FACTORS AFFECTING COST OF SINGLE FAMILY DWELLINGS IN BRYAN AND COLLEGE STATION, TEXAS WITH EMPHASIS ON CURB APPEAL

A Thesis

by

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ABSTRACT

The purpose of this study is to ascertain whether curb appeal has any effect on the property value of a single family dwelling. Curb appeal is generally defined as the general attractiveness of a house or other piece of property from the sidewalk, often used by home builders or realtors to evaluate a piece of property. It continues to be used as an indicator of the initial appeal of a property to prospective buyers. For this study, curb appeal has been measured by the level of maintenance of front yard, external features of a house (as viewed from the street side), landscaping, and territorial personalization of the yard. Some known predictors of the property value of a single family dwelling, such as total built-up area, the number of bedrooms and bathrooms, lot size, and location has been included in the statistical model for the study a sample of 112 single family dwellings from twelve neighborhoods in two neighboring towns in Texas, USA. The statistical technique used for data analysis is General Linear Modelling. Results show a statistically significant relationship between curb appeal and property value of single family dwellings in Bryan & College Station, Texas.

DEDICATION

I dedicate my thesis study to the three most important people in my life

Mr. Mahesh T. Wadhwani

Mrs. Roshni M. Wadhwani

Mr. Kushaal M. Wadhwani

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CHAPTER I

INTRODUCTION

From a Buyer's perspective, one should be able to find a reliable source to be able to estimate the value of a property. The customer should be able to figure out what are the major factors that are affecting the price of the property at the time of purchasing the desired house. From a Builder's perspective, one should be able to feed the customers' needs and also know on what basis a potential customer evaluates a property to be able to cater to specific needs.

Property values depend on the various different factors and amenities provided in single home dwellings namely- the size of the dwelling and lot size, a number of bedrooms and bathrooms, year of construction, quality of the neighborhood, accessibility to schools, presence, and appearance of the front yard, etc. (Chin and Foong, 2006)

Landscaping has become an important part of residential construction today. Realtors are claiming curb appeal to be an important aspect affecting property value. Curb Appeal is defined as the visual attractiveness which a house, commercial establishment, or other real estate property has when initially seen by a prospective buyer or other person standing in front of the property "at the curb" ("Curb appeal dictionary definition," 2016). This term is often used by homebuilders or realtors to evaluate a piece of property. However, empirical research to prove or disprove this theory needs more detailing.

Residents use their front yards for an area of personal outdoor enjoyment. Each person views enjoyment differently, and thus the perception to what can be personalized in the space varies. This level of personalization is to satisfy the people living there. Landscaping and personalization are important components while considering buying a house – even as a social symbol. This clearly defines the attributes of appeal to a person and could be improved with an eye for detail and care in your private outside space.

This research is aimed at determining whether or not curb appeal affects the value of a property holding a single home dwelling in Bryan & College Station in Texas. It is a rapidly growing University area catering to the needs of a population of approximately 228,660 as per 2010 census.

CHAPTER II

PROBLEM AND RESEARCH SETTING

Objectives of study

Curb appeal has been used as a criterion for evaluation of the housing sector but it has not been determined whether or not, this variable actually has an impact on the cost of housing. This study aims to ascertain whether or not curb appeal, being a qualitative factor, affects the property value of a single family dwelling. This study aims to conduct an analysis to determine if curb appeal alone, in the presence of other physical attributes such as number of bedrooms, number of bathrooms, plot area, etc., has any effect on the property value of a single home dwelling in the cities of Bryan and College Station in Texas.

This research aims at being able to provide both buyers and sellers a means to anticipate the effect of each of the variables affecting the price of a property listing. This not only enables these two groups to efficiently tackle the price variation problem but also supports both realtors and builders focus on the right criteria in order to negotiate a better price of the property that would be constructed or remodeled and to meet customer satisfaction limits. In particular, this research concentrates on being able to provide an answer to the question, whether or not the exterior visual appeal of a property has a direct relationship with its cost.

Review of literature

Socio-environmental attributes of open spaces in the property have seemed to influence the satisfaction levels of residents in a neighborhood. The collective efficacy of a neighborhood has a lot to do with the safety, social order and tentative crime and violence rates of different social groups in the neighborhood. A person residing or wanting to reside in a neighborhood weighs these factors with a high importance level to be able to want to live in a peaceful environment. It is considered to be an indicator of the social standing of residents. (Choudhury, 1997; Salleh, 2008).

Qualitative factors have been difficult to define and measure as they have been judged based on perception by individuals. Curb appeal has been difficult to measure and the challenge of measuring it was overcome by a survey instrument to measure the multidimensional concept of curb appeal by Freybote, et al. (2016). Another study by Wachter (2004) depicts the increase in housing value and its translation revenue by improving vacant land around the houses in New Kensington area. This study aimed to establish and analyze the determinants that contribute to neighborhood transformation to increase the overall curb appeal of a community.

Hofman, et al. (2006) have stated the importance of understanding how potential buyers of new houses prioritize different elements of a house to measure the trade-off between different housing attributes. Eventually, these factors have to be able to satisfy or dissatisfy the expectations of the potential buyers in their properties. Though curb appeal is stated to be very important and highly impactful while buying or selling a

house, it has been neglected in real estate literature and not too much research has been done to quantify it.

Rodriguez & Sirmans (1994) have established that homes with better visually appealing front yards are preferred to those that are relatively less visually appealing. Various attempts have been made to find a relationship between the landscaping and environmental factors affecting housing and the housing prices and the indices. All these attempts approach the problem with an assumption that the property value depends on particular attributes of a house or apartment complex (Boris, et al., 2009).

Curb appeal is perceived to show the kind of people living in the neighborhood and the quality of the neighborhood (Taylor et al., 1976; Verschure et al., 1977; and Sadalla et al., 1987). To understand a buyer's inclination toward a property value, the most successful method shown is through indirect investment decisions. Translation of resident satisfaction levels into personalization levels of private outside space increases the overall curb appeal of the area and how inviting the visual appeal of the individual dwellings and the neighborhood, on the whole, seem to be projected (Choudhury, 1997).

