Aspects of Building Typology and Their Influence on the Location of Economic Enterprises in Obunga Informal Settlement, Kisumu City

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Abstract In a rapidly evolving settlement, finding an ideal location which satisfies all the factors an entrepreneur would consider in locating an economic enterprise isn't an easy resolve. A business owner would like to have guarantee of maximum returns considering various factors and therefore, the analogy of comparative advantage comes to play. The study explores aspects of building typology and its impact on the location of economic enterprises in Obunga Informal Settlement in Kisumu city. It was guided by the systems theory, cross-sectional survey research design, multi-stage and stratified sampling techniques. The target population comprised of 211 economic enterprise owners (operators) which included 106 operators of retail shops, 39 operators of M-pesas, 30 operators of food kiosks and 36 operators of barbershops and salons. The corresponding sample size included 176 economic enterprise operators which included 80 operators of retail shops, 36 operators of M-pesas, 28 operators of food kiosks and 32 operators of barbershops and salons. A multilinear analysis results were presented using a model summary table, analysis of variance (ANOVA) regression model was used to test the corresponding hypothesis. Findings indicated a significant relationship between aspects of building typology and location of economic enterprises (F=10.824, critical value=2.094, α=0.05). This relationship was contributed by: house rent (β=-0.435, p=0.00), construction materials (β=-0.239, p=0.021), cost of building construction (β=-0.209, p=0.049), tenure status (β=-0.96, p=0.375), room size (β=-0.104, p=0.339), building accessibility (β=-0.129, p=0.270) and access to basic amenities (β=-0.07, p=0.095). The study concluded that the investigated aspects of building typology serves a key role in determining the location and resulting spatial pattern of economic establishments. The study recommends recognition of informal settlement's economic enterprises for spatial planning in respect to the various aspects of building typologies.

Keywords Building Typology, Economic Enterprises, Obunga Informal Settlement, Kisumu City

1. Introduction

1.1. Conceptualization and Review of Literature

Building typologies play a critical role in locating economic enterprises. Their evolvement over time in terms of space and the materiality lends them to characteristics associated with a sense of permanence (McCartney & Krishnamurthy, 2018). Similarly, informal settlements from different time periods vary according to levels of investment in buildings and on the other hand economic activities. McCartney (2012) identified six main types of building conditions within informal settlements that reflect duration, investment, and tenure: developer built, formally built multifamily building, self-built permanent, self-built semi-permanent, existing formally built tenement, and self-built shack. Permanent building can be either developer or self-built, sometimes to code, using durable building materials, although likely without foundations, whereas temporary structures do not have secure foundations and are typically constructed from nonpermanent building materials (such as iron sheets, cardboard or tarpaulins). These typology of building conditions call attention to the range of building forms observable within informal settlements (McCartney & Krishnamurthy, 2018).

A combination of various aspects of building typologies defines optimal location and the spatial pattern of economic enterprises in a settlement. For instance, a study by Faccarello (2015) indicated building rent as an important factor of consideration, where merits outweigh demerits. However, in the case of insecurity, rent becomes less decisive in locating an economic enterprise (Chawdhury, 2016). For this reason, therefore, political factors should not be sidelined when formulating policies for locating formal and informal economic enterprises.

A study by Kenya National Bureau of Statistics (2013)

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established that the type of construction materials used in flooring, walls and roofs indicate the extent of economic enterprise protection from insecurity and other environmental hazards. The permanence of building materials used to create structures indicates the rate of expected transformation and sense of safety for business investment. For example, investment in shelter through iron sheets or cardboards indicates nonpermanent solutions, whereas a house made of brick and mortar indicates greater investment and thus more stability (McCartney & Krishnamurthy, 2018). A study by Nyakeriga (2016) established the major factors that influence nature of building in Langas informal settlement of Eldoret. The findings of the study indicated a strong relationship between nature of building (construction materials, size, and access to basic amenities), land tenure and household income levels. While this study didn't directly compare nature of building with location of economic enterprises, it gives an insight on factors that in the long run may be a barrier or enabler for economic development within informal settlements. The UN-Habitat (2005) established that Obunga and Bandani informal settlements exhibit the highest density of housing structures, with more than 80 percent of plots built largely with mud walls and old, re-used corrugated iron sheets. This building typology responds to the needs of the poor resident who unfortunately can't afford decent housing elsewhere. Further, Turley, Saith and Bhan (2013) indicated that the ability to access basic amenities such as connections to water supply, electricity, and waste disposal determine safety, health and wellbeing of occupants as well as influencing the ability to invest in business opportunities.

