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| Northern Arizona University |
| Requirements |
| CS 476 – Localization |

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# Introduction

A short summary that briefly describes your understanding of the problem, the key features of the proposed software system, and the key risks that must be considered in your development efforts. You'll draw this text from the sections of the document discussed below, so this should be the last (and best-written) text you write.

The localization features of MoneyClip Mobile will provide customers with targeted advertisement, coupons, and loyalty networks that will be an additional feature to an existing web-based payments infrastructure.  Below, the Problem Statement, Functional and Non-Functional Requirements, Environmental Requirements, Potential Risks, and the Project Plan can be found.

# Problem and Solution Statement

MoneyClip Mobile (MCM) is a web-based payments infrastructure providing fee-free transactions to customers and merchants using through the use of mobile smartphones.  Mr. Joshua Cross of Hermes Commerce, Inc. is planning to make this mobile payment system more robust by providing targeted advertisements, coupons, and managing customer’s royalty programs.

This capstone project will develop the localization features for the MCM advertisement, coupons, and loyalty network.  The software will be developed for the existing MCM network and database to ease the transition of integration this feature.  The team will be developing the same copy of the existing network and database on a local server to develop in and test the added feature.  The prototype of the localization features implemented on the database, web service, and iOS/Android applications will be presented to Mr. Cross at the end of this project.

Part 1: Problem Statement  
  
This project is sponsored by Mr. Joshua Cross, CTO of Hermes Commerce Inc. in Flagstaff. Hermes Commerce Inc. produces an application called MoneyClip Mobile (MCM) that allows users to transfer funds to and from other users, merchants or customers, without involving physical money or credit, or debit, cards. Mr. Cross is responsible for the development of MCM as well as for the business aspects of the product. MCM addresses the need of users to exchange funds regardless of distance.

The general problem facing MCM is competition with popular technologies such as Google Wallet and Square. Mr. Cross’ goal for overcoming this challenge is to combine all the functionalities of the competition into one application and find a niche for that application. In order to accomplish this MCM needs to transfer funds between customers and between customers and merchants and determine when a customer is making a purchase from a merchant so the merchant can push the charge to the customer’s MCM account. Also, MCM will give customers control over what kinds and how many ads or coupons they receive, and give merchants options for when to push ads or coupons depending on customer trends. Another problem facing MCM is that the website and iPhone app do not reach effectively reach Android phone users. The mobile app is the big draw for this product so missing this chunk of potential users makes the product less appealing.

This project involves developing an Android application to help MCM reach a wider user base. It also includes implementing a localization function that notifies merchants when MCM customers are in their vicinity, allowing the merchant to push a payment request to the customer’s MCM account if the customer makes a purchase. This functionality allows true moneyless transactions. The third and final chunk of functionality that we will be developing is the data analysis algorithms that will be used for effective direct advertising. We will be implementing trend finding algorithms that will be used for direct advertising. These algorithms will use past user transactions to find patterns and compute probabilities that will be available to merchants to aid their advertising decisions.

Part 2: Problem Solution

System Improvements

One piece of functionality we are adding is the ability to allow customers to select the amounts and sources of ads that are pushed to their account via the iPhone app, Android app, or website. They can customize their settings so that they only get certain kinds of specials or no ads at all. Merchant settings can also be changed on the website or either app. The next function we are adding is the analysis of customer traffic to find patterns that merchants can use for direct advertising. The merchants will have the option to push an ad depending on the chance that a customer will respond. For instance, if a customer just ate at a restaurant downtown there is 40% chance that they will get drinks when they are done. This information will be available to merchants so a bar can set their account to push an ad whenever a customer makes a purchase at a restaurant downtown. In this situation there is a very low chance that the customer will eat again so another restaurant will probably not push an ad to this customer. Related to this ads must be pushed to customers soon enough that they have not left the area before they get the ad. We haven’t determined this time limit yet.