An empirical study to find out the effect of private outside space on a property value was conducted by Choudhury, et al. (2011) and was validated with other general price determinants. This study showed a positive effect and statistical correlation of at least one of the attributes of private outside space over the property value of a single home dwelling. Another study shows how landscaping design and sophistication affect the perceived value of a property. This study established that increased expenditure on

landscaping will increase the curb appeal of a property and help differentiate a home in a subdivision, in turn attracting potential buyers into a home (Niemiera, 2009).

Bessinger & Jacobs (2016) have observed that existing models to estimate the cost of a house put more emphasis on the physical factors and ignore the major criterion of curb appeal. This research has used several approaches, which use imagery as a primary means of data collection and have established that a combination of both, the objective attributes and curb appeal give a price more accurately applicable to the listing. In this study, the authors have used three different regression techniques for three different methods of pricing a house – linear regression, ridge regression, and random forest regression. Each of these methods is used to establish the price of the houses using objective data, imagery data and a combination of both. The authors have determined a correlation between exterior appearance and price of houses and have concluded that this study has been very promising to understand urban housing and can be extensively used in demographic prediction of the price of houses at an additional cost of incorporating image features to prediction models.

Chen, et al. (2013) discovered that an increase there is an increase of 7.7% in the sale price for each one point increase in the mean attractiveness rating, with a 3.9% higher impact on the listing price as well.

Problem statement

Curb appeal is being used as a criterion for evaluation of the housing sector but it has not been determined whether or not this variable actually has an impact on the cost of housing. This study aims to ascertain whether or not curb appeal, being a qualitative factor, in the presence of other physical factors, affects the property value of a single family dwelling.

The area around Texas A&M University has been selected for this research. There is a wide spread of property types that constitutes the town limits of Bryan-College Station. Single family dwellings have been selected so as to be able to clearly quantify the effect of curb appeal on the property value, as these types of properties do not have front yards shared with other properties, unlike apartment complexes and university housing provisions.

Research question

Does curb appeal affect the property value of single family dwellings in Bryan/College Station, Texas?

It is common to wonder what would be an appropriate price for a house while negotiating to buy it. This research aims at being able to provide both buyers and sellers a means to be able to anticipate the effect on the listing of concern. This enables both buyers and builders to tackle the price variation problem efficiently and would also aid realtors and builders determine the factors to focus upon to gain higher profits during the sale of a property that would be constructed or remodeled to meet customer satisfaction limits. In particular, this research concentrates on being able to provide an answer to the

question, whether or not the exterior visual appeal of a property has a direct relationship with its cost.

Research hypothesis

This study hypothesizes that curb appeal of a single family dwelling, even in the presence of other physical attributes, has a positive effect on the cost of the single home dwelling.

Limitations and delimitations of study

This study is delimited only to study the effect of curb appeal on the property value of a single home dwelling and not any other variables. It is assumed that other factors such as plot area, built-up area, the number of bedrooms, the number of bathrooms, etc. have already been established as significant factors that affect property value.

The limitations of this study are as follows:

- It tests the hypothesis only for a sample size of 112 single home dwellings over 14 neighborhoods, 7 neighborhoods from each city and 8 single home dwellings from each neighborhood chosen in Bryan and College Station in Texas;
- It ignores the aesthetics of the façade of the single home dwelling
- It ignores variability in cost of a property at different times of the year (for example, the price variation of a listing during summer and winter is not considered); and
- It does not consider variability in the listed value of the dwelling from different sources

CHAPTER III

VARIABLES AND THEIR OPERATIONALIZATION

Following, is a description of variables that have been used in this research:

- Town - Categorical variable describing in which town the single home dwelling is located;
- Neighborhood - Categorical variable describing in which neighborhood the single home dwelling is located;
- Plot Size (SF) - Area of the land on which the single home dwelling is built;
- Area (SF) - Built up area of the single home dwelling;
- Bedrooms - Count of the number of bedrooms in the single home dwelling;
- Bathrooms - Count of the number of bathrooms in the single home dwelling;
- Cost (USD) - Cost of the single home dwelling;
- Maintenance Rating - Perspective rating of how "well maintained" the front yard of the single home dwelling is;
- Presence of Address label - Binary variable to show whether or not an address label is present to locate the single home dwelling;
- Walkway leading to the front door - Binary variable to show whether or not there is a pathway leading to the front door;

- Concrete Pavement leading to the garage - Binary variable to show whether or not there is a concrete pathway leading to the garage, if any;
- Potted plants - Binary variable to show whether or not there is presence of any potted plants in the front yard of the single home dwelling;
- Defined edging - Binary variable to show whether or not there is presence of a defined edge from the garden area that separates the walkway to the front door and the concrete pathway to the garage;
- Flower beds - Binary variable to show whether or not there is presence of any flower beds in the front yard of the single home dwelling;
- Sectioned plantation groups - Binary variable to show whether or not there is presence of any divided sections of different plant groups to increase the visual appeal of the front yard of the single home dwelling;
- Stone Walls & Hedging - Binary variable to show whether or not there is presence of a defined edge, using stone walls or specific hedging methods, from the garden area that separates the walkway to the front door and the concrete pathway to the garage;
- Trees – Small - Binary variable to show whether or not there is presence of any small trees (ideally within an approximate 8 ft height) in the front yard of the single home dwelling;
- Trees – Large - Binary variable to show whether or not there is presence of any large trees (ideally greater than an approximate 8 ft height) in the front yard of the single home dwelling;

- Shrubs – Small - Binary variable to show whether or not there is presence of any small shrubs (ideally within an approximate 2 ft height) in the front yard of the single home dwelling;
- Shrubs – Large - Binary variable to show whether or not there is presence of any large shrubs (ideally greater than an approximate 2 ft height) in the front yard of the single home dwelling;
- Door Décor - Binary variable to show whether or not there is presence of any door decor on the front door of the single home dwelling;
- Bird baths - Binary variable to show whether or not there is presence of any bird baths in the front yard of the single home dwelling;
- Fountain - Binary variable to show whether or not there is presence of any fountains in the front yard of the single home dwelling;
- Sculptures - Binary variable to show whether or not there is presence of any sculptures in the front yard of the single home dwelling; and
- Curb Appeal - The numerical sum of all the territorial markers (binary variables making up curb appeal)

These variables were majorly categorized into 3 types-

1. Physical Variables
2. Visual Variables
3. Categorical Variables

Physical variables are explained as those variables that can be measured directly. This classification of variables includes the plot size, area, number of bedrooms and number of bathrooms that can be seen and measured from the single home dwelling. This data was obtained from the realtor websites – Zillow, Realtor and Trulia.