Additionally, block types determine the spatial location of economic enterprises. A study by Joosten and van Nes (2005) examined the influence of block types on natural movement of economic processes with an intension of understanding how micro-spatial conditions determine the dispersal of shops and cafes in Berlin. The results of the study revealed that block typology has a strong influence on the dispersal of shops and catering enterprises. The study also established that block sizes and public transport hubs correlate less well with the presence of economic enterprises. Furthermore, building accessibility and related infrastructure are important drivers for business location.

A study by Litman, (2019) found out that the drivers include connection to the road network and/or public transportation, the accessibility for consumers, suppliers and availability of parking lots and costs of parking. Narvaez, Penn, & Griffiths (2014) established that a combination of building rent and accessibility encourages people to re-adapt urban spaces for economic benefits. Equally as accessibility and connectivity of settlements, the status of building ownership defines the ability of business operators to uphold the legal division of property and the possibility of eviction shapes the location and resulting spatial patterns (Sotomayor, 2015).

A study by Bull (1998) on the effects of location and other attributes on the price of products which are place sensitive in demand established that room sizes and architectural style influences business location. This in turn determines the amount of rent payable by tenants (Wickramaarachchi, 2016). Location decisions also depend on competitors, whose presence can either produce negative effects of competition or positive effects of higher demand brought about by cluster destinations (Sevtsuk, 2014). Additionally, availability of factors of production such as land, labor and capital play a critical role in siting economic enterprises (Hanink, 2017). This involves the physical characteristics of site and proximity to services such as water and sanitation, electricity and disposal sites; capital, which is an important factor for business growth and expansion; and labor to facilitate business operations in regards to buying and selling (Janeska-Iliev & Debarliev, 2015). Therefore, it can be argued that a site that can best offer these attributes attract more businesses. However, in the case where the activities are unregulated may lead to diseconomies of scale, and space becomes congested, polluted and enclaves of crime. On the other hand, economies of scale lead to 'spatial competition', which in turn leads into increased land prices. On other instances, commercial activities cluster in certain sites due to agglomeration effects. This makes it easier for firms to share services, raw materials, infrastructure and market (Marciniak, 2014). In as much as localization is important, economic enterprises in the informal settlements thrive evading competition as well as taxation (Jones, 2019). Therefore, some of the vendors may resort into being mobile especially when competition is stiff or tax unaffordable.

From the foregoing exploratory review, it is apparent that most past studies acknowledge location of economic enterprises is depended on a combination of various aspects of building typology. However, a scarcity in literature still exists on the extent to which these factors influence the location of business in spontaneous settlements. Additionally, though studies have been carried out in the informal settlements of Kenya and Kisumu in particular, their scope were basically limited to establishing the major factors that influence nature of building (Nyakeriga, 2016), challenges facing the sustainability of slum upgrading projects and Situation Analysis (UN-Habitat, 2005). This study therefore bridges this gap by exploring the economy of Informal Settlements in Kisumu city, a case of Obunga.

1.2. Research Objective and Hypothesis

Based on the identified research gap, the objective of this study was to explore the relationship between selected aspects of building typology and the location of economic enterprises in Obunga informal settlement, Kisumu city. The null hypothesis was that there was that there is no significant relationship between selected aspects of building typology and the location of economic enterprises in Obunga informal settlement, Kisumu city.

