



INOVA™

Resource Management System (RMS)

Data Collection and Analysis: Round 2

April 30, 2015

Group E

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Background

Project Concept Statement

Resource Management System (RMS) is a robust mobile application that supports the professional and academic activities of surgical and podiatry residents at INOVA hospitals. RMS serves as a repository of selected resources identified by both residents and residency program instructors. These resources are essential for the development of industry-leading general surgeons and podiatrists. RMS includes additional features that enable residents to manage their time and responsibilities, to prepare for exams, and to give feedback to educators on how to improve the overall quality of education and training within the residency programs.

Description of Baseline

The major components of the original application concept were unchanged in the beta version and include the calendar, announcements, resources, and feedback. The following changes were made to the app based upon the responses received in the first round of testing:

- Cloud-based document management was specified in response to concerns about memory limitations on mobile devices;
- The overall look and feel of the app was refined by standardizing type style, size, and color across the app;
- Font size was increased across the app in response to multiple users' comments regarding the need for a zoom feature;
- Announcements were reduced to primary information, with tap-through access to secondary information; and
- Color-coding of calendar sources was added.

First round research identified a desire for users to have more control over filtering and organizing resources. Though preliminary changes were made to the interface in the resources component, the team determined that more data on user preferences should be gathered in round 2 testing before making substantive changes to the organization of content within resources.

Purpose of Round 2

Our goal for this phase of the project was to collect additional feedback on task flow and emotional experience. Round 2 user experience research focused on the fine-tuning stage of the user experience design and included a look at the user interface as best practice changes were incorporated in the Beta prototype. We also needed clarification on how the users want the resources presented, both initially and in a resource search.

Below is a snapshot of our overall process:

1. Review user feedback of initial prototype
2. Develop RMS Project Management Plan
3. Complete Alpha prototype revisions
4. Prepare for Round 1 user experience research
5. Conduct Round 1 user experience research
6. Analyze data from Round 1 user experience research
7. Complete Beta prototype revisions
8. Prepare for Round 2 user experience research
9. Conduct Round 2 user experience research
10. Analyze data from Round 2 user experience research
11. Complete Gold prototype revisions

Team Roles and Responsibilities

Data Collection

Round 2 Research Facilitator (Lead): Dina Saffouri

Research Evaluators:

Candice Bowes, Kimberlie Fair, Kara Pantalena, Nathan Walby

Data Analysis

Round 2 Data Analysts: Vi Huynh, Kara Pantalena

Prototype Development

Gold Prototype Lead Developer: Kimberlie Fair

Gold Prototype Support Developer: Nathan Walby

Report Writing

Research Brief Lead Writer: Kara Pantalena

Support:

Candice Bowes, Kimberlie Fair, Vi Huynh, Dina Saffouri, Nathan Walby

The remaining sections of this document describe the research goals, user experience research design, data results, inventory of changes, and examples of design changes from Beta to Gold versions of the application.

Research Design

Goals and Research Questions

Table 1. Goals, objectives, and research questions.

