Optimizing mobile devices

Design Team
Ryid Abed, Rawan Al Mmuamar
Andreas Papahiu, Anat Peleg, Toregydly Rakhimbeko

Design Advisor
Prof. Simon Dao

Abstract
The goal of this project is to study the progress and optimize the use/spread of a newly launched mobile device application called Repeat-Receipt created by MobiLaurus Inc. Repeat-Receipt is a loyalty program for smartphone devices that financially commits a user to coming back to a merchant even prior to its departure. A customer dines in the restaurant and gets a receipt at the end, then the user takes a picture of a receipt with a Repeat-Receipt application and receives an amount specific offer to get discount for the next purchase. The company’s challenge is to find the optimal expansion strategy that will require minimum resources in terms of expenditures and efforts by sales representatives. For intents and purpose of this project only restaurants and cafes were chosen as merchants. Relevant information pertaining to the research such as area specifications, population concentration, popularity, price range, number of customers, and location was collected for each merchant in order to completely understand the target demographics. A ranking model, regression model, and location allocation function are some of the main models being used to find out the optimum merchants where Repeat-Receipt should be advertised and improve the process flow. The model improves and enhances the sales representatives’ performance by focusing on specific targeted merchants that proved to be worth calling back to. By focusing on the optimal merchants, time, effort and frustration are reduced. Recommendations regarding the optimal process will be provided at the end of the study.
The Need for Project

Repeat-Receipt is looking to reach many merchants in order to increase the number of users. Repeat-Receipt is a new application for Smartphone that gives its users an opportunity to buy a 10% discount from a current purchase receipt amount for a only 1% of a current purchase receipt amount towards their next visit. The application is desirable for both merchants and users; users are getting discounts for restaurants that they go to periodically, and restaurants are getting loyal customers. Since it’s a new application, despite its uniqueness Repeat-Receipt is struggling to make the application stand out among the rest, and convince merchants to join them. Since the launch of the application, the sales representatives were able to close the deal with only 2% of the calls they made to the merchants.

The capstone group was assigned to increase the sales representatives’ performance by developing an expansion strategy that will point out the optimal sources and sinks. Sources and sinks are the restaurants, but Mobilaurus is going to be advertising Repeat-Receipt only at the sources, whereas sinks are simply going to fall under a trend that sources are hopefully going to spread as efficiently and far as possible. A good source is a restaurant that will spread out the notion of the application to the highest number of customers.

Optimal sources selection is based on acquired data of criteria such as merchants’ popularity, density, demographics and locations of the businesses. Knowing optimum sources, minimizes the advertisement costs, and reduces the time spent on calling numerous merchants, by focusing on those who are worth calling.

The Design Project Objectives and Requirements

The objective of this project was to find the optimal sources and develop an expansion plan for Repeat-Receipt. Design Objectives

The objective of this project was to define who are the optimum sources and develop an expansion plan for Repeat-Receipt. This was accomplished by a ranking model, which spurred a regression model that in its own highlighted major categories a source should have and to what extent. In addition, a linear programming was used to determine the number of optimal sources in a specific area and the distances between them.
Design Requirements

There are several requirements that were accomplished in order to complete our project: 1. A research about the target area and population was made to better understand the market of interest, 2. Understanding the correlation between number of customers and several other factors such as price, popularity, and distances from other restaurants, 3. Selecting several optimal sources such that the notion of the application will spread quickly to many restaurants and target the whole population, 4. Designing an expansion plan that will be used to find sources outside our target area and beyond this study.

Design Concepts considered

Several design concepts were considered in order to find the optimal sources. Several design concepts were considered and used in completing this project and creating a model that obtains the optimal sources.

Location Set Covering Problem (LSCP) Model

The initial stage was to define the coverage area a source has. The objective of covering models is to provide “coverage” to users and our target area. A user/location is considered covered when a facility is available to service the user within a specified distance or travel time.

The Location Set Covering Problem Model aims to locate the least number of facilities that are required to cover all users or demand points in a specified area. LSCP model does not take into consideration population, distance, and demand quantity specifics, which can lead to an excessive number of facilities (Ref. 1).

Maximal Covering Location Model

Another model that has been explored is The Maximal Covering Location Model. This model is looking at the problem of location allocation, from customer standpoint. The model finds the minimum number of sources and the locations where they will not be farther than the maximum distance people are willing to commute or walk to. (Ref. 1).

