Functional Specification, Juke
DCU Final Year Project 2019/20

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1. Introduction

1.1 Overview

Provides a brief overview of the system / product to be developed. It should include a description of the need for the system, briefly describe its functions and explain how it will work with other systems (if appropriate).

Juke is an online jukebox webapp. It would mainly be used in pubs and venues as a replacement for a physical jukebox. Users would queue up songs by searching them from a repository on the system and then vote on other songs in the queue. For example, If a song is downvoted a sufficient number of time by app users, it will be skipped.

Juke can also be used as a venue recommender based on music taste. It would look at your past history of played songs and find out which venues tend to play similar genres of music. It also looks at venues that users with similar tastes also enjoy and will recommend them to you.

We felt the need for Juke came about when trying to queue up songs in a physical jukebox in a pub, we were met with a long line to the box as well as a slow and clunky interface. These jukeboxes tend to be inaccessible to those with vision or mobility impairments and hope to take this into account when we are developing the app.

The app would communicate directly with the hypothetical venue(s) that have partnered with our project to have an admin-view of the song queue. If the venue decides that they do not want a certain song to be played (e.g. one that has been played a few times already that night) they can choose to skip it.

We will implement QR-code functionality to make it easier for those to immediately install the app from the app store and for users to sync their app with the venue they are attending.

1.2 Glossary

2. General Description

2.1 Product / System Functions

The Juke system will mainly be used as a media player in venues, which will allow patrons of the venue to select music to be played from an existing repository of music. The system will implement a smart queuing system to avoid situations where the same song is played multiple times.The system will display the current queue time to the user before they make any purchase, allowing their music playing decision to be well informed. The system will allow for user profiles which means the user's preferences will be carried over to different venues. Juke will also allow customers to provide feedback on the currently playing song, which will feed the system's venue recommender.

The user's version of the webapp will allow all users in a venue to vote to skip a particular song, should it not fit the mood of the evening. The venue recommender will allow users to see other venues around the country which play music to suit their taste.The user will be able to view these venues on a map interface, and search for a location to know in advance what venues would suit. The system will be responsible for building up both the user music

profiles and the venue music profiles. As the user interacts more with Juke, the system will give them easier access to the genre's they like, allowing them to quickly queue songs.

2.2 User Characteristics and Objectives

The user community will generally be tech-savvy, between the ages of 18-30. They will be generally familiar with typical app layouts such as Spotify or Apple Music where they locate their music in a search bar and then queue it up or play it normally.

The objectives from the users' perspective will be to have their song(s) played during the time they are attending the venue and also to have the ability to vote to skip songs they do not approve of. The requirements for the system are that it should be fast and responsive, but also contains enough data on the screen to help them find the song they wish to queue.

2.3 Personas

Persona 1

Average Persona - Joe Bloggs

Goal

To be able to use a digital jukebox to enhance their evening, be recommended interesting venues and have an uninterrupted, frictionless experience.

Motivation

To enjoy the music they like in a social environment. Find more social environments where their music will be played. Know when their song will be on.

Barriers

Vote to skip, not enough venues in their locality, inaccessible webapp, poor UI.

Mindset

Enjoyment, shared experiences, ease of use, value for money

Solutions

Remove vote to skip? Make it optional? Ensure high quality experience, accurate time to play. Avoid conflicts of interest. Make sure the recommender system is accurate.

Persona 2

Venue hunter - Sherlock Holmes

Goal

To find the best venue for them and their friends. Find new venues based on date and music style. Search for new venues in new locations. Find the best day to go.

Motivation

Unique music experience. Experimenting with different venues. Discovering the new night out for their peers. Getting to know a new town/city.

Barriers

Poor accuracy of recommender system. Map not working as intended. Out of date data for opening hours / theme nights etc. Lack of advertising.

Mindset

Goal achieved when a new event / venue is discovered. Time is essential as they want to be the first on the scene.

Solutions

Ensure recommender is accurate. Ensure Maps has up to date information. Enable notifications for “new” suggested nights. Suggest previously unvisited locations.

