
Designing a Radio Music Broadcast Interface For WICN

Final Report

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This report represents work of one or more WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

Abstract

WICN is a music radio station in Worcester, broadcasting jazz and other genres like bluegrass and world music. They have had issues with radio hosts using streaming services and relying on CDs for which the equipment is outdated. The goal of this Interactive Qualifying Project was to develop an interface that hosts could use to interact with a new database that would replace most CD and streaming usage. We surveyed radio hosts and other related employees at WICN and drew conclusions from what they needed to create a design and mockup of a user interface that was both simple and fully functional. We also investigated options for the station to use existing radio hosting software and made recommendations on how the station should proceed, creating the mockup and design of a new developed interface within a separate document and detailing the pros and cons of using commercial software.

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Executive Summary

We were tasked with making recommendations to the WICN radio station on how they should move forward with software to interact with their music database so that they may move away from CD and vinyl. To better understand the needs of the station, we investigated how they currently host shows and use software in the booth.

To solve the issue, we investigated design solutions that meet the requirements we found by both analyzing the demographics of WICN and interviewing the hosts. We synthesized a list of core features from the feedback we received:

- Fade between songs
- Allow for two songs to be displayed at the same time
- Queue to display and add upcoming songs in customizable order
- A built-in crossfade option between 0 and 6 seconds
- Automatic upload to Spinitron
- Be able to see metadata from the original CD
- Search for keywords and have a dropdown menu to filter by artist, album, or song
- Saved Songs
- Play and Pause function
- History and last played function

With these, we were able to design a mockup of software that we believe would suit the radio station's needs. We aimed to design a simple-to-use software that has all the core features that we outlined in the design document and results section. The overall design is simple with search results on the right that can be dragged into the queue on the left. This was chosen as the fundamental features are immediately apparent, making it simpler to use for a host that is not as technically proficient. We also decided to show the current playing song at the top with the on-deck song displayed next to it so a host can easily make sure the next song is the one that they want to play. We also wanted the crossfade option to be visible and easy to access so we decided on a slider bar that is positioned right in the middle of the current playing song and the on-deck song. This software is designed to be as simple as possible while also having all the features that the hosts would need.

After meeting with a software developer, we investigated commercial products and came across RadioDJ. This is free software WICN could use instead of developing their own software. We did, however, find a few drawbacks – foremost the lack of an easy to see history function which we determined to be a crucial feature. We synthesized a potential work around as RadioDJ has built in upload to Spinitron so a web application could potentially be developed to run on another monitor to display the station play history and last played. This is a reasonable alternative if developing software is too expensive.

Introduction

The Problem

The core problem in this IQP is twofold. First, the hosts have been using CDs, for which the players are outdated and can't be replaced due to the production models being discontinued. Second, the hosts have been using streaming software such as Spotify and Apple Music, which do not offer business licenses. These are issues for both the hosts and WICN as a whole. It is inviting trouble when the CD players fail or legal issues relating to the use of streaming services come up.

Previously, there were plans to switch hosts away from CDs and streaming and possibly digitize the CD library, but the conclusion was that digitizing the CDs would be prohibitively expensive, in the range of tens-of-thousands of dollars. Also, there was an opportunity to update their AudioVault software to AudioVault Flex, but this software was too complicated for older hosts. More info on the problem is in the background section.

The Methods

What we at first intended to do was both to find preexisting radio databases and build a user interface to operate them, but David (General Manager & Program Director at WICN) decided it was not strictly within the scope of the project, and our main priority was to build an interface to interact with a database. The main challenge was to build an interface that was simple enough that older hosts could use it, but still had all the necessary functions for other hosts who desired more nuanced features in their shows. Thus, we wrote some questions and interviewed a sample of hosts and other related staff at WICN. From this, we learned about different needs hosts had, such as the crossfade and history features; these are listed in the Data and Analysis section.

The Solution

Two solutions are given. First, we designed a mockup of a new interface, which can be found in the design document, using the features hosts requested. Second, we also learned that existing software such as RadioDJ could work for the hosts' needs with some caveats. We gave the design document, including the mockup and other conclusions, to WICN.

