WICN Android Application

An Interactive Qualifying Project

Submitted to the Faculty of

Worcester Polytechnic Institute

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

Submitted On

March 4th 2016

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Abstract

WICN is an NPR affiliated public jazz radio station located in Worcester, MA. Their Android phone application was not operating at full potential, and there were many reviews of the application which indicated that it required updating, especially in regards to its ability to play music. Both the project team and the staff of WICN noted that there were several features that could be added or improved upon in order to create a better application. The purpose of this project was to improve upon the app's existing features, such as the music playing ability of the application, as well as new features decided upon by the WICN staff and project team.

Chapter 1: Introduction

WICN is an NPR affiliated public jazz radio station located in Worcester, MA, which provides Jazz music, both their own programs as well as NPR programs, to the public. The version of the WICN Android application which is available on the application store does not meet the needs of the general public. Comments stated that there are several issues with the app's ability to play music, as well as missing some features that are available on the apps of other local radio stations.

Due to the style of music which WICN plays and their current audience, WICN has been looking for ways to increase the reach of their broadcast audience with the Android application. However, the application in its previous form was not able to gather information for WICN staff members such as who was listening and where they were listening. From this information, the staff of WICN could know if the Android application was successful in expanding their audience. Additionally, according to the GQP report #105, roughly 63% of smartphone and tablet users currently use music streaming apps, so an optimization and improvement in the WICN Android application could increase the overall number of listeners (Diana 19).

This project expands on the 2013 IQP that resulted in the existing Android application, and intends to improve it both in terms of availability to Android users and overall functionality. This project was built on the project team's perception of how the application could be improved, as well as taking ideas and comments from the WICN staff on the additions they wished to see in the application. The project group spent the Fall semester of the 2015-2016 academic year developing and improving upon the application, and they spent C term of the same academic year fine tuning the additions as well as demonstrating the new application to the WICN staff.

This project describes all additions added to the WICN Android phone application, how these additions were decided upon and implemented, as well as graphics showing additions to the organization of the application.

Chapter 2: Background

2.1 Analysis of Similar Radio Applications

Currently, it seems that local radio stations which use applicationss are using a system which shows the current song playing, as well as the last 10 songs which had been playing. This differs from some of the larger applications, such as iHeartRadio and the newer Samsung Milk Music, which do not have this feature. This is currently a feature which the WICN radio application does not have, but could potentially be added. The WICN Radio application also does seem to have the capability of sharing the music which they are listening to on the major social media platforms such as Facebook and Twitter. Another additional feature which was seen on a handful of local radio station applicationss was a feature of being able to either add songs to a list of "Favorites," or to give the song a "thumbs up" or a "thumbs down" rating. A feature such as this would enable WICN to improve the selection of music. One downfall of a feature such as this is that it appears that WICN has specific programs, so one user may not enjoy the overall content of the programming block. The ideal purpose of this rating system would be to allow WICN to see if there were artists which seem to be less popular, or if there are certain jazz genres which are less popular at certain times of day. WICN may also be able to expand upon their "Call Us" section, adding a feature which enables text contact, potentially through an email, comment board, or survey style feature which would enable people to send in requests or comments. Adding a "request" feature would require additional programming, so an executive decision would need to be made by WICN before adding a feature such as this. An additional feature, which seems to be lacking amongst local radio station apps, but more common among the larger radio apps, such as Pandora and iHeartRadio, is a bar or button which would show the music that

is currently playing. This button would allow the user to click the button in order to return to a simple song display screen with the song title and artist, as well as the play/pause button. A comparison and discussion of various radio station apps follows.

2.1.1 WFMT

When looking at this application, it opens similar to the way which the current WICN Android application opens onto the "Listen Live" page. Upon opening the menu, it can be seen that the some of the additional features which are available on the WFMT application are similar to the features which are available on the WICN application. One feature which is not shared between the WFMT and the WICN application is the ability to access the website for the radio station.

