



# Business Intelligence Implementation on the Marketing of Real Estate

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## 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 seek to follow the Business Intelligence principle of translating data into knowledge. The analysis identifies trends that confirm the valuable information gain by these techniques and these were translated into strategies that could be implemented for improving the quality of services provided by real estate professionals. To conclude the paper, I used data warehouse containing the loan application data to developed different models to predict the loan amount applications and The prediction model seek to serve as an example that could be used to translate the results on potential strategies for the real estate professional.

## Introduction

During the early 1990s, an analyst working for Gartner Group, named Howard Dressner, introduced the concept of Business Intelligence (BI). As mentioned by Watson and Wixon (2007), BI is currently the top-most priority of many Chief Information Officers and has become a strategic initiative for driving business effectiveness and innovation [1]. Ranjan (2005) stated that many companies are adopting BI tools and systems to learn from the past and forecast the future [2]. Based on Trieu (2016), much of the research on BI has examined the ability of BI systems to help organizations address challenges and opportunities [3]. BI enables companies and organization to make well informed business decisions and acquire competitive advantages [2]. BI systems are now used extensively in many areas of business that involve making decisions to create value [3]. 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 (Poulis and Thamir, 2015) [5]. 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 asset 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 [15]. 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 [8]. Today, it is difficult to find a successful enterprise that has not leveraged BI technology for their business [15]. 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 [22].

## 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 being affected. The real estate prices have dropped and foreclosures rates have increased. These combinations have created an increase of for 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 business strategies to improve profitability. The majority of these professionals don't use available data to gain competitive advantage and identify areas where they could improve their services.

