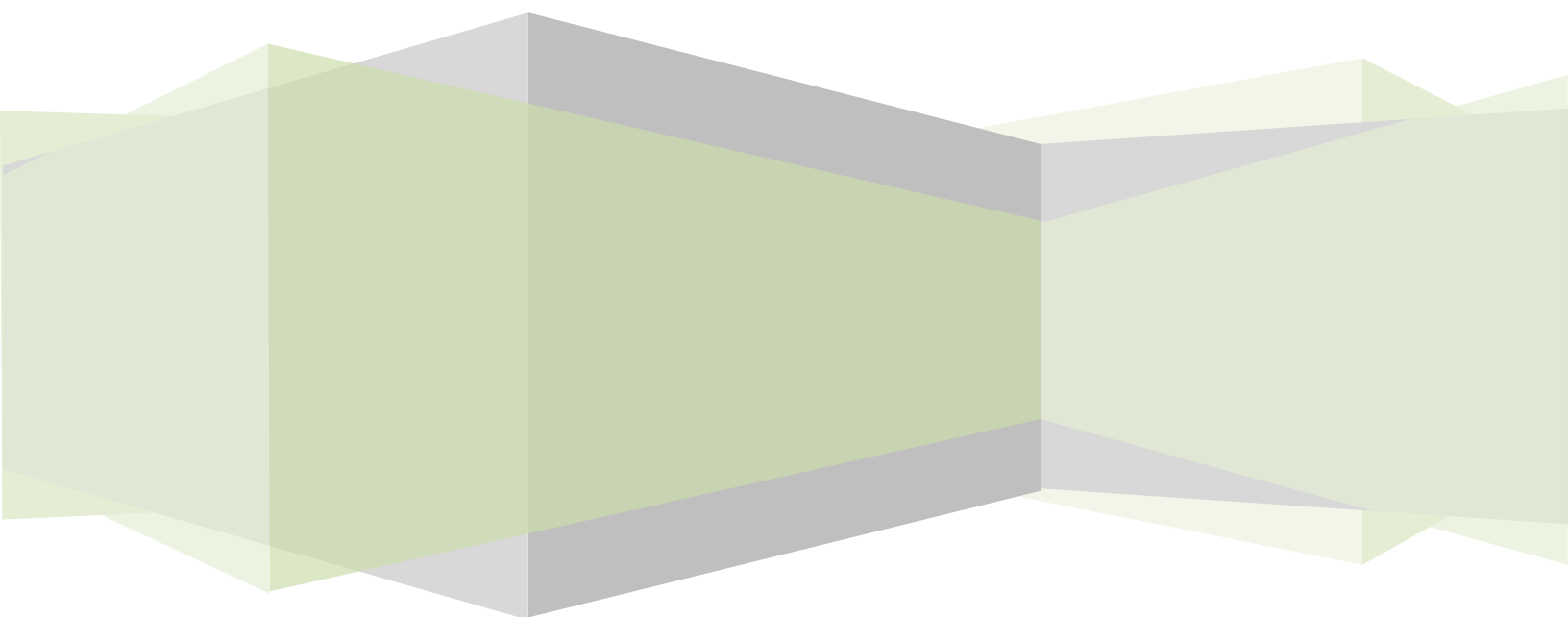# FutureNow CCR

An introductory Project to Human-Computer Interaction

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Contents

Problem Space

Context

FutureNow, Inc. has invited 9Team Consulting to provide an all-embracing product design for their upcoming release of the FutureNow "CCR," a mobile device used for acquiring satellite radio, audio/video multimedia, and global navigation information. Current technologies already exist in today's society; however, they do not exist yet in a single wireless device. As society continually becomes more mobile, technology of today's world must also follow suit by combining separate single-function devices into multi-functional and portable machines.

Use

The 9Team Consulting group will design a custom user interface for a new wireless mobile device allowing users to seamlessly switch between satellite radio, global navigation, and multimedia outlets (i.e., audio/video).   The FutureNow CCR will be created by FutureNow engineers, with the premise that the physical device will have similarities to many on-the-market touch screen apparatuses (i.e., Personal Digital Assistant (PDA), Apple's iPhone, etc.). 9Team Consulting has been advised that the FutureNow CCR will have a minimal number of external buttons and switches, with most device interfaces to be performed via a large touch screen display. It will also have a solid-state storage drive (i.e., Flash drive) in order for the users to download and store media files and data. The FutureNow CCR will be relatively lightweight, allowing for portability between different use locations at home, at work, and on-the-road, providing users the ability to use all provided functionalities at anytime, anywhere. Additional functionalities, such as wireless transmissions to external displays, are currently in preliminary discussions and may also be included with the formal distribution of the device.

