

Objectives of this study include:

1. To establish the extent of relationship between urban space design characteristics and social life in streets of Old Town Mombasa.
2. To suggest how urban design can be effectively utilized as a tool for enhancing social life in the streets of Old Town Mombasa.

3.0 Materials and Methods

This study has generalization of its findings to the entire street system of Old Town Mombasa as its fundamental purpose. To facilitate systematic assessment, each street is broken down into smaller units of space referred to as convex spaces. A convex space forms the basic unit of spatial analysis in this study.

3.1 Sampling Design

This study purposively focuses on all major streets of Old Town Mombasa. These include Mbarak Hinawy Road, Ndia Kuu, Nyeri Street, Thika Street, Kibokoni Road, Rodgers Road and Old Kilindini Road. Initially, a convex map for each street is drawn with a view to establish the population of convex spaces it contains. In total, there are ninety six convex spaces. According to Hillier and Hanson (1984) a convex space is one where no line drawn between any two points in the space goes outside the space. The procedure for coming up with a convex map of a street requires one to find and draw the largest convex space on a layout plan of the street. The next largest convex space is drawn and the process continues until the entire street space is accounted for. The process is carried out for all the streets and this allows for establishment of the sampling frame of spaces to be studied.

After establishing the sampling frame of convex spaces, the next step is to select a representative sample for detailed inquiry. To facilitate this, each space is coded uniquely. The selection then follows a two-stage process. In the first stage, all convex spaces in each street are systematically observed with regard to the intensity of human activities in each space. The intensity of activities is recorded on a five–point scale whereby the best condition is given a score of five (5) and the worst condition given a score of one (1). Purposive sampling is applied in selection of convex spaces in each category of score. The distribution of sampled convex spaces across the seven streets is illustrated in Table 1 below:

Table 1: Study population and sample size for the study

Street	Study Population	Sample size
Mbarak Hinawy	19	5
Ndia Kuu	18	5
Nyeri Street	16	4
Thika Street	8	3
Kibokoni Road	17	5
Rodgers Road	12	5
Old Kilindini Road	6	3
TOTAL	**96**	**30**

The sampling criterion is informed by three considerations. One, the sample size must be at least thirty for findings to be generalized to the parent population (Kazmier, 1976). Two, the spaces have to reflect variation with regard to distribution of human activities and three, the sampled convex spaces have to be spread geographically over the entire street.

3.2 Data collection

The study makes use of both primary and secondary data. Primary data is collected from survey of the streets whereas secondary data is obtained from review of literature. In the collection of primary data that is of qualitative nature, the study employs participant observation as one of the methods used in ethnography (Leedy, 1997).

Data that is of quantitative nature is collected by structured observation aided by an observation schedule. Human activities in a street space are recorded as intensity which is the total count per square metre of space. The activities are categorized into necessary activities, optional activities and social activities. Observation of human activities in space is consistently undertaken on week days between 9.00 a.m. and 4.00 p.m. This range of time is outside the peak hours when people are going to or coming back from school or work. On the other hand, urban space design characteristics to be observed and the method of recording each are

outlined in an observation checklist. Tools used in taking measurements of the urban design characteristics include a tally counter, a measuring tape for short distances and a measuring wheel for horizontal and long distances on the ground. Where necessary, some measurements are standardized on the basis of area of the space in order to allow for comparison of spaces of different sizes.

3.3 Data Analysis and Interpretation

The Statistical Package for Social Scientists (SPSS) program is used to aid data analysis through generation of outputs for interpretation. Intensity of a human activity in space constitutes the dependent variable whereas urban design characteristics of the space constitute the independent variable. Multiple regression using the stepwise method is used to establish independent variables that significantly explain the variance in the dependent variable. The significance of the relationship is tested by use of analysis of variance (ANOVA) at 99 percent confidence level.

4.0 Results

The study establishes various urban design characteristics that influence human activities within the spaces studied. In order to establish the relationship, multiple regressions are carried out for necessary activities, optional activities, social activities and total intensity of human outdoor activities. Outputs from the SPSS for the various predictions are illustrated in Table 2:

Model 1: Intensity of necessary activities in space using all independent variables as predictors

Table 2: Regression results for human activities in space

Variable:	X_W	X_{ABH}	X_{AHW}
Uns. B:	0.056	0.060	- 0.108

Constant = -0.618; R =0.748; R^2= 0.560; Adjusted R^2= 0.509; S_e= 0.194; df= 3, 26; F= 11.027; Sig.= 0.000

Model 2: Intensity of optional activities in space using all independent variables as predictors

Variable:	X_W	X_{ABH}	$X_{C/A}$
Uns. B:	0.072	0.065	- 0.846

Constant =-0.800; R =0.696; R^2= 0.485; Adjusted R^2= 0.425; S_e= 0.245; df= 3, 26; F= 8.148; Sig.= 0.001

Model 3: Intensity of human social activities in space using all independent variables as predictors