## Methodology

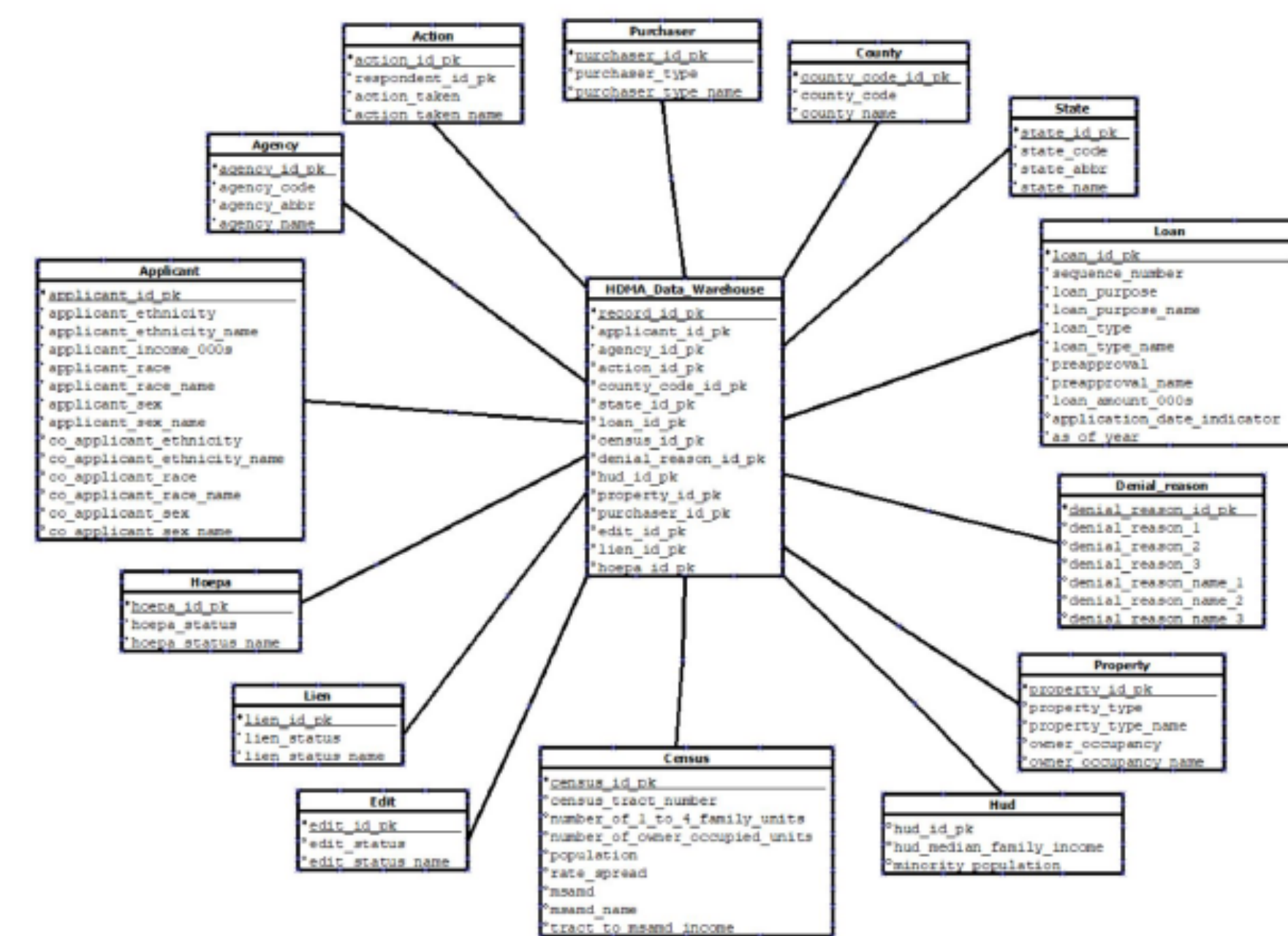


Figure 4 Data Warehouse Composition

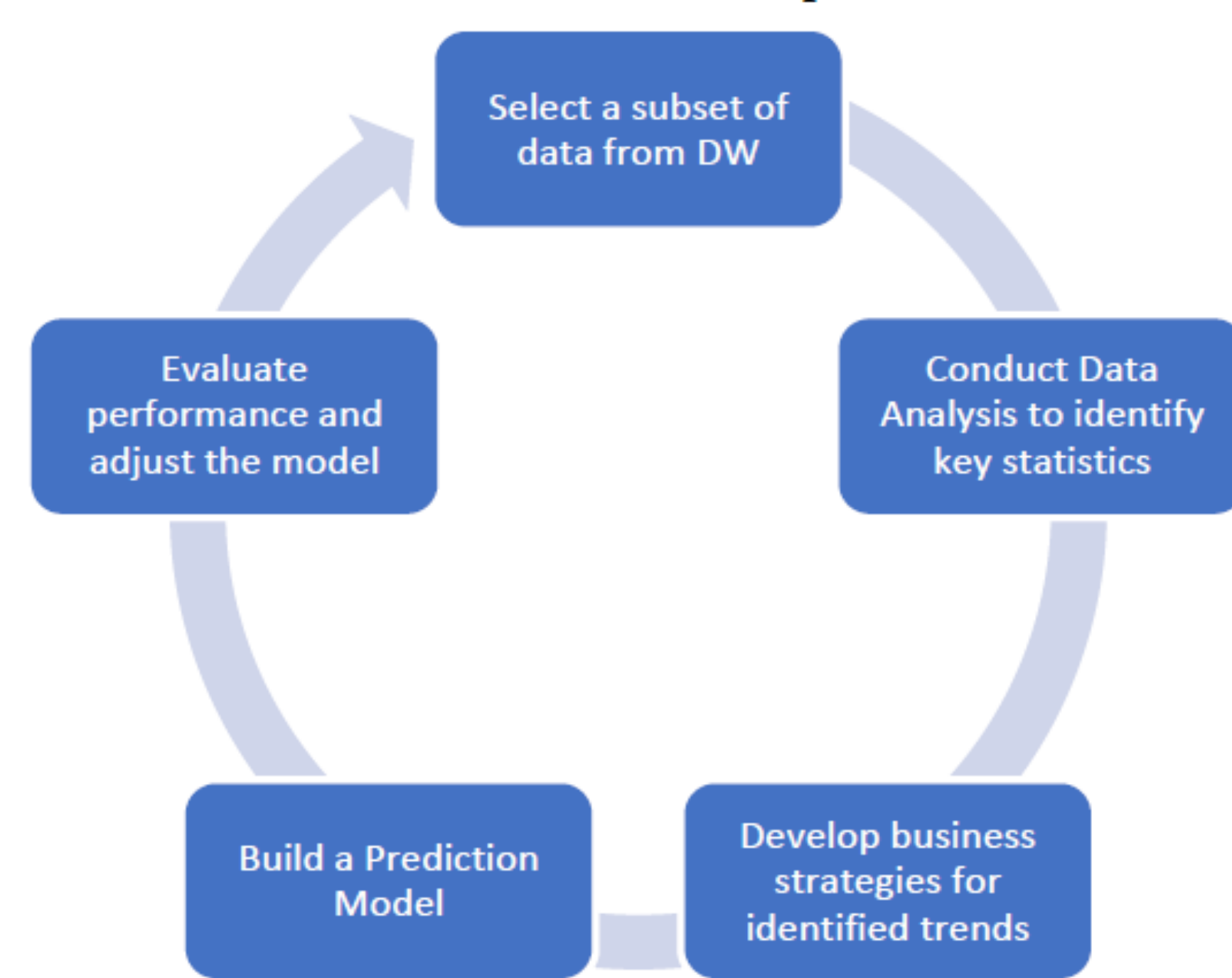


Figure 5 Data Mining Process Used for this study

## Results

After understanding the data, 67% of the records or a total of 647,324 records were used for the Business Intelligence analysis. Our