# Software Design Document

## Application Overview

The proposed application, henceforth referred to as GrandCare, is a mobile application that aids grandparents in raising their grandkids in numerous aspects of life.

## Statement of Goals

Presently, through the app development process to be carried out for the Apps For Good Project, we seek to aid the Central Massachusetts Agency on Aging in its mission of providing grandparents raising their grandchildren with helpful resources. These include the following areas:

(1) Language Translation
(2) Events
(3) Educational Opportunities
(4) Mental and Behavioral Health
(5) Transportation
(6) Housing
(7) Culturally Competent and Medically Tailored Food
(8) Financial Literacy

## Application Features

### *Essential Features of Minimum Viable Product (MVP)*

To clarify the structure of Grandcare, there are two primary avenues for the UI. One is dedicated to the grandparents' search for the resources enumerated above. The other is dedicated to the organizations responsible for the provision of such resources (provisional organizations). These include (but are not limited to):

- Food Banks and Food Pantries
- Extracurricular Programs
- Local Events and their Host Organizations
- Support Groups
- Facilities for Healthcare, Transportation, Finance, and Housing

Given that the purpose of Grandcare is to assist in the provision of aid to grandparents raising their grandchildren, the following requisites have been listed below as part of the MVP:

General Criteria:

(1) Structurally, Grandcare is to include a lock screen that appears immediately upon opening the application, followed by a login page.
(2) This login page should provide the option to sign in as a grandparent or provisional organization.
    (a) Upon installing and opening Grandcare for the first time, the user is to be prompted to set up an account, either as a grandparent or provisional organization.

For the ends of grandparents searching for resources:

(1) Grandcare is to provide a general menu for the user upon login, where each sector (based on the eight items listed previously) can be accessed (see preliminary diagrams of the UI).
(2) The MVP shall fulfill Items (1) through (4) from the needs listed above.

Fulfillment of Item (1):

(1) Grandcare is to utilize existing translation API to facilitate language translation for grandparents.
    (a) Such API may include Google Translate in addition to other interfaces.
(2) Text-to-text, text-to-speech, and speech-to-text features shall be available.
(3) Additionally, an effort shall be made to maximize the quality of translation for as many languages as possible.

Fulfillment of Item (2):

(1) Grandcare shall be able to provide grandparents information about upcoming events including time, location, purpose, and other logistics.
    (a) This information is to be provided from the data inputted by the host organization (see criteria for provisional organizations).
(2) Events are to be portrayed in the form of a calendar, with events listed in chronological order. Users should be able to select an event on the calendar, and from there, be redirected to the information on said event. The use of a calendar may necessitate borrowing from previous API (e.g., Google Calendar).

Fulfillment of Item (3):

(1) Grandcare is to utilize a combination of user-inputted data (from provisional organizations) and location services (i.e., Google Maps API) to provide grandparents with information about local educational, extracurricular, and childcare opportunities.
    (a) This shall necessitate some sort of filtration system based upon location, accessibility (i.e., cost), and the needs and focuses of the grandparent.
(2) Grandcare is to display to the grandparent a list of such organizations.
    (a) Organizations are to be listed in order of decreasing proximity (that is, the closer the location, the higher its position on the list).
    (b) However, the ordering of this list could be considered through the lens of alternative parameters (See “Non-Essential Features” section).

Fulfillment of Item (4):

(1) Grandcare is to provide access to mental and behavioral health resources in a similar manner to the provision described for Item (3), i.e. via a mixture of provisional organizations and Google Maps API.
    (a) In this context, provisional organizations may include local support groups, psychologists, psychiatrists, behavioral specialists, and similar facilities focused on providing mental and behavioral health support.
        (i) To clarify, support can be either for the grandparent or grandchild.
(2) Grandcare is to develop and display a list of organizations in a similar manner as described for Item (3), i.e. using distance in the MVP, and possibly using other parameters upon further development.
(3) In addition, Grandcare is to include various machine learning models related to mental and behavioral health treatment.

(a) There are pre-existing models for suicide detection in social media posts. Using similar models, the goal is to develop computational tools that can provide (to a certain degree) support for mental and behavioral health.

(4) Grandcare may also make use of anonymous surveys to help assess client needs.

For the ends of Provisional Organizations:

(1) Upon registration as a provisional organization, Grandcare shall prompt the user to describe the scope of their organization.
    (a) This can be in the form of a list of checkboxes for each of the eight needs.