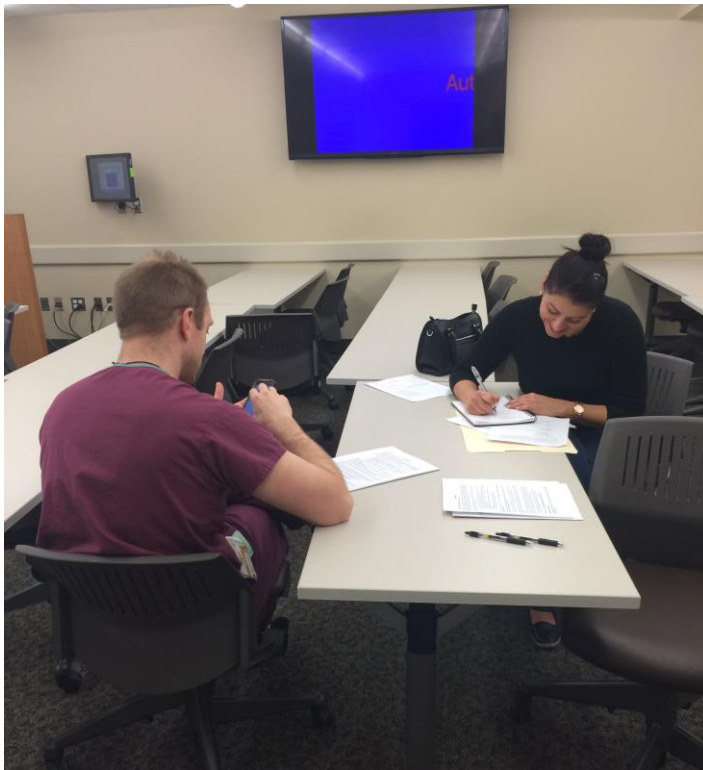
Goals	Objectives	Research Questions
<p>1. To identify “stickiness” and user attitudes toward the RMS mobile application.</p>	<p>Determine if the RMS is pleasing to use.</p>	<p>Do users enjoy using the application?</p> <p>Is the application useful?</p>
<p>2. To identify what features/functions are most helpful to residents in planning learning tasks.</p>	<p>Determine if the cognitive affordances of the icons and button labels clearly convey the intended meaning.</p>	<p>Are the cognitive affordances of the icons and button labels clearly conveying their intended meaning?</p> <p>Do affordances allow the user to intuitively understand the purpose of the application and employ natural task-completion strategies?</p>
<p>3. To identify a logical structure and flow of the application.</p>	<p>Determine if the structure and features of the app help user accomplish their intended actions.</p> <p>Determine if the task flow is intuitive.</p>	<p>Do cognitive affordances allow the user to access each planned task?</p> <p>Does the task screen show users what they expect?</p> <p>Do user expectations match how the task functions?</p>

Participants

Our participant profile revolves around medical residents. Our user demographic consists of both male and female adults, age 25 to 37, with a medical degree and who are in a residency program at a hospital. They are familiar with technology and all have a smartphone.

Eight individuals participated in Round 2 user experience research, however, not all eight completed the surveys or think-aloud. Six of the participants were general surgery residents from the first four post-graduate years (PGY). The general surgery residents were familiar with the application, having participated in Round 1 user experience research. Two of the participants were podiatry residents, one PGY-2, and the chief podiatry resident. The podiatry residents were unfamiliar with the application. We chose to test two different familiarity levels to identify if those familiar felt more ownership in round 2 and if the application was intuitive to new users. IRB approval was granted prior to research and development of the prototype.

Figure 1. A one-on-one session with the podiatry chief resident.



Methodology

Testing methodologies included a pre-test survey, a think-aloud scenario-focused activity, an interview, an A/B test, and the System Usability Scale (SUS) questionnaire. Surveys were completed by participants and later analyzed by the data analysis team.

Round 2 testing focused on the following user affordances: cognitive (helps the user in knowing something), physical (helps user physically do something), sensory (helps user sense something), and functional (helps user accomplish work - back end usefulness). Most of the functional changes were identified in Round 1 research, so Round 2 data collection of emotional impact was the priority.

Testing and Data Collection

Participants were paired with a test administrator for either a one-on-one session or co-discovery session (two participants per facilitator). Participants accessed the RMS Beta prototype on their own mobile devices. For user experience research, data was collected using paper surveys and paper evaluator sheets.

Test Dates: 04/15/2015 and 04/17/2015

Test Location: Classroom at ASTEC, INOVA Fairfax Hospital

Test Administrators: Candice Bowes, Kimberlie Fair, Kara Pantalena, Dina Saffouri, and Nathan Walby

Testing and data collection procedures were as follows:

1. Introduction and purpose
2. Instructions
3. Q&A before testing
4. Pre-test survey and demographics administration
5. Think-Aloud scenario discussion
6. Interview
7. A/B Test
8. SUS questionnaire administration
9. Closing remarks

Pre-Test Survey

The pre-test survey consisted of demographic information and questions pertaining to participants' reasons for mobile application usage.

Demographic information:

- Age

- Gender
- Residency program and year
- Brand of mobile device used for testing
- How many applications they use regularly
- Do you use your phone to study? Y/N

User Experience:

- I usually choose my applications based on visual design and aesthetics.
- I use one calendar for everything (personal, business, etc.).
- I would like to access resources through my phone when studying.
- Sharing resources with others from my phone is important to me.
- I like receiving recommendations for study materials from other residents.
- It would be beneficial for me to have a place to take notes on my phone.

