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## Design and Testing of a Voter Guide App for Individuals with Early Stage Alzheimer's Disease

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## **Executive Summary**

Vote Your Mind (VYM) aims to make the voter-education process more accessible and effective for individuals with cognitive difficulties, including impairments to attention and memory, and possible visual and/or hearing loss. The project tests the hypothesis that innovations in voter-guide design could improve voting accuracy and persistence to help affected populations overcome certain limitations and vote with greater confidence.

For this pilot study we designed, developed and tested a prototype tablet-based voter guide. The test application breaks dense text into chunks and provides feedback loops, navigational tools, and other enhancements. We conducted a usability study to evaluate the application with a cohort of adult participants with early-stage Alzheimer's disease. Of the user interface techniques tested, two showed the most promise: sentiment buttons and SnapText. Sentiment buttons consist of a check mark, question mark and exclamation point that allow the user quickly to annotate a section of text and encourage active engagement with the content. SnapText is a technique of progressively revealing text as a reader progresses through long sections, showing new text underneath what has already been read. This strategy helps to focus attention while maintaining contextual cues (the reader can easily review the page to see what was already covered).

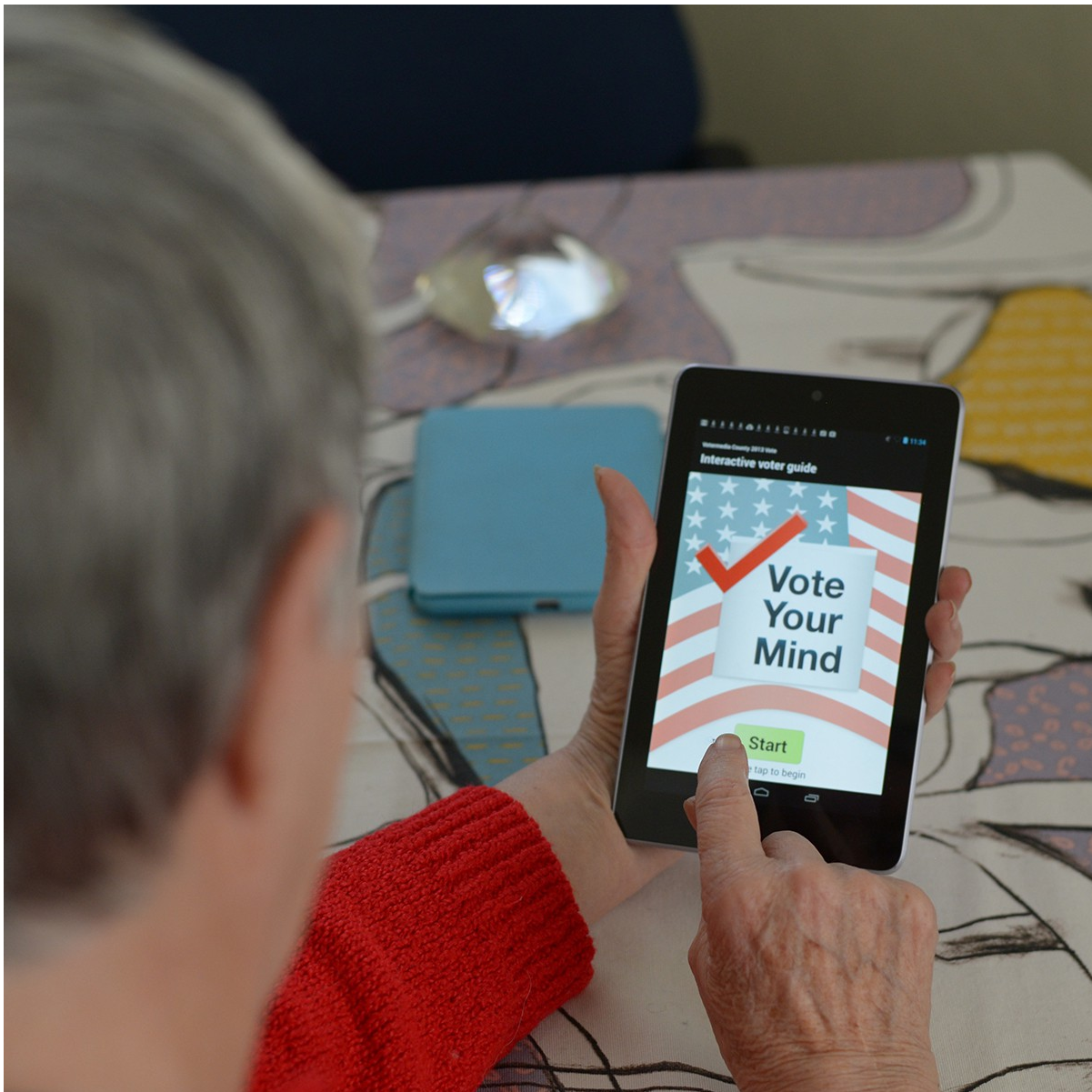
During the study, it became clear a social setting is the most optimal context for use of the app, as participants wanted to discuss candidates and issues with others. Additionally, many participants did not feel capable of using the app independently, and required assistance to set it up and progress through the material. Focusing use of the app in social settings, such as support groups and voting centers, makes sense as a starting point for follow-on study to examine how Vote Your Mind can support both private and collaborative voter education.