Of the data stored by MCM, we will use the customer transaction history to determine purchasing patterns. (other stuff needed for localization?) The algorithms we implement will produce statistics for merchants. The pattern recognition algorithms will analyze past customer transactions in order to predict the future purchases. (DON’T KNOW YET)Merchants will be able to look at the probability of a certain customer making a purchase from them and determine whether or not they want to push an ad to that customer. The localization functionality requires the storage of more user settings such as the types of ads or coupons they are accepting on their account.

System Impact

Our additions to MCM will make it a more comprehensive and robust commerce app. Therefore our sponsor will have a better product to pitch, potentially making his job easier.  
Since there will be no money exchange, transactions will be faster and lines will move faster. Theft may also decrease because there would be less cash to steal, making it not worth the effort and consequences.

With the added localization functionality, MCM becomes a comprehensive commerce application. Many other applications focus on certain aspects of commerce but none so far combine them. MCM will have the potential of removing the need for physical money entirely because you will be able to move money between customers, and between customers and merchants regardless of distance. Merchants will also be able to advertise more effectively and customers will be able to tailor their account for ads and coupons that they are interested in.

# Functional Requirements

1. **iOS/Android Application**
   1. Users
      1. Create Account Page
         1. Users must be able to enter their name.
         2. Users must be able to enter their birthday.
         3. Users must be able to enter their gender.
         4. Users must be able to enter their groups.
      2. Login Page
         1. Users must be able to login using their username and password.
         2. Users must be able to navigate to ‘Create Account Page” (see 1.1.1) from this page.
         3. Must update user location upon login
      3. Home Page
         1. Users must be able to navigate to “Settings Page” (see 1.1.4) from here.
         2. Users must be able to navigate to “Merchant Map” page (see 1.1.5) from this page.
         3. Users must be able to navigate to “Search Page” (see 1.1.6) from this page.
         4. Users must be able to log out.
         5. Must be accessible from every page.
      4. Settings Page
         1. Users must be able to edit their localization options from here.
            1. Users must be able to turn off their localization option.
            2. Users must be able to turn on their localization option.
         2. Users must be able to opt in to various levels of participation for advertisements and coupons.
            1. Users must be able to opt out of all forms of advertisements.
            2. Users must be able to choose only to receive ads from certain merchants.
            3. Users must be able to choose to receive coupons from all merchants.
         3. Must have a link to the home page.
      5. Merchant Map
         1. Users must be able to see merchants on a map within a 5-mile radius.
         2. Clicking on the merchant coupon or advertisement must direct the user to the merchant map.
            1. The merchant map must show the direction from the current user location to the merchant.
            2. The merchant map must distinguish the selected merchant with a different pointer.
            3. The merchant map must show the current user location on the map.
         3. Must have a link to the home page.
      6. Search Page
         1. Users must be able to search for merchants.
            1. Users must be able to search by merchant name.
            2. Users must be able to search by merchant category.
            3. Users must be able to search by nearby location.
         2. Users must be able to search for coupons
            1. Users must be able to search by merchant name.
            2. Users must be able to search by coupon category.
            3. Users must be able to search by nearby location.
         3. Users must be able to search for advertisements
            1. Users must be able to search by merchant name.
            2. Users must be able to search by advertising category.
            3. Users must be able to search by nearby location.
         4. Must have a link to the home page.
   2. Merchants
      1. Create Account Page
         1. Users must be able to enter their business name.
         2. Users must be able to enter their business address.
         3. Users must be able to enter their business category.
      2. Login Page
         1. Merchants must be able to login using their username and password
         2. Merchants must be able to navigate to ‘Create Account Page”(see 1.2.1) from here
      3. Home Page
         1. Merchants must be able to navigate to “Account Settings” (see 1.2.4) from here
         2. Merchants must be able to navigate to “Advertisement Settings” (see 1.2.5) from here
         3. Merchants must be able to navigate to “Advertisement Creator ” (see 1.2.6) from here
         4. Merchants must be able to logout from here

Must be accessible from every page.