Think-Aloud Scenario and Interview

Think-alouds were done face-to-face with the facilitator and evaluators asking the participants to verbally express their thoughts about their interactions with the RMS Beta prototype and to discuss their experiences with it during the session. Participants were asked to describe their steps to complete a scenario task. Test administrators facilitated discussions and collected data using identical scripted templates.

Interviews allowed us to probe user attitudes, wants, beliefs, and experiences, providing us with a better understanding on how to improve the RMS user experience and design. Questions were unstructured to assess the emotional impact and effectiveness of the affordances: cognitive, physical, sensory, and functional.

Testing Scenario

One of your supporting surgeons has asked you to be prepared to discuss the possibility of multiple organ dysfunction syndrome with a patient during an appointment scheduled for March 23. How would you use this app to support your efforts in preparing for that appointment?

Interview Questions

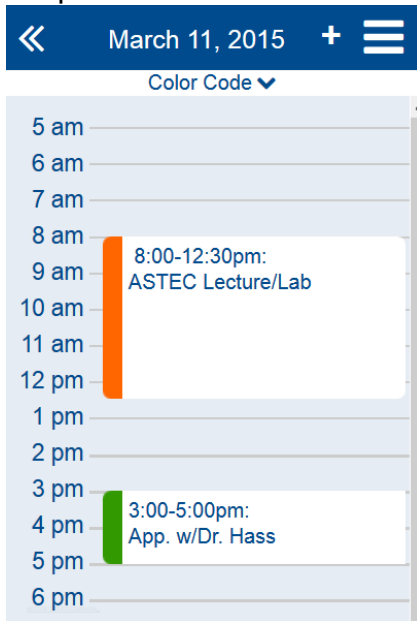
- How would you filter resources?
- What is the most important way in which you want to sort your SCORE curriculum?
- How do you prefer to save documents and store information?
- Tell me how you would want resources to appear on the application.
- Do you want to add a search function on the calendar?

A/B Test

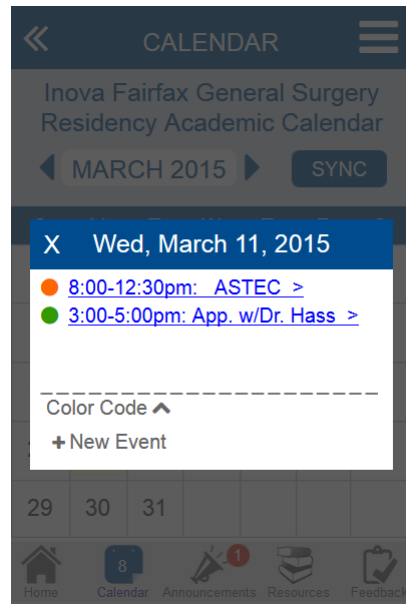
The participants were provided with variations on the day view in the calendar, the home screen, resources display, and SCORE resource display to validate design decisions in the prototype. We did a quick count of which option was selected.