People

The FutureNow CCR device will be intended for users who are on-the-go: around town, around the country, or even around the world. They should have basic understanding in the uses of satellite radio, GPS navigation, and audio/video download, but they may or may not be technically experienced with such devices. The primary targeted demographic for the FutureNow CCR are full- or part-time college students and professionals who enjoy new and exciting wireless technologies and have a desire to use one or all three primary FutureNow CCR functions. Parents of pre-teen children also comprise a targeted demographic due to the device portability and entertainment values it can provide on long car rides.

Usability and Experience Goals of the Users

Usability Goal	Description
Effectiveness	The FutureNow CCR will allow users simplified access to their radio subscriptions, play downloaded music or movies, and provide detailed mapping and directions using global positioning system (GPS) functionality. The goal is to combine these highly sought-after features into a single portable handheld device.
Efficiency	The interface will need to display as much information as possible without overburdening the user with information. All basic functionality should be attainable with minimized singular user actions (i.e., button click, touch screen action, etc.). Operation of the device will be quick, simple, and intuitive.
Learnability	Primary product use via touch screen functionality will give users a delightful experience in learning standard operating procedures. Basic setup functionality for programming (i.e., favorite radio stations, frequent travel destinations, etc.) will be provided for enhanced learnability.
Memorability	The interface will be streamlined to three primary functions, each making use of simplified affirmations. It should not require users to memorize complex instructions, and will provide enough recognition to functionality for those that may have forgotten.
Safety	The interface will provide safety mechanisms to the user via confirmation messages and physical, visual, or audible feedback. Upon interface problems, the system will self-correct and advise of possible problems and/or solutions.
Utility	Basic functionality will be provided via recognizable icons and display choices, and synchronization to a user's computer will be provided by both the interface and device.

User Experience Expectations

9Team Consulting will be focusing on three primary user experience expectations:

- ⊙ *Enjoyment*. FutureNow CCR users must have an outstanding experience with the new mobile device as it brings them the very best of satellite radio, the power of GPS, and the sheer joy of today's audio/video entertainment.

- ⊙ *Simplification*. Today's technology is evolving every day, providing products only dreamed of months ago. By providing the latest technology in a simplified format, not only technologically-savvy customers, but also those cautious of the complexity of technology will enjoy the FutureNow CCR.

- ⊙ *Accommodation*. Users of the FutureNow CCR will be subscribing to several media outlets for use of the product. Therefore, the device, and more importantly, the interface, must provide users with the proper functionality and processes in order to make full use of their subscriptions.

Conceptual Model & Proposed Solution

High-Level Concept

In 1979, Sony introduced the first "Walkman", a portable cassette tape player. Thirty years later, technology has evolved the Walkman into a multitude of portable devices, including laptop computers, MP3 players, GPS Navigational devices, Bluetooth headsets, portable DVD players, and the like. However, for the most part, each of these devices has been designed to serve a single purpose. In order to enjoy the benefits each of the aforementioned devices, one must purchase them individually (expensive), and carry each device at all times (reducing user mobility and pleasure).

For example, a commuter student may drive to/from school for class two times a week. In her trip, she makes use of her portable GPS Navigation system (powered by an in-dash power outlet) to determine proper directions to her school's commuter parking lot. She connects her MP3 player (to which two new "podcasts" were recently downloaded onto) to her car stereo to listen to during her trip. She then slips on her Bluetooth headset over her ear, and connects her cell phone to her car charger for power, in case she receives a call during her commute. Just in this example alone, she is making use of four unique portable devices (without counting connection wires), each of which serving a specific purpose.

The conceptual model base for the FutureNow CCR is to combine three of today's well-known portable devices into a single, portable device. It can be thought of as a portable GPS navigation system, satellite radio receiver, and audio/video unit. By integrating all of these functions into a single unit, the device will be useful on a practical and entertainment level. It will be particularly useful for people who are constantly on the go, and very enticing to a niche market of technology-savvy users. The functional design of the device would be akin to a portable version of a Barnes & Noble Bookstore, featuring individual methods to retrieve requested information (maps, locations, information through GPS, satellite radio), and a way to entertain the busy person on the go (through its media player complete with downloadable content).