Background

WICN is a National Public Radio affiliated station in Worcester, Massachusetts that broadcasts mainly jazz music with more variety shows throughout the week such as Americana, bluegrass, and world music. Many people working as hosts at WICN are older, retired gentlemen with a passion for music shows and productions. The station is in the process of moving away from the usage of CDs, vinyl, and streaming software in its production of radio shows in favor of an on-site, physical music database and is looking to develop a new interface that would bring it all together.

Demographics of WICN Personnel

WICN has its own unique circumstances concerning the implementation of a new interface to interact with their music database. The largest hurdle that the station needs to overcome in its introduction of a new interface is its ageing staff. David, the general manager at WICN, stated that most hosts working at WICN are retired – aged around 65 years with some in their mid-80s. There is expressed concern that older hosts with less technical expertise will be unable to learn and utilize an interface they have not been familiarized with previously. A new interface would have to be ultimately simple to meet the needs of WICN staff, but a focus towards simplicity is not a prevalent feature in most commercial DJ automation software as additional marginal utility greatly affects the interface's complexity. The station has thus started to investigate developing their own custom interface that would ideally fit their needs better than a commercial alternative. To do so, the developer must first understand the technical ability of the hosts and functional requirements the hosts have in a new interface. Also, in anticipation of a steep learning curve, hosts would need the ability to trial and learn the new interface outside the booth so as not to disrupt on-air shows.

DJ and Automation Software

Radio hosts use DJ and automation software to search, organize and play music and audio files in their shows. Automation software comes with many features built in that aid in the hosting experience such as search capability, playlist functionality, automatic audio transitions, and play history. Higher-end automation software includes more situational and specific features like live audio mixing or audio dimming for voiceovers, but this level of functionality is not

required, and in niche cases detrimental, for hosts to have access to. The automation software used by WICN is AudioVault, a product of Broadcast Electronics. The AudioVault version used in the booth at WICN is outdated and no longer supported by BE, but WICN has not replaced it as it works as it is for their hosts. They have purchased a newer version of AudioVault named AudioVault FLEX but found the interface to be too complicated for the hosts to grasp. David has expressed little desire to move away from their current AudioVault interface and prefers an additional interface with basic search and play functionality. An interface with search functionality that resembles software such as Spotify, Apple Music, Google Music, iTunes, or Amazon music would likely be desirable as hosts are already familiar with these layouts.

There are multiple auxiliary channels in the booth setup to lead into and interact with AudioVault that could be used to implement the additional interface. One leads to four CD players the station has purchased, which, while dated, are used preferentially by many hosts working at WICN. Another channel leads to a laptop in the booth that hosts use to access streaming services and play digital music from. Most of the hosts during their live shows only use the laptop or CD players to run audio and do not interact with AudioVault except at set points. Underwriting spots specifically are only run in the AudioVault software and require the hosts to pause their audio to play the spots manually at set points. If a new interface in the booth with access to a complete digital interface is added, the laptop would no longer be used for streaming as David has said this project is a push to move away completely from streaming services. One last channel is available for use if an additional audio source is required.

Hosting Experience at WICN

Hosts only talk and play music. The hosts, as mentioned, do not interact with AudioVault and many do not interact with the mixing board either. Some hosts have their own libraries of music they may bring in, but most use either WICN's collection of CD and vinyl or streaming services available on the laptop in the booth. Most radio hosts at other stations are likely to interact directly with the station's automation software, but that is not the case at WICN. As songs are not run by the automation software, transitions are prone to be clunky and the CD players have historically been known to skip at times. At any point, hosts can pause the audio to recount the music they've played, for their own narration, or to play an underwriting spot on

AudioVault. Hosts can also pre-record shows the station may play on a separate date. The shows are usually recorded at home and sent into the station to be programmed into AudioVault.