Calendar Day View

Option A



Option B



Home Screen

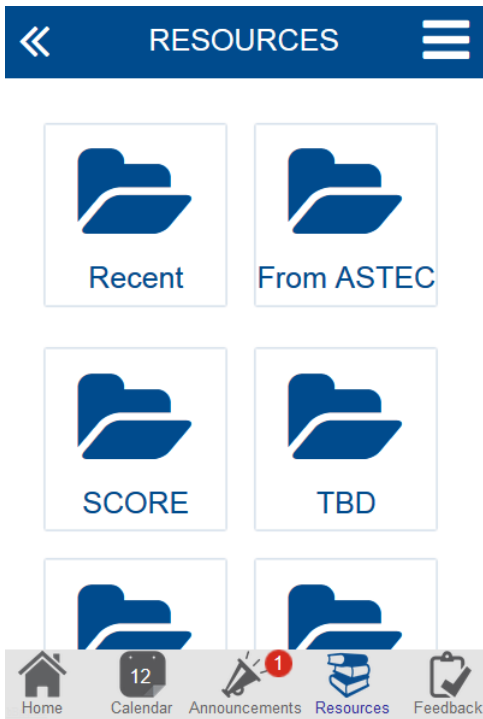
Option A



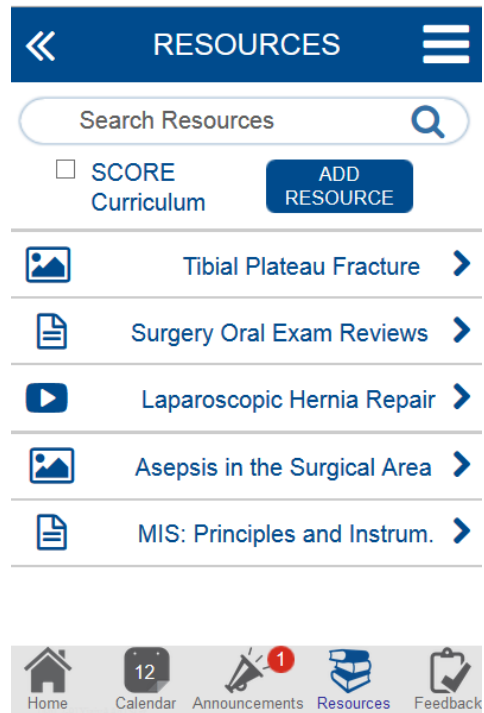
Option B



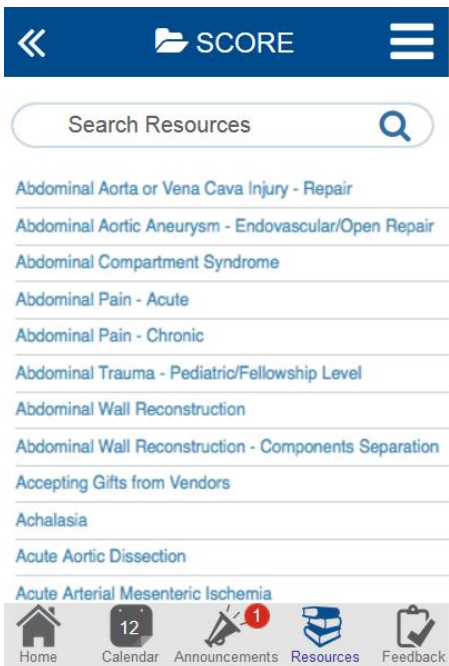
Resources Display Option A



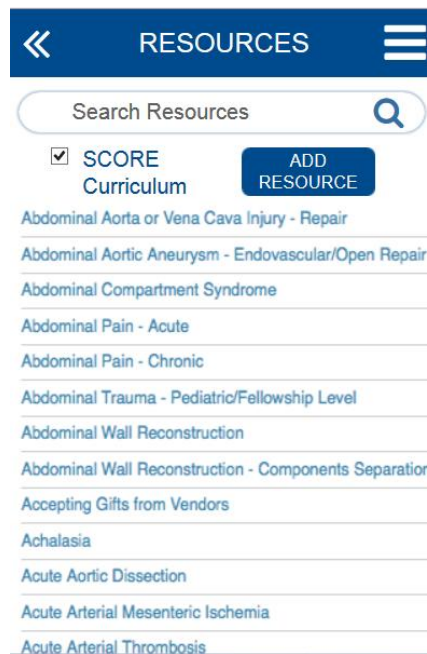
Option B



SCORE Resources Display Option A



Option B



System Usability Scale (SUS) Questionnaire

The SUS questionnaire is a global measure of system satisfaction and sub-scale of usability. The SUS is a valid measure, correlating highly to other usability questionnaires and shown to distinguish well between usable and unusable systems. This questionnaire has also been shown to be reliable and to distinguish differences well with small sample sizes. It consists of 10 questions (listed below), using a 5-point scale for user responses.