1.3. Theoretical Framework

The study was guided by the space syntax theory which was originally conceived by Ludwing von Bertanlanfy in 1940s as a model that accommodates interrelationships and overlap between separate components. The theory was anchored on the principle of integration of various aspects of a problem. The argument was that, problems cannot be solved well if considered as isolated entities from interrelated components (Pidwirny, 2006). This study is founded in the principles of systems theory which posits that a system is an assemblage of interrelated parts that work together by way of some driving process (Pidwirny, 2006). The world is thus regarded as self-regulating and self-correcting through feedback (Olsson, 2004). The argument in this theory underpins that a system is made of smaller units (sub-systems) that must function together to achieve a certain objective. This implies that incase one of the units fails, then the entire system is in jeopardy. In this study, Obunga informal settlement is regarded as a system comprised of economic activities that make life worthwhile. Location of these activities often depend on various sub-components which affect their functionality. The interrelation of these sub-components makes up a web of relationships making up an entire system (Pidwirny, 2006). The view of systems shall thus enable understanding of the extent to which various components influence location of economic enterprises.

2. Methods and Materials

2.1. Description of the Study Area

Obunga is located in Kisumu County of Kenya. The County abuts Siaya county to the west, Kericho county to the East, Homabay county to the south, and Vihiga and Nandi to the north. Obunga is approximately 1.39 sq.km and is situated 2 km north of the city center of Kisumu. It is located in East Kisumu sub-location and encompasses five smaller areas namely: Central 1, Central 2, Kamakowa, Kasarani and Sega. Obunga is named after the flowers that used to grow along a stream that flows through the settlement. It abuts Lolwe estate and Kondele to the west, Tom Mboya estate and Industrial Area to the south. It was formed when the colonial government forced the inhabitants out of Kisumu. Its population grew when it developed as a fish market, as the economy of Kisumu expanded (Karanja, 2010). Obunga has a high density of building structures made up of mud and iron sheets (UN-Habitat, 2005). The settlement is adjacent to the city's industrial area, and many of its inhabitants are from surrounding rural areas and migrated to the slum in the hope of finding work at the Kenya Breweries factory (Maoulidi, 2012).
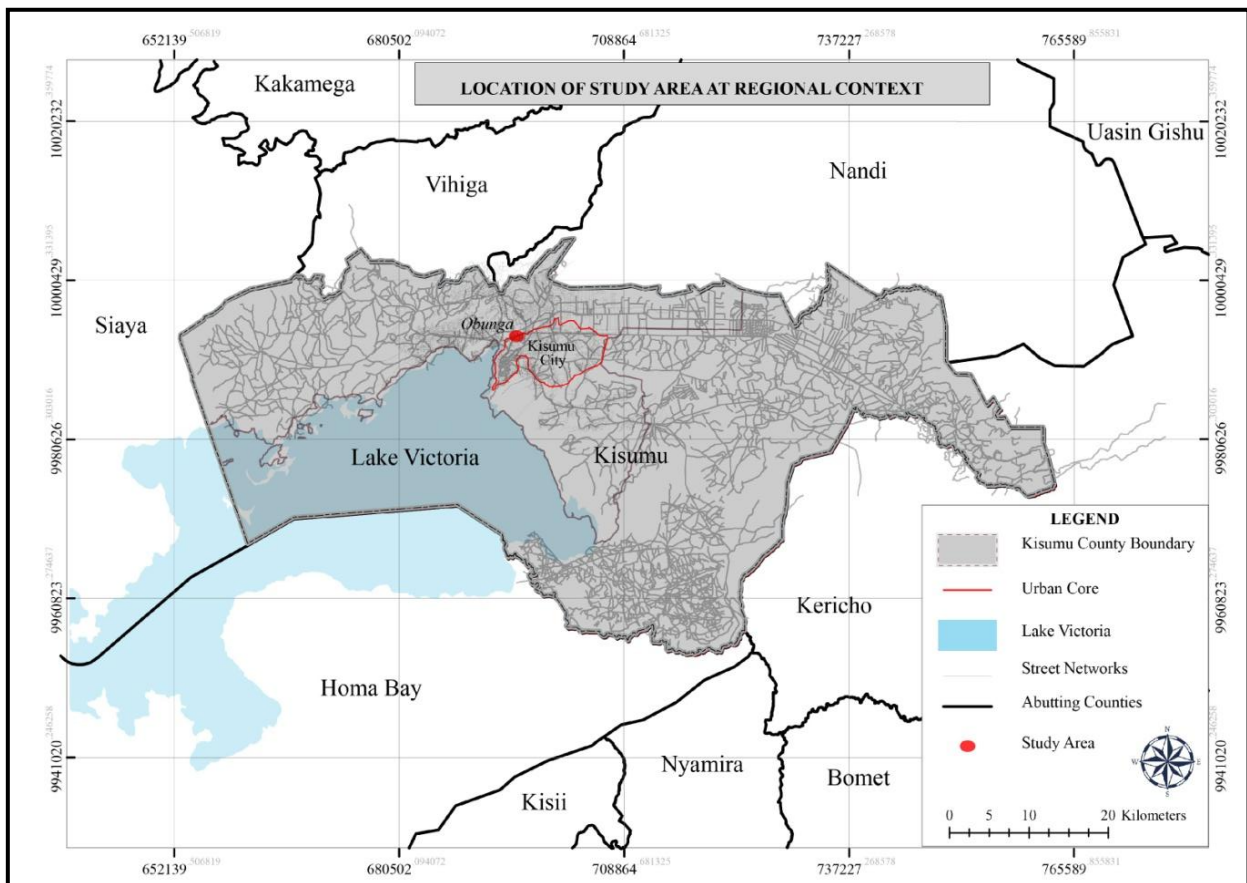