Business Intelligence analysis main objective is to translate the data set into knowledge and potential business strategies for the real estate professional.

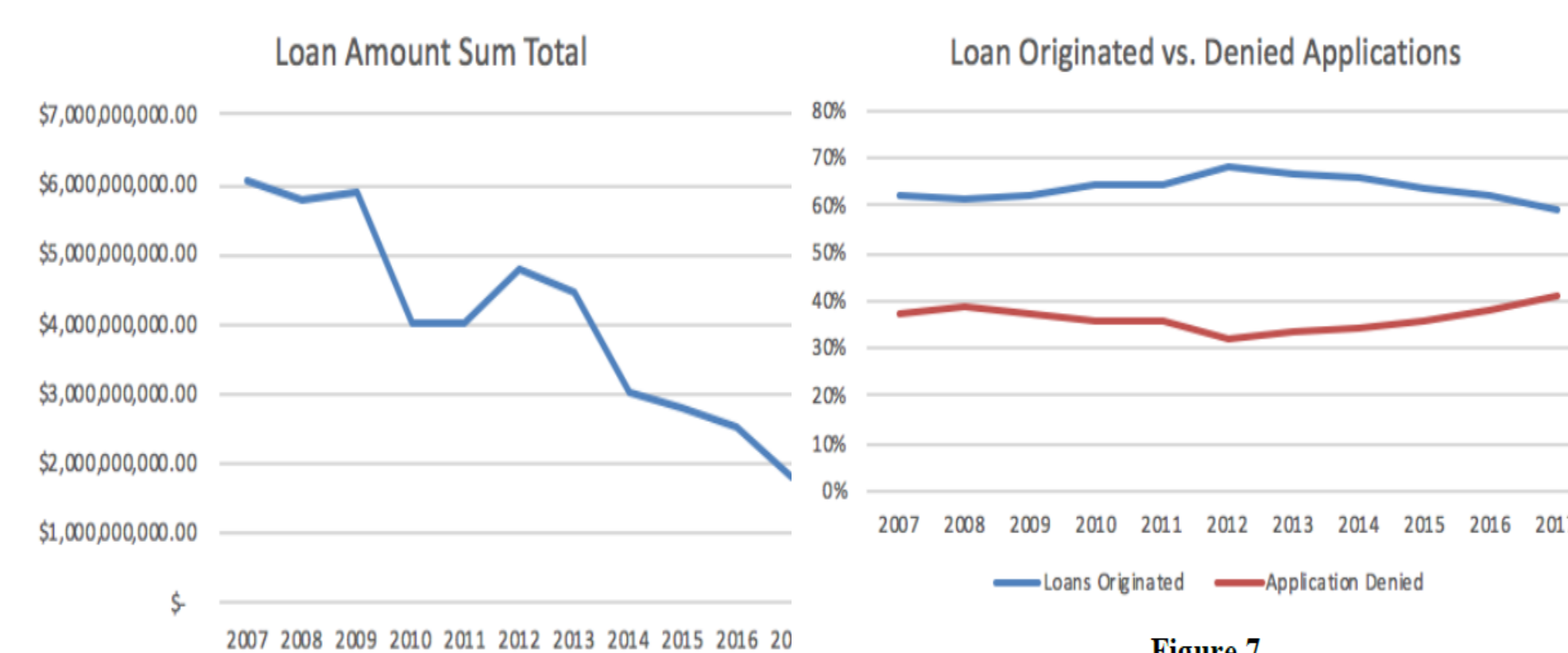


Figure 6 Total Loan Originated Amount per Year Figure 7 Comparison between loans originated and denied applications in percentage