This questionnaire addresses the cognitive and sensory affordances objectives. A space for providing additional commentary was offered in addition to the scaled responses. The questionnaire will gather the data needed in order to determine the emotional impact of the application. A score above a 68 (50th percentile) is considered above average and a score above an 80.3 (10th percentile) is the point where users are more likely to recommend the app to a friend. By using quantitative data, we are able to measure users' experience, which provides to us an accurate benchmark.

1. I think that I would like to use this app frequently.
2. I found the app unnecessarily complex.
3. I thought the app was easy to use.
4. I think that I would need the support of a technical person to be able to use this app.
5. I found the various functions in this app were well integrated.
6. I thought there was too much inconsistency in this app.
7. I would imagine that the most people would learn to use this app very quickly.
8. I found this app very awkward to use.
9. I felt very confident using this app.
10. I needed to learn a lot of things before I could get going with this app.

Data Summary and Results

The analysis team reviewed all raw data sheets containing quantitative and qualitative data. The outcome of the analysis was an inventory of user feedback and proposed revisions. See [User Feedback and Ticket List](#) section of this document. This document was reviewed by the team to ensure data accuracy and then handed off to the development team to begin Round 2 revisions.

Data Analysis Summary

The focus of this round of testing was on resource architecture/task flow and overall “stickiness” of the application. We wanted to identify if this application would be easy and pleasing to use; after all, the purpose of the application is to improve residency experience. Overall, the feedback was positive toward the application and included

actionable qualitative data that identified ways to improve task flow within the Resources and Calendar functions.

The pre-test survey indicated that aesthetics are important to our user and they agreed that having a mobile application for studying and syncing their calendar was important. This supported our decision to focus on the Resources and Calendar features of the application, which would have the most impact on residents' ability to study for upcoming labs and procedures. To determine the most effective emotional impact of the design, we used a quick A/B Test that informed changes to the Gold prototype based on a majority count.

Through the think-aloud, residents said things like, "I love the linking between pieces, like calendar to resources or announcements page to resources," "I like the format, it is easy to study," and "I would use this frequently." They also helped us identify the best way to organize resources, which is by folders that can be personalized. Each person wanted to organize differently, but most liked the folder format, so flexibility was key.

By having the participant try a scenario during the think-aloud, we identified a critical incident where a cognitive affordance was not appropriately labeled for the user to complete the task. This affordance was the 'Add Resource' button that users had to select in order to find and add the resource needed to successfully complete the scenario. This change falls within the overall reworking of the resources section for the Gold prototype.

Finally, the SUS questionnaire identified that among our specific user class (medical residents), this application would be not only useful, but also highly recommended to other residents.

Demographics Survey Result Data

Number of Users: 7 (6 female, 1 male)

Average Age: 30.3

Residency Year Totals:

PGY	Number of Users
1	1
2	2
3	2
4	1
5	0
6	0
N/A	1

Brand of Mobile Phone Used for Testing:

Apple/iPhone: 7

Number of Apps Used Regularly:

Range	Number of Users
<9	2
10-19	4
20-30	1

Number that use phone to study: YES (7)

Pre-Test Survey: User Experience Data

Table 2. Pre-test survey results from seven respondents.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I usually choose my applications based on visual design and aesthetics.		14%		57%	29%
I use one calendar for everything (personal, business, etc.).		29%		43%	29%
I would like to access resources through my phone when studying.			14%	57%	29%
Sharing resources with others from my phone is important to me.		14%	14%	43%	29%
I like receiving recommendations for study materials from other residents.		14%	14%	14%	57%
It would be beneficial for me to have a place to take notes on my phone.			43%	29%	29%

SUS Questionnaire

We had six respondents to the SUS questionnaire. Each questionnaire was scored separately. The SUS questionnaire has 10 questions that use a Likert scale from

strongly disagree (assigned a 1) to strongly agree (assigned a 5). Since the SUS questionnaire has both positively and negatively worded statements, we then had to adjust the scores. For odd numbered questions, we subtract a 1 from the response value. For even numbered questions, we subtract the response value from 5. This scales all responses from 0 to 4. All of the adjusted values are then added up and the sum is multiplied by 2.5. This gives the usability value between 0 and 100. A score above a 68 is considered above average. A score above a 74 has higher perceived usability. A score above an 80.3 is the point when users are more likely to recommend the application/product to a friend.