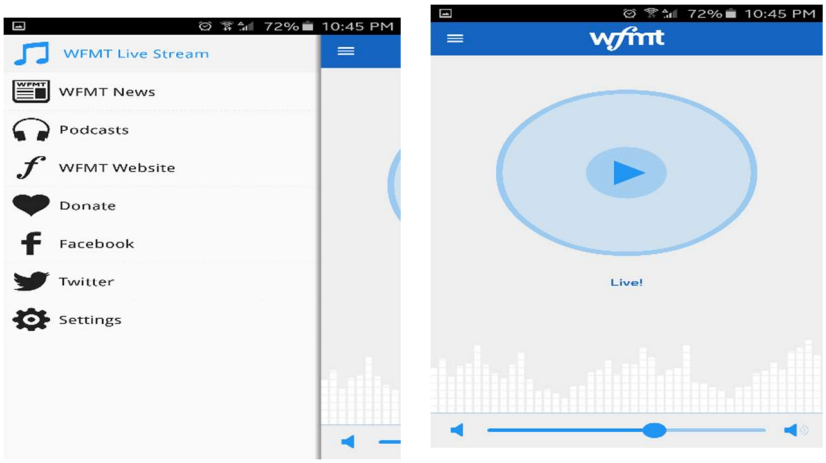

Figure 1. Screenshots of WFMT home screen(right) and menu bar (left).

2.1.2 KJZZ

The KJZZ radio application shows a variety of features. One of the primary difference between it and the other applications looked at, as well as the WICN application, is that the menu bar is available from the bottom, rather than from the side. The KJZZ application also features a "News" feature, as well as an "Alarm" feature. This alarm feature allows a user to set an alarm

which will go off at a certain time. One very significant difference from the KJZZ application when compared to both the WICN application and the other applications is that it gives the user the ability to send-in a 10 second voice clip directly to the radio station. The KJZZ application has also condensed its social media pages and contact information into a singular location on the menu bar.

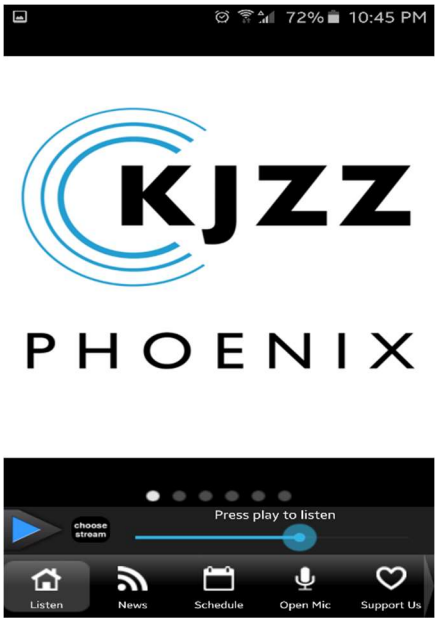

Figure 2. Screenshot of KJZZ radio application opening screen

2.1.3 WBAA

The WBAA application opens into a collection of news stories, as well as two options to switch to a page for classical music or jazz music. The WBAA application, upon opening the menu bar, shows several features which could potentially be useful, but are not on the existing WICN application. The most prominent of these features is the ability to set an alarm within the application, which notifies the user at a user-set time. Additionally, the large collection of local news stories and other features found upon opening the application could also be applicable, as WBAA has a component for NPR news, and WICN is also operated under NPR.