Figure 1.   Location of Obunga in a regional context

2.2. Research Design

This study adopted a cross-sectional survey research design. A cross-sectional study involves investigation of the research issue within a specified time frame (Aggarwal & Ranganathan, 2019) and allows respondents to describe and report the state of the variables and also allows the use of both quantitative and qualitative data (Ponto, 2015). This research design also involves asking questions on the what, when and how of a phenomenon (Hammarberg, Kirkman, & Lacey, 2016). Therefore, the study involved a survey of economic enterprise types and street networks existing in Obunga informal settlement. The opinion of respondents was sought, especially on the factors influencing economic enterprises location in the areas.

2.3. Target Population

Asiamah, Mensah, and Oteng-Abayie (2017) defines target population as a population from which results are generalized. It is also the total collection of all items in any field of study (Kothari, 2013). In this study, the target population comprised of 259 business operators (owners) from Obunga informal settlement categorized based on type of activity. This included 106 retail shops, 39 M-pesas, 30 food kiosks, 36 barbershops and salons, 16 textile shops, 7 butcheries, 3 chemists, nine entertainment shops, 7 bars, 4 cyber cafes and two welding shops. According to Yin (2002), this categorization approach is necessary where multiple sources of evidence is required. From the listed businesses, the study considered enterprises with more than 30 tallies for further examination thus, the target population totaled to 211 (extracted from retail shops, food kiosks, M-pesas and barbershops and salons). According to Kothari (2013) a large sample items of 30 and above renders sampling distribution of mean closer to the normal distribution. In accordance with the theories of optimal location, the number of economic establishments reflects their frequency of visits (Chang, 2004). Based on the tallies indicated therefore, it can be concluded that retail shops, M-pesas, barbershops and salons, and food kiosks, are most frequented by customers and hence represent a good target for the study.

Using the Krejcie and Morgan (1970) table of sample size determination, the samples selected.

Table 1. Selected sample size

Type of Enterprise	No. of tallies	Sample size
Retail shops	106	80
M-pesas	39	36
Food kiosks	30	28
Barbershops and salons	36	32
TOTAL	**211**	**176**

NB: The selected sample represents economic enterprise owners (operators)

2.4. Methods of Data Collection

Data was collected through questionnaires which is a survey instrument used to collect information from individuals about themselves or a social unit such as household (Kabir, 2016). A semi-structured questionnaire was administered to business owners. Questionnaires are justified for use as they allow for collection of basic descriptive information from broad samples (Kothari, 2013). Therefore, the questionnaire was designed to capture data in accordance with the research objective. Questions were mostly closed ended. Sreejesh, Mohapatra, and Anusree (2014) observed that closed ended questions are easy to administer and easy for the process of tabulation and analysis as it limits the respondents to the choices provided.

