Mobile Applications for Trust Based Marketing: Design, Implementation and Evalutation

by

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Submitted to the Department of Electrical Engineering and Computer Science
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Abstract

An emerging trend in marketing has been the use of web and mobile applications to market to a new generation of consumers. These forays into new media reflect a response to increased use of the internet, declining participation in traditional media channels, and new channels for user engagement. Mobile devices in particular are enabling the most enticing new channels for consumer interaction due their frequent use, close user proximity, and features like GPS or camera functionality. This thesis seeks to explore how the mobile platform can best be used to develop consumer trust. The test environment will be the exploration of 3 different mobile application for a major Japanese Bank, that vary in key application design dimensions and the ultimate development of one of them. Those dimensions will be information density, customizability and industry relevance. The application platform design is focused on adaptability so that other developers can use the generalized principles from the study to optimize and test their applications. This is a constraint largely enforced by the need to create a platform that can be adapted to the Japanese and US markets. In addition we seek to test how trust-based mobile apps compare to other stimuli like television, web ads, and mobile ads through controlled pre-post measures of test users.

Thesis Supervisor: Glen L. Urban
Title: David Austin Professor of Marketing
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To begin, I would like to thank my advisor, Professor Glen Urban, for all of his guidance, support, and friendship over the past two years. I've learned many things from Glen, who introduced me to the exciting world of digital marketing, and I am greatly indebted to him. I am constantly amazed by his thoughtfulness, his patience, and his deep insights into whatever problem is at hand.

I want to thank Shigeto Takei of Suruga, for his help defining the goals of the project, the user experience, translations and expertise in Japanese culture. He has been instrumental in helping me understand how financial customs work in Japan, and guiding focus group sessions. I also owe thanks to Emily Zhao for her contributions to the design of the concept applications.

This research is conducted at the Center for Digital Business and the Marketing Department at the MIT Sloan School of Management with the financial support of Suruga Bank of Japan. I would like to thank my sponsor for making my work financially possible, as well as for being a pleasure with which to work.

I would also like to thank Google and the teams I work with for enabling me to take a leave of absense to come back to MIT. I've learned a remarkable amount about the mobile, financial and commercial industries that will serve me well with my work in Google mobile and advertising.

Finally, I would like to thank my parents who have supported me in every way possible, but always let me make my own path. The older I get the more I realize how much they have shaped me, and I am eternally grateful for all of their sacrifices and lessons. I would also like to thank my longtime girlfriend Lucy Richert who helped motivate me to come back to MIT and has always been there to support me through long long nights of work.

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Contents

List of Figures

List of Tables

Chapter 1

Introduction

Traditional marketing techniques focus on finding new customers by sending messages that are not well-integrated with the target's activity, and which are consequently interruptions to a desired activity. For example, television and print advertisements are orthogonal to the television programs or newspaper articles with which they are paired. Banner advertisements are analogous on the web. These traditional methods are increasingly ineffective due to both customer fatigue and advances in technology such as TiVo, caller ID, and spam filters.

Mobile and web applications represent a new advertising medium for large companies. This medium is particularly compelling because it can attract customers with a clear value proposition, while more subtly promoting the brand or directly driving sales of the product. These applications have more stickiness than a banner advertisement because the user is attracted to the application for its offered value; mobile applications are particularly sticky because they involve installing the application on a user's mobile device. Additionally, mobile marketing collects customer behavior data (including information relating to time and location) and offers a mechanism to rapidly assess the efficacy of an advertising campaign.[5]

A look at any iPhone user's home screen will identify numerous examples of corporate-sponsored mobile applications. Some enable the user to use the company's service on the go: Google Mobile, Amazon, the New York Times, and Bank of America Mobile Banking are a few salient examples. Others offer a special service that

consumers might find useful; the Whole Foods Market Recipes application and the iFood Assistant by Kraft each attempt to simplify finding a recipe on the go and purchasing the appropriate ingredients, while the Cisco Global Internet Speed Test application tracks WiFi and 3G connection speeds. In some cases, the relationship between the application and the sponsor is tangential at best. Some examples are the Flex Photo Lab application by Ford, or the CBS Sports Mobile application sponsored by Audi.

Mobile devices are quickly becoming the dominant platform for new media, surpassing shipments of traditional desktop and laptop PCs in 2010.[7] High speed networks like 3G are accessible by over 95% of devices in Japan and over 50% of devices in the US[7], making those markets ideal targets for new media rich applications. The explosion of app usage has been led by the gaming, social, news, shopping and productivity application categories.[9] Many businesses have sought to reach this rapidly expanding market through their own gaming or productivity apps; however, the efficacy of such corporate-sponsored applications as advertisements is largely unknown.

The goal of this project is to evaluate three different application designs and measure how variations in the designs along the aforementioned dimensions affect advertising efficacy. The project sponsor is Suruga Bank of Japan, with the three proposed applications targeted at different consumer needs related to the life transition of marriage and moving into a new home. The first of these applications falls into the productivity category and is designed to help the bride plan the details of a wedding. The second application helps consumers compare homes and provides advisor services around the financial decisions for the purchase of a first home. The last app focuses on social media interaction by creating a central repository of photos and videos for guests and relatives to share and interact with at a wedding event.

We utilized focus groups to evaluate design prototypes of the three proposed applications, and choose one to develop into a fully functioning application for field trials in Japan. The home purchasing application generated the strongest positive feedback from initial testing and was also seen as the most closely related to the Suruga banking brand use in the study. A major portion of this thesis focuses on

the engineering design and challenges of this home purchasing app - with a particular focus on the features relevant to driving marketing goals like user engagement.

1.1 Summary of Thesis Content

Chapter 2 will provide background information about the rise of corporate sponsored mobile applications, interface morphing as a marketing tool.

Chapter 3 will give an overview of the design and use of three proposed applications.

Chapter 4 will provide results of the focus groups conducted on the three proposed application designs.

Chapter 5 will give an overview of the design and architecture details of the SmartMover Application.

Chapter 6 will walk through the use and features of SmartMover.

Chapter 7 will provide a description of the experimental framework SmartMover is a part of.

Chapter 8 will discuss personal contributions and future work.

Chapter 2

Background

2.1 Introduction

Suruga Bank is a Japanese commercial bank, which is physically based on the Shizuoka prefecture and greater Tokyo area. Quite different from most commercial banks in Japan, it has focused on retail banking such as mortgage, personal lending, and credit card business for more than 20 years. It built a CRM system throughout the 1990s that has led its reorganization into more customer-oriented units in the early 2000s.[10] It was also an early pioneer in virtual banking which enabled it to expand nation-wide by providing online services to consumers in locations where it lacked physical branches. Continuing with its precedent of consumer focus, Suruga is an ideal partner for the exploration of mobile applications to build trust and advocacy with consumers.

2.2 Traditional advertising models

Traditionally, companies would sell their products or service by push-pull marketing. This entailed sending one-sided messages though mass media channels such as TV commercials, telephone sales, and direct mail. The situation changed dramatically as consumers began to absorb more content through the Internet which made information inexpensive and ubiquitous. Push-pull marketing was no longer a pri-

mary channel for consumers to receive information about products or services as new community based information systems sprouted up on sites like Amazon, Yelp and ConsumerReports.

This change in consumer behavior led many companies to pursue relationship marketing. A key development of relationship marketing was personalized service and product differentiation informed by complex CRM systems. However, these systems still relied on user data to develop a quality personalization. Professor Glen Urban proposed "Advocacy marketing" to solve this problem in 2005.[11] Advocacy marketing encourages companies to communicate with customers interactively and provide full information so that the customers' profit will be maximized. Companies can make long-term profits based on the long-term trust and loyalty between customers. Progressive Insurance executed one of the largest and well known advocacy marketing campaigns with their insurance recommendation system that included competing insurers that may have better rates than Progressive.[1]

The desktop web has been the primary portal for new advocacy marketing techniques, however mobile devices are becoming an increasingly dominant platform for real time information retrieval. Consumers regularly use their mobile devices during the purchase research and discovery phase, even while standing in the checkout line.

2.3 Existing Mobile Banking

As the number of applications for mobile devices has exploded in the last 6 years, the banking industry has been quick to provide an array of mobile services. These applications primarily focus on providing functions for retail banking, investor services, and increasingly commerce related promotions. In general all of these applications are designed to provide either new interfaces to banking services (as in account management) or extensions to existing services. A general survey of applications available in the iPhone and Adroid Application markets found applications that offered the following features to existing customers.

[1]http://www.progressive.com/shop/about-car-insurance-compare.aspx

- **Account Information and management**

    1. Mini-statements and checking of account history
    2. Alerts on account activity or passing of set thresholds
    3. Monitoring of term deposits
    4. Access to loan statements
    5. Access to card statements
    6. Mutual funds / equity statements
    7. Insurance policy management
    8. Pension plan management
    9. Status on cheque, stop payment on cheque
    10. Ordering cheque books
    11. Balance checking in the account
    12. Recent transactions
    13. Due date of payment (functionality for stop, change and deleting of payments)
    14. PIN provision, Change of PIN and reminder over the Internet
    15. Blocking of (lost, stolen) cards
    16. ATM Locations

- **Payments, Deposits, Withdrawals, and Transfers**

    1. Domestic and international fund transfers
    2. Micro-payment handling
    3. Mobile recharging
    4. Commercial payment processing
    5. Bill payment processing

6. Peer to Peer payments
7. Deposit via photo

- **Investments**

1. Portfolio management services
2. Real-time stock quotes
3. Personalized alerts and notifications on security prices

- **Content and Commercial Services**

1. Loyalty-related offers
2. Location-based services

From this list it is clearly evident that mobile banking applications are primarily targeted at increasing loyalty or engagement among existing bank customers. However banks still continue to channel billions into traditional advertising channels aimed at consumers higher up the marketing funnel (Figure 2-1). These channels include television, print, online ads and event sponsorships. Mobile applications could also be a viable platform for reaching consumers higher up the marketing funnel in ways not directly connected to a bank's core services.