As part of each show, hosts are required to login to Spintron and report songs they are playing on the station's radio. The process consists of manually typing in the song name to Spintron and selecting the appropriate version for each song as they were played on the show. The song would appear in a list of music alongside which station played it. This is largely done in order to report music played on the station to PROs and SoundExchange who distribute digital performance royalties for sound recordings played. It is an integral part of radio hosting and must be done manually for each individual song played by every host that works for WICN. Spintron supports automatic upload of music through its API from a select number of automation software, including AudioVault Flex but does not support WICN's outdated version of AudioVault.

Previous Attempts to Implement a New Interface at WICN

The station has made attempts previously to move towards a singular interface for radio hosting, but no solution has stuck due to the convenience of traditional methods. The hosts at WICN have been able to host shows using their choice of streaming services, CD's and vinyl without issue for years and are apprehensive to switch to a new interface without proper motivation or reason. While the station could have forced the switch to AudioVault Flex, the hosts had no real reason to learn the interface as there was neither additional functionality they would use in the new interface nor any detriment to using streaming software through AudioVault. An effective interface solution would contain features hosts have expressed they would use, motivating hosts to make the switch and learn the new interface. Interviewing the hosts is thus desirable to personalize the interface's functionality to the hosts at WICN.

WICN's Digital Database Search

David expressed his desire for the station to move away from the use of CDs and streaming services like Spotify and Amazon Music in favor of a digital music database. WICN as an NPR affiliated station is not at risk for using music without purchasing licensing first. Nonetheless, there is a significant amount of ambiguity using Spotify and other services. While the station has the right to play music through its NPR affiliation, there are implications and

issues that may arise due to the music being produced by third-party software – issues that would be nullified by owning a music database for the station on a physical server. Most radio stations purchase blanket licenses from PROs (Performing Rights Organizations), but the organizations do not provide their own database of licensed music for the station to use. David has tried other means such as contacting other jazz and variety radio stations such as BGO and WWJZ but found them unresponsive to messaging.

WICN has a large CD and vinyl collection that it can digitize, but there are issues that prevent it. The CDs in WICN collection are old, and many do not contain metadata such as artist or producer that hosts use to introduce and find music. There may be ways to assign metadata to audio files after the fact, but David and the staff were not aware of any such option. Additionally, WICN's collection of CDs is substantial and would cost a substantial amount of money to digitize - estimated by David to be tens of thousands of dollars. Their collection of vinyl had to be recorded in real time and would take somewhere on the scale of ten years to rip to digital. Thus, it is undesirable for the new database to be ripped from the CDs or vinyl at least until it is feasible to be able to assign metadata to a collection of music.

Methodology

Project Methodology

Our project consisted of collaborating with the radio station, WICN, in order to create an interface that allows them to use a digital library to facilitate their hosting experience. Our team, including four students and an advisor, brainstormed as to what a successful platform would look like. We conducted interviews, visited the WICN station, talked to a developer about taking this project further than the IQP period and conducted weekly meetings in order to achieve clarity and produce a model and plan for the radio station to move forward.

Using the background information we collected, we synthesized a plan with our advisor as to how to proceed with the project. The first step we took was to visit the WICN office here in Worcester and interview the General Manager to better understand the problem that needs to be solved. We had an extremely fruitful conversation resulting in output such as:

- Vinyls and CDs
 - Some CDs do not have metadata
 - Keep the CDs without metadata as backup
 - Do not want to get rid of vinyl – hosts prefer the unique sound
 - Digitizing the entire CD collection is too expensive
- The station wants a direct download to AudioVault without using a 3rd party software
- AudioVault uses MP3s Mainly or WAV files
- The station is looking into licensing a database from another radio stations
- Blanket license through CPB (NPR)
 - They carry the license and carry the fees
 - No licensing that we must worry about
- Wants software to house the music, not make it, so there are no license issues

These are some of the takeaways we got from that meeting. This set us off to a really accelerated start as it cleared up a lot of the questions that we had and gave us an aim to achieve.