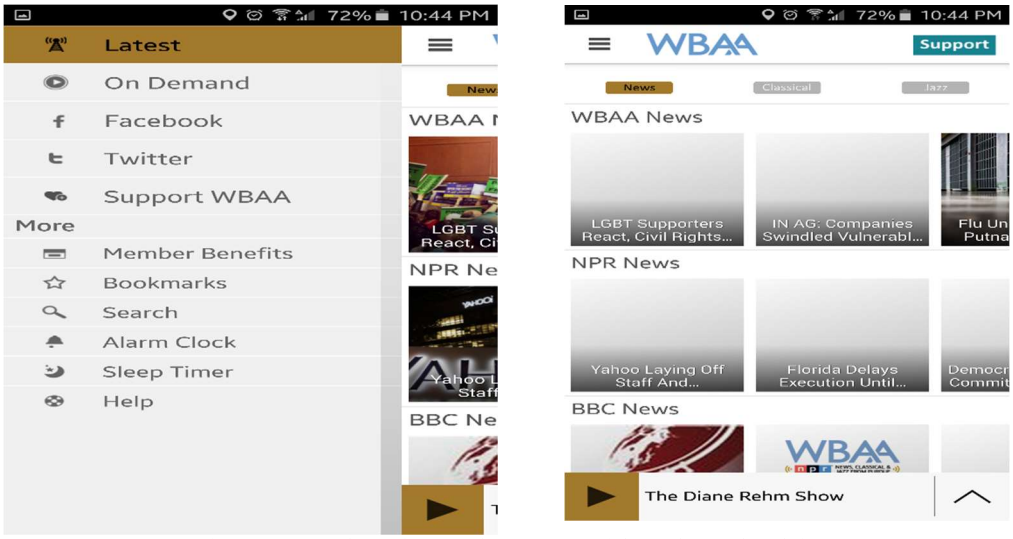

Figure 3. Screenshots of WBAA home screen (right) and menu bar (left).

2.1.4 NHPR

NHPR shows a very similar layout to WBAA, opening to a collection of news stories and having several additional features within the menu bar. Another feature which NHPR has, which could potentially be an added feature to the WICN application, is an active timeline, which changes with time and allows the user to see the time remaining on the current program. WICN does have a feature similar to this however, as it has an upcoming shows playlist available on the "Listen Live" page. The NHPR application also features access to their full website from within their Android application.

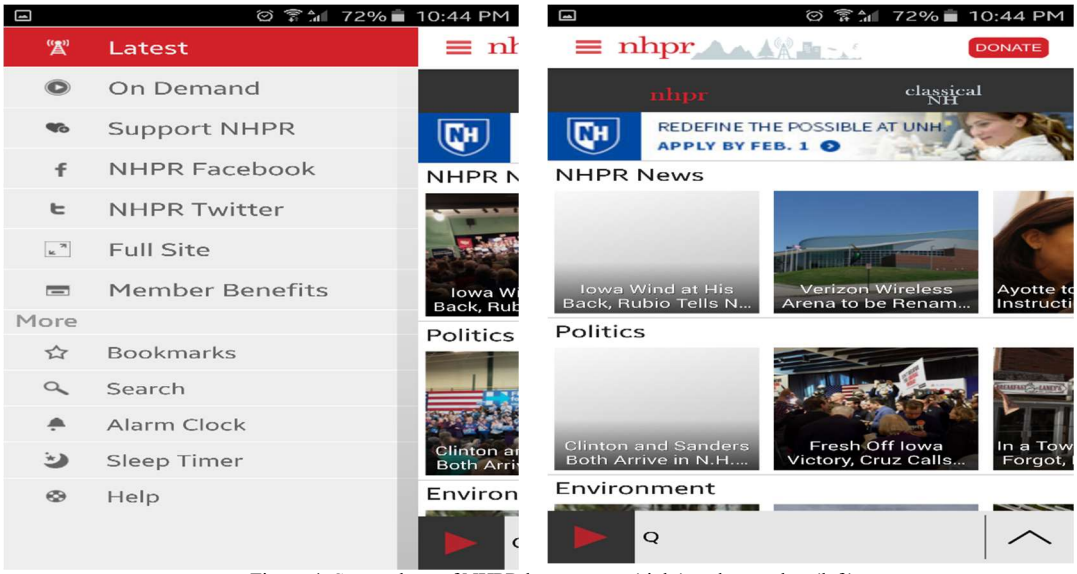

Figure 4. Screenshots of NHPR home screen(right) and menu bar (left).