The core research and development team included Greg Niemeyer, Principal Investigator and Associate Professor, UC Berkeley; Camille Crittenden, Director, CITRIS Data & Democracy Initiative at UC Berkeley; Dan Gillette, Visiting Scholar, CITRIS Data & Democracy Initiative at UC Berkeley; and Faraz Farzin, developmental psychologist and former Chief Scientist of the Social Apps Lab at CITRIS. Christine Green and Han Lee completed most of the engineering work and Andie Hsieh did the majority of the graphic design.

## Introduction

Vote Your Mind (VYM) was developed to make the voter-education process more accessible and effective for those with cognitive limitations including attention and memory, and possible visual and/or hearing loss. The hypothesis was that novel voter guide designs can improve the accuracy and interest of voters with cognitive impairments so they can overcome some limitations and vote with greater confidence.

The application offers a user-friendly and engaging interface that breaks dense text into chunks and provides feedback loops, navigational tools, and other enhancements. This pilot study



**FIG. 1: USER INTERACTING WITH THE START SCREEN FOR VOTE YOUR MIND**

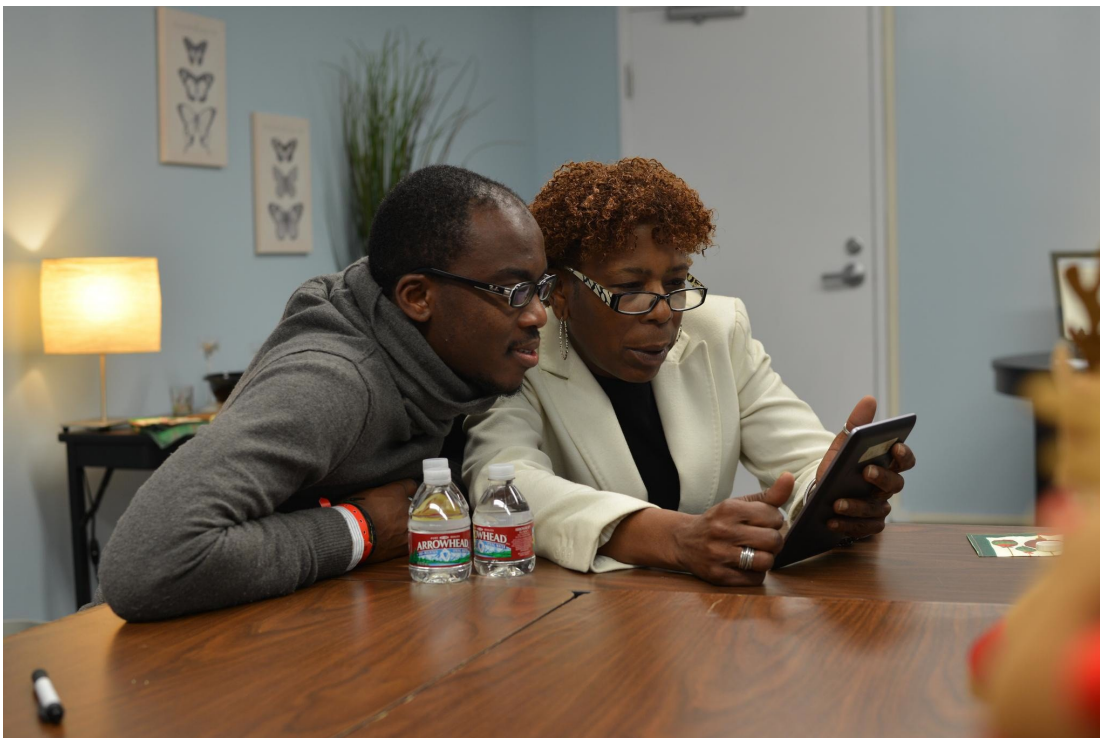
included designing, developing and testing a prototype tablet-based voter guide. A usability study was conducted to evaluate the pilot application with a cohort of adult participants with dementia and early Alzheimer’s disease.

The core research and development team included Greg Niemeyer, Principal Investigator, Vote Your Mind; Camille Crittenden, Director, CITRIS Data & Democracy Initiative at UC Berkeley; Dan Gillette, Visiting Scholar, CITRIS Data & Democracy Initiative at UC Berkeley; and Faraz Farzin, developmental psychologist and former Chief Scientist of the Social Apps Lab at CITRIS. Christine Green and Han Lee completed most of the engineering work and Andie Hsieh did the majority of the graphic design.