There has been some exploration of the mobile platform for marketing outside of direct display ads, but it has not kept up with the rapidly changing technology being built into mobile devices. Five years ago, the focus was on Short Message Service (SMS) as a way to have direct, tracked communication with consumers on simple feature phones.[5] This format has since faded due to its own limitations and the growth in full data connections that allow persistent access to any information on the Internet. Three of the primary limitations were the extremely limited message options available within the 160 characters supported, the consumer permission required to send messages due to the cost per message and most importantly that it relied on traditional advertising to gain initial consumer awareness. Full applications offer a richer platform to reach consumers and to establish recurring interactions.

Figure 2-1: Marketing funnel for consumer engagement

2.4 Interface Morphing

Different people process information differently. Some people are analytical; they prefer to take messages apart and to study each component in great detail. Others are more holistic, and prefer to be briefed on the bigger picture. Some people think visually, while others are better at processing words. These different cognitive styles have significant implications for businesses; a good salesperson understands that he can increase sales by adapting his pitch to appeal to an individual customer's mode of thinking.

The implications are similar in a mobile paradigm. For instance, mobile applications can be designed to appeal to highly analytical customers by including powerful controls for information navigation using tabs, drop-downs, and search boxes; or they can appeal to more holistic users by using visuals, open space and sparse interaction channels. We would expect that a application designer's choice of styles will affect

how frequently various groups of customers convert within the application. Classically, a designer would have to choose to cater to one kind of customer. In theory, however, applications could imitate a good salesman by detecting a customer's cognitive style and morphing to match it – a technique that has come to be known as "interface morphing."

Recent research in the web domain has demonstrated the efficacy of this technique. In a 2009 study, Hauser et al. built an experimental morphing website for BT Group which demonstrated an approximately 20% increase in purchase intentions by customers.[2] The website determined cognitive styles from clickstream data using a Bayesian model, then applied a dynamic-programming technique to achieve a balance between exploration (choosing various probably-suboptimal levels of morphing to determine how morphing affects purchase probabilities) and exploitation (maximizing short-term sales). These analytical techniques helped determine optimal "morph" assignments for customers to the experimental BT Group website, resulted in increased purchase intentions that, if implemented system-wide, represent approximately $80 million in additional revenue.

In this study, we will not be directly applying dynamic morphing to the interface, but we will be varying the application features along dimensions that could be modified through dynamic morphing in the future. By determining the key application design dimensions that influence user conversions, morphing systems can dramatically reduce the morphing space without sacrificing performance.

2.5 DubbleWrap Study

The DubbleWrap study was an MIT study done in 2011 that looked at mobile application impact on brand perception for Liberty Mutual.[3] In the study an iPhone application to catalogue an individuals home items for renters and home insurance was created to provide value for users and get them thinking about their insurance needs. The study grouped participants into test cohorts that were variably exposed to the application, the Liberty Mutual website, www.youcovered.com, and two thirty

second Liberty Mutual TV ads. By comparing the effects of user responses to survey's before and after the stimuli, the study was able to use difference methods to determine that the application was strongly more effective than other forms of marketing media.

The survey measures focused on participants familiarity with Liberty and competing brands, how likely they were to consider Liberty for their insurance needs and their general attitude towards Liberty. In addition to receiving positive ratings about a variety of attributes ("the app is informative", "the app is believable",), the app increased many of the brand ratings. Among other highlights, the app increased consideration by 25%, probability of purchase for rental insurance by 16%, and preference for Liberty Mutual by 84%. Moreover, the app was more effective than TV ads. We saw a 60% greater increase in consideration and a 34% greater increase in preference for Liberty Mutual compared to TV ads.

Chapter 3

Concept Applications: Design

I created three different application designs intended to engage potential new customers during major financial transitions in their life. Two of the applications are focused around the transitions associated with marriage, while the third is focused on helping users with a move transition. One of the wedding applications is really a general platform for social events, but we have chosen to use a wedding as an example social event. We have also tended to choose applications that favor women, since they tend to control household finances in Japan.[1] The wedding event precedes the initiation of a new household account shared by the bride and groom while moving precedes financial decisions like mortgages, insurance and potentially children. I created mockups, storyboards and experience descriptions to guide two separate focus groups with the target consumer population of Japanese women to understand how their preferences align with the proposed applications.

3.0.1 Moving Application

The Move Application is focused on helping users keep track of the steps required to find and compare potential new homes to purchase or rent. Users are presented with a list of tasks to complete during a move and functionality to compare potential homes and furniture. The application also helps users consider tradeoffs between homes beyond the physical property such as the neighborhood, schools, and financial

implications.

In addition to providing passive advertising for Suruga Bank, the application drives demand for key banking products like mortgages, home or renters insurance, and new household accounts. The purchase of a home is often a group activity as well, so we would like to vary the social dimension of the application with the ability to sync data between multiple users of the application, such as a husband and wife. Customizability will be varied according to the level of detail a user can add about a potential home.

Moving Application Description

> Are you getting ready to move into a new home? Get organized with this great moving app. Your planning will be a snap, so you can get down to enjoying your new digs!
>
> First the app helps you sort and compare properties you are considering for purchase. Stored information is presented in a straightforward, yet detailed form that lets you quickly and easily assess the pros and cons of each property. Take notes, photos, and details about each house you look at.
>
> Once you've settled on the perfect home its time to actually move in. To help you get organized as you move into a new house the app also provides pre-populated To-Do List tasks for your move. You can also customize the list to suit your particular move by deleting tasks that aren't for you, and adding new ones you need to do. A new home also means moving your stuff and getting new things to make your space comfortable. The application helps you plan out what furniture and other items you will need for each room as well as evaluate the total cost. Once you've got everything figured out you can use the budget function to see what its going to cost you to move in, and from month to month so you make sure you've got all your expenses covered or get advice for filling in any gaps.

Moving Application Dynamics

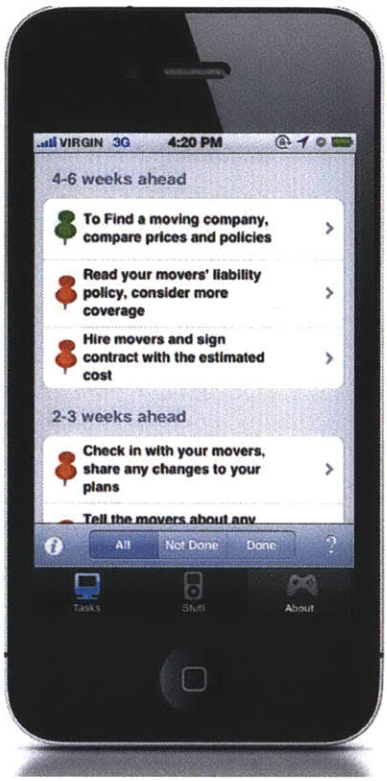
The home page gives users the option to navigate to their list of tracked homes or see a list of tasks to complete. The tab bar on the bottom also provides navigation functionality.

Figure 3-1: Home finding application

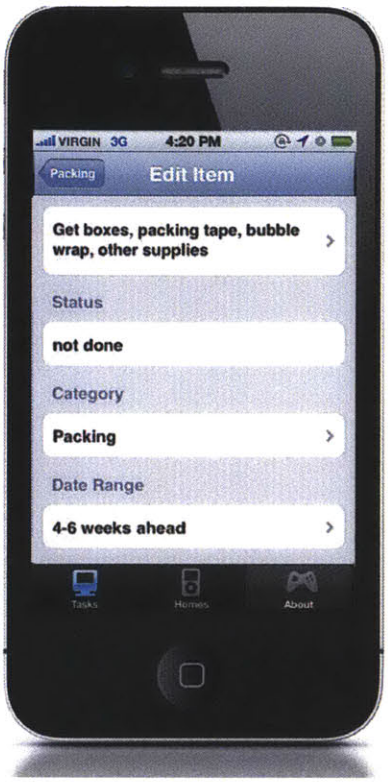
The application has a pre-populated list of tasks that most people need to complete during a move. It also enables the consumer to add their own custom tasks. For each task the user can give a short description, a category, and a time range it should be completed by.

Each home that the user visits and adds to the application is displayed in a list with its ranking to be easily compared to others. Clicking on a home from the list will bring up the detailed view of that home (figure 3-3b) with pictures, decomposed ratings , contact and location information.

Users can enter fine details about each home, including custom notes, pictures, area ratings, and the financial considerations for each home.

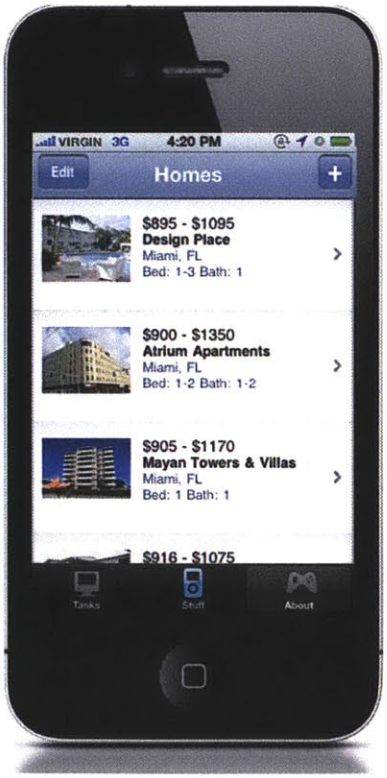


(a) Task List

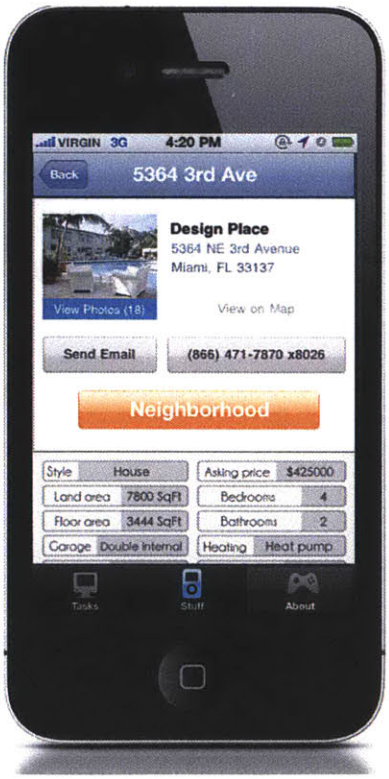


(b) Add Task

Figure 3-2: Home finder task features



(a) List of homes



(b) Listing details

Figure 3-3: Home finder comparisons

(a) Notes and photos (b) Neighborhood details (c) Financial details

Figure 3-4: Home finder comparisons

3.0.2 Wedding Planning Application

The wedding planning application helps users plan and compare options for a wedding as well as keep the bride and groom in sync. The application is primarily centered around a task list with a detailed set of comparison options to help users complete each task. A wedding is a key financial transition for most people, particularly for women in Japan. It precedes the opening of new joint household accounts and the search for a new home for the bride and groom to share. The social dimension of the application can be varied by enabling and disabling the syncing of content between the bride and groom. Customizability can be adjusted in the task list itself and the detail fidelity will be controlled in the itemized comparison functionality.