2.2 Analysis of Current Android Application

When reviewing the current WICN Android application, the first version that was reviewed was the version that was available on the Google Play store. When viewing this version of the application, there was one notable issue: the application was not capable of playing any music. There was no indication that music was loading, and in one instance there was a waiting period of roughly five minutes for the music to play, and in the end there was no music playback. These issues were noted to be fixed in a recent patch to the Google Play store, as there was an update to the application. The updated version of the application located on the Google Play store was the same version which was available on the GitLab storage software. It was this version of the application that the project work was based upon.

When examining the WICN application, it was found that there were several features, useful on the website or to WICN, that were not available on the current Android application. These features included the searching tool available on the website, or a method of contacting WICN in a method other than placing a phone call. The most recent version of the application,

which is the version available on the Google Play store, has also lost use of the alarm clock feature. The alarm clock feature was something which was stated to be a useful addition in GQP #105 (Diana 19). Another feature which was noted to be potentially useful was a feature which would allow the music playback controls to be available from any page on the application. Adding this feature would enable the user to be accessing any page of the application and still have control of the music playback.

Chapter 3: Methodology

3.1: Accessing the Source Code from GitLab

An early stage of the project was accessing the original code created by the previous project team to create the android application. Accessing this code allowed for the ability to add onto the existing application, rather than having to redo the work which had already been done. The source code was accessed by locating it on Professor Manzo's private GitLab storage, and then requesting permission to access it. Once it was accessed, and the proper credentials were acquired, the source code was loaded into Android Studio using a VCS function. Once this was done, the original source code was available to be worked on, and additional changes made could be loaded back to the GitLab storage.

3.2: Early Development Choices

In the early stages of project, one consideration that was made was how the progress of the application would be handled. Before gaining access to the original code for the application, one thought regarding the application was to start from the beginning. Then existing components of the application would be added into this new application and the new features would be added later on. When this was a consideration, there were two different options for the development platform. One potential platform was the MIT Application Inventor 2 software, which was a block style programing software used to make Android applications. The other viable option was the Android Studio software, which ended up being the chosen software. Android Studio was chosen because it not only allowed for more complex application, but it also enabled better music playback, which is a crucial function for radio applications.

3.3: Style of Music Player

Another potential optimization which was looked at to better the current application was a music player which would load at a faster rate, and allow the user to listen to music sooner after pressing the play button. One way in which this was viewed to be possible was to use a different style of music player called ExoPlayer. How ExoPlayer differs from the current MediaPlayer is that ExoPlayer is capable of beginning playback after less data has been downloaded to the phone (Developer). This means that as long as the music was still being loaded to the phone, the music would be able to play sooner. This is compared to the MediaPlayer function currently used, which does not have this change in the amount downloaded before playback is possible. However, despite ExoPlayer seeming to be a potentially better function, it was decided to continue using the MediaPlayer function. This was decided because the software level required to run the ExoPlayer function is slightly higher than the software level which allows for roughly 94% of Android users to access the application.

3.4: Maintaining a Lower API use for accessibility

As with the ExoPlayer, there were several other features that could have been improved or added if there were a higher number of users with a higher API. Currently the highest available API usable to allow >90% of Android users to be able use all features is API 15. It was decided to keep that amount of users able to run all features above 90% slightly arbitrarily, but also with the reasoning that if WICN wishes for this application to be a way in which they expand their listenership, the highest amount possible of listeners would be ideal.