## What is Vote Your Mind?

VYM is an application that modifies existing voting guide texts in the following ways:

- Text is presented on an interactive tablet
- Text is organized into short paragraphs which conclude with an option for user feedback input
- The app stores all user feedback inputs and presents them to users in a summary form at the end of each section of the voter guide
- At the end of each section, users can cast a vote either for a candidate or for or against a proposition
- At the end of the Voter Guide, users have an option to review their votes and to email their voting recommendations to themselves and others



**FIG. 2: ASEB STAFF TESTING THE APP**

## Design Principles and Prototyping

The goal of the design was to create tablet-based prototypes that would allow us to test our design concepts with this pilot study's target population. To achieve this goal, we first had to select a tablet. We chose the Nexus 7, a mid-size tablet that is comfortable to hold and relatively inexpensive, but offers limited screen real estate in relation to full-size tablets, such as the iPad. While the smaller screen presented challenges, it helped us stay true to the goal of designing a spare interface that provides appropriate ease-of-use, capabilities and contextualization without unnecessary features. For example, features such as progress bars and navigation controls had to be refined over numerous prototypes to avoid overwhelming the main text area, which led to a more focused feature set.

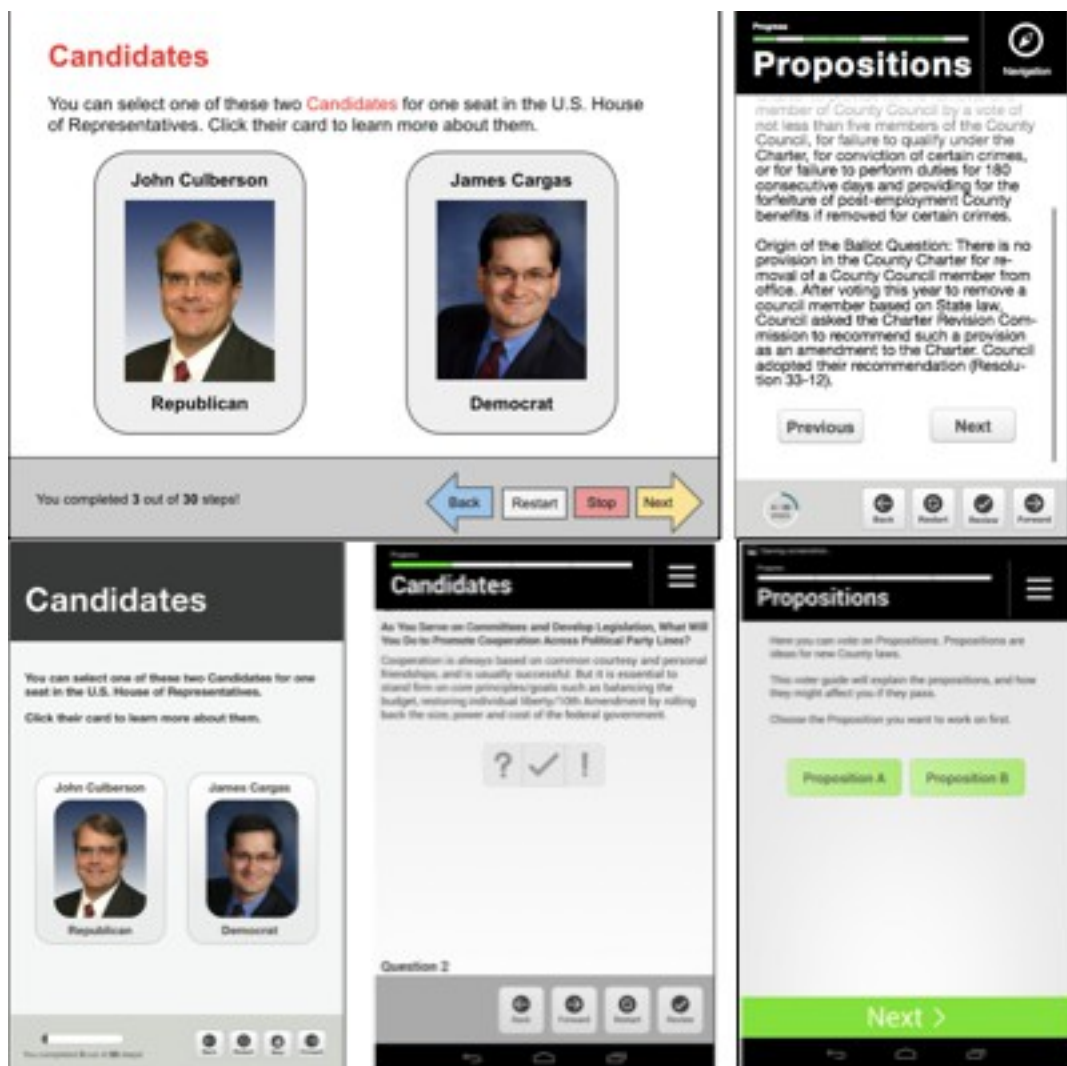


FIG. 3: EXAMPLES OF DESIGN ITERATIONS

Once the hardware platform was defined, the software platform had to be chosen. The two most promising options were to create a native Android application or work within the browser, basing the app on HTML 5. After significant deliberation, it was decided to create a native app, which would give us more fine-grain control over factors such as text presentation, gesture and data tracking.