2.5. Method of Data Analysis

A multiple regression analysis was used to determine the extent to which independent variables (aspects of building typologies) predicted the dependent variable (location of economic enterprises). In a multiple linear regression, there are p independent variables, and the relationship between the dependent variable and the independent variables is represented by the following equation ((Pounis, 2018):

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + ... + \beta_p x_{pi} + e_i$$

Table 2. Skewness and Kurtosis statistics of selected aspects of building typology

	Tenure status	House rent	Construction materials	Room size	Cost of building construction	Security	Building accessibility	Basic amenities
Skewness	1.131	.876	.384	1.035	.035	1.314	.931	1.169
Kurtosis	1.540	.080	-.711	1.065	-.639	1.634	1.559	1.574

The X's are the independent variables and Y is the dependent variable. The subscript j represents the observation (row) number. The β's are the unknown regression coefficients. To test for the corresponding hypothesis of this study, Kothari (2013) recommends the use of F-test in judging the significance where multiple correlation coefficients are involved. Thus, a multilinear regression ANOVA model was computed to give F-values. Null hypothesis was thus tested after comparing the F-values with critical values of F- distribution table at 0.05 significance level.

3. Results and Discussions

The study sought to determine the relationship between selected aspects of building typology and location of economic enterprises. Respondents were required to express

their perceptions in a Likert scale formulated question, the extent to which house rent, tenure status, cost of construction, construction materials, security, room size, accessibility and access to basic amenities influence location of economic enterprises. A multilinear regression model was thus developed to determine the impact of the independent variable on dependent variable.

3.1. Normality Test

The normality of data distribution was assessed by examining its skewness and kurtosis. The results in Table 4.11 shows that variables are normally distributed with skewness and kurtosis values ranging between -3.0 and +3.0. This implied that the study variables were normally distributed and hence further tests can be carried out on the data.

3.2. Test of Hypothesis on Selected Aspects of Building Typology

Hypothesis: H01: *There is no significant relationship between selected aspects of building typology and the location of economic enterprises in Obunga informal settlement.*

The study carried out a regression analysis to establish the statistical significance relationship between the independent variables. Thus, multiple regression ANOVA Table and beta coefficients were calculated.

$$Y = a + B_1 * X_1 + B_2 * X_2 + B_3 * X_3 + B_4 * X_4 + B_5 * X_5 + B_6 * X_6 + B_7 * X_7 + B_8 * X_8 + e$$

Table 3.   Aspects of Building Typology Multilinear summary model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662a	.438	.398	.871

From the findings of the study as indicated in the model summary Table, the regression coefficient of determination (R^2) is 0.438 and R is 0.662 at 0.05 significance level is an indication that the eight independent variables namely: Tenure status (X_1), House rent (X_2), Construction materials (X_3), Room size (X_4), Cost of building construction (X_5),

Security (X_6), Building accessibility (X_7), basic amenities (X_8) were significant in predicting the location of economic enterprises. The coefficient of determination indicates that 66.2% of the variation on location of economic enterprises can be predicted by independent variables notable: Tenure status (X_1), House rent (X_2), Construction materials (X_3), Room size (X_4), Cost of building construction (X_5), Security (X_6), Building accessibility (X_7), basic amenities (X_8). The remaining 39.8% can be explained by other factors that determine the location of economic enterprises but are not included in this analysis.

Table 4.   Multilinear Regression ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	65.736	8	8.217	10.824	.000b
1	Residual	84.264	111	.759		
	Total	150.000	119			

The ANOVA Table above indicates that the F-value of the model was 10.824 which is a high value. Also, the p-value showed a value of 0.000 which is less than the 0.05 significance level. Therefore, the result is significant at p<0.05 which indicates that the model is good and can be relied upon.

To test the hypothesis in a case were more than two independent variables are used to predict the depended variable (Kothari, 2013) recommends the use of F-test in judging the significance of multiple correlation coefficients. The calculated F value (10.824) was greater than the critical value 2.094 at α=0.05 significance level. Therefore, the hypothesis that there is no significant relationship between aspects of building typology and location of economic enterprises in Obunga informal settlement is rejected. This therefore implies that the factors used in the study are significant factors of consideration in predicting the location of economic enterprises in Obunga. Multiple regression coefficients can thus be written as (Table 5):

Enterprise location = $5.696 - .096X_1 - .435X_2 - .239X_3 - .104X_4 - .209X_5 - .070X_6 - .129X_7 - .169X_8$