Wedding Planning Application Description

> There are a lot of things to keep track of and choices to make when planning a wedding. This app will organize, guide and inspire you while keeping all the vital information at your fingertips as you plan your wedding. For each task you can mark a due date and take notes. In addition

the application lets you track and compare multiple options you are considering for dresses, cakes, venues, flowers, food and any other task.

Here's how it works: The app comes with a set of pre-populated common tasks for planning a wedding and you can add any custom tasks you want. For each task you can pull up a list of options you are considering. Want to find the perfect dress? Simply pull up that task and add a new option for every dress you are considering. The app lets you include photos, price, vendor and other notes about each dress so you can quickly see which one is the best match for you.

Wedding Planning Application Dynamics

Figure 3-5: Wedding planning application

The home page enables users to navigate to a task list or reception details.

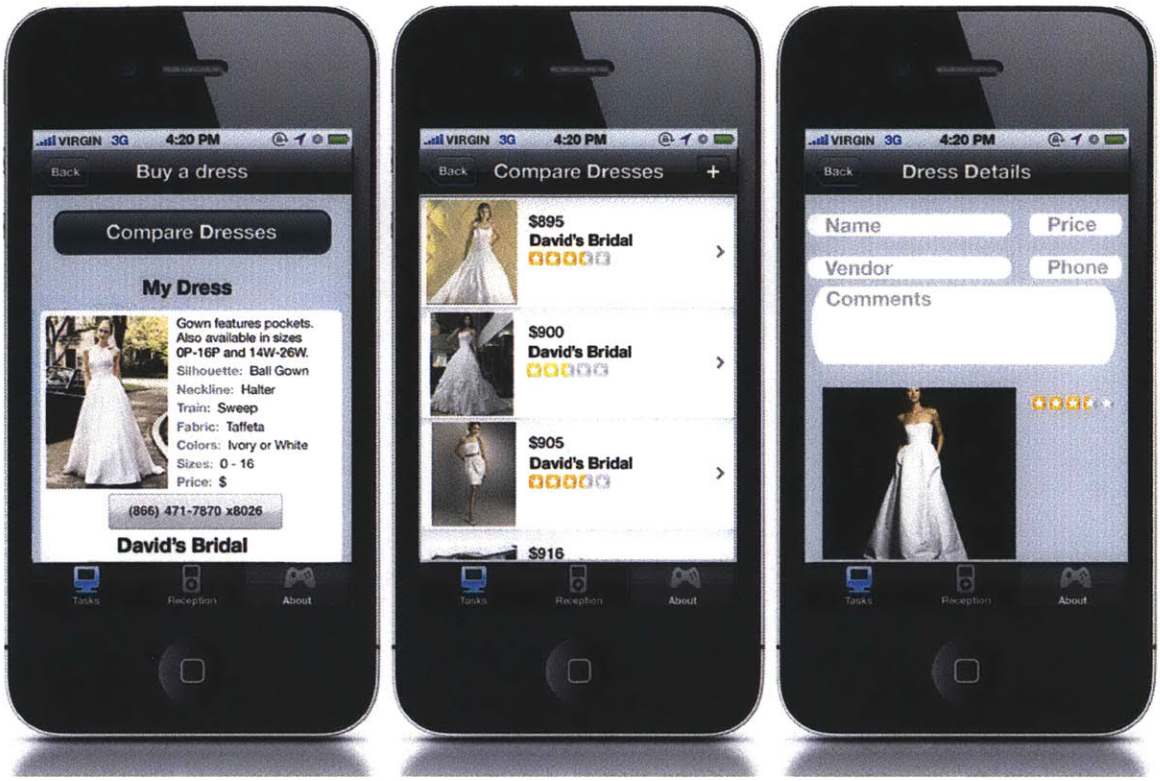
Similar to the moving application, users have a pre-populated list of common wedding planning tasks and they can add their own. They can also keep track of spending with the itemized budget feature.

Clicking on a task brings up a details screen to compare options associated with that task. In the example shown by figure 3-7 the bride can compare dresses and see her currently chosen dress. The comparison presents a list of rated dresses that the

(a) Task List (b) Add Task (c) Budget

Figure 3-6: Wedding Planner task and budget features

user has manually added as they shop for dresses in stores. For each dress the bride can add pictures, comments, pricing and vendor information.



(a) Buy a Dress details (b) Compare options list (c) Individual dress details

Figure 3-7: Task Option comparisons

3.0.3 Social Event Application

The third and final application centers around group participation in an event. As mentioned earlier, a wedding is an ideal event to engage consumers due to its relationship to financial decisions. This app allows users to enter custom information about their event through a web interface such as the locations, times and any sub events. Their event is given a unique ID that guests can enter into the application on their own phones to sync down all the custom information. In addition, guests can use that application to capture images during the event, which are automatically shared with any other guest of that event with the application in real time. Most social sharing models rely on individual person to person connections to enable sharing, however many events bring people together who do not have pre-existing connections. This is particularly true of weddings. Instead of forcing guests to establish links to one another, guests are essentially sharing photos with the event itself, and have access to any other photos others have added to the event.

Social Event Application Description

Imagine having a custom app for you and all your guests on your special wedding day. This app allows you to create a unique app with all the event and location details for just your wedding. Guests can download the app to stay on top of all the different events during the wedding day. They can also take photos which are automatically shared with everyone at the wedding. At the end you'll have an entire collection of photos without your guests having to share or send them to you. Guests can even take videos that get shared with everyone at the wedding so you can re-live all the fun the next day.

Social Event Application Dynamics

(a) Events (b) Places (c) Photos

Figure 3-8: Personalized wedding event application

A social event generally consists of 3 main components - sub events, places, and photos. Users don't need to be individually connected with each other through social networks, since the event is the common sharing domain. All pictures, sub events,

and places users take with the application are automatically shared with all other users registered for that event.

Chapter 4

Focus Group Results

In order to evaluate the three proposed applications, we conducted initial user feedback sessions and 2 focus groups with Japanese women who were either recently married or of marriage age as the target demographic. We chose to break our focus group users into two separate groups in order to control for group thought that might bias individual user's feedback. Results showed that the Moving Support application offered the most compelling features and was most likely to affect a user's impression of Suruga.

We structured each focus group into four segments. One segment for each of three application concepts and a fourth to compare the presented concepts. For each application we presented users with the application description and mock ups of the application. We then asked each participant to write down a brief description of the application in their own words as well as their initial impressions. We focused on having users write down their opinions on paper so as not to be influence by other members of the group. Once each individual had written down their impressions we opened up group discussion by asking users to raise their hand if they would use the application and read out loud their reactions. For those who disliked a concept, we particularly probed and discussed what features could be added to the application to add value. We also discussed if users would recommend the applications to their friends to gauge potential for viral and social marketing implications. Lastly we asked respondents how the concept would affect their opinion of Suruga Bank if they

provided such an application.

The first group consisted of 5 women - 3 single and 2 recently married. This group favored the Wedding Memories and Moving Support applications, but saw Wedding Memories as the most compelling. Results of this group are summarized in Table 4.1

Table 4.1: Focus Group 1 Results

Application	Moving Support	Wedding Planning	Wedding Memories
Most Likely To Use	2/5	1/5	2/5
Least Likely To Use	1/5	4/5	0/5
Most Related to Banking	5/5	0/5	0/5
Least Related to Banking	0/5	1/5	4/5
Probably/Definitely Use	4/5	2/5	3/5

The second group had quite different opinions than the first group. The group consisted of 6 single women and 1 married woman. This group favored the Wedding Planning application, perhaps because there were more single women who still had yet to plan a wedding. The moving application also tested well with this group of women, and again was most likely to affect a participants opinion of Suruga.

Table 4.2: Focus Group 2 Results

Application	Moving Support	Wedding Planning	Wedding Memories
Most Likely To Use	3/7	3/7	1/7
Least Likely To Use	2/7	1/7	4/7
Most Related to Banking	7/7	0/5	0/5
Least Related to Banking	0/7	0/7	7/7
Probably/Definitely Use	6/7	5/7	3/7

Table 4.3: Overal Results

Application	Moving Support	Wedding Planning	Wedding Memories
Most Likely To Use	5/12	3/12	4/12
Least Likely To Use	3/12	6/12	3/12
Most Related to Banking	12/12	0/5	0/5
Least Related to Banking	0/12	1/12	11/12
Probably/Definitely Use	10/12	7/12	6/12

Over all the participants, Table 4.3 shows that the most users were likely to use the Moving Support application and it was clearly the most closely related to Suruga

in peoples minds. The focus groups also provided important feedback and changes that I have been able to integrate into the applications implementation.

The primary suggestions for the Moving Support application were:

- Add features to support renting a home.
- Map display of homes that users will or have visited.
- Share the ratings of other app users.
- Support budget features for both initial and monthly costs for the move.
- Suggestions of what household and furniture items to buy.