We also talked to a software developer, to see how the project would shape out in the future. We discussed several options and ideas with him and shortlisted the most important takeaways.

To encapsulate, we used multiple strategies to extract the highest magnitude of information from all the parties involved. One of our primary and go-to methods was conducting interviews. We had conversations with a series of employees and learnt a lot about the radio station's needs. A complete list of questions can be found in appendices A and B. Our interviews were conducted as follows:

Interview Methodology

During our interactive qualifying project, WICN Radio Music Broadcast Interface, we conducted a series of interviews with people of various backgrounds and fields. Ranging from hosts to managers to developers, we penned down a series of questions to make sure that we got enough information to complete this project. After researching background information, our team visited the WICN office. Our first step was to draft a few questions in order to interview the General Manager, David Ginsburg. These questions were designed in order to achieve as much clarity as possible since our entire team was extremely new to the project. Some of the questions are as follows:

- Music sources hosts use and what they'd like to use
 - "Using Spotify and amazon music and other streaming services to supplement CDs"
 - Have you looked into getting a digital database before?
- What are the current licensing laws that you follow as a non-profit?
 - Use of local music files, Public digital libraries (Spotify), commercial digital libraries (Licensed)
 - Fair use - it is permissible to use limited portions of a work including quotes, for purposes such as, but not limited to, criticism, comments, news reporting, teaching, scholarship, [and] research.
- Are we replacing AudioVault or tagging onto it
 - What is the role of AudioVault now and what would you like it to be?
 - Have you considered replacing AudioVault as your automation software in the past? If so, what was stopping you?

As seen above, the open-endedness of these questions allowed us to understand the scope and depth of the task in front of us and how to tackle it. We learnt that these questions acted as a double-edged sword. Despite gaining a lot of information, we found ourselves in the dark regarding the connection of AudioVault and how it links to the big picture. Our main takeaways were that we had to keep our interface simple and easy to understand, we did not have to worry about licensing issues and that commercial software like Spotify/apple music are prohibited but should be mimicked due to their efficiency and popularity.

The questions for the hosts were a lot more personalized and targeted since we had a better understanding of where we wanted to be and had a sharper vision of what these interviews were designed to achieve. We decided to enhance our questions by using a simple, yet effective technique called breadcrumbs. Good interview questions should avoid being narrow, and leave trails for the interviewees to follow, this process is known as leaving breadcrumbs. The interviewees can pick up on these breadcrumbs and provide an answer that the interviewing team is searching for. The interview questions looked like:

- Can you walk us through the typical steps you take when setting up for a broadcast? What are the key components of your workflow?
- Reflecting on your experience with the current tools, what aspects do you find most effective when hosting a show?
- Could you also share any pain points or limitations you encounter with these tools?
- Can you discuss the various user interfaces you're accustomed to using in your broadcasting work?
- How do they compare, and are there any notable differences in functionality?
- Within the interfaces you mentioned, what specific features do you find particularly useful or essential for facilitating a smooth hosting experience?
- Are there any frustrations or drawbacks you personally encounter while using the current interface?

As seen above, these are a lot more structured and lead the interviewee in the direction we want them to follow. These interviews provided a lot of insight as to what the hosts currently use in their daily hosting experience. They helped us understand what specific features our interface should have and what to avoid going into this project. The production manager also

guided us away from AudioVault as the hosts do not interact with that platform. Our meeting with one of the hosts was a few weeks after the rest, this allowed us to modify our questions a little bit, such as these:

- How does fading songs together work while you are broadcasting? And how much do you use the mixing board?
- Reflecting on your experience with the current tools, what aspects do you find most effective when hosting a show?
- Could you also share any pain points or limitations you encounter when in the booth
- Are there any UI features from other music software that you would like seen in our software?
- Our plan is automatic upload to Spinitron - is that something you'd be interested in?
- Are playlists a feature that would be useful? In our case every host could be given one and it would let you save songs so you would not have to search every time.