(2) At a high level, provisional organizations shall be able to enter in data based on the scope of their organization (e.g., a local psychologist practice may provide their location and hours). This data ends up being displayed to grandparents.

With regards to Item (1):

(1) The translation features discussed shall also be made fully available to all users of the app, allowing organizations to easily communicate with clients should there be any direct interactions.

With regards to Item (2):

(1) Organizations associated with hosting events will be able to input information about their event. This data will then be displayed to grandparents.
    (a) This may include time, date, location, purpose, and other information.

(2) Grandcare shall allow provisional organizations to upload media (e.g., a digital poster) and display it to grandparents in conjunction with other data.

With regards to Item (3):

(1) Organizations associated with educational, childcare, and extracurricular opportunities shall be able to provide information about themselves.
    (a) This could include operating hours, age group, topic, location, and other pertinent details.

(2) This information is to then be displayed to grandparents.

With regards to Item (4):

(1) Organizations associated with the provision of mental and behavioral health resources shall be able to provide information about themselves.
    (a) This may include location, operating hours, age group, staff, contact information, among other parameters.

(2) This information is to then be displayed to grandparents.

***Non-Essential Features***

For the ends of grandparents searching for resources:

(1) This section focuses on fulfilling Items (5) through (8) followed by proposing other, more general features beyond the scope of the MVP.

Fulfillment of Item (5):

(1) Transportation options are to be provided by using a mixture of location services (i.e., Google Maps API and other pre-existing databases), and data inputted by any provisional organizations specializing in transportation (similar to previous items).

(2) Similarly to previous provisions, transportation options are to be listed either by proximity, or by other parameters (see Recommendation System Criteria below).
(3) Navigation services shall also be provided to grandparents.

Fulfillment of Item (6):

(1) Information about housing resources shall be provided to grandparents. This information will come from pre-existing databases on housing, as well as any shelters that are provisional organizations using Grandcare.
    (a) This may include cost, accommodations, safety of the area, and other data.
    (b) Landlords and similar entities would not be a part of this group since Grandcare shall use pre-existing data for residential housing.
(2) Housing options are to be listed in a similar manner to previous provisions.
    (a) However, with this parameter specifically, more emphasis shall be placed on housing that accommodates grandparents. This may include having bedrooms on the ground floor, support for negotiating stairs, among other housing adaptations.
    (b) Another thing to note is that other parameters, such as cost, are also of greater importance for this specific provision.

Fulfillment of Item (7):

(1) Grandcare shall provide information on local food shelters.
    (a) This information may include inventory on different items, location, cost (if applicable), dietary and cultural accommodations, current traffic, in addition to other data.
    (b) Regular updates on this provision's parametric data in particular is crucial to have.
(2) Food shelters shall be listed to the grandparents in the same way as has been described for other provisions.

Fulfillment of Item (8):

(1) Grandcare shall provide resources for financial literacy.
    (a) This would primarily come in the form of articles on the subject. The focus is to be placed on advice for managing assets as well as basic skills (e.g., how to pay taxes, how to pay a bill, etc.)
(2) Grandcare shall allow users to take (non-invasive) pictures of parts of their bills and other financial statements.
    (a) Using an image-processing software, this material would be analyzed. Following this analysis, grandparents would be provided an explanation about the material they have just scanned.
    (b) In order to be non-invasive, only specific parameters would be processed. For example, for a credit card bill, only the balance due would be processed, while the credit card number would be omitted.

Recommendation System:

(1) For most provisions enumerated upon, there exists some set of parameters describing them. For example, food shelters may list their operating hours, traffic, location, and dietary and inventory information. The major goal of this feature is to provide a precise recommendation system of the best option for each category of provisions specified.

(a) This will involve the use of a multi-classification machine learning model oriented towards decision-making. Said model would take in data on multiple parameters (these parameters varying given the specific provision of focus), run it through the model, and then provide the user a recommendation of the most ideal option (e.g., the best childcare center).
(i) This process may be influenced by the user in that the user shall be allowed to specify which parameters matter most to them. For example, when choosing between services for behavioral and mental health, the grandparent may prioritize cost over proximity.
(2) A component of this system may involve tracking the previous activities of grandparents.