Visual variables are explained as those variables that cannot be measured directly. An approach to measure these variables in binary form was taken in order to have a summation of these variables make up the variable called curb appeal.

Maintenance rating, though a variable based on perceptive rating, cannot be directly classified as a visual variable for this study as it is not measured in 0s and 1s, like the territorial markers. It is measured based on a scale of 1 to 5 – 5 being the best maintenance rating of the front yard of the single home dwelling.

Categorical variables in this study can be classified as the ones that defined the location of the single home dwelling. Town and neighborhood are the two categorical variables used in this study.

CHAPTER IV

METHODOLOGY

This research is staged into three phases as depicted in Figure 1:

Figure 1. Stages of Research

Data collection and sorting

Bryan and College station are towns built around the Texas A&M University and are located in Texas, USA. Bryan has 17 neighborhoods and College Station is consists of 25 such neighborhoods. Both of these towns are occupied by a variety of ethnic groups. During this research, data was obtained from realtor websites for houses in Bryan and College Station.

Realtor websites such as Trulia, Zillow and Realtor maintain data about property listings. These are is comprised of the physical properties of each of the housing unit such as year of construction, market list price, plot area, built up area, the number of bedrooms, the number of bathrooms, materials used for construction, etc.

The data collected were then structured and sorted to retain the neighborhood, plot size, area, number of bedrooms, number of bathrooms, year of construction and cost for the homes. After this, it had to be ensured that the visual attributes captured could be used as numerical data in a statistical data set. The visual data regarding attributes pertaining to private outside space and curb appeal of the area were gathered by personal visits to the site and had been recorded through photographs (taken with prior permission of owners) and personal observation. These were termed as territorial markers and 15 such markers have been established for further study.

A total of 112 houses had been selected randomly. For the data to be completely unbiased, 14 neighborhoods were selected at random from a total of 42 neighborhoods, 7 pertaining to each town were selected. From each of these neighborhoods, 8 houses had been randomly selected which met the minimum criteria of being single-family dwellings comprising at least 2 bedrooms. All these properties were selected using a combination of Google Maps, the official city's website, Zillow, Trulia, and Realtor; ensuring that there was no bias while selecting the houses. Trulia, Realtor, and Zillow had also been used to list out the physical variables of a property which are plot area, built-up area, the number of bedrooms, number of bathrooms, year of construction and list price. Physical variables are the variables considered to be tangible and can be easily counted. On the other hand, the visual variables are perception-based. In the course of this research, curb appeal and maintenance rating of a single family dwelling are considered as visual variables.

Once these houses were shortlisted, a personal visit to each house was made to photo document the yard front. These images were then sorted to observe a pattern of quantifiable variables, called territorial markers, as listed in table 1 below, observed as binary variables to create a dataset and check for the presence or absence of each of these markers in the single family dwelling under consideration. Then a summation of these variables was used to establish the value of the variable – "curb appeal" for each unit.

Territorial Markers

Presence of address label
Walkway leading to the front door
Concrete pavement leading to the garage
Potted plants
Defined edging
Flower beds
Sectioned plantation groups
Stone walls & hedging
Trees – small
Trees – large
Shrubs – small
Shrubs – large
Door décor
Bird baths
Fountain
Sculptures

Table 1. List of Territorial Markers

For the maintenance rating, the houses were observed and a perspective rating was given to each of them in an unbiased manner – the highest being 5 for the best-maintained units, the criteria being neatness, cleanliness, presence of healthy grass and plants; and absence of any weed or garden pests. The criteria also included spotting for

any conformance conflicts or breakage in the walkway, stairs leading to the doorway or garage pathway.

A preliminary statistical analysis of this data set was conducted. The mean of the cost of these houses was found to be $191,960 with a standard deviation of $77,608. Table 2 represents a portion of the dataset.

Slno.	Address	Town	Nieghbourhood	Plot Size (sqft)	Area (sqft)	Bedrooms	Bathrooms	Year of Construction	Cost (USD)	Maintenance Rating	Curb Appeal
1	3919 Old Oaks Dr,Bryan, TX 77802	0	0	11,326	1,510	3	2	1984	127,912	4	5
2	3915 Old Oaks Dr,Bryan, TX 77802	0	0	13,068	1,847	4	2	1983	154,529	5	9
3	3907 Old Oaks Dr,Bryan, TX 77802	0	0	12,632	2,267	4	2.5	1973	191,495	4	9
4	3703 Valley Oaks Dr,Bryan, TX 77802	0	0	9,897	1,478	3	2	1981	135,116	3	5
5	3604 Old Oaks Dr,Bryan, TX 77802	0	0	12,197	2,357	4	2	1976	206,701	4	8
6	2908 River Oaks Cir,Bryan, TX 77802	0	0	10,236	1,766	3	2	1974	146,262	5	10
7	2905 Oakside Dr,Bryan, TX 77802	0	0	9,375	1,630	3	2	1975	135,000	4	6
8	3804 Windridge Dr,Bryan, TX 77802	0	0	14,810	2,084	3	2	1972	179,500	5	10
9	2608 Manchester Dr,Bryan, TX 77802	0	1	10,489	2,162	4	2.5	1991	215,900	5	8