Theoretical Device and Application Concept

Physical Device

The FutureNow CCR device will reflect three growing trends in portable devices. First, the device will make use of touch-screen technology, allowing for users to physically interact with the user interface itself, rather than with a significant number of external, physical buttons. Second, the CCR will allow for connectivity to multiple adaptors, including USB and docking stations, permitting the device to connect to a number of larger modes of use (ie, home computer, automobile, home entertainment system, etc.). Third, the device will incorporate voice-activation functionality, allowing users hands-free device control, a noted safety and lawful feature while driving.

Initial specifications given to 9Team Consulting, the physical device is being developed with parameters of approximately 4" H x 5" W x ¾" D (rounded rectangular), and will weigh approximately 7 oz (200g). Size and weight dimensions are considered key device components allowing users the desired functionality without burden of device awkwardness or extra bulk. FutureNow executives have stated the total number of external buttons will be at absolute minimum, as most device interaction should be controlled by the user interface. There are two (2) designed connectivity ports (common RCA headphone, common USB 2.0), and four (4) perforated sections for external speaker and/or microphone

areas. A solid-state storage device of 16 GB will be incorporated for file storage purposes, and a replaceable rechargeable nickel-cadmium (Ni-Cd) battery will be implemented. The device is intended to be operated horizontally, such that internal sensors will adjust the display to the closest horizontal axis, allowing both right- and left-handed users very similar (if not identical) physical user experiences. The display will support native 32-bit color at a 480x272 resolution, in a 16x9 ratio.

User Interface Behavior

The FutureNow CCR touch-screen technology will provide users the ability to browse possible interactions as well as direct instructions to perform specific desired functions. Voice-activation functionality opens avenues for conversing interactions with the device, such as asking for driving directions to a specific address or location. Users will be able to manipulate specific interface buttons and/or menu options to quickly proceed to their desired end state. Overall, user interaction must be designed to provide the user enjoyment in a simplified user interface, yet provide ample functionality to accommodate all users appropriately.

Product Requirements

Functional Interface Requirements

- Access to GPS, Satellite radio, Audio/Visual download (streaming and video/audio, and downloadable video/audio)access to gps and internet
- Satellite positioning, satellite radio, access to the web
- LCD Touch-screen interface
- 16gb solid state storage
- Built-in rechargeable battery (Ni-Cd or Lithium-ion) that recharges in docking station (computer or vehicle) or wall plug-in
- Voice-command recognition (for GPS navigation)
- Standard device controls (ie, volume, display, etc)
- Bluetooth, WiFi, USB connectivity
- High fidelity screen output (480x272, 16:9 ratio, 32-bit color); good contrast, brightness
- Open source OS for customization (if desired)
- Built-in high-fidelity speakers

Data & Content Requirements

- Satellite radio companies (such as Sirius/XM) are enthusiastic to establish content contracts with new FutureNow CCR Users. FutureNow will provide registration methods with their choice of satellite radio companies. Users will be billed separately for purchased contracts with third-party sources.
- Allow for certain features to be inactive (i.e., if user does not have subscription for satellite radio or other pay-for media).

Environmental Requirements

- Access to a national wireless broadband network as much as possible.
- Compatible with various contexts of use, allowing the users to adjust display controls to meet environmental needs (e.g., use in bright sunlight, use in noisy conditions, large font sizes, etc.).

User Requirements

- Seamless transition between major modes of operation, and can have all functions running at the same time? (i.e., using GPS while radio playing, while download going on in background)
- Menu-based commands.
- Provide on-screen keyboard for manual input (when necessary or requested)
- Allow for random music play of stored audio files
- Allow for genre selection of satellite radio stations

Initial User Scenarios

Scenario 1

Mike is a 21-year old college student who commutes to school every day. He lives 30 miles away and the trip each way takes 40 minutes, sometimes 60 minutes in heavy traffic. During rush hour he finds himself bored during the drive, and wishes he had some entertainment for the waits. He regularly brings his iPod, his satellite radio receiver, and his GPS system along, but finds it cumbersome to keep track of all of his gadgets. One day while being rushed for time, Mike forgets to bring the charger for his iPod, and during his extended trip, it runs out of charge. Mike is frustrated and wishes that he could have just a single device that would provide him with the essential services of GPS and radio, while giving him full access to his multimedia library. He often thinks to himself that he would like to view podcasts along his drive to keep up on news and current events.