Results

Host Feedback

In our first two groups, we were able to talk with WICN's production manager. She was able to inform us of the use of AudioVault, and on how our software will be implemented in the hosting both. From her input, we found out that hosts don't use the software other than to play the radio stations' underwriting spots. We also learned that AudioVault is a difficult program to use, and that our software will not be integrated into it. Since she said no one can modify it, we removed our questions about AudioVault from future interviews as it was not relevant to the experiences of the hosts.

During the sessions, we were able to get information on what the hosts would like for features in the software. One feature the hosts expressed most frequently is a simple crossfade function. A set of hosts currently use third-party programs that don't have good crossfade options and their songs abruptly end as a result. Another important feature is a queue function so the host can have their entire show planned out. We were also told it would be nice to have the on-deck song be more noticeable so that it is more visible than the rest of the queue. To go with this feature, we were told that they would like a history function to see the order the songs were played. This will help them recount a group of songs that they played on air and to remember the order that they played them in. A less important feature we heard was the ability for playlists to be made, but we theorized this would lead to far too many playlists if they had the opportunity to make as many as they wanted. To combat this, we came up with the idea for a saved song list where each host would have their own so they wouldn't have to search for their go to songs every time. The last major feature that we found was from a one-on-one interview with a host who uses songs from his iTunes account, that being the last-played feature. This allows him to see the last time that he played a song and avoid accidentally playing a song two shows in a row.

After our interviews with the hosts, we were able to make a list of core features that the hosts would use in a music software interface, namely:

- Fade between songs
- Allow for two songs to be displayed at the same time
- Queue to display and add upcoming songs in customizable order

- A built-in crossfade option between 0 and 6 seconds
- Automatic upload to Spinitron
- Be able to see metadata from the original CD
- Search for keywords and have a dropdown menu to filter by artist, album, or song.
- Saved Songs
- Play and Pause function
- History and last played function

Developer Feedback

Having a reasonable understanding of the design and feature requirements of the potential interface, we reached out to a developer who our advisor put in touch with us. The purpose of communicating was to check the feasibility of our proposed features and understand what additional information the developer of the interface might need to design and program the product. We found in discussions with the developer that all local features were feasible and comprehensive. Features that interacted with Spinitron's API needed a more thorough documentation of the API's details, and the developer asked that we investigate and document it.

After examining the features and design requirements, the developer asked us to look more into commercial software, including a link to Spinitron's list of compatible automation software and recommending one in particular – RadioDJ. RadioDJ was free to use, and WICN did not require more complex features found in other commercial software on Spinitron's list. We also anticipated that regardless of which software was chosen, WICN needed a plan for hosts to learn the new interface, preferably before entering the booth. We confirmed that the program could be installed on any windows pc and theorized that the program could also be installed on host's windows pcs, allowing them to learn the interface wherever they were.

We met with David and confirmed that plan was worth pursuing. If RadioDJ did not seem to fit the needs of the station after a trial, software with features and design requirements as we outlined the design document could instead be developed.

Conclusions

After taking in all the recommendations from the hosts and the developer we can make two recommendations about how the Radio Station should move forward with music software. The first is to use the RadioDJ software. David agrees it has a simple enough interface and is free to download and use. We do believe that the software has a few drawbacks due to a couple missing features, however these could be solved with a web app that could show the history of what the hosts last played from Spintron. As a secondary recommendation in the event RadioDJ does not fit the needs of the station, they can develop their own software that is specifically designed to do so. This has the drawback of being a more expensive option, however, it can be tailored to be exactly what the hosts need while hosting a show. Both options are great choices for the radio station and will help it modernize and move away from outdated technology.

In our research into the subject of assigning metadata to music which lacks it, we found MusicBrainz (musicbrainz.org) hosts a database of music metadata that is free to download and use. It is possible that CDs from WICN's collection ripped to digital that lack metadata may possibly be assigned metadata en masse. The option for WICN to rip their CD collection to digital remains open, but we have not assessed the accuracy to which metadata can be assigned.