Table 2. Data Snapshot

Data analysis

The statistical software used for this study is the IBM SPSS Statistics. General Linear Modeling was the statistical technique used to test the relationship between the dependent and independent variables, in this case, being the combined effect the physical variables (plot size, area, number of bedrooms and number of bathrooms), categorical variable (town and neighborhood) and the visual variables (maintenance rating and curb appeal) on cost of single family homes. A General Linear Model is a form of ANOVA (Analysis of Variance) procedure used to test the statistical relationship between one or more predictors that could also be covariates and the continuous response variable. This is done using -1, 0, 1 coding scheme to code categorical variables to ease the process of analysis. Also, this Univariate ANOVA uses the least squares regressions approach to analyze the difference between factor level means using multiple comparisons ("6.1 - Introduction to Generalized Linear Models," 2017; "General Linear Models (GLM)," 2017). GLM was specifically used in this analysis because of the inclusion of the category variables of “Town” and “Neighborhood”. The R squared statistic was found for this dataset. The value of this constant should range from -1 to 1, -1 depicting a negative linear relationship and 1 depicting a positive linear relationship between the dependent and independent variable. The dataset is coded accordingly and fed into this software to run a Univariate Analysis of Variance test on the data set. A line graph for the data, classified on basis of town where the single family dwelling was located, is plotted to understand the trends related to cost, curb appeal and maintenance ratings of the properties. The descriptive statistics

regarding the data is depicted as in table 3. Table 3 gives the mean values and standard deviations for all 112 houses, classified for each variable, thus giving us an insight on the data set distribution. Estimated Marginal Means, both town wise and neighborhood wise are as shown in figure 2. This depicts the effect of each covariate on the model and is adjusted for any other variables as well.

Descriptive Statistics				
Dependent Variable: Cost (USD)				
Town	Neighborhood	Mean	Std. Deviation	N
Bryan	The Oaks	159,564.38	29,384.56	8
	Windover East	185,052.63	18,563.11	8
	Scasta Place	136,827.50	27,458.96	8
	Culpepper Manor	174,495.50	38,251.91	8
	North Garden Aces	124,925.88	17,119.02	8
	North Oakwood	206,948.13	61,383.61	8
	Lakeview North	86,541.13	18,166.50	8
	Total	153,479.30	49,355.17	56
College Station	Chimney Hill	264,211.63	73,389.91	8
	Glenhaven	220,651.38	66,736.71	8
	College Hill Estates	241,750.25	76,468.12	8
	Carter's Grove	144,750.88	14,422.21	8
	College Hill Woodlands	310,998.88	80,661.55	8
	Timber Ridge	151,964.00	20,780.67	8
	Breezy Heights	278,756.50	52,623.15	8
	Total	230,440.50	81,879.58	56
Total	The Oaks	159,564.38	29,384.56	8
	Windover East	185,052.63	18,563.11	8
	Scasta Place	136,827.50	27,458.96	8
	Culpepper Manor	174,495.50	38,251.91	8
	North Garden Aces	124,925.88	17,119.02	8
	North Oakwood	206,948.13	61,383.61	8
	Lakeview North	86,541.13	18,166.50	8
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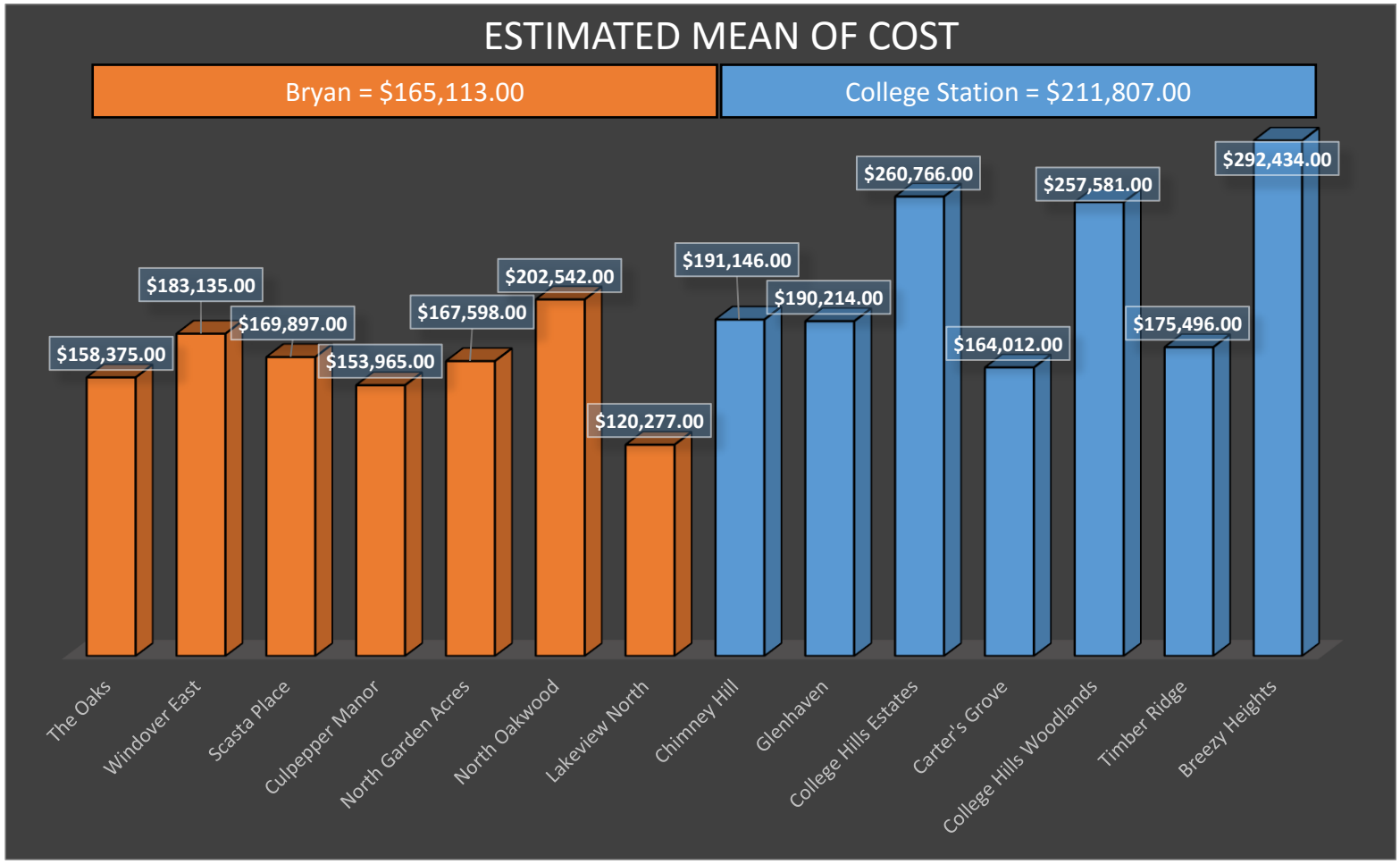
	Glenhaven	220,651.38	66,736.71	8
	College Hill Estates	241,750.25	76,468.12	8
	Carter's Grove	144,750.88	14,422.21	8
	College Hill Woodlands	310,998.88	80,661.55	8
	Timber Ridge	151,964.00	20,780.67	8
	Breezy Heights	278,756.50	52,623.15	8
	Total	191,959.90	77,608.14	112