Mike notices the release of the FutureNow CCR and is relieved when he discovers that he can do all these things and more. Being technically savvy, he appreciates the open source operating system would allow him to design new applications that fit his needs in his free time. Mike's first application is to program an application that suggests alternate driving routes to school when the satellite radio news station tells him there is heavy traffic in his area.

Scenario 2

Sandy is a 37-year old mother of two children. Her husband works long hours in his demanding position, and so Sandy is left to take care of all the chores, including driving her children to school, going to the groceries, and dry-cleaners. Due to a company promotion, Sandy's family just recently moved and she is still trying to learn the new town they live in. She uses the FutureNow CCR to help her figure out where things are, and never gets lost on the way home. In the meantime her children can watch their favorite cartoons on the way home, so that when they get home they can focus on their homework instead of trying to watch television.

Sandy is also a considerate wife, and to help her husband catch up on news, she downloads the day's major events and important topics so that at night, before going to bed they can watch the sessions together to stay informed despite their very busy lifestyles.

Design & Prototypes

Physical Product Design

For the purposes of this project, 9Team Consulting preferred to develop an interface based on a fixed physical device. Appendix A demonstrates the finalized conceptualization of the physical product device. All interface designs were developed in reference to the physical device.

Concept Design

The FutureNow CCR is designed for primary use in the car, with secondary uses for outside the car as a portable device. The device should be seen as an improved alternative to bringing 3 or 4 different devices on trips, by combining the features of GPS/Radio/Audio Visual media functions. Initial low-fidelity prototype sketches and screenshots are demonstrated in Appendix B.

High-Fidelity Design

A high-fidelity prototype was developed within FrontPage 2003 using enhanced versions of the low-fidelity conceptual screenshots demonstrated in Appendix B. This high-fidelity prototype was streamlined and used as a basis for the initial usability study. The high-fidelity prototype can be found at the following URL:

http://www.davidcraske.com/Info541/CCR.htm

Evaluating the Design

Usability Study

9Team Consulting selected six (6) participants to take part in a usability study, based on the developed high-fidelity prototype. The participant demographics in the study included the following: 2 females, 4 males; all were between the ages 24-35; previous technological experience ranged from Novice user, Proficient User, Expert Technology users, to IT analysts, as self-reported. All participants were presented a standard introductory script to assess willingness to participate in our study, and were given the option to opt out. Once the participants agreed and basic questions were answered, they were reassured to take their time to perform the indicated tasks and to not worry about making mistakes. The participants were also asked to think aloud during their testing of the prototype.

Participants were asked to perform three basic tasks users would perform while using the FutureNow CCR Interface:
1. Play the movie GoldenEye
2. Navigate to 1415 9th street, Lawrenceville, IL
3. Switch to Internet radio. Attempting to click on the "internet radio" button was considered successful completion of this task.

Each task was timed, and general notes were taken by the evaluator during each test section. After all tasks were completed, users were given extra time to access additional functionality within the CCR device as they liked. The evaluator was present at all times to answer questions asked by participants, and to point out more specific features perhaps not seen during the usability testing.

Evaluators from 9Team Consulting concluded the usability study by asking the users to rate each major function of the device on a scale of 1-5, with 1 being the worst and 5 being the best. Below are the results of both the task completion times as well as the ratings given by each user.

User	Task 1 time (sec.)	Task 2 time (sec.)	Task 3 time (sec.)	A/V rating (1-5)	GPS rating (1-5)	Radio rating (1-5)
1	25	60	200	4.5	3.5	2
2	25	35	200	5	4	2
3	68	16	58	2	2	3
4	122	72	122	2	2	3
5	45	60	90	3	3	2
6	30	30	60	3	2	2
Avg.	52.5	45.5	122	3.25	2.75	2.33

Individual user responses to the open-ended interview questions were collected and categorized into Appendix C.

Assessment of Findings:

From our usability study, 9Team Consulting acquired a significant amount of data regarding the FutureNow CCR product and its initial impact on the user experience. Usability participants agreed that the concept of the FutureNow CCR made sense, and that there is indeed a market segment interested in such a device. These opinions, as well as specific usability feedback, give us great hope that with a focused redesign effort the CCR will be a unique and desirable commodity in the marketplace.