Results

97.5

92.5

87.5

82.5

82.5

75

(AVERAGE = 86.25)

SUS Questionnaire: Suggestions For Improvement and Other Comments

- “Folders for organization with search features.”
- “Make accessible for iPad and computer.”
- “Easy to navigate.”
- “I would use this frequently.”
- “Systems-based resources organization.”
- “Ability to email or save the resources ex. articles, videos to our computer.”
- “Ability to get alerts sent to email or text message for upcoming events.”
- “Option in calendar to see all lessons as a list for the year instead of giving month by month.”

Think-Aloud: Scenario Qualitative Raw Data

- “Info is so specific – a search is good”
- “Difficult to manage”
- “Where would you add a resource?”
- “Didn’t occur to me bookmark would be the way to add.”
- “Would not look at tutorial.”
- “Lecture Date or Resource organization should be controlled by user”
- “Can this be used for iPad? That would be ideal because the screen is larger and it is easier to download articles.”
- “Really good, moves quick, not slow”
- “Instead of selecting the day, if calendar could swipe”
- “Want unlimited items in the calendar”
- “Like syncing the calendar”

- “Want to get email alerts of events that are on the calendar”
- “When I download, I usually organize by topic”
- “Label what the topic is that day”
- “Love the linking between pieces, like calendar to resources or announcements page to resources”
- “Like the format, it is easy to study and easy to read PDFs”
- “Capability of PowerPoint is awesome!”
- “I like the look”
- “Would like to highlight, bookmark, and make favorites”

Progression of Clicks

- *Resources > Calendar > Date > GOT STUCK*
- *Resources > Add Resources > Search (success)*
- *Calendar > selected 3/23 > selected link of article in the date*
- *Home > Resources > GOT STUCK > Tried Add Resources > Search (success)*
- *Resources (“hope to find link organized by systems”) > STOPPED*

Interview Qualitative Data

1. How would you filter resources?

- Title x4
- Date of lesson or lab x2
- Date of posting x1
- Topic x1
 - “general notes versus journal articles; systems-based”

2. What is the most important way in which you want to sort your SCORE curriculum?

- Alphabetically x2
- Date of the lesson x2
- SCORE subject x2
- Other x1
 - “Useful across platforms”

3. How do you prefer to save documents and store information?

- Hard drive x2
- On personal computer x1
- Print it x1
- In the cloud x3
- Other x1
 - “On iPad, as a PDF document, or a word doc if notes were made.”

4. Tell me how you would want resources to appear on the application.

- Folder format x4
 - “systems-based”

- “Topic”
- “Videos, PowerPoint, file type”
- Images x1

4. Do you want to add a search function on the calendar?

- Yes x5

A/B Test Data

Feature	Option A	Option B	Either
Calendar Day View	71%	29%	
Home Screen	33%	67%	
Resources Display	57%	43%	
SCORE Curriculum	43%	43%	14%

User Feedback and Revisions Ticket List

User Feedback – Round 2 Ticket List

This table categorizes all user feedback from Round 2 testing. Within the table, we labeled Round 2 updates as “Request Change.” Our team reviewed and discussed items for revisions as well as discussed prioritization. We identified where more data, analysis, and/or time was needed before changes would be made (items labeled: “wish list”). Items labeled as N/A are known issues with the software platform.

Table 3. Ticket list for revisions.

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
1	Home Screen	A/B Test Results	Design	Request Change	2 nd Rd	Change home screen to tiles with red highlight.	Complete
2	Tutorial	“Would not look at tutorial.”	Design	No Change	N/A	Tutorial was requested in initial research.	N/A
3	Calendar (Month View)	Ability to swipe	Technical	N/A	N/A	N/A	N/A
4	Calendar (Day View)	A/B Test Results	Design	Request Change	2 nd Rd	Day view is now a full page and not a pop-up box.	Complete
5	Calendar (Month View)	Label topic on day	Design	N/A	N/A	Cannot do, day box is too small, will have to click.	N/A
6	Resources	Points when user was stuck while completing scenario	Design	Request Change	2 nd Rd	Removing “Add Resource” button, making it a “+” sign. Can search on main screen.	Complete