Persona 3

Accessible Persona - Stephen

Goal

To use Juke with their accessibility issues properly identified and addressed. Listen to music in a social environment with no hassle.

Motivation

Enjoy the music they like in a social environment. Use a webapp that addresses their specific needs while delivering the same functionality. Find accessible venues.

Barriers

Poorly designed apps, physical Jukeboxes being unusable, accessibility needs not met. Trying to find an accessible venue.

Mindset

Goal achieved when app delivers the same service Joe Bloggs would get while still meeting accessibility needs in a dignified manner.

Solutions

Incorporate accessibility at all stages of development. Speak to users about their own specific accessibility needs. Test accessibility functionality to ensure service is still provided.

Persona 4

Admin Persona - Moe Syzlack

Goal

To enhance the experience of their customers, avoid conflict and generate revenue. Advertise their own brand of night. Have control over Juke to change song at a moments notice etc.

Motivation

Happier customers, more revenue from Juke, themed nights, build a brand for their venue. More inclusion, more control.

Barriers

Explicit content, difficult to integrate ads with current systems, customers repeating songs, noise in venue, resolving conflicts for offensive songs.

Mindset

Goal achieved when customers are receiving top quality service which Moe can control to suit situations.

Solutions

Dedicated admin page where songs can be skipped, explicit content can be enabled / disabled. Allow Moe to change volume in the venue, conclude music for the night, make announcements over speaker, advertise upcoming nights on Juke webapp.

2.4 Constraints

Lists general constraints placed upon the design team, including speed requirements, industry protocols, hardware platforms, and so forth.

The time constraints of this project are from 23rd September 2019 - 11th May 2020.

We aim to implement appropriate accessibility requirements in our design so that as many users as possible can use our app, this may involve halting typical design processes in order to make sure these procedures are implemented, e.g. UI design may depend on making it colour-blindness friendly.

The music provided will be from a premade song repository. This will be to avoid complications using Apple Music, Spotify APIs that require requests to be put out and to avoid the commercial aspects of this project.

Ensuring the website is light and easy-to-load to ensure that it can be used efficiently over mobile data such as 3G and 4G and is also mobile friendly for the users.

3. Functional Requirements

3.1 Main Jukebox functionality

- **Description** - This will be the backbone of Juke. We have to ensure the digital Jukebox works as intended. The Jukebox will allow users to play music in a venue. From selecting a song on their own device, through payment to actually listening this process has to be perfect. Without the Jukebox the rest of the project falls apart.
- **Criticality** - We have identified the Jukebox as the most critical aspect of the project.
- **Technical issues** - We will have to ensure playback quality is up to standards. We don't want any lag in playback. The song a user has selected has to be the one that is played. We want to make the entire process of playing a song as painless as possible for the user which will require extensive testing. Accurately getting time to queue will be important as users have indicated this would be important to them. We will have to set up a repo of royalty free music to avoid copyright infringements.
- **Dependencies with other requirements** -The Jukebox itself will only depend on the admin side being set up correctly. Apart from that and maybe some minor recommendation in song choices it will be able to run by itself.

3.2 Venue Recommender

- **Description** - The venue recommender will take user's listening data on an individual basis and recommend venues to them based on what music is generally played there. This system will also build venue profiles to provide accurate recommendations. The system will take artists, genres etc into account. It will also take the days of the week into account for venues as different venues could have "themed" nights on a day by day basis. The user will also be able to view venues in their locality on a map screen and see their recommended venues there. Or the user can search a location and see venues there.
- **Criticality** - This system will be our secondary focus as we feel like this will be the unique selling point of Juke. Users might not use this in the venues but we hope that this will be what keeps them coming back to find that next cool venue for them.
- **Technical issues** - Building the recommender system itself will be technically difficult. Neither of us have experience with building a system like this but we

hope, through extensive testing, to get an accurate system. Integrating the map screen with the system could prove to be difficult. We will also need to make sure the right metadata is being collected from both users and venues to achieve the desired results. We will also have to let users know exactly what data is being collected. We will also have to weigh the metadata correctly so we don't get false results in our recommendations. We will need to extensively test the system to ensure it provides useful recommendations to every type of user. We will have to ensure that songs are correctly labelled by genre and artists which could require transformation of metadata. We will be looking at algorithms such as K-nearest neighbour in our attempts to achieve this system.