* + 1. Account Settings
       1. change product category
       2. add an address
       3. modify addresses
       4. change name
    2. Advertisement Settings
       1. Merchants must be able to see a list of their pre-approved advertisements and coupons.
       2. Merchants must be able to modify their existing coupons and advertisements and coupons.
          1. Modified advertisements and coupons must be approved again by MCM.
       3. Merchants must be able to edit their target audience for each advertisement.
       4. Merchants must be able to opt in to different levels of participation for ads and coupons.
          1. Merchants must be able to opt out of pushing any form of advertisement.
          2. Merchants must be able to choose different types of customers determined by various factors (such as frequent customers, new customers) for different advertisements.
          3. Merchants must be able to push advertisements and coupons to all targeted customers.
       5. Must have a link to the home page.
    3. Advertisement Creator
       1. Merchants must be able to create an advertisement.
       2. Merchants must be able to submit an advertisement to MCM for content approval.
       3. Merchants must be able to specify target audience for the advertisement.
          1. Merchants must be able to specify legal limitations of the advertisement

Alcohol advertisements require the age of 21 or over.

* + - 1. Must have a link to the home page.

1. **Website** 
   1. Users
      1. Create account
         1. In addition to the existing create account page, users must be able to perform the following actions.
            1. Users must be able to enter their birthday, including the year.
            2. Users must be able to enter whether or not they are a student.
            3. Users must be able to enter their gender.
      2. Login Page
         1. Users must be able to log in using their username and password.
      3. Home Page
         1. Users must be able to access the settings page.
         2. Users must be able to access the merchant map page.
         3. Users must be able to access the search page.
         4. Users must be able to access the recent activities page.
         5. Users must be able to manually input their current location, for the case when location privacy settings are enabled.
      4. Settings Page
         1. Users must be able to perform the same tasks that are available in the apps.
         2. Users must be able to edit their localization options from the website.
            1. Users must be able to turn off their localization option.
            2. Users must be able to turn on their localization option.
            3. Users must be able to opt in to various levels of participation for advertisements and coupons.
            4. Users must be able to opt out of all forms of advertisements.
            5. Users must be able to choose only to receive ads from certain merchants.
            6. Users must be able to choose to receive advertisements from all merchants.
         3. Merchant List and Map Page
            1. Users must be able to see a list of merchants and their coupons within a 5-mile radius.

Users must be able to see the relative merchant location distance.

* + - * 1. Clicking on the merchant coupon or advertisement must direct the user to the merchant location on the map.

The merchant map must show the directions from the current user location to the merchant’s location.

The merchant map must distinguish the selected merchant with a different pointer.

The merchant map must show the current user location on the map.

* + - * 1. Users must be able to search for merchants.

Users must be able to search by merchant name.

Users must be able to search by merchant category.

Users must be able to search by nearby location.

* + 1. Ad/Coupon Search Page
       1. Users must be able to search for ads/coupons by merchant name.
       2. Users must be able to search for ads/coupons by categories.
       3. Users must be able to search for ad/coupons by location.
    2. Recent Activities Page
       1. Users must be able to see a list of their recent localization activities.
       2. Users must be able to delete a list of their localization activities.
       3. Users must be able to sort through their list of localization activities.
  1. Merchants
     1. Create Account
        1. In addition to the existing create account page, merchants must be able to perform the following actions.
           1. Merchants must be able to input their product type.
           2. Merchants must be able to input their location by address.
        2. Merchant accounts must be approved by the MCM administrator for legitimate information.
     2. Login Page
        1. Merchants must be able to log in using their username and password.
        2. There must be a link to the “Create Account Page” (see 3.2.1)
     3. Home Page
        1. Merchants must be able to access the settings page.
        2. Merchants must be able to access the merchant map page.
        3. Merchants must be able to access the search page.
        4. Merchants must be able to access the recent activities page.
     4. Account Settings
        1. Merchants must be able to edit their product type.
        2. Merchants must be able to edit their location by address.
     5. Advertisement settings
        1. Merchants must be able to see a list of their pre-approved advertisements and coupons.
        2. Merchants must be able to modify their existing coupons and advertisements and coupons.
           1. Modified advertisements and coupons must be approved again by MCM.
        3. Merchants must be able to edit their target audience for each advertisement.
        4. Merchants must be able to opt in to different levels of participation for ads and coupons.
           1. Merchants must be able to opt out of pushing any form of advertisement.
           2. Merchants must be able to choose different types of customers determined by various factors (such as frequent customers, new customers) for different advertisements.
           3. Merchants must be able to push advertisements and coupons to all targeted customers.
     6. Advertisement Creator
        1. Merchants must be able to create an advertisement.
        2. Merchants must be able to submit an advertisement to MCM for content approval.
        3. Merchants must be able to specify target audience for the advertisement.
           1. Merchants must be able to specify legal limitations of the advertisement