## **Navigation and Text Presentation Strategies**

### **Sourcing Base Text**

To find appropriate base text for prototyping and testing, we reviewed voter guides from around the country. We found significant variability in terms of complexity, consistency (use of similar language throughout vs varying terms and descriptions of issues) and length. The sources we ultimately chose (listed below) were considered of average quality in our sample and provided enough similarity between items to allow for A/B testing of prototypes.

#### Source Text:

Candidates: League of Women Voters of Houston Voters Guide for the November 6, 2012 Election, US Representatives:

- James Cargas
- John Culberson
- Sean Seibert
- Sheila Jackson Lee

Propositions/Amendments: League of Women Voters of Howard County (<http://lwvhc.wordpress.com/state-questions/>):

- Q3: Suspension And Removal Of Elected Officials, Constitutional Amendment (Ch. 147 of the 2012 Legislative Session)
- Q7: Gaming Expansion Referendum, (Ch. 1 of the Second 2012 Special Session)

Propositions Amendments: League of Women Voters of Anne Arundel County, MD 2012 General Elections Voters' Guide

(<http://lwvmd.org/n/sites/default/files/2012VGAAG-Correction.pdf>):

- QUESTION C, County Council - Removal from Office
- QUESTION J, Use of Bond Premiums

While our samples were well chosen, once we began working with the text, frustrations mounted. Our initial plan was simply to reorganize the text and use a variety of presentation strategies to make it more readable. This strategy would have met two goals: it would ensure impartiality and create an easily replicable system for text preparation. However, we quickly realized that although the base text was relatively well-written when compared to typical election language, it still was lengthy and imprecise — the team felt the text needed to be further simplified to make it more plain and readable.

Numerous strategies exist for simplifying text, but many appear to be more a dark art than a set of procedures that lead to the desired result. Still, based on a variety of best practices, we were able to create a stepwise process that we hoped would ensure impartiality while generating plain language. Sources of inspiration were Kathryn and Michael Summers (Summers, 2005), Ginny

Redish, Whitney Quesenbery, Dana Chisnell and Sharon Lankowski (Redish, 2010; Quesenbery, 2012).

The following is the list of rules originally developed to simplify the base text:

- Structure
  - Proposition Order
    - Title
    - Subtitle
    - “Do you believe...”
    - “If you vote for... If you vote against...”
    - Abstract
      - Goals of proposition
      - How it is
      - How it will change
      - Pros and cons
    - “Would you like to learn more.” *link*
      - Our re-arranged version
      - Original text
    - “To x, do y. To a, do c.”
  - Make architecture default to linear
  - Put what the user should get out of the section at the top
  - Put the goals of the section at the top
  - Put text and tasks on different pages
  - Show who is responsible for the information
- Formatting
  - Break headers into rows
  - Break lists into bullets’
  - Keep single column
  - Reduce the number of links per page; use inline links primarily to redirect users who are in the wrong “linear information path”
  - Make navigation look and act like navigation; create a clear visual signal of user’s location within the site
  - Use standard link behaviors—no pop-ups, no DHTML rollovers, no new windows
- Language
  - Replace terms with plainest counterpart
  - Make text more casual through the use of spoken connector words, even if grammatically not necessary
  - Use [active phrasing](#)
  - Break long sentences
  - Break long paragraphs
  - Date the information
- Add graphics and animation
  - Only if it enhances comprehension

The next step was to adjust the text according to these rules. Rearranging sections, breaking longer passages into smaller ones and providing consistent formatting was easily done. Surprisingly difficult was transforming the jargon. This was predominantly because descriptions of issues varied widely within each proposition — details varied on what the issue really was each time an attempt was made at labeling. As a result, it was impossible to choose or create a single, consistent phrase that described an issue and still be certain it was appropriately complete.



For this reason, we ultimately did little to transform the actual words of the propositions, except for adding text to fill in missing sections or simplifying where we could be certain that the original intent was not lost, tending to change only a single word within a phrase. For the candidate statements, we changed only formatting and section order, since the text was in the candidates' own words.

## Chunking

To make the text easier to read, it was chunked into smaller paragraphs. We incorporated three different methods into the prototypes:

- Scrolling Presentation: The simplest form of presentation, where text is presented as a single page that is navigated through scrolling.
- Single-chunk Presentation: A single paragraph is presented per page with headers providing context.
- SnapText Presentation: New text appears successively below text that has already been revealed. Sections are kept small, but less so than for the single-chunk presentation method (see Fig. 4).



**FIG. 4: SNAPTEXT PROGRESSIVELY ADDS NEW TEXT TO A PAGE**

## Organization

Base text was reorganized to follow the same outline format throughout. The final format varies slightly from the original set of text simplification rules.