Variable:	X_{RLU}	$X_{D/AoS}$	X_{AHB}
Uns. B:	-0.426	3.559	0.041

Constant =-0.126; R =0.702; R^2= 0.492; Adjusted R^2= 0.434; S_e= 0.213; df= 3, 26; F= 8.400; Sig.= 0.000

Model 4: Total intensity of human outdoor activities in space using all independent variables as predictors

Variable:	X_W	X_{ABH}	$X_{C/ML}$
Uns. B:	0.199	0.189	-1.950

Constant =-2.346; R =0.753; R^2= 0.567; Adjusted R^2= 0.517; S_e= 0.570; df= 3, 26; F= 11.332; Sig.= 0.000

In Models 1 to 4, R= Multiple correlation coefficient; R^2= Coefficient of determination; S_e= Standard error of the estimate; Uns. B= Unstandardised coefficient; df= Degrees of freedom of the model; F= Analysis of Variance coefficient; Sig.= Significance (p) value of the model; X_W = Width of a street; X_{ABH} = Average building height; X_{AHW} = Average height of windows; $X_{C/A}$ = Number of columns per square metre of space; X_{RLU} = Proportion of residential buildings; $X_{D/AoS}$ = Number of doors per square metre of space; $X_{C/ML}$ = Number of columns per metre length.

4.1 Modelling Necessary Activities in Space

Multiple regression analysis between urban design characteristics and necessary activities establishes that three independent variables significantly explain 50.9 percent of the variance in the dependent variable. The independent variables include width of a street, average building height and average height of windows (Equation 1). The prediction is significant at 99 percent confidence level.

$$\textit{Necessary activities in space} = -0.618 + 0.056X_W + 0.060X_{ABH} - 0.108X_{AHW} +/- 0.194S_e \quad \ldots\ldots (1)$$

Both the width of a street and average building height have a direct relationship with the dependent variable. This implies that an increase in either of the variables, while holding all the other variables constant, results in an increase in the intensity of necessary activities in space. The average height of windows, on the other hand, has an inverse relationship with the dependent variable. This suggests that an increase in the average height of windows of buildings defining the street space results in a decrease in the intensity of necessary activities in space.

4.2 Modelling Optional Human Activities in Space

Multiple regression analysis between optional activities and all independent variables reveals that the width of a street, the average building height and the number of columns per square metre of space significantly explain 42.5 percent of the variance in the dependent variable (Equation 2). The relationship is significant at 99 percent confidence level.

$$\textit{Optional activities in space} = -0.800 + 0.072X_W + 0.065X_{ABH} - 0.846X_{C/A} +/- 0.245S_e \quad \ldots\ldots (2)$$

In this model, the width of a street and the average building height have a direct relationship with the dependent variable. This suggests that an increase in either of

them, while holding all other variables constant, leads to an increase in the intensity of optional activities in space. The number of columns per square metre of space, however, has an inverse relationship with the dependent variable. This implies that a space with a higher intensity of columns has a correspondingly lower intensity of optional activities.

4.3 Modelling Human Social Activities in Space

Multiple regression analysis between human social activities and all independent variables reveals that the proportion of residential buildings, number of doors per square metre of space and the average height of buildings significantly explain 43.4 percent of the variance in the dependent variable (Equation 3). The prediction is significant at 99 percent confidence level.

$$\textit{Human social activities in space} = -0.126 - 0.426X_{RLU} + 3.559X_{D/AoS} + 0.041X_{AHB} +/- 0.213S_e \quad \ldots\ldots (3)$$

The proportion of residential buildings has an inverse relationship with the dependent variable. This suggests that an increase in the proportion of residential buildings, while holding all the other variables constant, leads to a decrease in human social activities in the street space. The other two variables in the model have a direct relationship with the dependent variable, implying that an increase in either of them, while holding all the other variables constant, results in a corresponding increase in human social activities in space.

4.4 Modelling Total Intensity of Human Outdoor Activities in Space

Multiple regression analysis between the total intensity of human outdoor activities and all independent variables reveals that the width of a street, average building height and the number of columns per metre length significantly explain 51.7 percent of the variance in the dependent variable (Equation 4). The relationship is significant at 99 percent significance level.

$$\textit{Total intensity of human outdoor activities in space} = -2.346 + 0.199X_W + 0.189X_{ABH} - 1.950X_{C/ML} +/- 0.570\ S_e \quad \ldots\ldots (4)$$

The width of a street and average building height have a direct relationship with the dependent variable whereas the number of columns per metre length of space has an inverse relationship with the dependent variable.

Generally, the results show that six urban design characteristics significantly influence human activities in the streets of Old Town Mombasa. These are the width of a street, average building height, number of doors per area of space, average height of windows, intensity of columns and proportion of residential buildings. The dynamics of action of each of these characteristics is discussed in Section 4.0 of this paper.