- **Dependencies with other requirements** - The recommender system will rely heavily on the metadata provided by the users listening habits which will come from the jukebox. It will also rely on the venue profiles, which it will be required to build from the venue jukebox metadata. It will have to integrate with the map screen, as the recommender data will recommend venues to be displayed on the map.
- **Others** - The infrastructure required for collecting and processing the data for the recommender system could be an issue.

3.3 Accessibility

- **Description** - Accessibility is important to us as we want all users to be able to use Juke with as little stress as possible. From the beginning of our development we will be developing with this in mind. Juke will be designed to be easy to use, accessible to anyone and work on all devices from flagship phones to older devices with limited broadband. We want every type of user to be able to use these devices too, whether physically impaired, visually impaired or those who are inebriated at the time of usage..
- **Criticality** - One of the most critical aspects of Juke, we will be taking steps from the beginning of development to ensure that all accessibility issues are satisfied as we believe an accessible system is conducive to a functional system.
- **Technical issues** - Technically making Juke accessible shouldn't be too difficult, we will just have to ensure this requirement is met at every stage of development as opposed to being added as an afterthought.
- **Dependencies with other requirements** - Accessibility will have some effect on every aspect of Juke. We want the whole product to be accessible to anybody.

- **Others** - This requirement may require us to do some additional user research so we can effectively meet the needs of various impaired users.

3.4 Admin Screen

- **Description** - The admin screen will be for the staff in the venue. This will handle the playing of songs and allow the admin to change volume levels, enable explicit content, set timers, make announcements, play a “house” playlist and skip songs if desired.
- **Criticality** - This requirement is not our main priority, however we feel that if the system is ever to be used in a real venue outside of the scope of this project it would be a must have.
- **Technical issues** - Setting permissions for this system would be important. We don’t want anyone who shouldn’t be changing these settings to change them. We would also have to make sure the queue time is updated if a song is skipped by a member of staff.
- **Dependencies with other requirements** - This system would rely heavily on the Jukebox requirement as the two would work hand in hand.

3.5 Map Screen

- **Description** - The map screen will be developed to allow the user to see venues in their locality or search for venues in another location. Venues will appear as plots on the map which can be selected to view further information.
- **Criticality** - This is not very critical to the overall system but would be a nice way of viewing nearby venues. A list would suffice though.
- **Technical issues** - Integrating Google Maps into the project could prove to be troublesome. Ensuring the map is accurate and plots are displaying where they should be will require some testing.
- **Dependencies with other requirements** - This requirement will rely heavily on the recommender system to display the user’s recommended venues. It will also depend on Google Maps, which as a third party we cannot be responsible for. We will have to ensure the metadata for locations and recommendations are accurate so the display will match up.

3.6 Payments

- **Description** - Payments would be handled by offering a variety of e-commerce solutions such as card payment, PayPal, Mastercard etc.
- **Criticality** - We have put this right down to the bottom of our requirements as we believe it is outside the scope of the project.