Table 3. Descriptive Statistics



Covariates appearing in the model are evaluated at the following values: Plot Size (sqft) = 12044.9304, Area (sqft) = 1806.9464, Number of Bedrooms = 3.32, Number of Bathrooms = 2.214, Maintenance Rating = 3.86, Curb Appeal = 7.14

Figure 2. Estimated Marginal Means – Town-wise and Neighborhood-wise

CHAPTER V

RESULTS AND INTERPRETATION

Statistical findings

The results indicate a positive relationship between curb appeal of a single family dwelling and its cost for the residential sector in Bryan and College Station in Texas (Table 4). The p-value of 0.035 is less than the assumed alpha level of 0.05 demonstrating significant results. Thus, the null hypothesis can be rejected. We also see statistically significant values to the extent of 0.05 for area, the number of bathrooms and neighborhood that influences the price of housing. The F-test and p-values for the data is shown in table 4 below.

Tests of Between-Subjects Effects					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	578166544700.000[a]	19	30,429,818,140.71	30.97	0.00
Intercept	878,570,808.32	1	878,570,808.32	0.89	0.35
Plot Size	499,548,850.28	1	499,548,850.28	0.51	0.48
Area	47,714,126,451.97	1	47,714,126,451.97	48.56	0.00
Bedrooms	948,906,413.37	1	948,906,413.37	0.97	0.33
Bathrooms	9,846,052,563.31	1	9,846,052,563.31	10.02	0.00
Maintenance Rating	302,150,257.72	1	302,150,257.72	0.31	0.58
Curb Appeal	4,514,331,061.95	1	4,514,331,061.95	4.59	0.03
Town	-	-			
Neighborhood	128,625,832,352.19	12	10,718,819,362.68	10.91	0.00
Town * Neighborhood	-	-			
Error	90,389,112,360.51	92	982,490,351.74		
Total	4,795,599,293,115.00	112			
Corrected Total	668,555,657,033.92	111			

a. R Squared = .865 (Adjusted R Squared = .837)
b. Computed using alpha = .05

Table 4. Tests of Between-Subjects Effects

The F values in table 4 for the corrected model signify that the model on the whole demonstrates the relationship between the independent variable and the dependent

variable well. The intercept term is used to denote the values of the reference group of the dataset. The values in table 6 indicate the parameters for each group being tested, considering the last group as the control group for the categorical variables – Town & Neighborhood. The coding labels are shown below as well in table 5. These values are used to in a prediction model to predict the means of each group.

Neighborhood	Coding
The Oaks	0
Windover East	1
Scasta Place	2
Culpepper Manor	3
North Garden Acres	4
North Oakwood	5
Lakeview North	6
Chimney Hill	7
Glenhaven	8
College Hills Estates	9
Carter's Grove	10
College Hills Woodlands	11
Timber Ridge	12
Breezy Heights	13

Town	Coding
Bryan	0
CS	1

Table 5. Coding Labels

Parameter Estimates						
					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	121,717.567	24,230.260	5.023	0.000	73,594.179	169,840.954
PlotSizesqft	0.446	0.625	0.713	0.478	(0.795)	1.686
Areasqft	67.431	9.676	6.969	0.000	48.213	86.649
Bedrooms	(6,979.947)	7,102.391	(0.983)	0.328	(21,085.910)	7,126.015
Bathrooms	23,236.324	7,340.075	3.166	0.002	8,658.302	37,814.347
MaintenanceRating	(1,885.615)	3,400.210	(0.555)	0.581	(8,638.725)	4,867.495
CurbAppeal	3,151.558	1,470.255	2.144	0.035	231.504	6,071.612
Bryan	(172,157.064)	16,483.351	(10.444)	0.000	(204,894.423)	(139,419.705)
College Station	0[a]					
The Oaks	38,097.546	16,218.921	2.349	0.021	5,885.368	70,309.724
Windover East	62,857.847	16,340.177	3.847	0.000	30,404.846	95,310.849
Scasta Place	49,620.078	16,013.334	3.099	0.003	17,816.215	81,423.942
Culpepper Manor	33,687.854	16,442.888	2.049	0.043	1,030.860	66,344.849
North Garden Acres	47,320.912	15,975.513	2.962	0.004	15,592.165	79,049.659
North Oakwood	82,264.788	17,515.575	4.697	0.000	47,477.345	117,052.232
Lakeview North	0[a]					
Chimney Hill	(101,288.321)	18,507.320	(5.473)	0.000	(138,045.455)	(64,531.186)
Glenhaven	(102,220.323)	17,518.214	(5.835)	0.000	(137,013.007)	(67,427.638)
College Hill Estates	(31,668.228)	15,992.500	(1.980)	0.051	(63,430.714)	94.259
Carter's Grove	(128,422.331)	16,520.001	(7.774)	0.000	(161,232.479)	(95,612.183)
College Hills Woodlands	(34,853.113)	17,087.620	(2.040)	0.044	(68,790.603)	(915.624)
Timber Ridge	(116,938.509)	16,155.249	(7.238)	0.000	(149,024.229)	(84,852.790)
Breezy Heights	0[a]					
Bryan * The Oaks	0[a]					
Bryan * Windover East	0[a]					
Bryan * Scasta Place	0[a]					
Bryan * Culpepper Manor	0[a]					
Bryan * North Garden Acres	0[a]					
Bryan * North Oakwood	0[a]					
Bryan * Lakeview North	0[a]					
College Station * Chimney Hill	0[a]					
College Station * Glenhaven	0[a]					
College Station * College Hill Estates	0[a]					
College Station * Carter's Grove	0[a]					
College Station * College Hills Woodlands	0[a]					
College Station * Timber Ridge	0[a]					
College Station * Breezy Heights	0[a]					
a. This parameter is set to zero because it is redundant.						
b. Computed using alpha = .05						