Candidate Section Outline:

- Subsection 1: Candidate name, picture, party and incumbent status
- Subsection 2: Question 1
- Subsection 3: Question 2
- Subsection 4: Question 3
- Subsection 5: Background
- Subsection 6: Selection

Proposition Section Outline:

- Subsection 1: Proposition Title
- Subsection 2: What does the proposition propose?

- Subsection 3: Why is the proposition on the ballot?
- Subsection 4: How it is now
- Subsection 5: What will change
- Subsection 6: Pros
- Subsection 7: Cons
- Subsection 8: A vote against means
- Subsection 9: A vote for means
- Subsection 10: Selection

## App Navigation

Navigation through the app can occur either linearly, by clicking the down and next arrows, or non-linearly, by selecting from the "hamburger" menu icon in the upper right hand corner. Additionally, forking between candidates and propositions, each candidate, and each proposition is possible at the beginning of major sections. The overall architecture for the app can be seen in the attached file, VYM architecture.

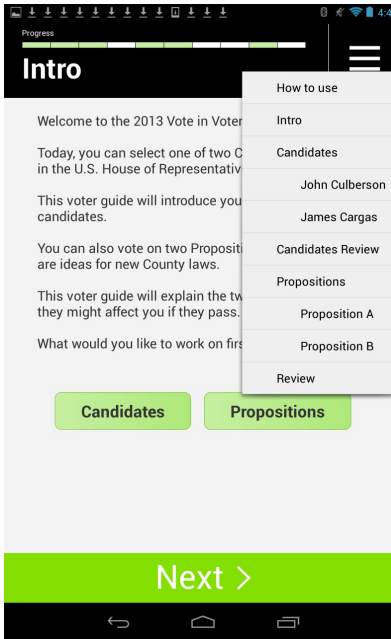


FIG. 5: THE NAVIGATION MENU

## Text-to-Speech

VYM was developed to allow for the use of TalkBack on the Nexus 7, providing text-to-speech (TTS) capabilities. A demo of VYM with text to speech enabled can be found in the attachments.

## Progress Tracking

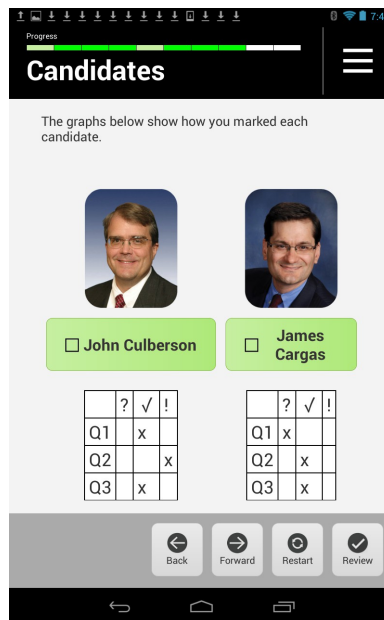
### Progress Bar

A progress bar was included to inform users how close they are to completing the set of tasks within the app. Studies have shown that individuals are driven to accomplish a given goal, and therefore a progress bar can be a powerful and effective tool for sustained engagement.

Additionally, the progress bar shows gaps that may occur when a voter is working through the content in a non-linear fashion.

### Annotation

We explored many methods for annotating text, as both a method for increasing engagement and helping users track their thoughts in relation to the issues. In the end, we decided to go with a three-choice set of sentiment buttons of which each user could make their own meaning. Our first concept was that of thumb-up, thumb-down and thumb-sideways, but this felt too restrictive. The set that we arrived at consists of a question mark, check mark and exclamation point. The



**FIG. 7: CANDIDATE REVIEW PAGE**

user has the option to leave the buttons alone deselected or choose one. The buttons are presented at the end of each subsection of text. The intended purpose of the sentiment buttons is to both provoke active reflection and provide a quick way to make a note about a section without having to enter text. The choices a user makes are recorded, and represented to the user at the end of each section (see Review Pages). This way, the sentiment buttons create a complete feedback loop in which users track evidence of their reflections.

### **Review Pages**

At the end of each section, such as a group of candidates running for the same office or the end of a proposition, the user is presented with a review page. The review page includes a list of options that can be selected (candidates, for/against) and a graph of the user's annotation history (a tally of sentiment buttons).

### **Email Sample Ballots**

Bringing completed sample ballots or notes to the polls to vote is considered a best practice and a way to cognitively support voters (Selker, 2007). For our target population, bringing a "cheat sheet" is even more critical, due to how the stressors found in polling places (noise, movement, poor lighting and a general lack of familiarity with surroundings) can be disruptive enough to prevent one from voting completely. For this reason, VYM provides an opportunity to email a cheat sheet from the app at the end of the interaction.

### **Data Collection**

For research purposes, the prototypes were created with data collection features to track all key clicks, dwell times and selections. This data is stored in a text file for later review. Logs can be reset by entering *1022* at the timeout prompt and selecting *reset*.