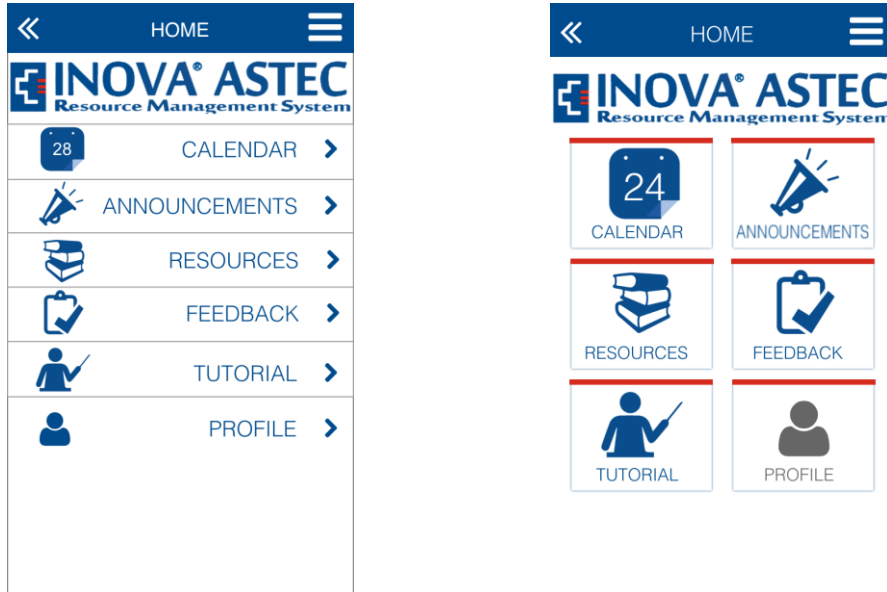
#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
7	Resources	A/B Test Results Folders for organization with search features Want user control to organize resources “Systems-based resource organization” Organize by topic	Design	Request Change	2 nd Rd	User can make and personalize folders for their own sorting.	Complete
8	Resources	“Where do you add a resource?”	Design	Request Change	2 nd Rd	Adding a “+” sign to each Resources page.	Complete
9	Resources	“Didn’t occur to me bookmark would be the way to add.”	Design	Request Change	N/A	One response; put a plus sign on Resources page for adding.	N/A
10	Resources	Preference was for cloud-based storage	Design	No Change	N/A	Already cloud-based.	N/A
11	Search	Info is so specific – a search is good	Design	Request Change	2 nd Rd	Add a search bar to Calendar and each Resources page (as you drill down).	Complete
The feedback items below are WISH LIST items. (#12-16)							
12	Application	Make accessible for iPad and computer.	Technical	Discuss	N/A		N/A

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
13	Calendar	Ability to get alerts sent to email or text message for upcoming events	Design	Discuss	N/A		N/A
14	Calendar	Option to see all lessons as a list for the year instead of giving month-by-month	Design	Discuss	N/A		N/A
15	Resources	Ability to save resources to computer	Design	Discuss	N/A		N/A
16	Resources	"Would like to highlight, bookmark, and make favorites"	Design	Discuss	N/A		N/A

Changes to Prototype: Beta to Gold

The Gold prototype can be accessed here: <http://g3b7hs.axshare.com/#c=2>
The following are screenshots from the Beta prototype (left, titled “a”) and the Gold prototype (right, titled “b”).

Figures 2a and 2b. Changes to the Home screen.



Figures 3a and 3b. Changes to Calendar day view.