3.5: New Features Added

3.5.1: Calendar Event Creation

This feature allows for the addition of an event from the WICN application "Events" page to the user's personal calendar. It does this by taking the information within the Event description, the event name, location, and converts this information to strings, which are usable pieces which can be added to the code to create text within the created calendar event (String). The events become clickable, and having an action occur when they are clicked on, by creating an OnItemClick function. This sets the individual item as a clickable feature, and triggers the event creation when clicked. The code can be seen below.

```
eventsList.setOnItemClickListener(new AdapterView.OnItemClickListener() {
   @TargetApi(Build.VERSION_CODES.ICE_CREAM_SANDWICH)
   @Override
   public void onItemClick(AdapterView<?> parent, View view, int position, long id) {
      String Title = upcomingEventsTitle.get(position);
      String Location = upcomingEventsVenue.get(position);
      Intent intent = new Intent(Intent.ACTION_INSERT);
      intent.setType("vnd.android.cursor.item/event");
      intent.putExtra(CalendarContract.Events.TITLE, Title);
      intent.putExtra(CalendarContract.Events.EVENT_LOCATION, Location);
      startActivity(intent);
```

3.5.2: Search Functionality

The two searching capabilities of the application were both made using the concept. Both pages take the term that the user searches, converts them into a string, and then inserts the term into a url (String). Specifically, the term is inserted into the search url's of both Wikipedia and WICN. Where these two components differ is the type of page that they open up to show the results of the search. The WICN search bar opens a WebView function, which allows the user to see the webpage embedded within the app (WebView). The Wikipedia search function simply opens the search url into a new browser screen.

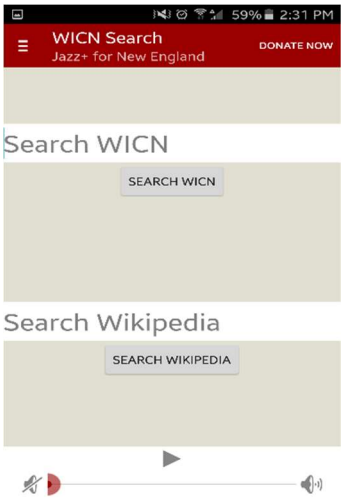

Figure 5. A screenshot of the newly added Search Function.

The code which allowed for the buttons to function is the following:

```
button.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String wicnsearch = editText.getText().toString();
        webView.loadUrl("http://www.wicn.org/search/node/" + wicnsearch);
    }
});

Button button2 = (Button) relativeLayout.findViewById(R.id.button2);
final EditText editText2 = (EditText) relativeLayout.findViewById(R.id.editText2);

button2.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String wikisearch = editText2.getText().toString();
        Intent intent = new Intent(Intent.ACTION_VIEW, Uri.parse("https://en.wikipedia.org/wiki/" + wikisearch));
        startActivity(intent);
    }
});
```

3.5.3: Shop and Vehicle Donation

The ability to view the vehicle donation page was made by using a WebView function, which opens an embedded web page into the application (WebView). In comparison, the shop page simply opens a new page of web browser, but it is opened externally. For both, the functions were made simply to open the url of the corresponding site.