Table 6. Parameter Estimates

Figure 3 below is a spread vs. level plot. This diagnostic plot is used to promote equal spread of a factor variable in a transformation. This is done by using the slope of the transformation to determine whether or not one has to refit the B values (intercepts used to describe the dependent variable and independent variable relationships) to stabilize the variance. In this case, a high R squared and figure 3 indicates the concentration of the neighborhoods in their respective cost groups, thus depicting how estimated means vary with city – curb appeal having a role to play in the adjustment on the dependent variable.

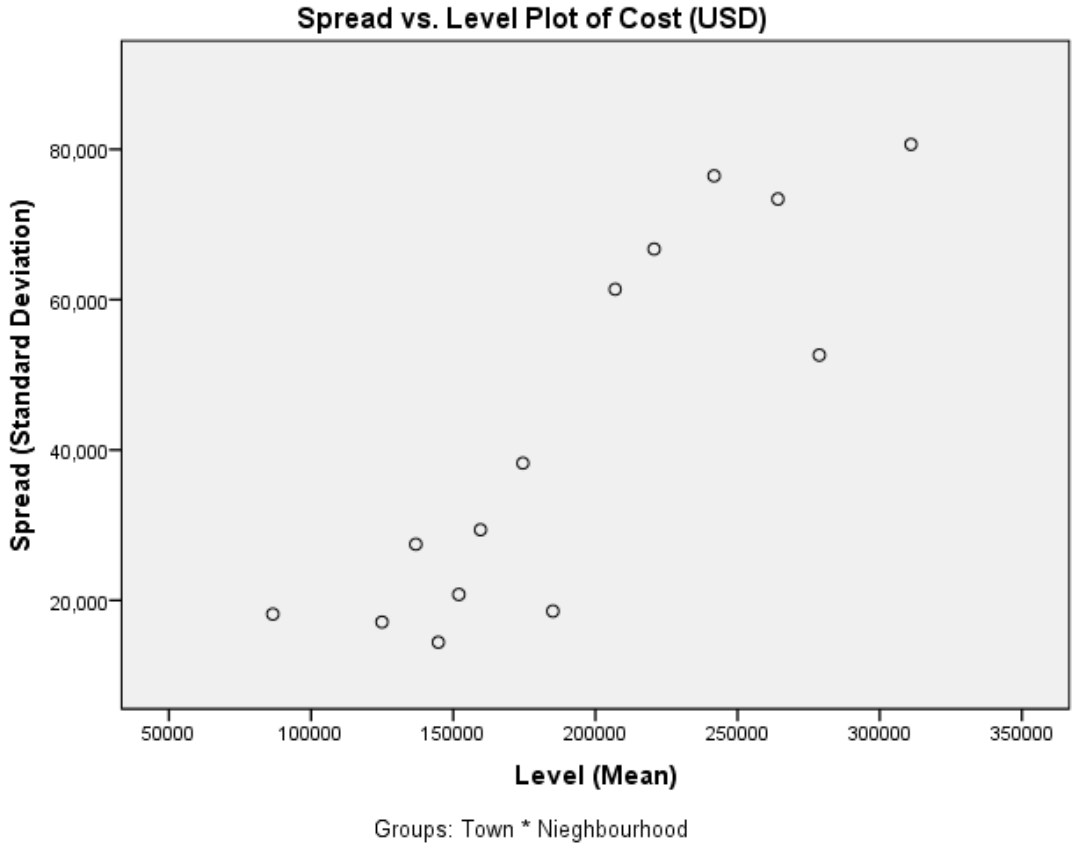


Figure 3. Spread vs Level Plot of Cost

A residual plot is a scatter plot that is used to plot the residuals of the difference between the observed value and the predicted value of the dependent variable, in this case being cost, on the vertical against the independent variable on the horizontal. Figure 4 below shows a standardized residual plot of the cost of the single home dwellings against each neighborhood. For a good model, the mean of the residuals should be zero and the variance should be constant along the horizontal axis. If the variance of the residuals is constant, and the shape of the graph is a set of parallel lines along both the sides of the horizontal axis, the model is said to be homoscedastic. If not, the model is called homoscedastic. In addition, for a dataset that fits extremely well in the model, there should be no outliers on the plot.