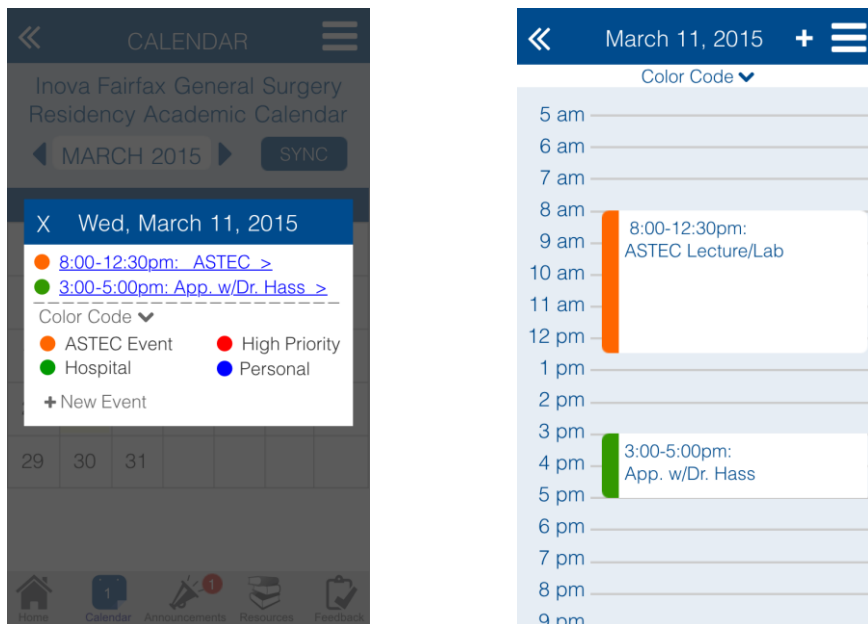
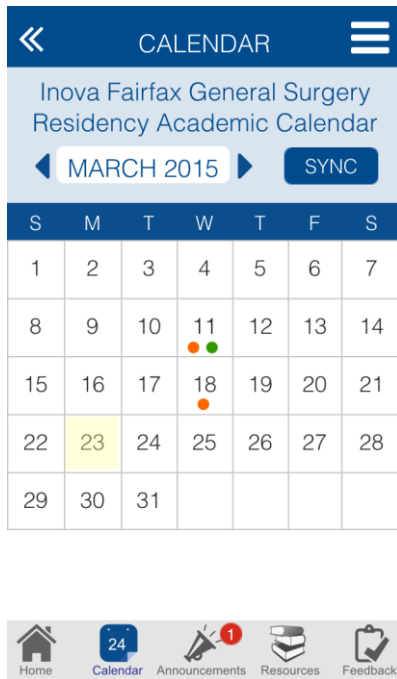


Figure 4a and 4b. Adding “Search” to the Calendar.



Figures 5a and 5b. Changes to the Resources main page.

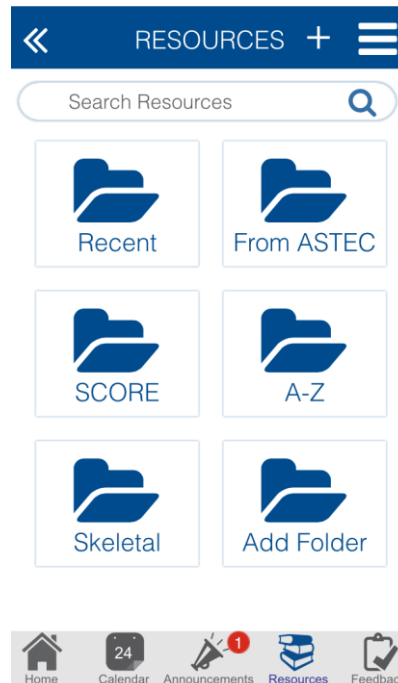
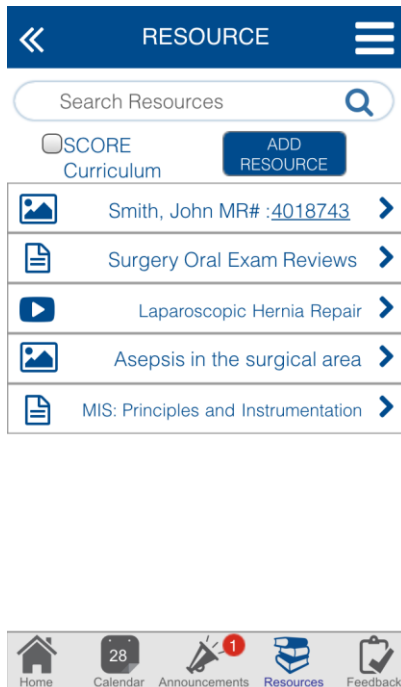


Figure 6a and 6b. Changes to the way resources appear in folders.