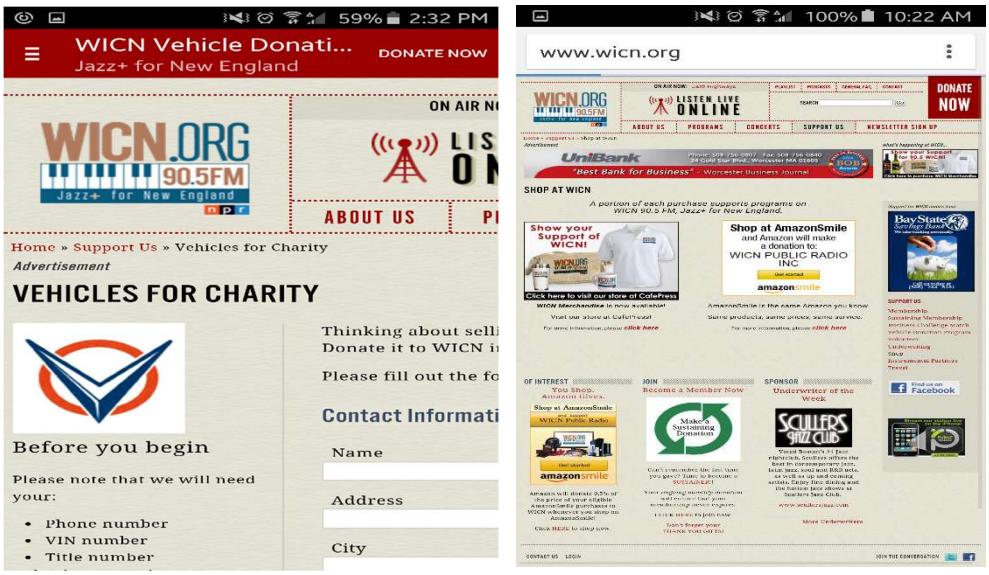

Figure 6. Two screenshots, the Vehicle Donation (Left), and the Shop page (Right), added during the project.

3.5.4: Feedback

The feedback page, added to the WICN Android application by the project team, works by allowing the users to draft an email within the application. Then, upon pressing the "Send" button, the application creates an email in the user's email application of choice with all of the fields, recipient, subject, and text, filled out upon creation (Android Sending). At this point the users is allowed to review their email before sending it from the email function of their phone. A benefit of this application is that if the users sends emails from multiple accounts linked to different applications within their phone, the user will be able to select the application linked to the account which they would prefer to send the feedback with.

The fields are filled in by taking the text which the user enters, as well as the spinner choice, and converts them to strings (String Resources). These strings are then used within the application as the text which will later fill in the fields of the email address.

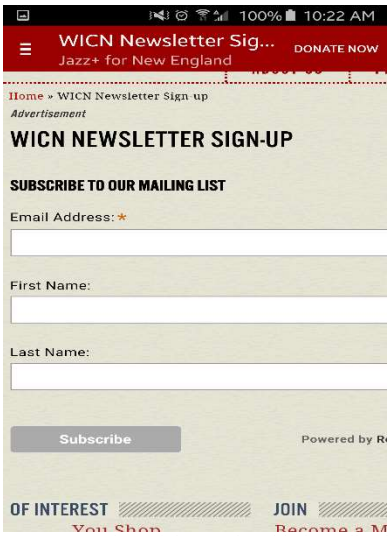

Figure 7. A screenshot of the newly added Feedback Page

The code which enabled sending email from accounts, as well as having all of the fields filled out prior to creating the email was:

```
protected void sendEmail(){
    Log.i("Send email","");
    String[] TO = {"emailaddress"};
    String Message = MessageText.getText().toString();
    String Name = NameText.getText().toString();
    String Subject = spinner.getSelectedItem().toString();
    Intent intent = new Intent(Intent.ACTION_SEND);
    intent.setData(Uri.parse("mailto:"));
    intent.setType("text/plain");
    intent.putExtra(Intent.EXTRA_EMAIL, TO);
    intent.putExtra(Intent.EXTRA_SUBJECT, Subject);
    intent.putExtra(Intent.EXTRA_TEXT, "Hello, my name is " + Name + ",\n" + Message +"\n Thank You" );
    startActivity(intent);
```

Where “emailaddress” is the email of the WICN station.

3.5.5: Listener Survey

The survey function added to the application functions similarly to the vehicle donation page. It functions similarly in that the application uses a WebView function, which opens a webpage which is embedded in the application. This survey, created for WICN so they would be able to collect listener demographic data, was made by creating a Google account titled WICN RADIO,

and then using this account to take advantage of the Google forms feature in Google. Initially, it was planned to use SurveyMonkey, another popular online survey site. Upon visiting SurveyMonkey and creating an account, it was found that free basic membership would only allow for a 10-question survey and 100 responses. Google Forms allows for any number of questions as well as any number of responses.