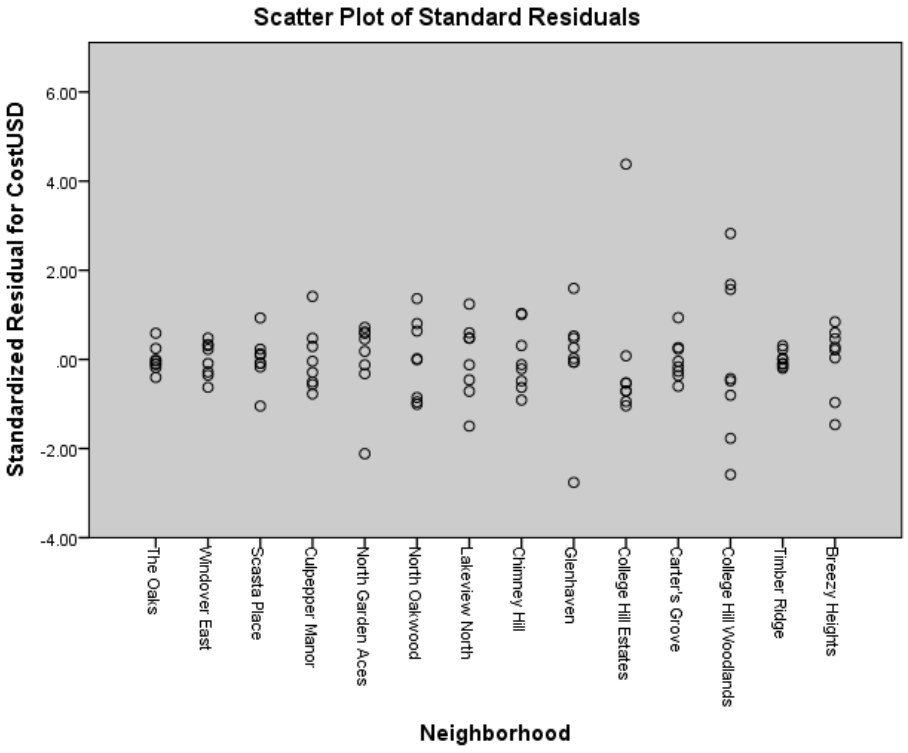


Figure 4. Scatter Plot of Standard Residuals

Interpretation

From table 4, it can be seen that a high R squared value, i.e. 86.5%, signifies that the variability in the housing is explained well by the independent variables considered and that the data points fit well in the model with low variance from the regression line. R squared value, called the coefficient of determination, is a proportion measure that can be used to interpret the variance in the dependent variable from the independent variables, using the given model. Ideally, a high R squared value, i.e. 1, means that the dependent variable and the independent variables have a perfect relationship. It is observed that the effect of curb appeal on the price of a single family dwelling is statistically significant at the level of 0.05. The positive relationship between the cost of a single family dwelling and its curb appeal can be viewed in table 4. Thus, it could be concluded that, there is enough evidence that the relationship hypothesized between curb appeal and cost of a single family dwelling in the sample does exist in the population; and this study can be further extended to different sectors in the construction industry to gauge and verify the effect of curb appeal on the prices of property.

The scatter plot of standard residuals shown in figure 4 suggests that this is a good model as the mean of the standardized residuals is found to be zero. In addition to the mean, the variance of the residuals is 0.829. The plot has some outliers, though most of points fall within a constant band of the variance through the plotted values. The curve does bulge outward as the independent variable changes. Thus, we can call this a heteroscedastic plot of the residuals. The heteroscedasticity of this plot is explained by

the high Coefficient of Determination value of 86.5%. This suggests that though model explains the data effectively, there are still some outliers to the extent of 13.5%.

In figure 5, we see a matrix of the scatter plots for the observed values and the predicted values. Since we have established that the model is a good model and explains the data in a consistent manner, we observe that both, the observed and predicted values follow a similar line pattern along the line of axis in each of the graphs.