On a general level, given that the Radio function had the lowest rating of the 3 primary functions, future re-design efforts will focus more on improving the layout and interaction of the Radio section. Specifically, it became evident that certain labels were highly confusing for the users. Redesign efforts will fix this problem by renaming problem labels with terminology more intuitive for users. "Satellite Radio" will be renamed to "Radio," as many users pointed out that AM/FM and internet radio are not forms of Satellite Radio.

Another specific intervention will require a rethinking of our navigation bars, as many users were lost to the idea of being able to use the touch screen to scroll between pages. It is possible that in future versions of the device, the discrete horizontal navigation buttons will be replaced instead by icons, while the vertical navigation buttons will be replaced by a scrolling bar.

For the home-screen, users requested the ability to select the main functions directly (i.e. GPS, Radio, Audio/Visual) rather than having to rotate the carousel, a design fix that may be easily implemented.   Another running theme amongst user feedback was the necessity of a "back" or "cancel" button from each step of the application. Many users noted that while choosing a route for their GPS system for example, that they could not return to the previous screen if they changed their mind to select an alternate route.

The last major point that the users seemed to agree on is that certain parts of the interface seemed cluttered or tedious (in particular the radio function). 9Team Consulting team would work to simplify the interface in future revisions of the CCR by revising the layout of the buttons, revising the labeling as mentioned above, and placing objects in more intuitive locations.

Appendices

### Appendix A – Fixed Physical Device Design
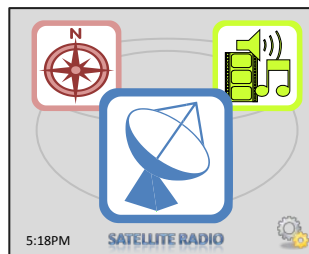
Physical Device Itself
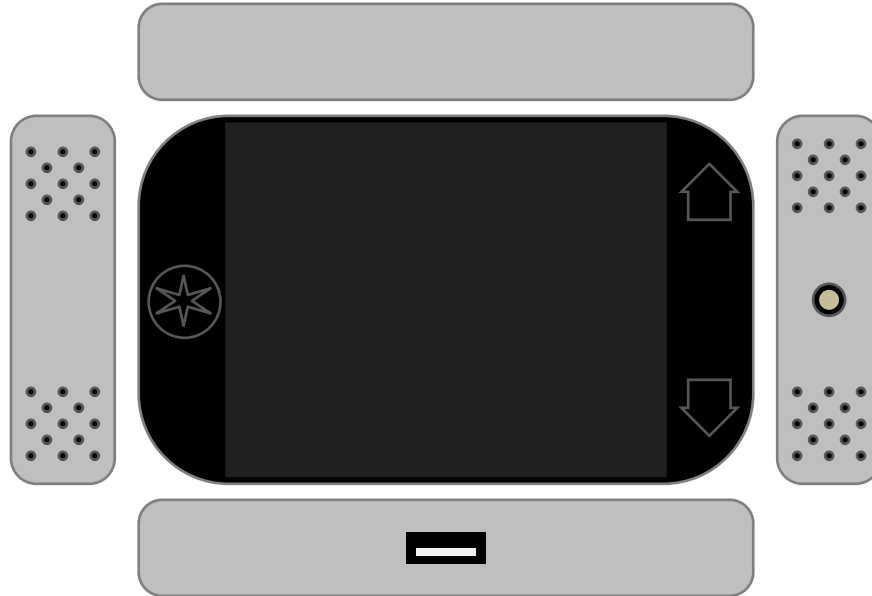
Note: Graphic not shown to scale.

Appendix B – Initial Low-Fidelity Prototype Screens

All three members of 9Team Consulting contributed below screenshots as low-fidelity screenshot examples during the initial conceptualization of application functionality. This appendix does not show all screens provided by team members, but are presented as representative concepts from three separate application interface angles.
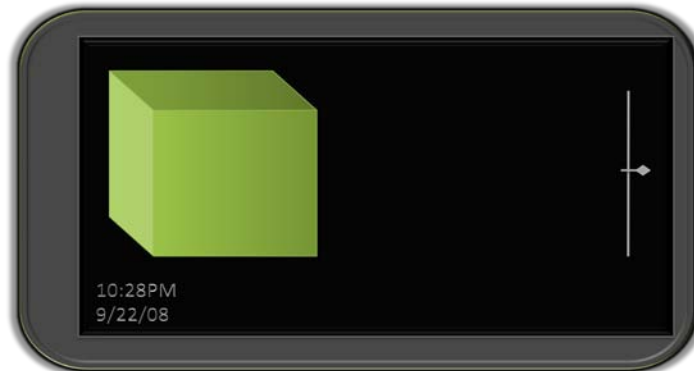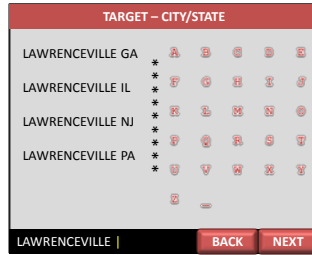