### **Final Prototypes**

Our original intention was to create a single prototype that would present our best concepts based on preliminary user testing of individual features. Due to difficulty recruiting participants, we went into our final test phase with less validation of our concepts than intended. As a result, three experimental prototypes were created to test a broader array of user interface approaches. The

decision to test three prototypes occurred late in the project, requiring the same sets of content be used for all experimental conditions except the baseline, as matched alternatives were not readily available.

## VYM 1

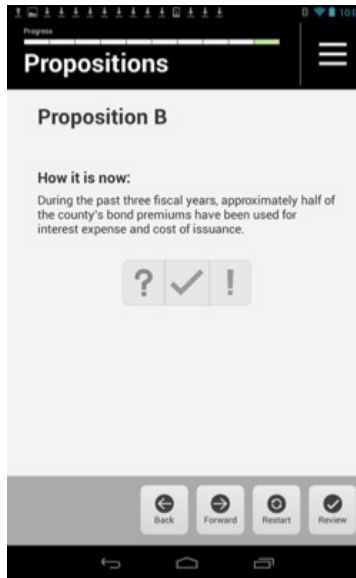
This version of the application provides a simplified set of linear navigation features, consisting of either a *down* (next for moving through subsections) or *next* (next for moving between subsections) button. All other navigation is handled by either the navigation menu or the devices' back key. This represents what we believe is the most spare and simplified version for navigation, freeing up screen real estate and reducing the number of options that could cause confusion. The downside is that we are enforcing a forward and linear movement through the app above all other methods, which could negatively affect users who do not work well in such a system. Text chunking in VYM 1 is single-chunk, showing headers and a single paragraph at a time.



**FIG. 8: VYM 1 NAVIGATION BUTTONS**

## VYM 2

This version is based on our earlier designs. Navigation buttons are persistently displayed no matter the context, and they are incorporated into the app "chrome" (the UI elements that make up the persistent app border) along the bottom edge. This system is more like a web browser in functionality and allows for the addition of back, restart and review buttons. The text presentation style for candidates is SnapText, but propositions are single chunk. This was due to technical difficulties in dealing with the propositions. This can be easily fixed in future versions of the app but was beyond what could be accomplished during this study.



**FIG. 9: VYM 2 NAVIGATION BUTTONS**

### **SnapText Proposition**

Since SnapText was not implemented in either Android app for propositions, a quick HTML site was created to test SnapText on its own.

### **Baseline Text**

For a baseline measure, a voter guide was prepared that was as traditional as could be imagined on a tablet. This version is a single HTML page that the user scrolls to advance text. The text was standardized like the other content, with simplified paragraphs, bulleted lists and reorganized sections.

**Candidates**

**Sean Seibert (R)**

**As You Serve on Committees and Develop Legislation, What Will You Do to Promote Cooperation Across Political Party Lines?**

Being elected to represent the people comes with a serious responsibility to solve the problems that face this Great Nation. Once elected, I will meet with all elected officials in the 18th District so we can work together to solve the important issues.

**What Components Should Be Included in a Comprehensive National Immigration Policy and**

**FIG. 10: BASELINE PROTOTYPE**

## **On the Cutting Room Floor**

We explored and even developed a number of features that were ultimately discarded in the final prototypes. The first concept involved special gestures to interact with the app, such as drawing a check mark to mark a text block as read. At first we thought this type of feature would be a fun way to keep users alert and connected to the content. We even solved the technical challenges of such gestures. Ultimately, the feature was omitted because we felt it made the user experience too complicated for our target audience, which was borne out by the research discussed in more detail below.

Introducing interactive activities likewise didn't make the cut. For example, a matching game where statements are dragged from a list to rest on top of the appropriate candidate was envisioned. A "forced choice" system would prevent the formation of erroneous connections in the mind of the user by not allowing wrong answers to stick — the item would snap back to its starting place if an attempt was made to drag it to the wrong candidate. We still believe such an activity would be of value to spur active reflection, but we decided for this phase to focus our energies on the core experience, saving such feature for the future.

Another feature set that was not implemented was multimedia renderings of complicated data, such as economic data found in proposition text. Potential media included interactive and annotated graphs, animated walkthroughs of complex steps or video containing supplemental material. As with the interactive activities, the decision was made to save development of this type of content and interaction for future phases of development.

## **Research Design**

The research protocol described below was approved by the Institutional Review Board at UC Berkeley.

### **Recruitment**

Initial efforts were made to recruit a small group of veterans, ages 18 years and older, who have mild cognitive impairments, possibly as a result of a Traumatic Brain Injury (TBI), in order to test the efficacy of VYM. To help identify and enlist potential participants, we contacted clinical psychologists at the Palo Alto and Martinez Veterans Affairs Hospitals who agreed to inform their patients about the study and provide our contact information. Additional recruitment was done through a flyer that was posted in the UC Berkeley Student Center (100 César E. Chávez Student Center) where the CalVets group office is located and in the Haas Veterans Club that serves veterans in the Berkeley MBA community. Despite these efforts, we were unable to recruit a sufficient sample that represented this target population within the timeframe necessary to complete the study. Several factors may have adversely affected response rates, including multiple co-occurring etiologies such as PTSD, depression, and social anxiety, all of which contribute to the presenting levels of cognitive impairment in this population.