For the ends of Provisional Organizations:
With regards to Item (5):
(1) Any organizations that specialize in transportation services shall be able to input information about themselves.
(a) This may include cost, common routes, and other parameters.
With regards to Item (6):
(1) Any organizations that specialize in the provision of housing shall be able to input data about themselves. This data would primarily be surrounding their location and the nature of housing facilities, with particular regard for the accommodations noted above (first-floor bedrooms, etc.).
With regards to Item (7):
(1) Food shelters shall be able to input data about their services.
(a) This will include location, inventory and dietary information, traffic, and other parameters. Live updates on information will be crucial for this parameter in particular, as food is a crucial resource and food shelter conditions change rapidly.

**Technical and Data Feasibility**

Overall, this idea is technologically and empirically feasible. Since there is an entire part of the app dedicated to provisional organizations entering in their data, and other data is to be extracted from pre-existing databases, all the necessary data for Grandcare can be attained with relative ease. The proposed systems for data input and display features should also be easily implemented for this application. However, there are some cautionary items to consider, though many of these relate to features intended to go beyond the scope of the MVP.

Firstly, the scope of provisional organizations could grow to be very large very quickly, since Grandcare seeks to cover many areas of service. Managing such a diverse and expansive set of data could prove to be a challenge. This would necessitate the development of a highly streamlined system for data management. The other major concern relates to the privacy of the user and the efficacy of certain features described for this application. When dealing with mental and behavioral health services, scanning financial documents, and carrying out similar functions, this may involve private information or information that is otherwise undesirable for the public eye. This may make users wary of using the app. As such, when constructing the program that carries out these functions, great care must be taken to ensure user privacy. This may involve some process for immediately deleting sensitive data so that it is not saved. Lastly, it will have to

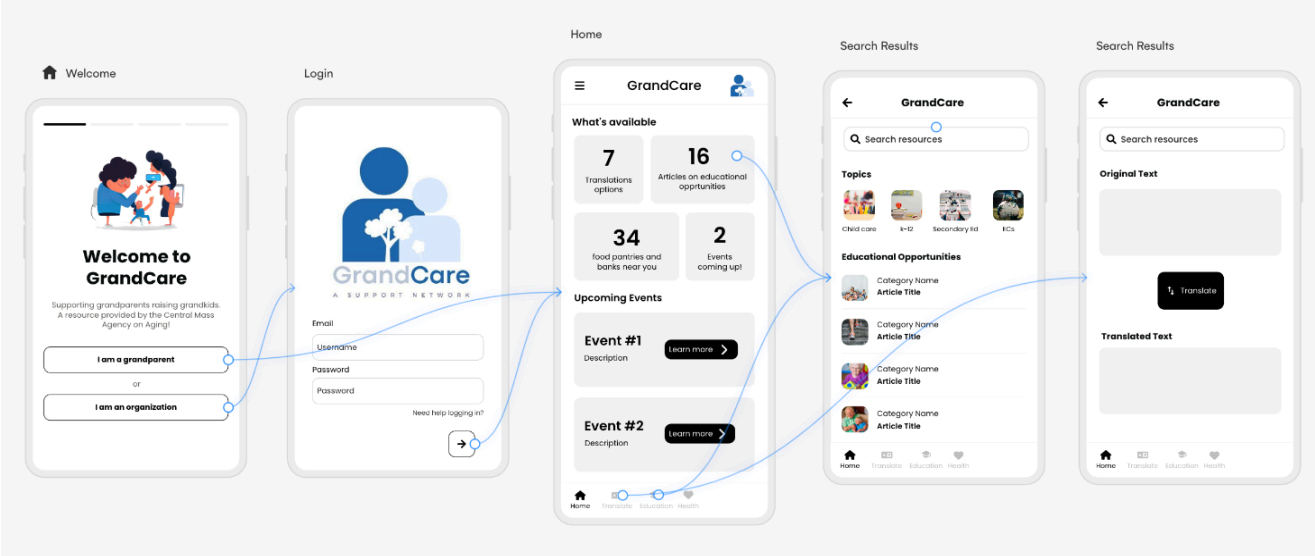
be made clear to the user that some of the tools implemented in Grandcare should not be taken as expert opinion. This is especially true for the various machine learning algorithms proposed throughout this document. For example, one of the proposed algorithms may suggest a specific childcare facility to choose. However, this may in fact not be entirely suitable to the needs of the grandparent. As such, it would have to be made clear to the user that the model output is only a recommendation and should not be taken as indisputable fact. Grandparents would be more willing to engage with Grandcare knowing that their discretion is still a key component when it comes to making use of resources related to the care of their grandchild.

