Abstract

This research identifies the Business Intelligence's components and techniques that could be implemented on different industries. Also, I review literature available in relation to the implementation of Business Intelligence systems within the Real Estate Industry. This study conducted a data mining analysis using an available public data from 2007 until 2017. Using this data mining, I need to follow the Business Intelligence principle of translating data into knowledge. The analysis identifies trends that confirm the valuable information gained by their techniques and how these were translated into strategies that could be implemented for improving the quality of services provided by real estate professionals. To conclude this paper, I used data warehouse containing the loan application data to develop different models to predict the loan amount applications and The prediction model seek to serve as examples that could be used to translate the results to potential strategies for the real estate professional.

Introduction

During the early 1990s, an analyst working for Gartner Group, named Howard Dresner, introduced the concept of Business Intelligence (BI) [1]. As mentioned by Watson and Watson (2010), BI is currently the top-priority of many Chief Information Officers and has become a strategic initiative for driving business effectiveness and innovation [2]. Rajan (2005) stated that many companies are adopting BI tools and systems to learn from the past and forecast the future [3].

Based on Traice (2014), much of the research on BI has examined the ability of BI systems to help organizations address challenges and opportunities [4]. BI enables companies and organization to make well-informed business decisions and acquire competitive advantages [5]. BI systems are now used extensively in many areas of business that involve making decisions to create value [6]. Most organizations have been impacted by the BI revolution and their strategies have changed business processes to make them more efficient and to create a new competitive advantage for these new business practices (Pauls and Tharay, 2015) [7]. At the same time as most organizations start their BI, many struggle to align their technology approach to BI and business objectives, and deliver solutions that fail to meet business needs.

Businesses are leveraging their data assets aggressively by deploying and experimenting with more sophisticated data analysis techniques to drive business decisions and deliver new functionality such as personalized offers and services to customers [8]. Although BI has been around for a long time, there are significant opportunities created by the availability of big data and advances in machine learning [9]. Today, it is difficult to find a successful enterprise that has not leveraged BI for their business [10]. The objective of the Real Estate Agent is to facilitate the real estate transaction by marketing the seller’s property, search for a property that meets the requirements of the buyer and providing consultation to buyer and/or seller during every step of the process. In the era of information, the Real Estate Agents has not capitalized on the opportunity of using data, applications and technology to increase services value and performance. At the forefront of technology, tech and software companies are battling to create Artificial Intelligence that will begin to not only automate parts of sales, but also allow businesses to make better decisions than people, and real estate is just one of the industries poised for disruption [11].

Methodology

Analyzing the Figure 7 and Figure 8, there is a direct relation between the increment of denial applications and increment of loan applications that are not requested preapproved. Therefore, our hypothesis that stated that buyers follow the Real Estate Professional advice a requested a loan preapproved is contradicted based on the previous analysis. Considering that we are turning data into knowledge to make strategies for the real estate professional, the next step is to look deeper on the denial reasons for these loans.

A 54% of the denial reasons concentrate on applicant’s credit history and debt-to-income ratio. Therefore, our hypothesis that a low percentage of loans are denied by the real estate professional to provide the consultation before the loan application is contradicted.

So, the real estate professional may modify his operating procedures to implement some activities to improve his efficiency and work smarter. Translating the results of this table to strategies, a real estate professional could gain competitive advantage by delivering more consulting services to the buyer of the properties or loan applicants. Considering this strategy, the real estate professional should provide a consulting service to the buyer or the loan applicant considering the following:

- Calculation of the debt-to-income ratio,
- The credit score of the buyer or loan applicant,
- Estimate the down payment and closing cost for a mortgage loan and ensure that the buyer have sufficient funds to cover these costs.

The above Figure 9 shows the percentage and comparison of the different loans for the loan applications between the complete data (from 2007 to 2017) and the last 3 years of data. Basically, this data present more than 72% of the denial reasons are concentrated on real estate with prices between $50,000 and $150,000 on the last three years. Therefore, a focus on this specific market by the real estate professional could result on more demand and more profit for his work.

Evaluation performance and adjust the model

Conclusions

The World of Business is in constant change and every business that want to survive need to be competitive and gain advantage to be profitable. Despite the long time that has been acclaimed that strategic business failures, different industries have not taken advantage of the benefits from a well-designed Business Intelligence system. Through the implemented Business Intelligence systems, Business can transform historical data into knowledge, improve the decision quality and developed well-supported strategies to gain competitive advantages.

At this research present, through the use of data mining techniques, business could translate data into useful information to develop business' strategies to improve its services and profitability. The real estate industry have a huge range of data and documents that could provide valuable knowledge. This industry, without a doubt, is poised to be taking advantage of Business Intelligence initiatives in various areas. The future of the real estate professionals will be extremely impacted by the benefits of Business Intelligence.

Today, the real estate professionals have enormous opportunities to use the BI and Machine learning tools available to develop effective strategies and work smarter.

Problem

For over the past 15 years, the real estate marketing strategies used by Puerto Rico’s market have not seen major innovations. Today, the current economic situation in Puerto Rico has been marked by almost 10 years of recession, where the real estate market has been affected. The real estate prices has dropped and foreclosure rates have increased. These combinations have created an increase of sale properties on the market and a lack of buyer or demand for the market of real estate. This could define the ideal time for the real estate professionals to rely on technology to work smarter on their businesses.

Therefore, this study seek to prove the huge advantage that real estate professionals when applying data mining techniques on data and information available to improve services and/or develop new strategies to improve their businesses. A majority of these professionals don’t use available data to gain competitive advantage and identify areas where they could improve their services.

Results

Table 3 Accuracy comparisons of Prediction Models by Regression Analysis used

<table>
<thead>
<tr>
<th>Regression Model Used</th>
<th>Train MAE</th>
<th>Test MAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rep Tree</td>
<td>42.51</td>
<td>54.04</td>
</tr>
<tr>
<td>XGBoost Regression</td>
<td>45</td>
<td>59</td>
</tr>
<tr>
<td>Random Forest Regression</td>
<td>43</td>
<td>56</td>
</tr>
<tr>
<td>Least Mean Square</td>
<td>49.36</td>
<td>60</td>
</tr>
<tr>
<td>Additive Regression</td>
<td>47.63</td>
<td>59</td>
</tr>
<tr>
<td>Inverse Absolute Error</td>
<td>56.70</td>
<td></td>
</tr>
</tbody>
</table>

Considering that the resulting accuracy of the prediction models still high, the model should be improved and should have more tuning to have more reliable predictions and used it to develop other strategies.

Acknowledgments

First of all, I want to thank my family and friends for the support during the process of this study and this Master Degree. Also, I sincerely thank Dr. Nellidio Torres for his guidance and advise on this project. I also thanks the Director Dr. Alfredo Cruz for providing me the opportunity to embark on the Computer Engineering journey.

References


Author: Douglas S. Acevedo Martinez
Advisor: Dr. Nellidio Torres
Electrical and Computer Engineering and Computer Science Department