

**gReader**  
A Universally Designed, Device-Independent Email Client



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## Overview

- The ubiquity of email messaging necessitates the need for anywhere, accessible email receipt.
- gReader:
  - An *application plan* for offering access to e-mail that is largely device independent.
- Project:
  - proposed solution, the final implementation, and the results of a preliminary user-task analysis.

## Overview

**The Project:**

Design of a Text-To-Speech (TTS) application that reads e-mail to users, records the messages in two popular media types for transfer to portable entertainment devices and portable communications devices (PCD).

Conducted user task analysis on eight users ranging from 19 to 34 years old

## Why Email?

- Current research focuses on the use of screen readers and other assistive devices.
- Screen readers are not as attractive to people with sight.
- Current research does not focus on mobile, accessible email
- Email is so pervasive that access to email must be universal.
  - Email should not be limited to sighted individuals.
  - Email review should not be limited to moments when users can read
- Email requires universal access
  - At home
  - While driving
  - At the park

## Modern Mobile Devices



- Portable Communications Device:
  - Designed for **Communication**
  - Mobile Phones, PDA, "Smartphones", iPhone
  - Typically require device specific coding practices
  - Most are *multimedia capable*
  - Most can be connected to a personal computer

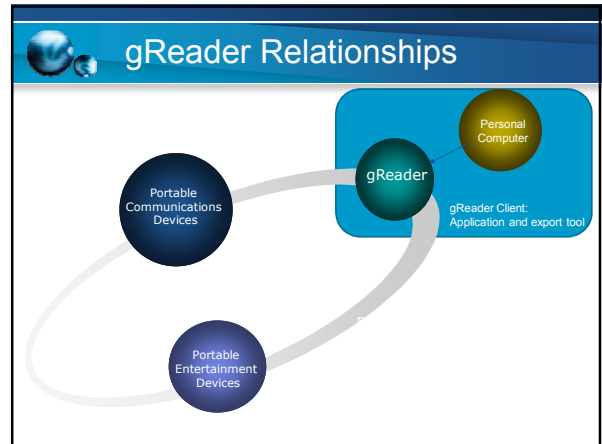
## Modern Mobile Devices

- Portable Entertainment Technology
  - Designed for entertainment
  - Apple iPod, Sony PSP
  - Typically require hardware specific software development
  - Ubiquitous technology
  - Some are tethered to personal computer for content update



## Project Motivation

- Scenario 1:
  - Walking through busy streets to a meeting is difficult while reading, user could benefit from a system that allows them to hear their latest messages while they walk.
- Scenario 2:
  - User has a list of driving directions that were emailed to them, instead of reading them while driving user B can use their vehicle's iPod port to listen to the directions while they drive.
- Scenario 3:
  - A visually impaired user can use small footprint interface and text to speech functionality, to review messages while actively engaged in another task on the computer.



## A Universally Designed, Device-Independent Email Client

### Design and Implementation

## Application Interface Design

- Aesthetic minimalist design and usability inspired by Jacob Nielsen's Heuristics
- Fits in 200 x 400 pixel space
- Scrolling message for compact display
- No setup screens, no options
  - Up and running instantly
- 2 "Transparent" Layers
  - Message preview
  - Message "view"

## Application Interface Design

- Applications states are communicated according to Nielsen's **Visibility of System Status**:
  - Audibly:
    - Announce Error
  - Visual:
    - Scrolling text
  - Visual (color coded alerts)
    - Red: Critical Problem
    - Yellow: Attention
    - White/Blue: No problems

## Application Interface Design

- Keypad
  - Low cost, tactile navigation without additional hardware
  - All interface controls are described for use by screen readers
  - One key export

### Technical Design (APIs)

- Email Retrieval:
  - Indy Sockets open source
- TTS
  - Microsoft Corporation's Speech Software Development Kit
- Audio File Conversion
  - Windows Media File Encoder