5.0 Discussion

The study realizes that the width of a Swahili street has a significant direct relationship with necessary activities, optional activities and total intensity of human outdoor activities. Wider streets create an opportunity for more activities to be accommodated and hence increased human interaction. The width of a street has a bearing on its scale and according to Moirongo (2011), the scale of a street has to appropriate if the space is to efficiently fulfill its role as a physical setting for human activities.

The average building height has a bearing on density of users of a space. The study establishes a direct relationship between average building height and each of the four categories of human outdoor activities. A higher building height implies a street space has more and diverse activities that attract more people into the space. A higher building height thus suggests a higher encounter rate of pedestrians in the fronted street space and according to Jacobs (1961), this is a desirable environmental quality. This finding is consistent with that of Alfonzo *et al.,* (2008) which establishes that a higher density of activities in space has a direct relationship with the intensity of use of space by pedestrians. This further concurs with Ozer and Kubat (2007) which points out that introduction of central functions, such as retail, in a settlement, enhances an increase in the number of people in space. These people, with their diverse purposes and destinations in space, manifest different behavioural patterns that form a basis of categorization of the various human activities. Besides buildings of bigger height leading to increased density of people in Swahili streets, they offer shade and protection of pedestrians against weather elements. Shaded spaces often attract various human activities due to their thermally comfortable conditions. This is more critical in Old Town Mombasa where climate is hot and humid.

The height of a window from the floor of a building usually influences activities around it. As this study finds out, the lower the window, the more the activities in space that relate to it. This means more inside and outside connection or more constitutedness of urban space (Hillier, 2002; Moirongo, 2011). According to Hillier and Hanson (1984), constitutedness of space is said to exist when adjacent buildings are directly or indirectly accessible to it. In this case, a window whose starting height is lower promotes visual linkage between the inside of a building and activities in the street. Constitutedness is also enhanced by the intensity of doors opening into the street space. People in such a space experience a sense of security, a quality accorded by a higher degree of surveillance from adjacent buildings. This quality of space acts a magnet for various human activities. Conversely, streets that have a lower degree of constitutedness impede human activities such as window-shopping and promote fear of crime. The direct relationship between constitutedness of a street and the intensity of human activity therein established in this study concurs with other studies in the built environment. Baran *et al.,*

(2008) finds out that more accessible streets are associated with a higher degree of walking behaviour. Hillier (1988) establishes that spaces fronted with walls that have no openings are characterized with lower encounter rates of pedestrians.

This study realizes that a higher proportion of residential buildings in a Swahili street does not support a higher diversity of outdoor activities. The Swahili society is closely-knit and relies heavily on the presence of residential dwellings to promote social interaction among its members. The dwelling unit acts as an intermediate and interconnecting element between the streets thus intertwining public and private spaces. The residential units offer settings for social activities such as taking coffee, and playing of games such as draft and dominoes. Such activities are usually conducted within verandahs on the front side of residential buildings. Verandahs are semi-public and are associated with a higher intensity of columns. Whereas a higher proportion of residential buildings and a higher intensity of columns are associated with a higher intensity of social activities at the local scale of a street, the study establishes an inverse relationship at the global scale of the town. The results reveal that a higher proportion of residential land use minimizes presence of strangers in the street space. Any stranger in such a space is perceived as a potential criminal and residents behave territorially in excluding strangers from it (Newman, 1972). Contrary to this, presence of strangers in space contributes to increased surveillance and improved sense of security (Hillier, 1988; Jacobs, 1961; Alexander, 1977). This dominance of residential land use in Swahili streets impedes diverse interactions and thus significantly minimizing intensity of human outdoor activities. This study's finding is consistent with that of Makworo (2012) which establishes that a diverse mix of land use activities enhances pedestrian activities in public space.

5.1 Conclusion

This paper has established a significant relationship between human activities and urban design characteristics of Old Town Mombasa. These characteristics include width of a street; average building height; constitutedness of space as indicated by average height of windows and the intensity of doors at ground level of adjacent buildings; proportion of residential buildings and intensity of columns. Human activities in space depict the social life of a community. In the case of Old Town Mombasa, this social life is a strong attribute of the Swahili culture.

Revitalization of streets of Old Town Mombasa to make them better people places requires urban design to focus its action on four areas. One, the width of street, in relation to the adjacent buildings, should be of appropriate size. The wider the better but not unnecessarily wider as this jeopardizes street scale. Two, urban design should recognize that increased density of settlement accorded by higher building heights is desirable as it results in a more vibrant social life in the streets. However, street space at the ground level should be adequate to accommodate the

increased numbers of users so as to avoid overcrowding. Three, the streets should be more accessible, both physically through doors and visually though windows, from the adjacent buildings. This results in improved surveillance of and sense of security in the street space. Four, there should be a diverse mix of compatible land use activities characterizing a street. Predominance of residential land use constituting a street should be avoided as this minimizes the diversity of human interactions in the space.

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