Welcome and Home screen

GPS screen

Radio Screen

File Library screen
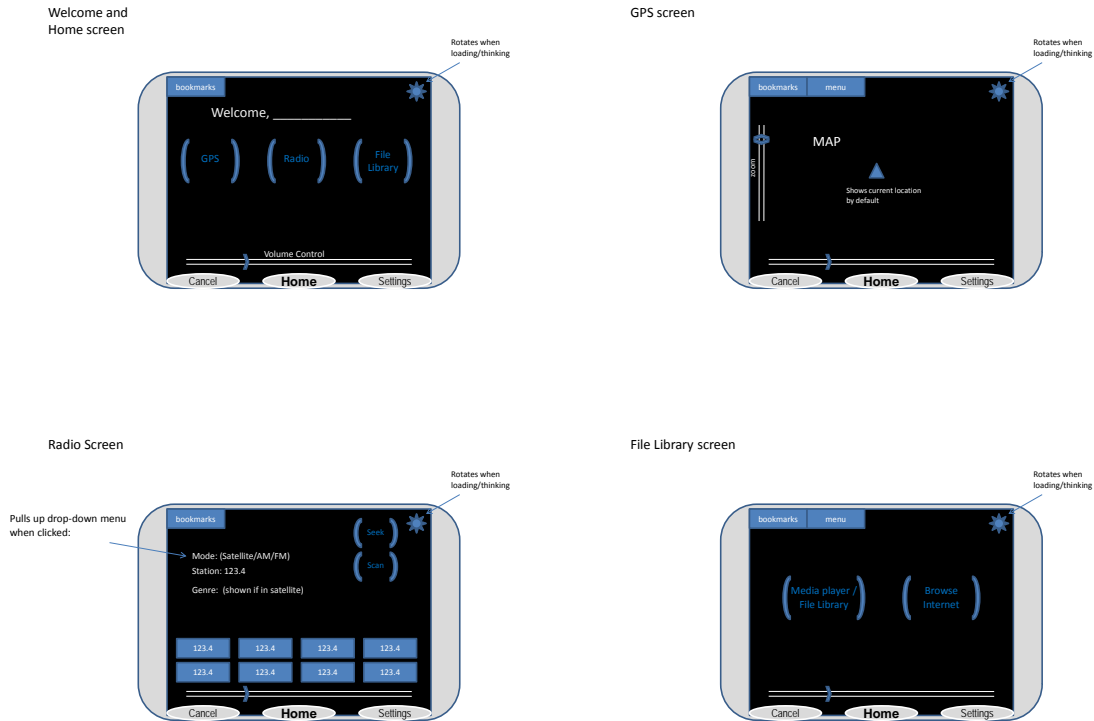
Home Page (Level 1)

- Navigation via touch "slide across"
- Gears = Device settings
- Selection = icon single-tap
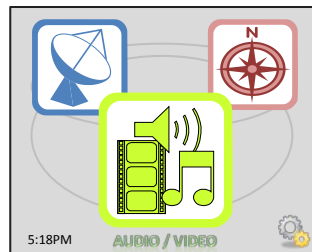
Appendix C – User Responses from Usability Study Interviews

General Device:
- I-phone like orientation made things confusing: up vs. down
- Physical arrow buttons ambiguous
- Liked home button, settings button
- Carousel confusing for some, some preferred to directly hit button for function they wanted

Audio/Visual:
- Multiple users stated would use "By Title" more often than "By Category"
- Alphabetize movie listings
- "Ipod has better controls" vs. "Steve Jobs is not God" vs. "Good color, obvious, simple nice/easy simple navigation" and "nice dual screen layout"

GPS:
- Needs Display Map
- Multiple Users wanted to change routing method but couldn't
- Quickest vs shortest confusing
- Mixed reviews on the "Cruise" function – confusing vs interesting

Radio:
- Rename "Satellite Radio" to "Radio"
- Multiple users thought navigation bars were confusing
- Tedious layout/screens
- "Make it simpler"