### A Universally Designed, Device-Independent Email Client

### User Study

### User Study

- Two Component Study
  - Survey
  - User Task Assessment
- 9 Participants
  - 3 Female
  - 6 Male
  - Age 19-35 (mean 24)

User #	1	2	3	4	5	6	7	8	9
Age	24	20	19	22	27	35	23	20	28
Own Apple iPod?			✓	✓				✓	✓
Own Any Brand Mp3 Player?	✓					✓			
Own Portable Game Device?		✓		✓			✓	✓	
Own Portable Phone?	✓	✓	✓	✓	✓	✓	✓	✓	✓
Own Smart Phone or PDA?								✓	

### User Study

- Survey Goal:
  - Gauge interest in the proposed application
  - Understand habits of Portable Communication Device and Personal Entertainment Device users

### Portable Device Usage

#### Portable Communications Device

- The average participant
  - used their **portable communications device almost daily**
  - chose not to connect their portable communication device to a desktop or laptop computer (although this was commonly an option for them).
  - Participants 2 and 8 were the **only respondents to conduct any e-mail tasks on their devices.**

### Portable Device Usage

#### Personal Entertainment Devices

- The average respondent :
  - Used their personal device at least **several times a week.**
  - Use per session was slightly over **1-2 hours.**
  - When available, the participants connected their device to a desktop or laptop computer at least **one time a week.**
  - **2/3 of the participants installed software on their computers** to facilitate usage of their device.
  - **1/3 of the participants installed software on their device.**

## Email Usage

- The average respondent
  - checks email daily to several times a day.
  - spends an average of 4 minutes checking email each time
  - The median time spent checking email during a review session was only 3 minutes.
- 7 of the 9 respondents expressed interest in checking their email from a portable entertainment device.
- 5 of the 9 respondents expressed interest in having their email read to them via a portable entertainment device.

## Application Testing

- 5 standard email messages
  - Ordered from simplest to most complex
  - Users asked to comprehend each message and report its contents
  - Participant 1 opted out of this test
  - Time recorded by study evaluator

## Test Design

<p><b>Control Group</b></p> <ul style="list-style-type: none"> <li>4 users provided high resolution screen shots from Yahoo! email</li> <li>Asked to read content from screen</li> <li>Designed to avoid evaluation of the Yahoo! email interface</li> </ul>	<p><b>Test Group</b></p> <ul style="list-style-type: none"> <li>4 users provided the gReader application                             <ul style="list-style-type: none"> <li>Asked to listen to content</li> <li>Provided headphones</li> </ul> </li> </ul>
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## User Test Analysis: Highlights

- Email comprehension wavered, with gReader outperforming on questions 11 and 12

## User Test Analysis: Highlights

Average time is flat until question length increases.

## User Test Analysis: Highlights

- Participant #5 (test group)
  - The poorest accuracy
  - He spoke English as a second language.
  - Answered the questions in the least amount of time (compared to control and study group)
  - Had at least one auditory misinterpretation (30<sup>th</sup> vs 13<sup>th</sup>) \*
  - Removing user 5 from the study group yields significantly higher gReader accuracy rates, but it also increases review times by nearly 25%.
- Participant #4 (control group)
  - Surprisingly poor accuracy.
  - Spent the most time answering each question set.
  - She was 0% accurate on question 10, which had a median response accuracy of 100% across both groups.
  - She also responded slightly below average on question 12.

\*Auditory misinterpretation was defined by two words that sound similar, but have different meaning (similar to a homonym)

## Observations

- Post study feedback from users
  - Essential that the gReader application provide
    - a pause button
    - rewind to a segment of the message.
- Results indicate that the gReader application functioned as designed
- Although the application was tested in a controlled environment it seems that gReader has the potential to improve the usability of mobile e-mail messaging.

## Future Work

- Development for Mobile Phone
- Testing against visually impaired audience
- Test comparing accuracy and speed to screen readers
- Improve UI