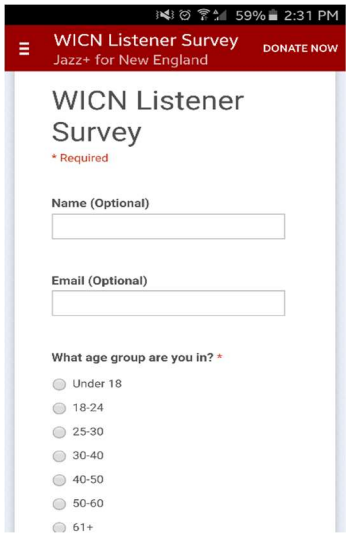

Figure 8. A screenshot of the newly added Survey Page

3.5.6: All Page Player Access

On the original version of the Android application, the ability to play and pause the music was only available on the "Listen Live" page. Seeing this as a potential drawback, a change that the project team set was to change the screens which the player was available on. The method for doing this was to take the structure of the application and alter the availability of the music player controls. The application is structured so that there is one main activity, which holds the menu and the header, which are the two features available across the other pages. The individual pages are loaded as fragments, smaller components which can be opened and closed easier within the application. In contrast, the Main Activity is a large event within the application,

which houses the fragments and can be harder to start and close. By altering the code, the player function was transferred from the “Listen Live” page fragment, and onto the “Main Activity”. After correcting the layout of each individual page, the music player was capable of being accessed from any page.

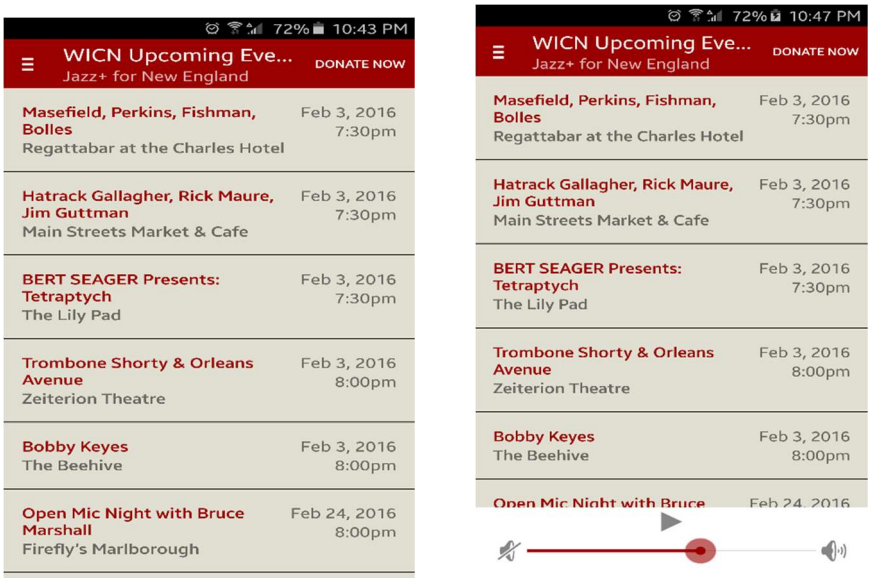

Figure 9. Screenshots of original application without player(left) and same screen with player (right)

3.5.7: Reminder Function

One of the features which was called for by the various reports was to have some form of an alarm clock feature which would alert the user at a specific time. This feature was added in the form of the “Reminder” page. By creating an alarm which would go off at a certain time, picked by the user, the application calls this alarm to create a notification. This is done by creating an alarmmanger function, which would receive the AlarmReceiver page upon the completion of the certain criteria (AlarmManager). The criteria in this case being that the time which was chosen on the time picker matched the actual time (TimePicker). When this condition is met, the application then activates an alarm, which is the task coded into the AlarmReceiver page

(Android Application). The notification is then displayed on the phone and the user can tap on it in order to open the application.