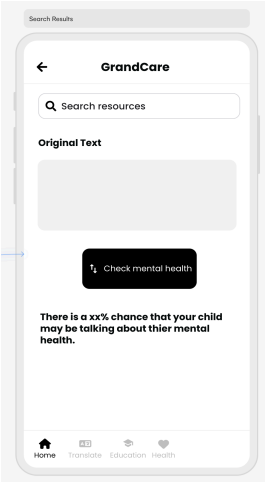
Overall, besides the cautionary items discussed, the proposed application appears to be a feasible project in terms of timeline, data acquisition, and program implementation. However, as the development process progresses, it may be necessary to modify Grandcare's features and scope.

**Persistent Storage**

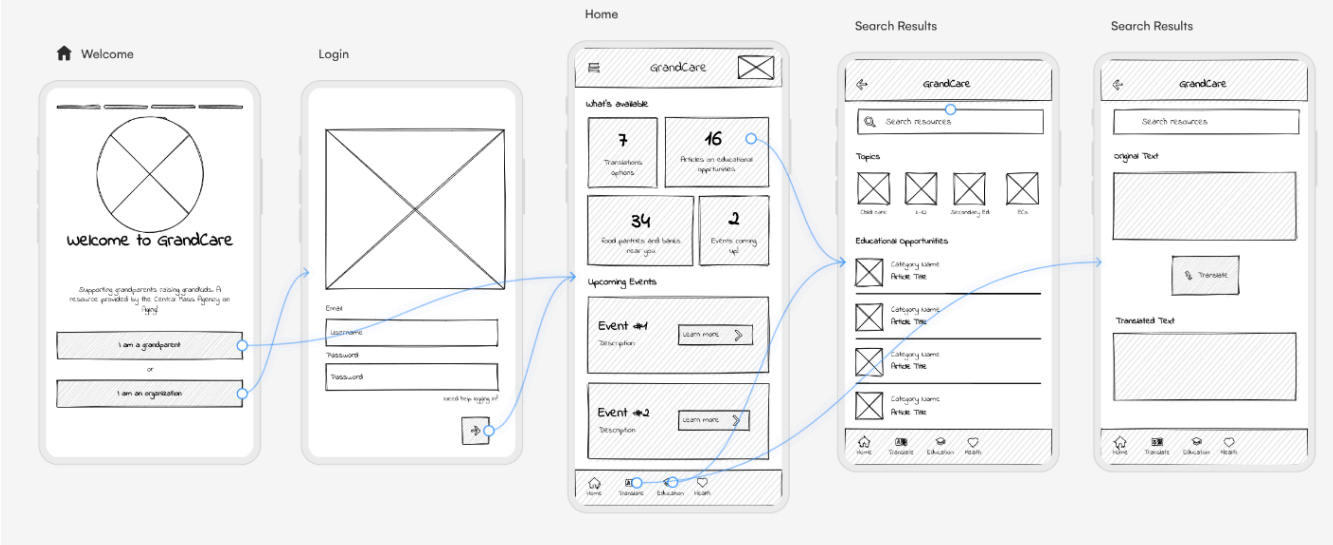
For this application, a cloud database will need to be utilized to store information about organizations and the nature of their provisions, whether it to be the timings for an event or the inventory of a food shelter. To achieve this, the realtime Firebase database will be implemented in the application.

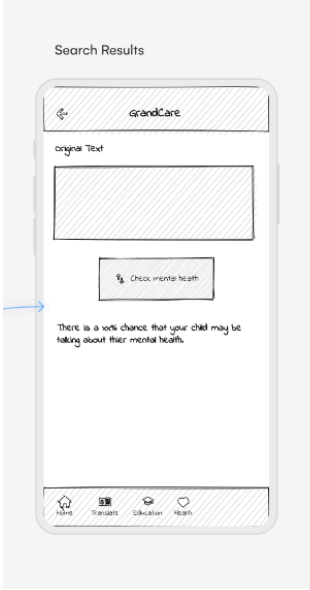
## User Interface



***Wireframe***


Welcome
Welcome to GrandCare
I am a grandparent
or
I am an organization
Login
Email
Username
Password
Password
Home
GrandCare
What's available
7
16
34
2
Upcoming Events
Event #1
Learn more
Event #2
Learn more
Search Results
GrandCare
Search resources
Topics
Educational Opportunities
Search Results
GrandCare
Search resources
original Text
Translate
Translated Text


Search Results
GrandCare
original Text
Check mental health
There is a 90% chance that your child may be talking about their mental health.

## Flowchart/Structural Diagram