Table 5.   Multilinear Regression Coefficients (location of economic enterprises)

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	5.696	.368		15.457	.000
	Tenure status (X1)	-.096	.107	-.076	-.892	.375
	House rent (X2)	-.435	.087	-.362	-5.010	.000
	Construction materials (X3)	-.239	.102	-.195	-2.335	.021
1	Room size (X4)	-.104	.108	-.085	-.961	.339
	Cost of building construction (X5)	-.209	.105	-.183	-1.994	.049
	Security (X6)	-.070	.121	-.055	-.576	.566
	Building accessibility (X7)	-.129	.116	-.091	-1.109	.270
	Basic amenities (X8)	-.169	.100	-.139	-1.684	.095

3.3. Influence of Tenure Status on the Location of Economic Enterprises

Results from Table 4.14 indicate a non-significant relationship between tenure status and location of economic enterprises (β=-0.096, p=0.375). This indicates that decrease in tenure status would result into 9.6% decrease in locations of economic enterprises.

3.4. Influence of House Rent on the Location of Economic Enterprises

Results indicate a significant relationship between house rent and location of economic enterprises (β=-0.435, p=000). This affirms that a decrease in house rent would result into an increase in locations of economic enterprises by 43.5%. Thus, business operators would consider to locate their enterprises in buildings with relatively lower rents.

3.5. Influence of Construction Materials on the Location of Economic Enterprises

Findings in this aspect of building typology portrays a significant relationship with location of economic enterprises (β=-0.239, p=0.021). Therefore, decrease in quality of construction materials would result into increase in locations of economic enterprises by 23.9% in Obunga informal settlement. This is because, use of quality materials might result into increase in house rent which has a negative impact on location of businesses.

3.6. Influence of Room Size on the Location of Economic Enterprises

Results display a non-significant relationship between room size and location of economic enterprises (β=-0.104, p=0.339). This implies that a unit decrease in room size would result into decrease in locations of economic enterprises by 10.4%. The implication here is that enterprise operators are likely to consider locating their enterprises in buildings with relatively larger space.

3.7. Influence of Cost of Construction on the Location of Economic Enterprises

Findings indicate a significant relationship between cost of building construction and location of economic enterprises (β=-0.209, p=0.049). Therefore, a decrease in the cost of construction would result into an increase in locations of economic enterprises by 20.9%. Low construction cost means that people can invest in more buildings where economic enterprises can operate.

3.8. Influence of Security on the Location of Economic Enterprises

The study reveals a non-significant relationship between security and location of economic enterprises (β=-0.070, p=0.566). This indicates that a decrease in security would result into decrease in locations of economic enterprises by 7%. Thus, insecure places are likely not to attract location of any economic enterprise.

3.9. Influence of Building Accessibility on the Location of Economic Enterprises

A non-significant relationship exists between building accessibility and location of economic enterprises (β=-0.129, p=0.270). This indicates that decrease in building accessibility leads into a decrease in locations of economic enterprises by 12.9%.
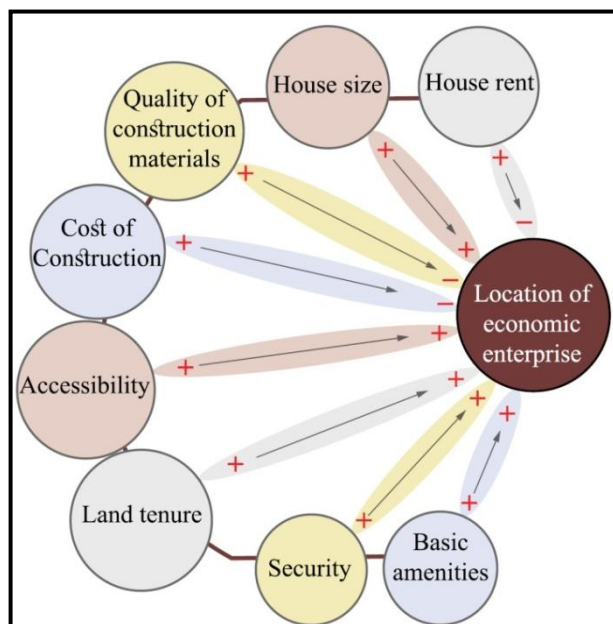
3.10. Influence of Access to Basic Amenities on the Location of Economic Enterprises

Access to basic amenities indicates a non-significant relationship with location of economic enterprises (β=-0.169, p=0.95). Thus, decrease in basic amenities would result into a decline in locations of economic enterprises by 16.9%. This implies that in order to attract more locations for economic enterprises, basic amenities must be provided. These amenities may include but not limited to electricity, water, drainage and waste management systems.