Alcohol advertisements require the age of 21 or over.

* + 1. Advertisements (list of ads on account?)
       1. Merchants must be able to create new coupons and advertisements.
       2. Merchants must be able to modify existing coupons and advertisements.
       3. Merchants must be able to opt in to different levels of participation for advertisements.
  1. Administrator
     1. Administrator must be able to approve new advertisements/coupons.
     2. Administrator must be able to take off inappropriate advertisements/coupons.
     3. Administrator must be able to see a list of merchant activity.
        1. Admin must be able to see a list of approved ads/coupons.
     4. Administrator must be able to see a list of user activity.
     5. Administrator must be able to manage when merchant’s ads get pushed to a customer.

# Environmental Requirements

In this section, you will discuss the non-functional requirements that relate to environmental considerations, such as restrictions that relate to hardware platforms, software libraries or products that must be used, programming languages required by the customer, or any other external standards, laws, or constraints of any sort that your system must conform to.

Existing Infrastructure

The team must use the existing MCM infrastructure, so the transition of adding the localization feature will be seamless.  Thus, a Mac computer will be required for iOS/iPhone programming.  iOS deployment on a physical device requires a subscription to the Apple Developer Network, which costs $99 annually.

Content Filter

Initially, merchants will be able to create any ads that they choose to. However, in  the case that ad content is found to be inappropriate, the system will need to allow for a content filter to be easily added.

Google API Limitations

Geocoding is the process of converting addresses into geographic coordinates which you can use in Google Maps to place markers or position the map. Geocoding is a time and resource intensive task. Google recommends designing a cache for all systems that use geocoding to store addresses that have been pre-geocoded whenever possible. This is particularly crucial to implement because Google API has a query limit of 2,500 geolocation requests per day. If the limit is exceeded too often, Google will block access to the Geocoding API. Furthermore, our implementation of the system is limited to the inputs and outputs used by the Google API.

[1] <https://developers.google.com/maps/documentation/geocoding/#Limits>  
  
  
Java and XML

Android applications must be developed using the Java programming language along with XML. Our client has asked us to create an android application that showcases our localization capabilities, therefore, Java and XML must be used in the implementation of our project.

Android devices

There are several differing Android devices currently on the market. The most crucial difference to understand while implementing our project is the difference in screen size and screen density between the devices. Due to this, we must implement our Android application so that our interface is displayed relative to each device screen rather than one particular screen size.

**Might be Useful**  
<http://opensignal.com/reports/fragmentation.php>

Android OS

There are several different Operating Systems that are being used on Android devices. Our application will have to be implemented so that it can be accessed on as many different OS versions as possible. The application should also be developed using an API high enough to fully and correctly implement the system, but the API should be as low as possible so that more devices can be compatible with the application.

iPhone devices

xCode

iPhone applications must be developed using xCode. Our client has asked us to create an iPhone application that showcases our localization capabilitie, therefore, xCode must be used in the implementation of our project.

# Non-Functional Requirements

This section should contain a discussion of the non-functional properties particularly relevant to the product under development. Does the system need to perform under certain bounds of correctness or performance? Reliability? Reviewing the listing of non-functional properties of software systems from your software engineering course notes will be helpful, but remember that not all of those qualities will be relevant to your project.  
Furthermore, recall the qualities of *specificity* and *verifiability* that are characteristics of good non-functional requirements statements: Your statements should be specific to your project's needs, not general statements that sound good for all software systems. Your statements should also be clearly verifiable and should serve as tests that your system will either pass or fail; for example, I can't test "my system will run super fast" but I can test "my system will retrieve a customer record in 0.5 seconds."