The primary feedback for the Wedding Planning application was:

- Most women use a wedding planner provided by the location of their wedding.
- Difficult to customize to their needs since every wedding is different.
- Questioned why a bank would be providing the application
- Liked the ability to create sub events within their wedding to help run the activities on the day of the event.

The primary feedback for the Wedding Memories application was:

- Liked the idea of sharing photos without needing to manually organize and exchange photos
- Would be limited to just smartphone users, but everyone wants to take photos at a wedding.
- Couldn't imagine this changing their view of Suruga.
- Divide the pictures up into scenes based on when they were taken.
- Add messages to photos.

Based on these results and feedback from Suruga it was determined that the Moving Support application would be the best candidate for a full application prototype. I expanded the initial concept to include features for rental homes and customize the content based on a user's timeline, whether they were renting or not and their financial status. I have also included the ability to track items to furnish a new home. Lastly, I renamed the application to SmartMover to highlight that it helps with more than just choosing a home, but the whole life process.

Chapter 5

SmartMover Application: Design and Implementation

5.1 Overview

The SmartMover application was built as an iPhone application using the iPhone 4.0 SDK. The iPhone platform was chosen as the most popular single device in the Japanese market, claiming about 40% market share.[4] In order to dynamically customize and update the application content over time, I designed the iPhone application to pull content from a web-server using the JSON data wire format. The current development server utilized the Django web framework on Linux Apache, however any web server using HTTP could serve the same function. For the native iPhone application, I am using the `AddressBook` , `CoreLocation` , `MapKit` and `CoreData` Frameworks in addition to the standard `UIKit`, `Foundation`, `CoreGraphics` and `QuartzCore` Frameworks that all applications start with.

Welcome Screen The Welcome Screen serves to gather fundamental data about application users to help guide the advice given to them, the tasks that are prepopulated and the preset room configuration. The user only sees the welcome screen once at which point the data is saved and every subsequent use of the application moves immediately to the tabs view.

Task List The task list utilizes a grouped TableViewController with a pre-populated list of the tasks involved with finding a home, moving in and associated financial decisions. The list is dynamically pulled from a web-server upon application initialization after the user completes the Welcome Screen. The task list is dynamically customized to the user based on the information provided in the welcome screen. For example only users who are looking to buy a home have tasks related to finding a mortgage or mortgage insurance. The table is backed by a FetchedResultsController to handle data modifications and updates to each task. Selecting a task brings up a detail view of the individual task and in some cases links to the financial advice section of the application.

Home List The Home List is the most complex component of the application. The initial page utilizes a ScrollView to let the user switch between a TableView list of all the homes or a MapView of the homes. The list view is designed to display lots of information in a dense layout for more analytical users, while the map view is targeted at more holistic users. From the initial page users can add new homes or bring up a details view to set properties like price, ratings, location and photos. We make use of the open source Three20 library and the Google Image Search API to enable syncing photos from the web related to the home location. The Three20 library helped provide a number of performance optimizations when handling remote image resources like caching and lazy loading which are important in the mobile form factor. Many of the controls used to enter data for a home were custom built since the standard SDK either did not provide their function at all or they lacked the customizability needed.

Room Planning I chose to organize furniture and household items into groupings by room since that would enable users to consider their furniture needs visually in subgroups. A key focus of room planning is to understand and estimate the costs required to furnish each room in a new home. As such the initial screen presents users with a list of all the rooms in their home with the total cost of all items in each room below each room name. Selecting a room brings up a details view of the room name

and all the items inside the room. A user can add additional items with a name, cost and photo as they choose how they want to layout their room.

Financial Planning The Financial Planning section is the primary gateway between the application and financial services offered by Suruga. The initial view shows two series of bar charts - one to represent budget balances for initial expenses and the other to represent the budget balance for recurring expenses related to the move. Each budget can be selected to bring up a detailed list view based on a TableViewController split into a section for expenses and income. I populate each budget with an initial set of items when the application is initialized after the Welcome Screen. Besides the budget functionality, this section also supports financial adviser services that customizes the advice and questions for the user based on their unique financial situation determined by the information they enter and which tasks they have completed from the task list. This dynamic data is pulled in realtime from a web server as the user requests advice. The communication protocol is http GET messages and the data wire format is JSON.

5.2 Task List

The Task function has two main components - the table view and the details view.

5.2.1 View Controllers

The task list view controllers serve as the core launching point to guide and drive user interaction with the rest of the application features. I designed the view controllers to be able to dynamically load content and change their navigation structure based on downloaded configuration files. The goal was to allow Suruga to improve and build more personalization systems into the application by simply updating remote configuration files rather than updating the application view controllers directly.

- `TaskTableViewController`: Displays the list of tasks and handles the management of the task data instances. This class implements the NSFetchedResultsCon-

trollerDelegate to communicate with the actual data store and the EditTaskItemViewControllerDelegate to communicate with the editing view of a single task.

- `TaskListTableViewCell`: A subclass of `UITableViewCell` designed to add a checkbox to the left side of each task in the table view. This class primarily serves to detect and communicate tap events to the parent TaskTableViewController.

- `EditTaskItemViewController`: A UIViewController that displays information about a single task and supports user editing functions. For the pre populated tasks, this view also links directly to view for financial advice to help accomplish the task.

5.2.2 Models

In order to keep the Task list sorted and organized there are two model entities. All model entities are built on top of Apple's Core Data framework using a local SQlite database on the phone.

- `Task`: Represents a single item in the Task List
  - `name` Visible display name of the task.
  - `creationDate` For custom tasks - holds the time the task was created. Used to help sort the Tasks entities in the list.
  - `dueDate` When the task should be completed by.
  - `completed` Boolean value that is true if the task has been marked completed.
  - `category` A Foreign Key to the `Category` entity that the task is a member of.
  - `order` For pre-populated tasks this field determines the sort order of the tasks.

  - `notes` User entered notes related to the task.

- `Category`: Represents a Category for a group of Tasks - for example "Find a Home" or "Move into Home".

  - `name` Visible display name of the Category. Used for header sections of the Table View
  - `order` For pre-populated Categories this field determines the sort order of the categories.
  - `tasks` A set of all the `Task` entities that belong to the category.

5.3 Homes

The central point for user tracked data, the home view makes use of several different ViewControllers, MapViews, custom user interface controls and URL request handlers. Since the finding of a new home is the central task that the application seeks to help users with I wanted to provide the most robust feature set for this section to help draw in potential customers.

5.3.1 ViewControllers

Since the views in the Home tab are highly customized most controllers start by subclassing the general UIViewController class and then implement protocols for the application features they seek to support so that interface components are able to communicate with them.

- `HomeTableViewController`: The launchpad for the home view. This controller is actually a UIViewController with a scrollView as it's primary view. Within the scrollview are two pages - one for a TableView and another for a MapView that can be switched with a page control. The controller implements the UITableViewDelegate and UITableViewDataSource protocols so that the TableView interface can communicate with the controller. The MapView communi-

cates with the controller via the MKMapViewDelegate to get information about the home locations and detailed text which it stores in `HomeMapAnnotation` objects. This controller also serves as the base data controller to manage the creation, reading, update and delete of home entities and all related data elements. From either the MapView or the TableView a user can launch into the HomeDetailViewController to interact with a single home's data.

- `HomeDetailViewController`: The base of a single home entity is the launching point for editing all related pieces of data about a home. This view allows the input of core home data like the address, contact phone number and to see the home location on a map. It uses buttons to launch the user into subviews to modify more detailed home information. Each subview defines its own protocol for communicating updates to a home's data that the delegate HomeDetailViewController implements.

  - `PriceViewController` A subclass of UIViewController that displays text boxes for the user to input detailed price and cost information for a home. Rather than just a single price value I have asked users to enter the cost of a home as different components like "agent fees", "deposit", "property tax" and "insurance". This helps users identify costs they may not have considered and helps the application make better financial recommendations personalized to the user. To handle the number of text views, I have the page dynamically scroll up as the keyboard is revealed so that the boxes don't get obscured.

  - `RatingViewController` A collection of ratings for a home. The overall rating is a custom star rating control I built called `DLStarRatingControl`. The sub ratings use slider controls to allow more fine tuned ratings of features like transportation and nearby businesses.

  - `SVGeocoder` and `SVPlacemark` are classes that provide forward geocoding functionality to determine the latitude and longitude of a home based on user entered address data. They utilize the Google Maps location

API rather than the built in functionality in IOS 5.0 in order to support more devices. Since they make web requests, they communicate with the MapViews via publish/subscribe observers that don't block the user interface thread while the request is being made. The interface only updates upon successful completion of forward geocoding.

Image ViewControllers

I have dedicated a separate section to the image functionality available from the `HomeDetailViewController` since there are multiple channels for a user to capture image data about a home. Since many home listings are available online, I wanted to enable users to grab images directly from the web in addition to using pictures taken on the phone.

- `CustomImagePicker`: A custom UIViewController that displays all the images linked to a particular home. Each image is actually a button that can be selected to bring up a larger fullscreen picture. At the top of the view are options to select either images from the web or capture one with the phone's camera.

- `UIImageExtras` A utility class that expands the interface if UIImage elements to support easy transformations. I created this library to quickly and efficiently scale down photos to thumbnail images for storing in the backend.

- `JSON Photo Picker`: I utilized the open source Three20 IOS library that the Facebook iPhone application is built with to help create a dynamic web photo viewer. The photo content is pulled from the Google Images API.

  - `Photo` A model representation of a single web photo. Rather than store the raw photo data, this class stores urls for various sizes of the same photo so that I only fetch the data when the user actually wants to view the photo.

  - `PhotoSet` Handles the heavy lifting of syncing photos to present, loading the photos only when necessary and parsing the Google JSON data about the image locations.

- `WebPhotoViewController` and `WebThumbsViewController` are custom versions of the Three20 photo viewers extended with the function to save photos to a particular Home entity.

5.3.2 Models

Rather than use a single home entity with all the data, I created a layered nest of data entities. This enables the ability to quickly sort home's by their rating, price or location and also only avoids loading more data than is needed for a view to create it's display. For example - if a user only wants to modify the price information of a home, the `PriceViewController` only needs to load the price data and not the rating or images.