Analyzing the Figure 7 and Figure 8, there is a direct relation between the increment of denial applications and increment of the applications that do not requested preapproval. Therefore, our hypothesis that stated that buyers follow the Real Estate Professional advise a requested a loan preapproval 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 64.4% 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 debt-to-income because the Real Estate Professional 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:

- Analysis of the credit history,
- Calculation of the debt-to-income ratio,
- collateral and
- Estimate the down payment and closing cost for a mortgage loan and ensure that the buyer have sufficient cash to cover these costs.

The above Figure 9 shows the percentage and comparison of the different amounts for the loans applications between the complete data (from 2007 to 2017) and the last 3 years of data. Basically, this data present that more than 72% of the demand of mortgage loans 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.

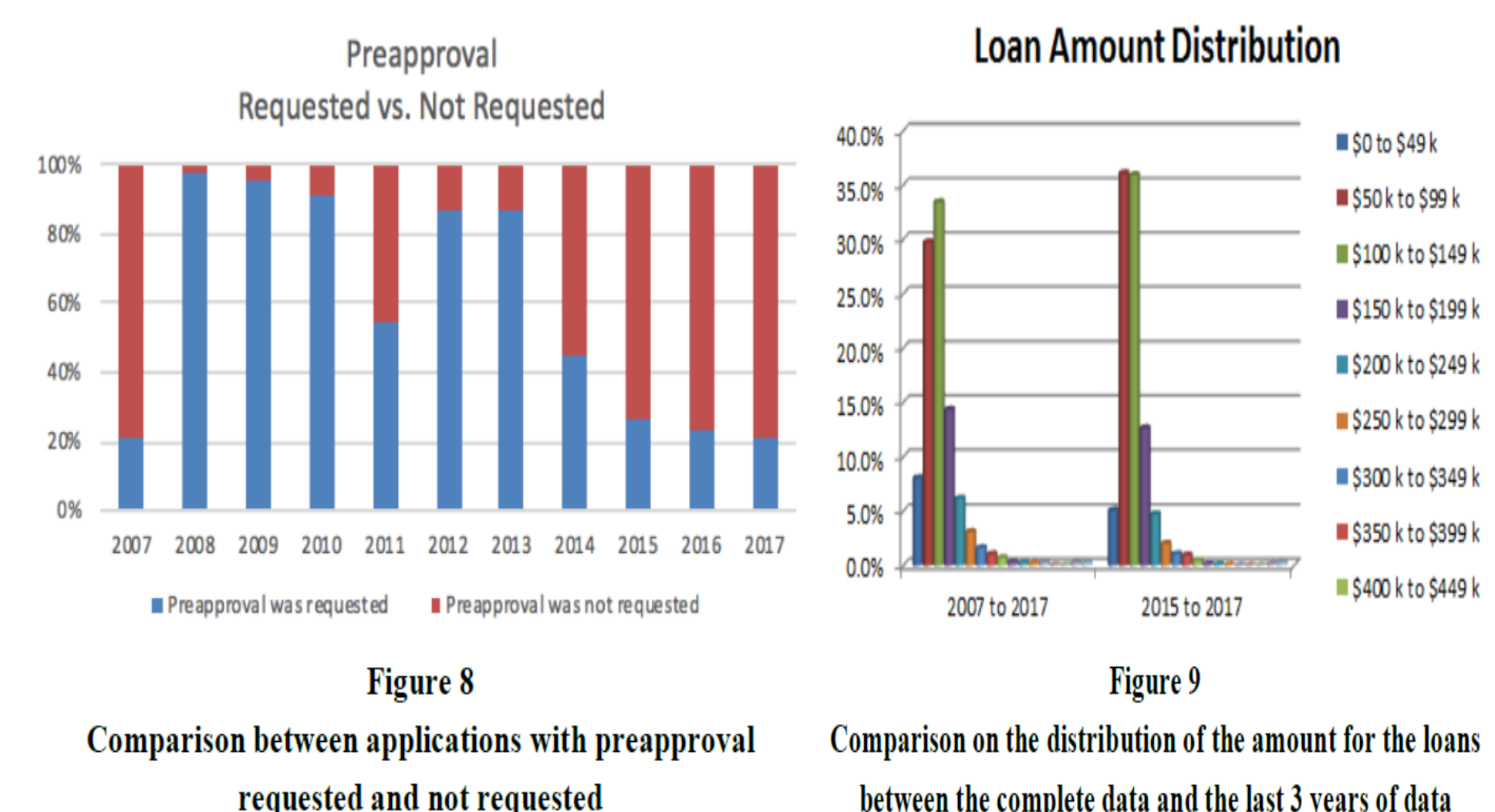


Figure 8 Comparison between applications with preapproval requested and not requested Figure 9 Comparison on the distribution of the amount for the loans requested and the complete data and the last 3 years of data