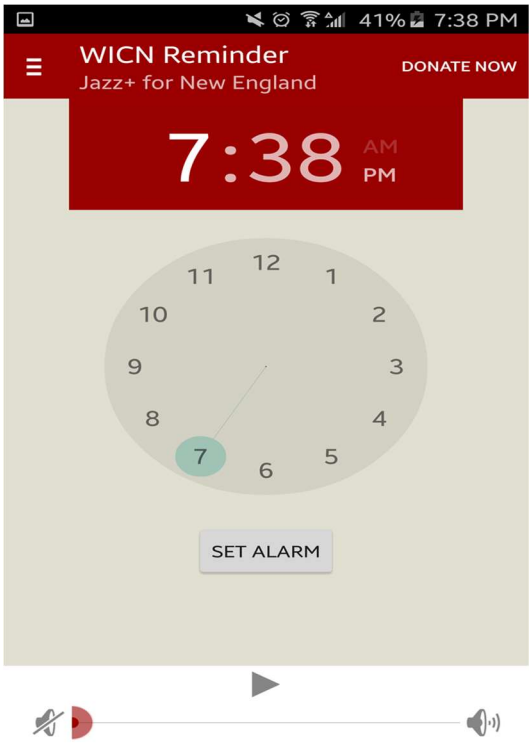

Figure 10. A screen shot of the added Reminder Function page.

3.5.8: Newsletter Sign-up Update

Following the meeting with the staff of WICN, they had requested that a change be made to the existing WICN applications which would update the form for their newsletter sign up. This change was made in the applications by altering the original URL which was opened by the previous applications and updating it to the new URL provided by the staff of WICN.

Chapter 4: Implementation

Before the updated version of the application could be uploaded to the Google Play store, the staff at WICN needed to review the application so they could present their feedback and ask any questions. This transfer of information was done in a meeting with WICN at their office. At this meeting, a summary of the existing application was presented, followed by a summary and demonstration of each new feature which was added to the WICN Android application. At this meeting WICN informed the project team that they had two new websites which they wished to have accessed in place of their “Newsletter Signup” page and their “Shop” page. These changes were made, and then the final APK file was able to be sent to WICN via email. Additionally, the email had a word document attached which contained the passwords required to have complete ownership of the application, as well as the Google account which has ownership of the WICN Listener Survey created by the project team.

Following the transfer of ownership and the APK email to WICN, Professor Manzo of WPI was contacted in order to obtain information on if there were any special protocols required in order to upload the Android project files back to the GitLab storage where it was originally obtained.

Chapter 5:Conclusion and Recommendations

This project proved to be quite challenging, as the project team had no past experience with Android coding experience. There was an extensive amount of research done, with the project showing new features well integrated into the application with no seen flaws.

5.1 Development Limitation

One very noticeable limitation for this project was the loss of roughly seven weeks which were used as both time to learn the programming language, as well as the time which it took to access the source code for the original WICN application and learn how to navigate the files of code. There were, however, minimal other limitations that did not involve overall skill of the project team or the inability to add new features due to the API limits. As with the past project, a real time playlist cannot be added because WICN does a series of programs rather than a set playlist. This also limits abilities to have other features such as a “Favorite” button and other features which would be dependent on a playlist.

5.2 Improvements within the application

There were several components which were added the application to attempt and make the application more desirable to the users. Along with these additions, some features were added upon in order to make them more useful to the user.

5.3 Future Improvements

There are several improvements which could be added in order to improve the application for the user in the future. One of the largest improvements that could be made,

mentioned earlier in this report, was the switch to the ExoPlayer function to replace the current style of music player. This would potentially allow for fast loading times of the stream, an important feature for a radio application to have. Another change which could be added is completely embed email function. The one problem that arises if wishing to do this is that there would have to be complete communication with WICN in order to create an account with which the email would be sent from within the application, as that is a required function. One additional fix, which was not seen until the meeting with WICN staff was a problem with the Drupal interface, which exceeded the project term, which was a small issue with certain punctuation.

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