Given the difficulties faced in recruiting veteran research participants, we sought to expand our participant inclusion criteria to include non-veterans who are experiencing cognitive impairments. We contacted the Alzheimer's Services of the East Bay (ASEB), a non-profit organization serving individuals with dementia.

## **Participants**

In December 2013, our team visited ASEB to test a prototype version of VYM with individuals with early stage Alzheimer's. Five participants were enrolled in the study (four females and one male, all between 61 and 84 years old). One participant chose not to complete the session, leaving data collection to four participants.

## **Procedure**

Each participant completed the study in an individual testing session. Our research procedure included three parts: reading and signing a consent form, an assessment of cognitive functioning (The Montreal Cognitive Assessment; MoCA©), and a test run with one or more versions of our application presented in random order. We videographed all interactions. Participants were compensated in the form of a \$25 gift card at the end of the session.

## **Results and Discussion**

While we collected hard data, such as user logs, the sample size was too small to draw powerful conclusions from such data. The real value in our testing was in observing how users interacted with the guides and learning more about their current preferences and practices around voting.

## **MoCA Scores**

The MoCA was developed as a screening instrument for domains of impairment commonly encountered in individuals with Mild Cognitive Impairment. It was designed to be a rapid (10 minutes), sensitive, and easy-to-administer assessment. Details on the assessment are available at [www.mocatest.org](http://www.mocatest.org). The test is divided into eight domains: visuospatial/executive function, naming, memory, attention, language, abstraction and orientation.

The administration of the MoCA was surprising, with only two out of the four participants successfully completing the assessment. This showed deficits that were not readily apparent in conversation and general interaction. As a result, it was a useful measure to clarify how our strategies mapped to different capabilities.

## **General Observations**

Our data and observations show that individuals with early stage Alzheimer's exhibit a wide range of cognitive impairments and faculties that directly affect their ability to make use of the application. In some cases, the app lowered the threshold of engagement compared to plain text, and offered the participants an easier path to articulate and share their voting recommendations. In other cases, the participants were not able to engage effectively with one or more parts of our protocol. Compared to typical users, we can see that those participants who could make use of the VYM application spent about 200% of a typical user's time on completing a run through the program.

## **Text Presentation**

Reading rate varied dramatically between participants and text presentation schemes. Many stated that they preferred more paper-like text presentation that they could simply work through, but when observed, this appeared to cause the slowest and most labored reading. In such situations, many employed a technique of moving a finger along the edge of the text, presumably



marking the line currently being read, and many were visibly subvocalizing as they read during the baseline condition.

Under the chunking condition, reading rate was faster, but comprehension didn't appear to be as high as other conditions when participants were quizzed. Also, half the participants mentioned that they felt the need to go back to previously read chunks and that it was not easy to do.

The SnapText conditions appeared to allow for the most comfortable reading for all but one participant. One participant commented, "I like this, it's faster! Your eye is not distracted... It is more like the way you read."

### **Annotation and Feedback**

All participants in the trial appreciated the notion of marking their feedback with the sentiment buttons, though it was clear that for all but one, the purpose of the buttons was not self-evident and that explicit instruction should be incorporated into future versions. Few appeared to be interested in the related graphs of their input provided on the review pages. During follow up, it became clear that the counts were too abstract — the participants weren't just interested in the balance of their responses, they wanted to connect each mark to the original content, asking for better labeling of each item. Some also suggested that there be linking or "zooming" to the related content as a memory aid. From our interactions it became clear that the sentiment buttons provide a framework for reflecting the user's experience back to the user him/herself, providing a sense of agency concerning their reasoning process. Sentiment buttons provide a record of the user's reactions, not just a record that a user read a page. This sequence of reactions emphasizes how reasoning is a process with many steps. Further studies will explore how much the feedback marks increase a user's engagement in reasoning.

### **Voting is about both Logic and Emotion**

From our early exploration of casually showing mockups to those around us, to the comments and observations made during our formal testing, it was clear that when considering how best to support voters in their decision making process, it is not simply a matter of providing quality information in an efficient manner. In most cases, when we showed our work to others, the first reaction was an emotional response to the statements made within the text. In one case, we had to stop testing a prototype because the participant found the content so offensive to her world view.

The emotional response plays a significant role in how individuals decide to vote. Equally important is the fact that if the emotional response is not processed consciously, it can interfere with other deliberations. For this reason, interactive voter guides need to be able to straddle the worlds of both logic and emotion. It appears that the moderate ambiguity of our sentiment buttons allowed the participants use them as needed; for some, they acted as statements of approval or disdain, while for others, they signified degrees of clarity in the argument or alignment with their own values.

### **Voting May be Private, but Making up One's Mind is Often Social**

Although voting itself is typically construed as an individual and anonymous act, our users all discussed how they view voting as a social process in which they form their decisions through interactions and dialogue. Additionally, at our informational meeting during recruitment, the participants discussed their feeling that they are "disappearing" from the view of society as their

disease progresses. Voting is an important tool to feel visible, connected and valued by the community.