- `Home`: Represents a single item in the Home List
  - `name` Visible display name of the home.
  - `phone` A contact number of the agent or owner of the property.
  - `rating` A foreign key to the `Rating` entity for the home.
  - `price` A foreign key to the `Price` entity for the home.
  - `images` A set of `Image` entities that hold data about images of the home.
  - `address` A foreign key to the `Address` entity for the home.
- `Rating`: Represents a set of rating values for a single `Home` entity. The sub rating options were chosen based on the most important factors to Japanese home buyers.
  - `overall` Overall rating of the home on a scale of 1 to 5. This value is used to display the star rating on the details view of a home.
  - `location` How convenient the location is for nearby services and shops.
  - `transportation` How convenient the location is commuting or public transit.

- `price` The price relative to other homes in the area and the condition of the home.
- `facilities` How are the schools, parks and other facilities in the area.
- `layout` The size and arrangement of the building. Some people may value wood floors, while others want a lot of light.

- `Price`: The different costs associated with a single `Home` entity.
  - `runningCost` The monthly cost of the home - either rental fees or mortgage payments.
  - `initialCost` The amount due to move into the property. This is the down payment on a mortgage or the deposit and upfront rent on a rental property
  - `fees` One time fees to agents, banks or other parties that do not go towards the actual home.
  - `taxes` Property taxes due on the home if the user is buying.

- `Address`: The components of an address for a `Home` entity.
  - `street` Number and street name.
  - `city`
  - `state` Two letter state abbreviation.
  - `zip` Five digit zip code
  - `latitude` latitude of the address computed through forward geocoding on the address.
  - `longitude` longitude of the address.

- `Image`: Holds references to the data stored for an image. A `Home` entity can have many `Images`.
  - `thumb` Binary data for a 64x64 pixel thumbnail of the image.

- `pathToFull` String path to the larger image stored in the phone's filesystem.
- `transportation` How convenient the location is commuting or public transit.

5.4 Rooms

Designed to help organize and estimate the cost of the items in a new home, this section uses a hierarchical structure. To help get the user started - I pre populate the list with a few basic rooms common to every home after the user finished the Welcome Screen.

5.4.1 ViewControllers

The navigation flow for the Room tab is from `RoomsTableViewController` → `OneRoomTableViewController` → `FurnitureItemViewController` → `PhotoAppViewController`.

- `RoomsTableViewController`: The launchpad for the furniture view shows a list of all rooms and the total cost of the items in the room. This ViewController also manages the data entities stored for rooms and the items in them. It is a direct subclass of `UITableViewController` and uses built in cell styles.
- `OneRoomTableViewController`: The base of a single room is also a subclass of `UITableViewController`, with the top two rows hardcoded to present information about the room and the bottom rows to represent individual items in the room. I've set all the furniture items to be forced into editing mode so that a user can quickly delete them.
- `FurnitureItemViewController` Presents the information about a single furniture item within a room. A user can set the name, price, type and add a photo via a separate photo controller.

- `PhotoAppViewController` A view that lets the user see a large photo image of a single furniture item, select a different photo from their photo library or take a new photo. I chose to limit the application to only 1 photograph per furniture item to save space and simplify the interface.

5.4.2 Models

There are only two models for the Rooms section since I was able to reuse the Image model from the Homes section of the application.

- `Room`: A Room within a house - holds all the `Furniture` entities for the room
  - `name` Visible display name of the room.
  - `furniture` A set of all the `Furniture` entities that the room contains.
- `Furniture`: A single piece of furniture within a `Room`.
  - `name` Visible display name of the furniture item.
  - `price` A number for the cost of the item if the user needs to purchase it.
  - `type` A string for the type of the item. Helpful for the user to compare multiple items of the same type. A type must be selected from a static list of options such as "Bed", "Lighting" or "Couch".
  - `room` A foreign key to the `Room` entity that holds the piece of furniture.
  - `Image` A foreign key to the `Image` entity that holds image data about the piece of furniture. Note that a piece of a furniture can only have a single associated image.

5.5 Financial Planning

The Financial planning section lets the user view the options they have entered in the Homes and Rooms sections relative to the larger financial impact they will have. Although this section provides a main launch point into detailed budget information

and the advisor function, users can navigate directly to the adviser functions from within a related task. To accomplish this I developed an internal url routing scheme that lets the main application delegate parse text strings to determine a view controller, its content and related views. This way the flow from a task to an advisor can be dynamically determined at runtime via data passed from a remote server.

5.5.1 View Controllers

- `FinancialHomeViewController` Snapshot of the user's overall budget status. This view has a section for an initial budget and a running budget with bar charts to show the spread between income and expenses. At the bottom a user can launch into the FinancialAdviceViewController. The creation of the bar chart is fairly complex as I scale the height of the bars relative to one another since it's impossible to have an absolute scale that functions for all users.

- `BudgetTableViewController` A two section TableView with expenses on the top and income on the bottom. I pre populate this list to help the user get started and remember what to consider. Each cell uses a custom view with a text box that can be directly edited in the list rather than needing to pull up a detailed view. The last row of each section functions as a button to add additional budget items to that section.

- `BudgetItemViewController` A simple ViewController to display the information about a budget item. This view also gives details about what costs or income should be included for pre-populated budget items. There is also a button that launches the financial advisor with a custom set of questions depending on the item.

- `FinancialAdviceViewController` Suruga's portal for communication to the user. I needed to design this view to be as flexible as possible so that it could be configured based on downloaded JSON strings. The advisor has two slide views that link together in any number of combinations. The first view offers a

large view for a primary question and then a list of options to select from. The second view has room for a photograph, detailed advice text, a link to more information provided on the web and a continue button that could lead to more question slides.

5.5.2 Models

Only the BudgetItems are statically saved in the applications database. The financial advisor questions and advice are downloaded only when needed and held in local memory while the view is being displayed.

- `BudgetItem`: A single item within a a budget. Can be a form of income or expense.
  - `amount` Value of the income or cost associated with the item.
  - `isExpense` A boolean value to determine if the item is a form of income or cost to the user.
  - `name` A string representation to show what the budget item is for in the budget list
  - `notes` Detailed description of the budget item used for pre populated budget items and to give advice.
  - `inInitialBudget` A boolean value to determine if the item is an initial cost such as a down payment or a running cost like a monthly mortgage payment or annual property taxes.

5.5.3 JSON Data Entities

The data used to determine the flow of the advisor can take the form of 3 JSON message types - `Question`, `Option`, and `Answer` that are nested together to define the navigation heirarchy. The `Question` message has 4 main attributes:

- `type` The type of the object always "question_slide".

- `question` The text question displayed to the user.
- `image_url` The url for an image to display to the user when asking the question.
- `option_list` A list of options to select in response to the question text. These are displayed in a table view on the question slide.

```
{
  "type":"question_slide",
  "question":"This is question1",
  "image_url":"www.suruga.com/image.png",
   "option_list":[ <OPTION OBJECTS> ]
 }
```

Figure 5-1: An example JSON string for a question page

Figure 5-1 gives and example of what a Question object might look like. The `Option` item represents an option shown in the list of responses a user can select for a question. Each `Option` has three attributes:

- `next_type` The type of the object that this option leads to either "question_slide" or "answer_slide".
- `option_text` The text to display to the user in the list of options.
- `next_slide` An object of either `Question` or `Answer` that this option leads to.

```
{
  "next_type":"question_slide",
  "option_text":"This is question1",
   "next_slide":{Question or Answer object}
 }
```

Figure 5-2: An example JSON string for an option item

An example of an option item is given in Fig 5-2. The terminal page for any advisor path and is the `Answer` page - where detailed reccomendations and potentially a direct link to Suruga's website are given. An `Answer` has five associated fields and an example is given in Fig 5-3.

- `type` The type of the object always "answer_slide".
- `overall_text` The overall text to describe the topic and important factors. This can often be customized to the user's individual financial situation based on information sent in the original request.
- `good_text` The text to describe the good features about the option the user has chosen.
- `compare_text` The text to describe other options the user may be considering as an alternative and their relationship to the chosen option.
- `suruga_text` The text to describe offerings suruga has that relate to the option the user has chosen.
- `suruga_link` A link to the page on Suruga that relates to the option the user has chosen.

```
{
  "type":"answer_slide",
  "overall_text":"When you make purchases,...'',
  "good_text":"1. You don't need to carry a money ...'',
  "compare_text":"A) Convenience\nThere aren debit ...'',
  "suruga_text":"Suruga Offers this card",
  "suruga_link":"http://suruga.jp"
}
```

Figure 5-3: An example JSON string for an answer item

Putting it all together we can see what a short advisor message from the server might look like in formatted JSON of Fig 5-4.

```
{
  "type":"question_slide",
  "question":"This is question1",
  "image_url":"www.test0_1.com",
   "option_list":[
    {
       "next_type":"question_slide",
       "option_text":"Option 1",
       "next_slide":{
          "type":"question_slide",
          ''question'':''this is the 1 title text",
          "image_url":"www.testImage1.com",
          "option_list":[
             {
                "next_type":"answer_slide",
                "option_text":"Good Answer Option",
                "next_slide":{
                   "type":"answer_slide",
                   "overall_text":"When you make purchases,...'',
                   "good_text":"1. You don't need to carry a money ...'',
                   "compare_text":"A) Convenience\nThere aren debit ...'',
                   "suruga_text":"Suruga Offers this card",
                   "suruga_link":"http://suruga.jp"
                }
             },
             {
                "next_type":"answer_slide",
                "option_text":"Option 2",
                "next_slide":{
                   "type":"answer_slide",
                   "overall_text":"some text",
                   "good_text":"great option"
                }
             }
          ]
       }
    },
 ]
 }
```

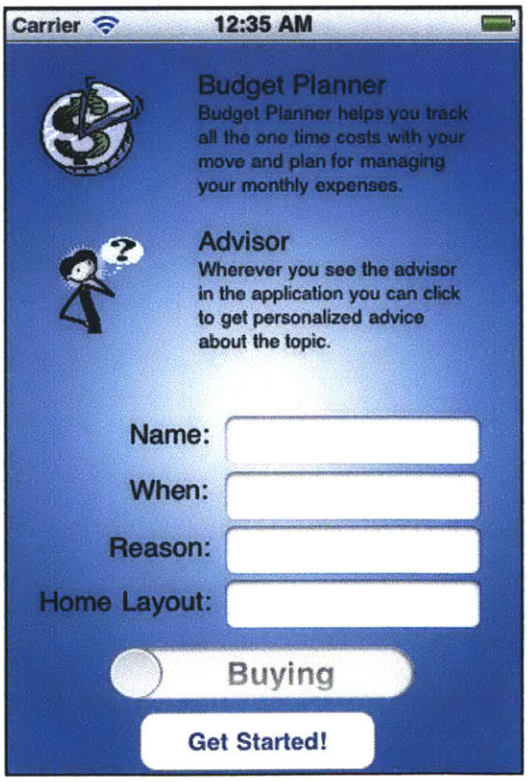
Figure 5-4: An example JSON response to populate the Financial Advisor

Chapter 6

Moving Application - Walkthrough

The first time a user opens the SmartMover application they are greeted with a brief description of the application functions to familiarize them with the application. Scrolling down on the view reveals a section where we ask for personal information about the user in order to personalize the information and advice we give them. This is a one time screen that the user only sees when first opening the application. Figure 6-1 shows what this launch screen looks like.