Due to MCM having an existing infrastructure, the localization feature must be integrated into the existing system seamlessly.  This includes the existing webservice, iOS application, and the database.  The Android application is yet to be developed for MCM, so the basic skeleton of the iOS application will be used.

This one involves verifiability tables.   
  
Goes in table (Requirement, Description, Condition, Threshold of Verifiability)   
Accessibility  
Efficiency???  
Scalability - google api (see environmental req)  
Integrity  
Maintainability  
Performance (timing, efficiency?)  
portability → documentation important  
reliability  
reparability  
reusability  
robustness  
size  
understandability  
usability

# Potential Risks

This section outlines the potential risks that are the most relevant to this project. It analyzes the impact of the risk and also steps to mitigate the risk if possible.

Security of Localization Integration

**Risk:**

The localization feature of the system compromises the security of the existing payments infrastructure of MCM.  The integration of the localization feature of the system to the existing MCM infrastructure may create security loopholes in the system.  

**Impact:** The impacts of this risk would be very high, since user payment information is at risk.  Thus, utmost care must be put into the integration of the system to avoid security loopholes.

Privacy Protection Makes Geolocation Impossible

**Risk:**

Users have a privacy protection on their geolocation, so targeted ads based on location becomes unfeasible.

**Impact:**

The localization feature heavily relies on the user’s specific location, and thus targeted ads and coupons become impossible.  The user would need to manually input their current location to the system, which becomes an inconvenience to the user.  Merchants would also be unable to push advertisements and coupons, potentially losing customers.

Merchants Push Too Many Advertisements and Coupons

**Risk:**

Merchants push too many advertisements to their users using the new feature in localization.

**Impact:**

This risk would degrade the reputation of MCM, making it seem like a spammer app.  Users may disable, remove, or block the application from pushing advertisements, in which case useful features of localization become unavailable.

No Cell Service

**Risk:** No cell service at the user location.

**Impact:** Users would not be able to receive real-time updates of nearby merchant information, advertisements, and coupons.  Users may thus not be able to receive relevant coupons, losing money.  Merchants may also lose potential customers.  Mitigation strategies for this risk would be to provide offline functionality for users.

Inaccurate Geolocation

**Risk:**

Location information obtained from mobile devices are inaccurate.  Location readings from mobile devices can be inaccurate for several reasons.  A combination of GPS, Cell-ID, and Wi-Fi information are used to provide the user’s location.  These services provide different levels of accuracy, and it may result in inaccurate user location.  Also, customers using their mobile devices are often moving from location to location, and the user location system may not provide accurate data at one point in time.

**Impact:**

Users may receive irrelevant advertisements and coupons from merchants.  Also, inaccurate user location may confuse the user and prevent them from using the app in the future.  This results in a loss of customers for MCM and their affiliated merchants.

MCM Server Failure

**Risk:**

The MCM server may go down.

**Impact:** Customers would not be able to receive real-time updates of nearby merchants and their advertisements and coupons, thus potentially losing money.  Also, merchants would also be losing potential customers during server down-time.  One of the mitigations for this risk is to save offline information for the apps to be useful while the server is down.

More than One Merchant in User Proximity

**Risk:**

User is in proximity of more than one merchant.

**Impact:**

Users may receive data from more than one merchant.  Users may be confused by having the application notifying them about multiple merchant information.  Merchant transaction may then become inaccurate, where users are paying to the wrong merchant.

# Project Plan

Offer a short discussion of your project plan, as it stands right now. Describe a number of milestones (as you begin, 5-10 milestones should be easily identified, but this will become more finely granular as you continue working), in terms of the functional requirements for the system (or groups of functional requirements), and lay out when these milestones will take place in the months to come. A graphical depiction like a Gantt chart should be included, as an augmentation to your text.

Sources