TJHSST Computer Systems Lab Senior Research Project
Simulation of Marketing Mix - Placement of Business
2009-2010

Mendel Chen

April 9, 2010

Abstract

Every company faces the problem of success involved with the marketing mix. These aspects include the four P's of price, product, place, and promotion. In this project, the aspect of place is focused upon. This location problem is part of the last aspect of the distribution channel. The purpose of this project is to find the optimal store location, or the last section of the distribution channel based on a few variables such as population density and location of competition. For testing, ceteris paribus conditions are assumed (other variables in the marketing mix and distribution channel is assumed constant). The project will feature a GUI aspect created in Java to display the optimal location of a business. The optimal location will be found using a fluid heuristic to evaluate possible locations.

Keywords: marketing mix, distribution channel, physical location, location problem

1 Introduction

1.1 Rationale

Every company has to spend resources to hire analysts to determine the optimal location of a physical store. The analyst does this job by determining the location that has the most potential in terms of market share and profitability.

1.2 Purpose

The purpose of the project is to assist business owners with making the important decision of the placement of a physical store. Although a computer analysis may not cover all the aspect an analyst does, the computer can be more thorough and process more possibilities to give a better idea about good potential business locations.

2 Background

The research can be classified as a type of location problem. Location theory was first introduced in 1909 by Alfred Weber, when he tried solving a

problem to minimize the total travel distance for his customers. My program expands upon this type of problem by incorporating the location of competition and possibly other aspects to create a more complex model that uses more variables.

Finding the optimal location is currently done through professional advisors. The advisors take into account many variables of marketing mix and distribution channel such as location of the store, advertising, price, etc. Many programs have been written to model the process, although few have succeeded because of the many variables involved. Models tend to focus on the placement aspect of the marketing mix as it is the aspect that can be more easily measured quantitatively. The variables included in the placement aspect include population density, ease of access, and location of competition. A heuristic is then developed to evaluate the data and to find the optimal location, based on market share and profitability. However, many previous models have failed to accurately find the optimal location because the significance of placement varies depending on the placement. For example, gas stations place more empthasis on location than a store such as Costco. The object is to create a model where the heuristic can be easily adjusted based on the emphasis placed on the placement aspect.

The other weakness with analysts is that humans can only cover so many possibilities. My program aims to analyze every possible location with all the inputs, providing a much more thorough search. The shortfall however, is that there are many factors than cannot be quantified and the computer cannot process these variables.

3 Procedure/Methodlogy

The model will be coded in Java with the occasional use of Python for various preparational tasks. For example, Python is used to copy the data from a population density map into a usable text file. The program will include separate aspects including a GUI and a heuristic class to allow for easier editing. The GUI displays a map of Fairfax County (test region) and display the location of local competition along with the optimal location. A rating will also be given for possible business locations.

The primary focus of the project is to locate a reasonable location for a possible business. This will be tested by finding the newest store that has been opened in the area, and running the program to locate the possible

locations and determining if the calculated results coincide with the location of the actual store. The secondary focus is to develop a good heuristic that can be easily adjusted through the GUI to deal with particular situations.

4 Expected Results

The project incorporates an easy to use GUI to model the optimal store location as part of the last section of a distribution channel. The program also includes aspects of a fluid and open heuristic to better model the situation. The heuristic allows for the emphasis placed on the location aspect of distribution channels to be easily altered and also allows for additional variables to be easily added.

The program may not necessarily replace the work of financial analysts and advisors, but the program should give a good approximate of which locations are good for opening new businesses. The program could be used by analysts as a starting point as the program will eliminate the blantantly bad options. The program and the heuristic can also be expanded upon in the future by adding more accuracy to the heuristic and possibly incorporating more factors for a more accurate prediction.

5 Current Results

The current version of the program includes the completed GUI to display the optimal location. The current GUI includes the map of the location of the business and marks the competition along with the optimal location. Population density data along with data on the location of local businesses has been prepared and processed into a heuristic function that is up and running. Lastly, the results display is working and the heuristics are printed out to a PPM, that displays the ideality of each location and the more ideal the location is, the darker the pixel is displayed on the PPM file.

6 Moving Forward

The project will eventually lead to an easy to use application that combines the main Java optimization program with all the preparatory programs in Python. From there, the GUI will be perfected to allow the user to enter a

zip code followed by a type of business and the current output of ideality of each location will be displayed. This program will be able to provide business owners a general idea of where a physical store shoudl be.

6.1 Software

Python will continue to be used for the preparations tasks especially with images and Java will be used for the main optimization program, because it is a good balance between easy programming and fast run time.

References

[1] Brandeau, Margaret L., Chiu, Samuel S. 'An Overview of Representative Problems in Location Research.' *Management Science.*, pp. 645-674, 1989.

[2] Constantinides, Efthymios. 'The 4S Web-Marketing Mix model.' *Electronic Commerce Research and Applications.*, pp. 57-76, 2002.

[3] Huang, Leo, Chen, Kaung-Hwa, and Wub Ying-Wei. 'What kind of marketing distribution can maximize revenues: The wholesaler travel agencies perspective?' *Tourism Management.* San Francisco, pp. 733-739, 2009.

[4] Ulaga, Wolfgang, Sharma, Arun, and Krishnan, R. 'Plant location and place marketing: understanding the process from the business customers perspective.' *Industrial Marketing Management.*, pp. 393-401, 2002.

[5] Westerbeek, Hans M., Shilburyl, David. 'Increasing the Focus on Place in the Marketing Mix for Facility Dependent Sport Services.' *Sport Management Review.*, pp. 1-23, 1999.