(a) Launch page description



(b) User Customization Options

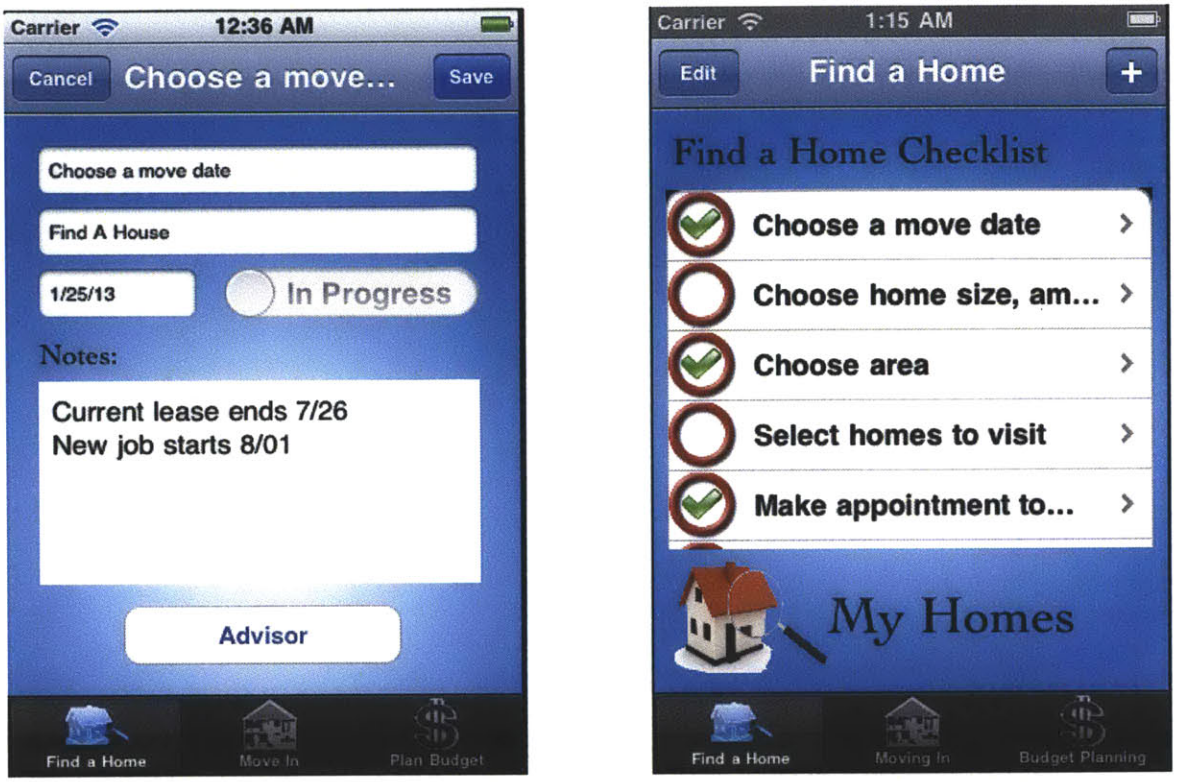
Figure 6-1: Application information and launch screen

After completing the launch screen, the application loads up a custom checklists for "Finding A Home", "Moving In" and "Budget Planning". These three tasks are separated out onto separate tabs shown in Figure 6-2. The home page for each tab consists of a checklist along with an icon to launch into the application's features that will help accomplish the goal of that tab. For "Find A Home" that tool is the "My Homes" listing that lets users track, store photos and rate the homes they are considering as they visit them. For the "Move In" goal, the "Layout Rooms" feature lets users plan out the furniture layout and costs for each room in their new home. For the "Plan a Budget" goal, there is a "Budget Planning" tool as well as a "Financial Advisor".

(a) Find a Home (b) Move In (c) Plan Budget

Figure 6-2: Three main application tabs

Each item in a checklist can be selected to bring up a details view of information about that task. As shown in figure 6-3a a user can add notes, set a due date, mark the progress status of task, view the goal the task relates to and name the task. Besides just the pre-loaded tasks, the user can add custom tasks as needed. For pre-loaded tasks, we sometimes have relevant information for the task to help the user, which can be reached by an advisor button for only those tasks. In addition to modifying checklist item information in the details view, tasks can also easily be checked off



(a) Checklist Item

(b) Checked Items

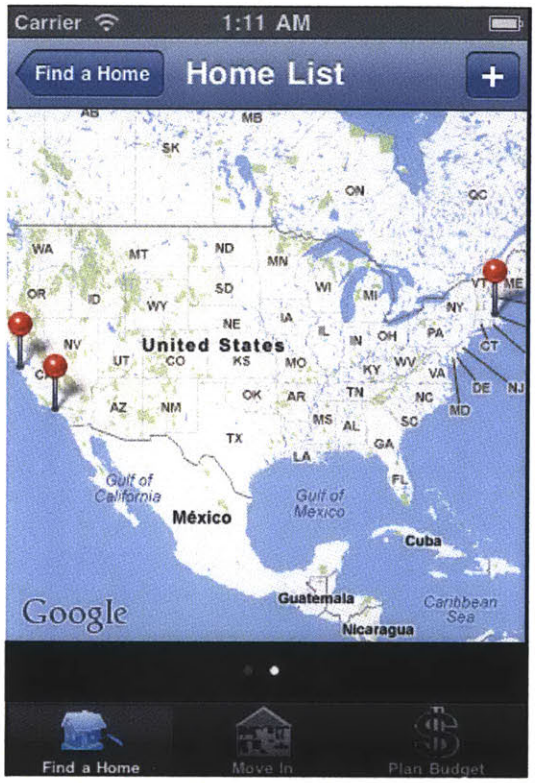
Figure 6-3: Application Checklist Function

directly on the list from the tab home page. In figure 6-3b the view indicates that the user has completed three of the items on the checklist.

As the user starts researching homes - it is likely they will want to store information about the homes based on their in person visits. The mobile device offers an ideal platform for letting the home hunter record information as they are actually visiting the homes rather than only using the publicly available online information. A user can open the "My Homes" tool to see a list of the homes they have added information about. We offer both a list view shown in figure 6-4a with the home name, address price and rating, as well as a MapView shown in figure 6-4b where a user can see all their homes geographically laid out. Selecting a home from the map view brings up details like a photo, the name and address above the map pointer.

Selecting a home from the list or the map view allows the user to enter all the details about that home. The primary page shown in figure 6-5a has the core information like the home address, its overall rating, its price and a map view of its

(a) List View



(b) Map View

Figure 6-4: My Homes Listings

(a) Home Details

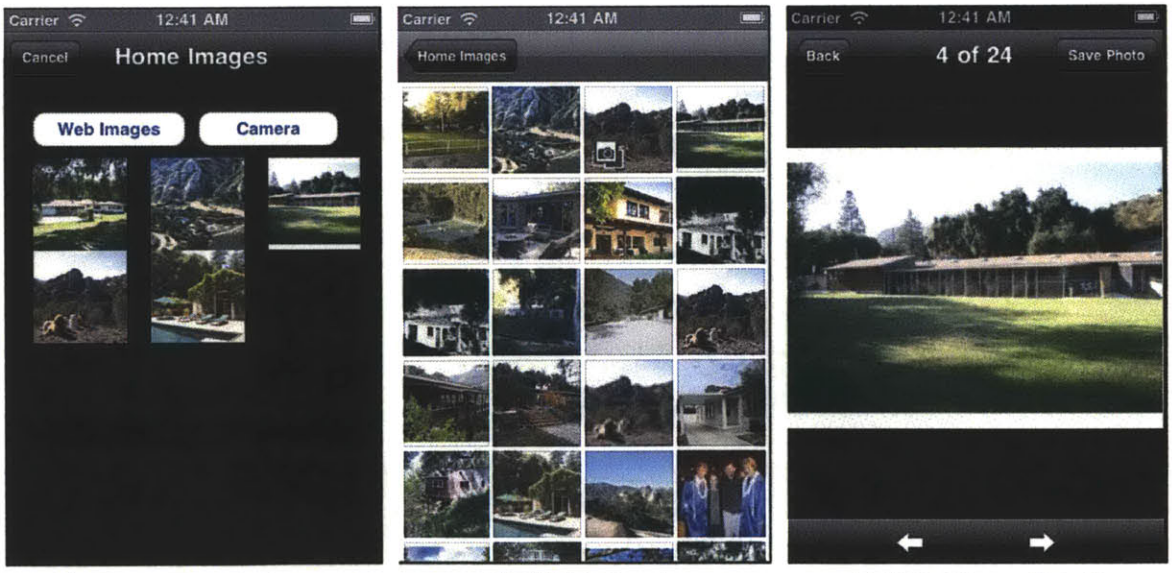
(b) Rate Home

(c) Home Costs

Figure 6-5: Home Details Views

location. Selecting the rating function lets the user set a 0-5 star overall rating of the home that shows up on the main page, but they can also set detailed ratings in sub categories like location, transportation, parks etc. The cost view, given in figure 6-5c, has a similar detailed breakdown into initial costs like deposits and running costs like mortgage payments, insurance and taxes.