The VYM app supports social dialog well, because the tablet is ideal for two-person information exchange, and at the same time supports recording the voting preferences of one person. The "share by email" feature allows for storing and sharing a user's vote, and gives the user a measure of control about whom to share their voting preference with.

### **Click Data**

A preliminary analysis of the click data collected by the application reveals that average reading times for candidate and proposal texts were 63 and 64 seconds respectively, with a standard deviation of 90 and 71 seconds respectively. Average reading times on section introductions were 9 seconds. Reading times on introductory pages averaged less than 2 seconds. This data shows that participants spent far more time on the text in the voter guide than on the structure of the voter guide. We conclude that the novelty of the structure did not interfere with perception of the content. The high standard deviation shows that participants made decisive and efficient choices about what to read and what not to read. The application allowed them to skip content because they either read the content before, disagreed with it, or decided to ignore it. Without attributing a positive or negative valuation to the act of "skipping" we find that the application structured the content effectively so participants could spend time reading what they wanted to read. The application enabled focus.

The data allows us to speculate that longer texts generally elicited votes against the described candidate or proposition, and we would like to study correlations between word count and positive votes further. We note that a voter guide application serves as an effective platform for this kind of inquiry.

## **Lessons Learned**

This pilot study offered insights beyond those in design interface. A few suggestions for further investigation are below.

### **Technical Lessons Learned**

Clearly, creating native Android prototypes provided a solid user experience and an easy mechanism for app dissemination, but iterative prototyping in Android proved much more difficult than anticipated. In many ways, getting an app started in Android is much easier than in other platforms, but we encountered many hurdles as we continued development. In hindsight, it would have made more sense to prototype individual features in HTML 5 for early-stage validation, allowing for more agile development, resulting in a more complete plan for what to develop in Android.

### **Using Screeners**

It is important to consider the appropriateness of the MoCA for quantifying cognitive abilities in older populations for research purposes. While the MoCA is routinely used to distinguish between an individual with healthy cognition and someone with mild impairment or dementia, the assessment can be too difficult for those with moderate to severe conditions. Furthermore, the

idea of undergoing cognitive testing can be daunting for older patients, who may become anxious and unable to complete the tasks. Even with our researchers reassuring the participants that their score on the assessment would not affect their participation in the study or their clinical care, it was an emotional experience for all but one of the participants (the one who had the least difficulty). Additionally, the MoCA took much longer than expected, eating into the time available for testing prototypes. This experience leaves us ambivalent on the use of screeners for such studies — the information they provide is valuable but the cost is high for this population.

## **Next Steps**

Our main observation is that all participants exhibited a strong sense of collaboration with their support group, indicating that any successful voter guide should provide a platform for users to navigate through their choices collectively and to share and discuss their voting recommendations. Considering the collaborative aspects of voting especially for persons with cognitive impairments, we see the need for further studies that address the integration of electronic tools such as VYM with human support. For example, VYM might be highly effective as a facilitation tool for a caregiver who collaborates with a patient, rather than as a tool that a patient uses alone. Additionally, one participant suggested the formation of civic locations where one could discuss the issues with others in a non-partisan way. Such a service might be an excellent auxiliary use of vote centers leading up to an election.

All participants in our study expressed how important it is for them to vote. We speculate that the impact of an application, in conjunction with caregiver support, extends the patients' sense of agency and self-worth. We would like to study VYM over several years to validate this speculation.

We only tested two propositions and two candidates. A typical voter guide features more components, and we clearly need to test VYM with a complete ballot to determine if the positive effects of structuring are scalable.

Since the application is on a device that can connect to the internet, it is conceivable that the voter guide application would link to third party websites. We would like to study if such links to party websites, proposition sponsor websites or news articles would enhance or distract the voting process.

Considering advances in web-based application languages such as AJAX and HTML5 and the many limitations of generating apps for smartphone operating systems, we want to explore creating a web-based version of VYM, which would run on any browser. We need to balance accessibility and privacy for such a version, and resolve issues around login procedures.

## **Acknowledgements**

The following individuals assisted in this project:

- Han Lee and Christine Green did the majority of the engineering
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# **Appendix**

## **Attachments**

- VYM Baseline Text.html: Baseline text formatted for testing
- MoCA-Instructions-English.pdf
- MOCA-Test-English.pdf
- VoteYourMind\_consent\_version3.pdf
- Recruitment Flyer
- VYMFlyer.pdf: Recruitment flyer
- SnapText.zip: Files for testing the SnapText feature with a proposition
- VotingApp-v1-sprint9-rc1.apk: Latest VYM app, type 1
- VotingApp-v2-sprint9-rc1.apk: Latest VYM app, type 2
- VYM Architecture.pdf: Map of VYM architecture
- VYM TTS Demo.mov: Demo of text-to-speech being used with VYM

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