Multi Objective Model

Finding the optimal source that will attract the highest number of customers depends on several objective functions. The first objective function finds an area with cluster of restaurants, where the distance between a source and other merchants around it is minimal. Second, finds the optimal source, which depends on demand-oriented objectives
that include the popularity, distances, and price range of a merchant.
Third, maximizes the profit by increasing the number of restaurants
joining Repeat-Receipt application.

Regression Model

Regression is a statistical technique that aids in finding an
equation for a large set of data taking into consideration many factors.
The regression model shows us the most influential factors that have
the most affect on the dependent variable. It finds the relationship
between variables (Ref. 1). It points out the dominant characteristics
that increase the number of customers a restaurant has, and may help to
predict the possible revenue from a source.

Recommended Design Concept

Using a ranking model,
regression, and maximum
coverage location model, a set of
possible recommendation were
made.

Design Description

Ultimate goal of this project is to increase revenues from users,
by increasing number of users and merchants with the program, while
decreasing efforts and expenditures of sales representatives. In order
to appeal to a bigger population, a viable set of criteria was chosen to
see what a number of customers depends on. After some investigation
and due to resources limitations, 4 criteria were chosen to be key in
affecting the number of customers. Four main columns of this ranking
model are Δ distance to all other merchants, Δ time to all other
merchants, Δ popularity of that specific merchant, and Δ price
associated with this merchant. Besides main columns, there are
secondary columns that include words such as average or adjusted.
Even though Δd and Δt are data sets from a single source – Google
Maps; price criteria is based on Zagat and Urbanspoon, even more
popularity criteria incorporates data from Zagat, Urbanspoon, Yelp
and TripAdvisor. Secondary columns of popularity and price take care
of averaging up different source data. Then secondary columns adapt
averaged data into linear percentages. Δd and Δt become inverse
because the smaller the Δd/Δt the better. Average popularity stays the
same for results closer to 1 are preferable. Average price uses a
simplified bell curve, since the closest price to the mean of all prices
is better. These adapted linear percentages are multiplied by a beta
coefficient in order to get a relative distance, relative time, relative
popularity, and relative price. Beta coefficients are arbitrary
percentages that add up to 100% across the board. Since this kind of project is among the first of its kind, if not the first, all 4 beta coefficients were chosen to be 0.25. Adding relative: d, t, pop, price gives a unique percentage for each restaurant where numbers closer to 1 are ranked at the top.

**Analytical Investigation**

Ranking model was a success and regression model could be drawn from it. Data unspecified to any beta coefficient, thus adapted linear percentages were analyzed against existing data of number of customers at a corresponding restaurant. Analysis of 4 criteria to customer data was a critical part and essential way to obtain the true beta coefficients for each criterion. Regression model, similar to reverse engineering, allowed to see which criteria are more critical and key to the decision process.

Finally working with the refined data and coefficients, Maximum Covering Location Model was used in association with Linear Programming to solve for the minimum number of sources and their best allocation in the area.

**Key Advantages of Recommended Concept**

Limited manpower, resources, timeframe rise this concept above all other. Simplicity and relative accuracy of excel modeling of ranking allow any individual to collect criteria data for any area of interest, plug it in, and acquire overall ratings and ranks of each restaurant. Regression model is an accurate and precise test of ranking model data in relation to the number of customers, regression is a great and grave analytical tool. Maximum Covering Location Model and Linear Programming are final steps towards reaching the ultimate goal, spending less money by targeting minimum number of best sources.

**Financial Issues**

The designed and developed models did not acquire any costs to Northeastern University. The only software used was Excel that is available on all lab facilities at the university.

The proposed design presents a model that will give the optimal location to choose a business as a source for the advertisement campaign and the potential businesses (sinks) around it. Microsoft Excel, which is available in all computer labs at Northeastern University, was used to gather information and implement the models. Therefore, the design of process and the implementation of the model
do not acquire any costs on the University nor Mobilaurus. The advertisement costs for Mobilaurus will be minimized by allocating the optimal source that the model will suggest.

**Recommended Improvements**

To optimize the selection process of the sources and sinks, the model could be designed to cover the entire city instead of a targeted area.

Because of the time limitation, the model was designed to cover a specific busy area in the city. A suggested improvement would be to expand the model enough to cover the entire city instead of a target area. Another improvement to add to the project that was also hard to do with the time constraints, is to gather the information about the number of customers and popularity personally by going to restaurants and collecting the data, instead of relying on online sources and words of merchant managers.