Since a key benefit of the mobile device is that it can be used to take photos while visiting the home, I've added a lot of photo functionality. From the details view in figure 6-5a the user can select the camera button to see all the photo's they have stored for that home. From there they can either add their own photos from the phone's camera or search the web for photos based on the home's address. Since most homes for rent or sale have public listings on sites like Zillow, we scrape common real estate sites, Google Street View and the general web to present a set of thumbnail images under that address. The user can select the photos from the thumb view in figure 6-6b to load the full sized image. If they want to save the image to the home they can click the save button from the detail view in figure 6-6c.

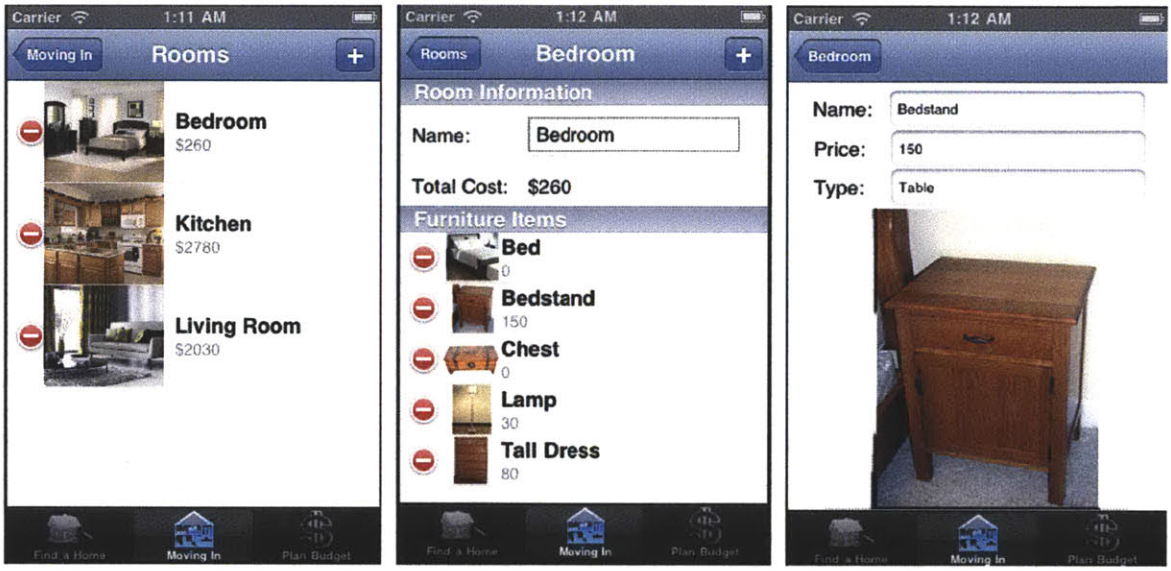


(a) Home Thumb Images (b) Web Thumbs (c) Web Photo Details

Figure 6-6: Home Images Views

Once the user has settled on a home (or even while still looking), they need to start thinking about actually moving in. The "Move In" tab provides the "Layout Rooms"

function to help keep this organized. From the main screen shown in figure 6-7a the user can see a snapshot of the rooms in the home, as well as the total estimated cost of all the items in that room. Selecting a room brings up a list of all the items inside the room. Each item has a name, image, and cost. Selecting an item brings up a details view with a larger image of the room item, taken from the phone's camera, and lets the user edit details about that item.



(a) Room Listings (b) One Room List (c) Furniture Item

Figure 6-7: Home Layout Functions

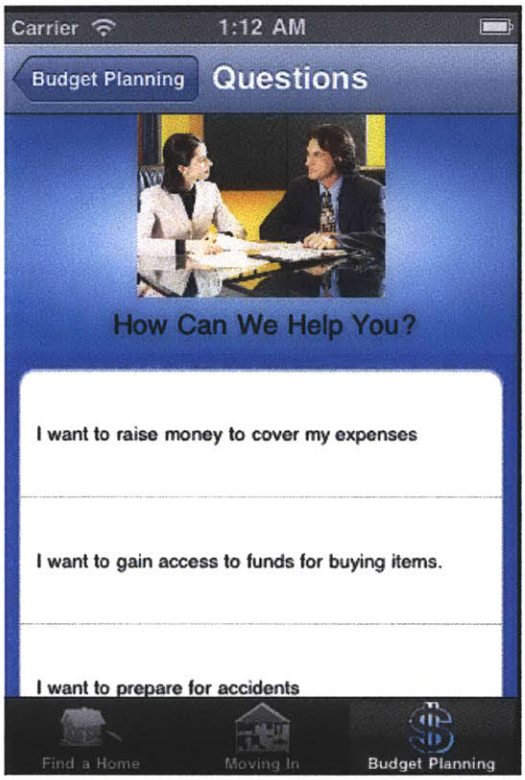
As they manage the move process users need to consider all the financial implications of their options. The "My Homes" list and "Home Layout", help the user estimate costs for the homes and furniture they are considering, but the "Budget Planner" brings it all together. The home page graphically lays out how the one time expenses from the move relates to the user's current capital, as well as how their future monthly costs relate to their monthly income. Each budget starts with a pre-populated list of expenses to consider shown in figure 6-8b. Users can also add their own expenses or sources of income. Besides quickly editing budget items inline, users can also bring up a details view that gives general information about the budget item if it is pre-populated and lets the user launch the advisor for help.

The advisor helps to guide the user through their move process by giving advice

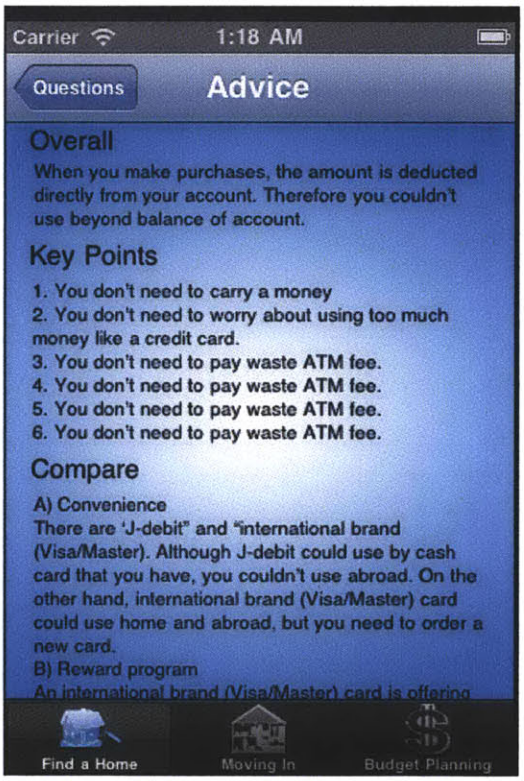
(a) Budget Graphs (b) Budget Lists (c) Budget Item

Figure 6-8: Budget Functions

for pre-populated tasks, budget items and letting the user choose from a number of options for future financial goals. When the advisor loads, it sends information about the users' move goals, budget status and the topic the user is seeking advice for to a web service. The web service uses this data to compile a custom set of questions and answers for the user to guide them through a wizard process. At the end of every advisor question and answer session there is an answer page that gives a general recommendation, pros of the current choice, other options to consider and potentially information about services Suruga Bank offers. For example user with a $2000 initial budget deficit as shown in figure 6-8a needs to raise some funds to cover their initial move. That would appear as an option in the question set presented to the user, and based on the user responses it might recommend a card loan, borrowing from family or an employer.



(a) Advisor Question



(b) Advisor Answer

Figure 6-9: Dynamic Advisor

Chapter 7

Moving Application - Experimental Design

7.1 Experimental Design

We intend to test the application against traditional media outlets in a market research experiment to test it's effectiveness for reaching potential new Suruga customers. We are also interested in which components of the application are most important for consumer impact.

7.1.1 Independent Variables

The SmartMover application can be modified along three principal axes.

- **Amount of information offered**: The application should range from providing a great deal of information from third-party sources to providing only basics. The Advisor function is an ideal platform to vary information since it is the main content portal of the application. This axis measures how offering more (and/or more realistic) information affects consumer trust. The advisor can also be dynamically varied to offer more or less information.

- **Degree of customization/content allowed**: The application should range in the degree to which content can be added and customized. This axis measures

how much customization promotes a sense of ownership and investigates the balance between giving the user control and overwhelming the user with options. For the SmartMover application this affects how much we use the personlized data the user sends us in our advisor reccomendations as well as the language used in the advisor text.

- **Industry relevancee**: The application should range in how close its services are to the core services provided by its sponsor. In the SmartMover application, the advisor feature can direct users towards Suruga products or not. We could also not use the budget feature in some versions of the application - instead focusing on the home listings functionality that is further from Suruga's core value proposition. Do consumers trust an application function more when it isn't being pushed by a brand that services that function?

7.1.2 Observations and Data Collection

First-order metrics for measuring advertisement success include:

- **User retention rate**: the percent of users who continue to use the application.
- **Number of referrals**: the extent to which users invite their friends to use the application.
- **Time spent on application**: the average time spent per day on the application among users who regularly use the application, as well as the distribution. (Do the distributions have the same shape or do different versions produce different skews?)
- **Number of distinct daily uses of application**: in addition to caring about the amount of time users spend on an application, we should care about the *pattern* of usage. An advertisement has a different effect experienced ten times for one minute from when it is experienced once for ten minutes.