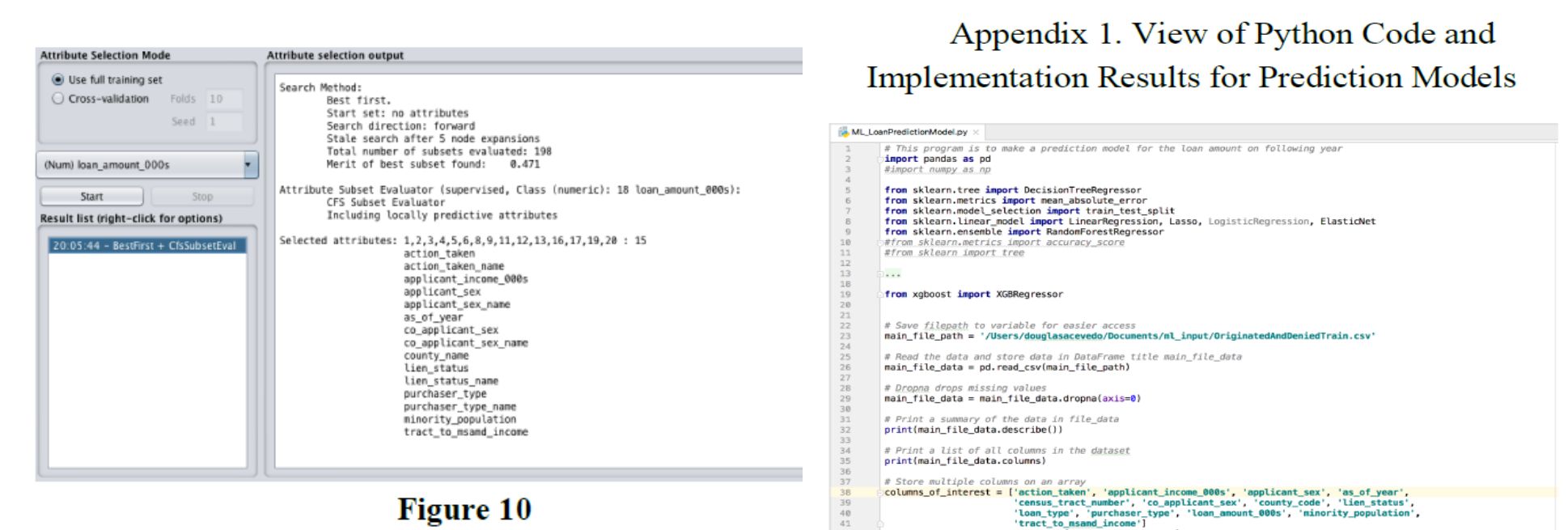


Figure 10 View of the Attributes selection output in Weka

Appendix 1. View of Python Code and Implementation Results for Prediction Models

Regression Model Used	Train MAE	Test MAE
Rep Tree	42.51	34.04
XGB Regressor	45	39
Random Forrest Regressor	43	43
Least Median Square	49.36	--
Additive Regression	49.71	--
Iterative Absolute Error	58.79	--

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

## 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 BI have been achieving great success histories, different industries have not taken advantage of the benefits from a well-designed business Intelligence system. Through the implementation of Business Intelligence, business transform historical data into knowledge, improve the decision quality and developed well supported strategies to gain competitive advantage. As this research present, through the use of data mining techniques, business could translate data into useful information to develop business' strategies to improve 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 advantages 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 professional have enormous opportunities to use the BI and Machine Learning tools available to develop effective strategies and work smarter.

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