Appendix A

Interview Direction Questionnaire for David Ginsburg

- Music sources hosts use and what they'd like to use
 - What issues involve hosts "using Spotify and amazon music and other streaming services to supplement CDs"
 - Have you considered licensing a digital database before?
- What are the current licensing laws that you follow as a non-profit?
 - Use of local music files, Public digital libraries (Spotify), commercial digital libraries (Licensed)
 - How does WICN fall under "Fair use"
- Are we replacing AudioVault or tagging onto it
 - What is the role of AudioVault now and what would you like it to be
 - Have you considered replacing AudioVault as your automation software in the past? If so, what was stopping you?
- Clarifications on David's Email
 - What it means to "add a specific database storage location where gatekeeper would add "thank-you's" and "testimonials" for hosts to use in their programming"
- Contact and communication with hosts
 - How would hosts provide feedback on the usability and effectiveness of the new interface?
 - What training and onboarding resources do you envision for hosts to familiarize themselves with the new digital interface?
- Are there specific search and navigation functionalities that hosts frequently use and should be incorporated into the digital interface?
- Considering the dynamic nature of radio hosting, do you see value in having a mobile-compatible version of the interface for on-the-go access
 - Are there specific features that would be essential in a mobile interface?
- Should hosts be able to customize their interface based on their preferences and the specific requirements of their shows?
 - Are there features that would allow for a personalized experience for each host?

Appendix B

Interview Direction Questionnaire for WICN Radio Hosts

Initial Host Questionnaire:

- Can you walk us through the typical steps you take when setting up for a broadcast? What are the key components of your workflow?
- Reflecting on your experience with the current tools, what aspects do you find most effective when hosting a show?
- Could you also share any pain points or limitations you encounter with these tools?
- Can you discuss the various user interfaces you're accustomed to using in your broadcasting work?
- How do they compare, and are there any notable differences in functionality?
- Within the interfaces you mentioned, what specific features do you find particularly useful or essential for facilitating a smooth hosting experience?
- Are there any frustrations or drawbacks you personally encounter while using the current interface?
- If so, could you elaborate on what aspects you find problematic?
- Considering the issues you've identified; do you have any recommendations or suggestions for enhancing the interface to address these concerns?
- Are there any physical or accessibility factors you believe should be considered when designing or updating the interface?
- From your perspective, do you think it would be beneficial for hosts to have the ability to customize their interface based on their preferences and the unique requirements of their shows?
- Are there specific features or functionalities that you believe could offer a more personalized experience for hosts within the interface?
- How would you react to the idea of introducing an additional interface displayed on a separate laptop? Do you think it would enhance or complicate your broadcasting workflow?
- In terms of search and navigation within the digital interface, what are some key functionalities that hosts frequently rely on and should be incorporated?
- Are there any features like public playlist and play data that would be useful to add to this search program?
- Is there any additional insight or perspective you'd like to share regarding your experience with the software and tools used in your broadcasting activities?
- Could you demonstrate how you typically search for and select your favorite song using your preferred program or method?

Host Questionnaire, Updated 2/20/2024:

- Can you walk us through the typical steps you take when setting up for a broadcast? What are the key components of your workflow?
- How does fading songs together work while you are broadcasting? And how much do you use the mixing board?
- Reflecting on your experience with the current tools, what aspects do you find most effective when hosting a show?
- Could you also share any pain points or limitations you encounter when in the booth
- Are there any UI features from other music software that you would like seen in our software?
- Our plan is Automatic upload to Spinitron - is that something you'd be interested in?
- Are playlists a feature that would be useful? In our case every host could be given one and it would let you save songs so you would not have to search every time.

Core features to get host opinion on:

- Allow for two songs to be displayed at the same time, this avoids downtime and leads to a smoother hosting experience
- Empty Queue to display upcoming songs in customizable order
- Entire history of WICN's music taken from Spinitron API – Default hidden
- A built-in fade option with the ability to be turned off so a host can use the mixing board if preferred
- Be able to see metadata from the original CD
- Search for keywords and have a dropdown menu to filter by artist, album, or song.