I refer to these as first-order metrics because they measure the effectiveness of the application to promote the application rather than a brand. It will also be important

to measure efficacy at promoting the Suruga brand and at promoting actual sales. Some ideas for these metrics include:

- **Brand surveys**: surveying users to get their opinions on Suruga, as well as opinions on competitors.
- **Sales**: matching the names of application users to data on account creation, insurance sales or mortgages taken. This might be hard to measure accurately due to the complexity of name-matching, privacy concerns or regulation of data access, and the longer horizon for financial transactions compared to application usage and study length.

Chapter 8

Conclusion

8.1 Academic Contributions

This thesis described an adaptable mobile application that can be modified along several parameter axes to test the effect of various design decisions on advertising efficacy. My work entailed understanding the target market, designing three potential applications, testing in two initial focus groups, and building a high fidelity application, SmartMove, for larger field testing. SmartMove was designed to enable morphing into various versions for different parameter choices. I have built a public web-service and administrator interface to enable the easy manipulation and configuration of the SmartMove content and advisor information. The application is set to go to field trials this summer in Japan. Future work could include extending this approach to other applications or designing experiments to make more general inferences about one of the parameters tested in this study such as content morphing. This could also include automated mobile interface morphing systems in addition to the dynamic content engine.

Trust-based marketing apps provide tremendous opportunities for new marketing strategies. They provide a means of establishing trust with consumers in an interactive fashion that is simply not possible with traditional media. Apps can be seamlessly integrated into users' daily lives, and they can provide real value to their users. Traditional trust-building strategies entail showing a consumer a commercial

related to trust, which is surely of limited efficacy compared to providing an excellent app that provides a useful service.

Moreover, trust-based apps are versatile. SmartMover might be used to engage younger consumers to begin building a relationship early, as when a student looks for their first home after university; but it can also be effective to target families as they move into a larger home to accommodate children.

On the engineering side, a brief comment bears mention. Lessons learned from developing engines and scripts to support these apps through logging, parsing, data extraction, and data import, as documented in this thesis, can be used in followup studies. Like all of the work at the Center for Digital Business, the story here is about how technology can be used for tremendous leverage in tackling big problems. The technology-driven approach described here has the opportunity to greatly magnify companies' efforts to build trust with their consumers—efforts that certainly qualify as a big-picture problem.

Overall, these demonstrations represent a large step forward for trust-based app-based marketing, and future work is immediately in order to begin refining and expanding the contributions of this thesis.

8.2 Future Work

First and foremost, the ongoing Suruga study described within should help address the question of how mobile applications can be utilized as trust-based marketing platforms.

Planning has already begun for another set of focus groups with Japanese women in the Boston area to provide feedback on the live application. The data from these tests will be used to refine and modify the application before the larger test in the Fall 2012. The larger test the experiment methodology will utilize per/post and test/control design measures on awareness, consideration, brand image, preference and probability of action based on survey data from consumers exposed to the application and alternative forms of media.

Beyond this, we can extend this approach in several directions. Future work is needed to identify the cost of driving consumers to a free mobile app; with over 350,000 apps in the iPhone app store, for example, the app may not gain the initial momentum needed to put it in the top downloads list without some advertising dollars.

Additionally, a trust-based app should be implemented in the field with sales and click-through metrics used to gauge efficacy. This work will feature its own set of challenges—measuring marketing efficacy outside of market research is notoriously difficult—but many of the strategies here will carry over.

More generally, the methodology used in this thesis—market research, focus groups, dynamic content engines—can be repeated in other studies, for other companies or using other app designs, to target more specific questions. What kinds of apps are most effective at building trust? Is there a difference in consumer behavior from platform to platform? Does frequency of usage affect brand measures?

Appendix A

Appendix

A.1 Focus Groups

A.1.1 Discussion Guide

1. INTRODUCTION, FOCUS GROUP RULES, ETC. (2 minutes)
2. WARM-UP DISCUSSION: (8 minutes/ET :10)
    - Id like to go around the room and have you introduce yourself; tell us where you live, who lives in your household with you, and tell us about your favorite app that you use on your phoneand whether youve ever deleted an app and why?
3. Moving App. (DEMO & DISCUSSION) (35 minutes/ET :45)
    - Top of Mind Reaction/Likes & Dislikes/Likelihood of Use
        - On a piece of paper, ask them to write a VERY brief description, in their own words, of what they just saw. (This will help us quickly gauge whether the app makes sense to them and also whether our demo is making it clear to them.) On same sheet of paper, write down top-of-mind reaction. Did they like it or dislike it? How likely would they be to use it? (Getting this committed to paper so that group think doesnt influence each others responses.)
        - Ask for hands of those who liked it and thought they would use it. I will ask them to read their description and then probe: appeal, functionality, cool factor, likelihood of use, etc.
        - For those who DISLIKED: Ask them to read their description. (This can help us isolate whether their disinterest is because they didnt

understand it or whether its just not for them.) Then probe appeal, functionality, cool factor and what they didnt like about it.

- What could make it more interesting or useful?
- **Would they recommend to friends? Why or why not?** (WATCH FOR: whether they feel this is overt marketing ; were looking to see if we peg the BS meter or whether theyre accepting of this as a branded app thats not pushing too hard.)
- What does an app like this say about the Suruga brand?

4. REPEAT ABOVE FOR Wedding Planner (Presentation and discussion; 15minutes/ET 1:00)

5. REPEAT ABOVE FOR Wedding Memories (Presentation and discussion; 15 minutes/ET 1:15)

6. DISCUSSION/COMPARISON OF THREE APPS and OTHER CONCEPTS: (15 minutes/ET 1:30)

   - At this point we can allow the respondents to compare the three apps they have just seen and tell us which they liked best, which they would be most likely to use, and get any other reactions they have.
   - OTHER QUESTIONS/ISSUES? (TBD)

7. THANK YOU and DISMISSAL

A.1.2 Questionaire

A.2 Financial Adviser

This section provides information on the content and flows used for the advisor.

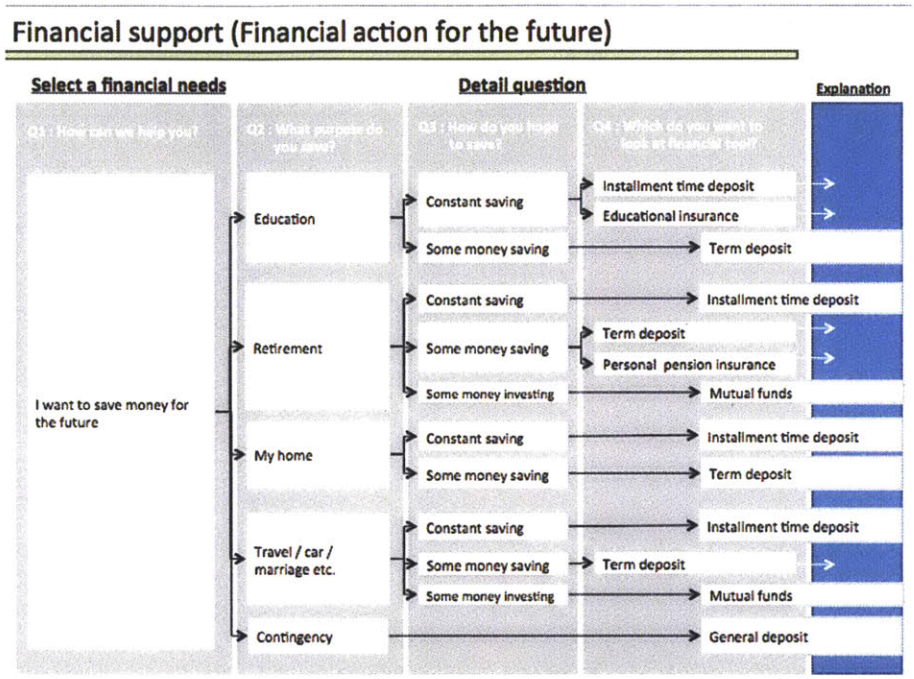


Figure A-1: Advisor Question Flow 1

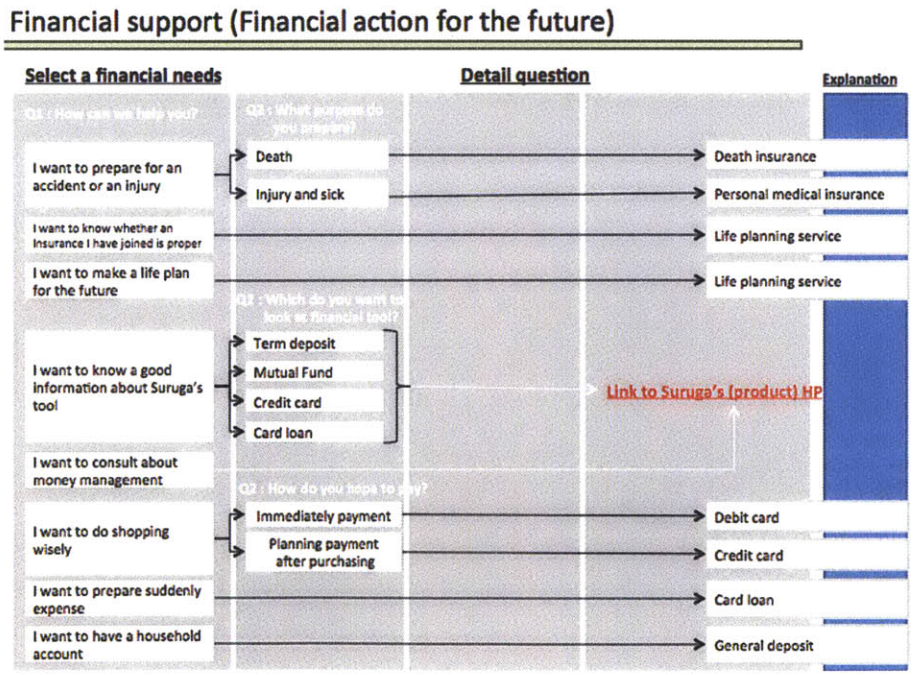


Figure A-2: Advisor Question Flow 2

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