3.11. Discussion of Results

The study investigated the impact of selected aspects of building typology on the location of economic enterprises. Findings indicated that decrease in house rent would result into an increase in locations of economic enterprises by 43.5%. As indicated by World Bank (2019) increase in building rent is a big threat to the poor urban dwellers who in most cases can't afford decent structures to operate their businesses and live in. Thus, business operators would consider to locate their enterprises in buildings with relatively lower rents. Similarly, the study established that cost of building construction influences location of economic enterprises. Findings indicated that a decrease in the cost of construction would result into an increase in locations of economic enterprises by 20.9%. Past studies have indicated that the cost of building construction influences house rent (Okoronkwo, 2011) which in turn influences location of economic activities (Chawdhury, 2016). Further, results on construction materials indicated that use of substandard materials of construction in buildings would result into increase in locations of economic enterprises by 23.9% in Obunga informal settlement. This however disagrees with the findings of (McCartney & Krishnamurthy, 2018) who indicated that use of permanent building materials enhances safety and results into more business investment. Though the findings are different, there are facts that use of permanent materials could lead to increased house rents (Faccarello, 2015), which might prove too expensive for the poor business owner to afford. For example, buildings built of iron sheets indicates non-permanent solutions, whereas those made of brick and motor indicates greater investment (McCartney & Krishnamurthy, 2018), thus, they will charge more rent than the non-permanent buildings.

Additionally, the study established that tenure status, room size, building accessibility and access to basic amenities had non-significant negative relationship with location of economic enterprises. This implies that decrease in the aforementioned aspects would result in decrease in locations of economic enterprises by 9.6%, 10.4%, 0.7%, 12.9% and 0.7% respectively. These findings are in agreement with those of Litman, (2019) who found out that building accessibility through connection to the road network and/or public transportation, enhances access by consumers and suppliers hence more economic enterprises; Narvaez, Penn, and Griffiths (2014) who established that status of building ownership defines the ability of business operators to upholds the legal division of property and the possibility of eviction which Sotomayor (2015) indicates that - it shapes land use development. The study further agrees with the findings of Turley, Saith and Bhan (2013) who established that access to basic amenities such as connections to water supply, electricity, and waste disposal determine safety, health and wellbeing of occupants influences the ability to invest in business opportunities. Finally, the study agrees to the findings of Wickramaarachchi, 2016) who established that room sizes within which a business operates influences location; as well this also influences the amount of rent payable. In a systems approach, it can be concluded that these aspects function to make both positive (increase) and negative (decrease) loops that influence the location of economic enterprises in Obunga informal settlement.

Figure 2. Causal loop diagram of aspects of building typology and the location of economic enterprises

4. Conclusions

The study findings did confirm that there exists a significant relationship between dependent and independent variables subjected in this study. The study concludes that the selected aspects of building typologies influence the location of economic enterprises in Obunga. Therefore, house rent, accessibility, cost of construction, construction materials, room size, security, access to basic amenities and tenure status determine the location and resulting spatial pattern of economic establishments. Based on these findings, the study recommends a participatory approach and public private partnerships in planning for economic activities. This approach will provide sustainable solutions in the provision of basic amenities, construction of better housing, security, accessibility, land tenure, room size as well ensure a secure land tenure system. Provision of low-cost commercial buildings at an appropriate scale and rate will help in avoiding more informalities. This can be achieved by reducing the cost of construction materials as well as tapping on local construction technologies, skills and materials. The use of local resources will reduce transportation and associated costs which cuts down cost of construction and in the long run result into relatively affordable rents and improves business environment.

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