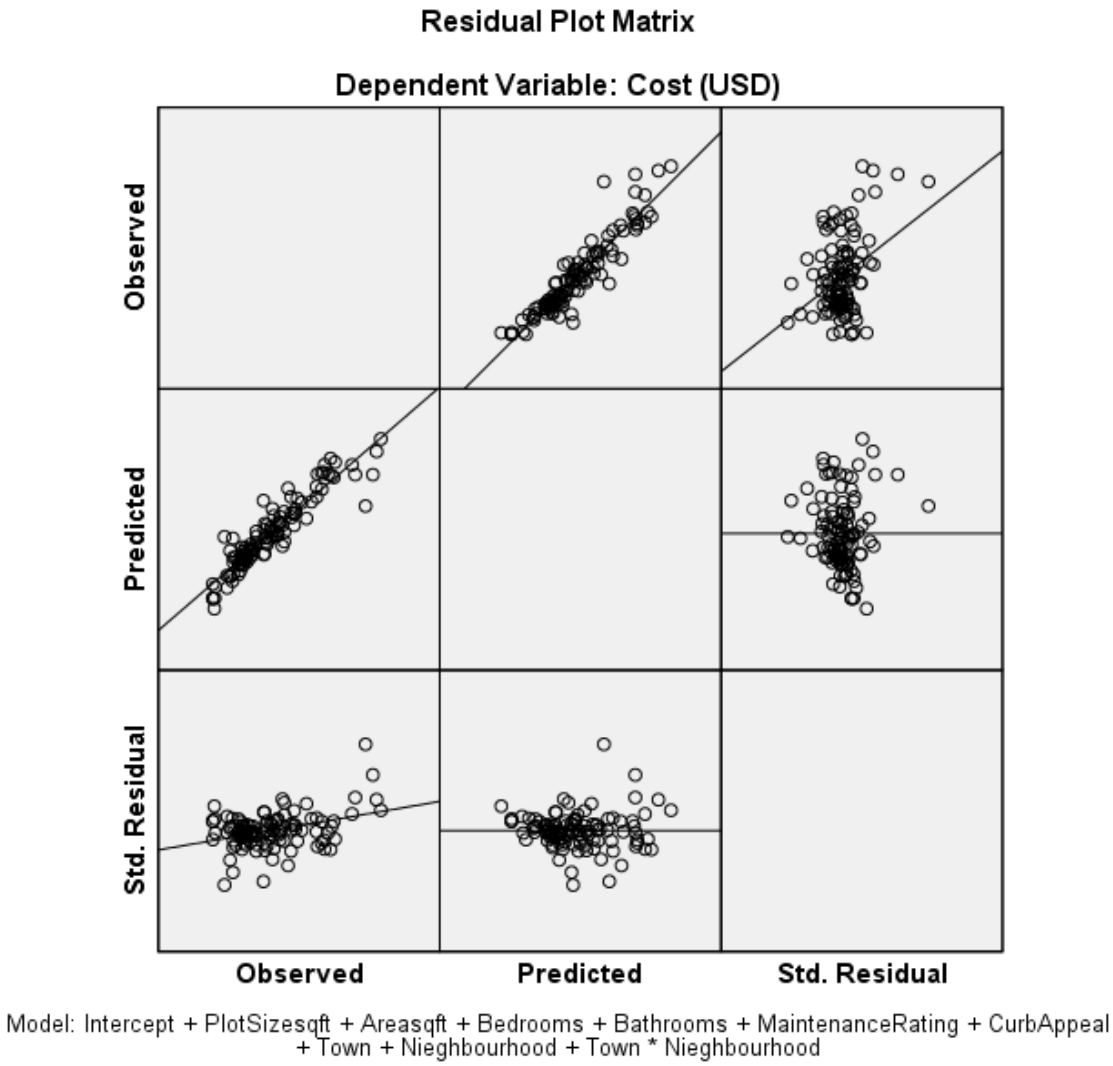


Figure 5. Residual Plot Matrix

From table 6, it is also observed that the variables “town” and “maintenance rating” are redundant in the presence of the variables “neighborhood” and “curb appeal respectively. This is because of the fact the variable “neighborhood” is representative of the location altogether. The variable “curb appeal” consists of the holistic picture of the presence of territorial markers that are well maintained, thus showing that the

"maintenance rating" is redundant. In figure 2, one could see a scatter plot of the estimated marginal means of single family dwellings across both the towns and also a spread of the pricing along all the neighborhoods. In addition, the variable "bedrooms" is insignificant probably because the variable "area" is representative of this variable. This graph depicts the variation that could be because of the varying curb appeal and maintenance of the neighborhood due to the location and accessibility of the neighborhood, which could be explored further through a research. Figure 3, the spread vs. level plot, indicates that with the neighborhood, the average cost of a well-maintained property with good curb appeal would vary due to the effect of the covariates. The positive relationship between the cost of a single family dwelling and its curb appeal can be viewed in this graph with curb appeal having a mean value of 7.14.

Hence, this study could be concluded by saying that the B values from table 6 fit the following equation -

$$\text{Cost} = \beta_0 + \beta_1 \text{Neighborhood} + \beta_2 \text{PlotSize} + \beta_3 \text{Area} + \beta_4 \text{Bathrooms} + \beta_5 \text{CurbAppeal}$$

where,

Cost is the cost of the single home dwelling in USD

Neighborhood is the categorical variable giving the location of the single home dwelling

PlotSize is the quantitative variable giving us the area of the plot on which the single home dwelling is built in sft.

Area is the built up area of the single home dwelling in sft.

Bathrooms is the count of the number of bathrooms in the single home dwelling

CurbAppeal is the count of the number of territorial markers in the front yard of the single home dwelling

CHAPTER VI

CONCLUSION

The study helps us demonstrate a positive correlation between the cost of single home dwellings and the physical and visual attributes of the property. It is seen that, even in the presence of all the other physical variables, curb appeal is statistically significant while testing its relationship with the dependent variable.

Alongside, it was observed that the variables “town”, “maintenance rating” and “bedrooms” act as a proxy and are redundant in the presence of the variables “neighborhood”, “curb appeal” and “area”.

This empirical research is directed towards establishing an accurate relationship between curb appeal and property value of single home dwellings, which can be used by the industry officials for effectively targeting demand and supply parameters. It is also directed toward aiding effective managerial decision-making process flow for the conceptualization of construction, prediction buyer needs and market demand trends. Nevertheless, it has to be kept in mind that the sample size used in this research is of only 112 single family dwellings. For any further research area in this area, a larger sample size would likely be more beneficial.

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APPENDIX

Photos of single home dwellings in each neighborhood with their corresponding curb appeal rating and cost –

Figure 6. The Oaks, Curb Appeal: 10, Cost: $179,500

Figure 7. The Oaks, Curb Appeal: 5, Cost: $135,116

Figure 8. Windover East, Curb Appeal: 10, Cost: $192,000

Figure 9. Windover East, Curb Appeal: 6, Cost: $184,935

Figure 10. Scasta Place, Curb Appeal: 8, Cost: $139,900

Figure 11. Scasta Place, Curb Appeal: 5, Cost: $126,739

Figure 12. Culpepper Manor, Curb Appeal: 10, Cost: $209,900


Figure 13. Culpepper Manor, Curb Appeal: 6, Cost: $117,059

Figure 14. North Garden Aces, Curb Appeal: 8, Cost: $130,807

Figure 15. North Garden Aces, Curb Appeal: 8, Cost: $141,089

Figure 16. North Oakwood, Curb Appeal: 9, Cost: $265,000

Figure 17. North Oakwood, Curb Appeal: 10, Cost: $116,600

Figure 18. Lakeview North, Curb Appeal: 10, Cost: $109,900

Figure 19. Lakeview North, Curb Appeal: 5, Cost: $79,900

Figure 20. Chimney Hill, Curb Appeal: 10, Cost: $416,181

Figure 21. Chimney Hill, Curb Appeal: 8, Cost: $240,119

Figure 22. Glenhaven, Curb Appeal: 13, Cost: $211,642

Figure 23. Glenhaven, Curb Appeal: 9, Cost: $184,191

Figure 24. College Hill Estates. Curb Appeal: 11, Cost: $246,460

Figure 25. College Hill Estates. Curb Appeal: 7, Cost: $163,890

Figure 26. Carter's Groove, Curb Appeal: 8, Cost: $178,253

Figure 27. Carter's Groove, Curb Appeal: 8, Cost: $133,270

Figure 28. College Hills Woodlands, Curb Appeal: 11, Cost: $ 323,250

Figure 29. College Hills Woodlands, Curb Appeal: 10, Cost: $ 399,900

Figure 30. Timber Ridge, Curb Appeal: 9, Cost: $197,000

Figure 31. Timber Ridge, Curb Appeal: 5, Cost: $135,500

Figure 32. Breezy Heights, Curb Appeal: 12, Cost: $357,551

Figure 33. Breezy Heights, Curb Appeal: 3, Cost: $275,245