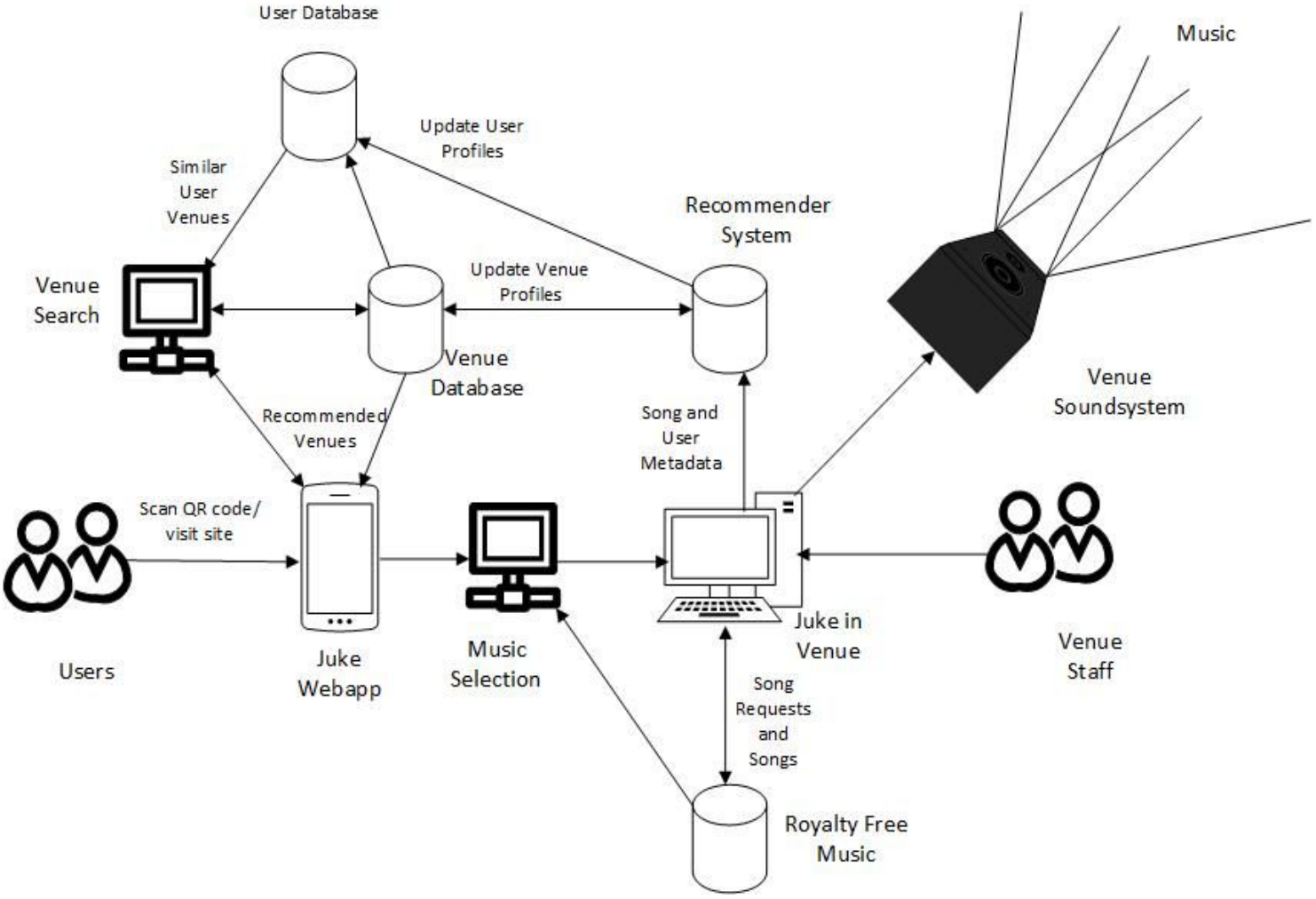
- **Technical issues** - The system would have to be secure. We would need somewhere for the payments to go. We would have to pay royalties for real songs also.
- **Dependencies with other requirements** - This would rely heavily on the Jukebox system itself.

3.7 Native App

- **Description** - Should we have time we would like to develop Juke as a native Android or iOS app.
- **Criticality** - We don't see this as critical at all as it is simply a want not a need. It would be the next natural progression for Juke but we won't lose sleep if we don't end up having time to develop it.
- **Technical issues** - Technical issues for developing native apps would be quite a problem which is why we're not prioritising this requirement, given the time available.
- **Dependencies with other requirements** - This would depend on all the above requirements and would probably require us to re-develop some of them for native app use.

4. System Architecture

4.1 System Architecture Diagram



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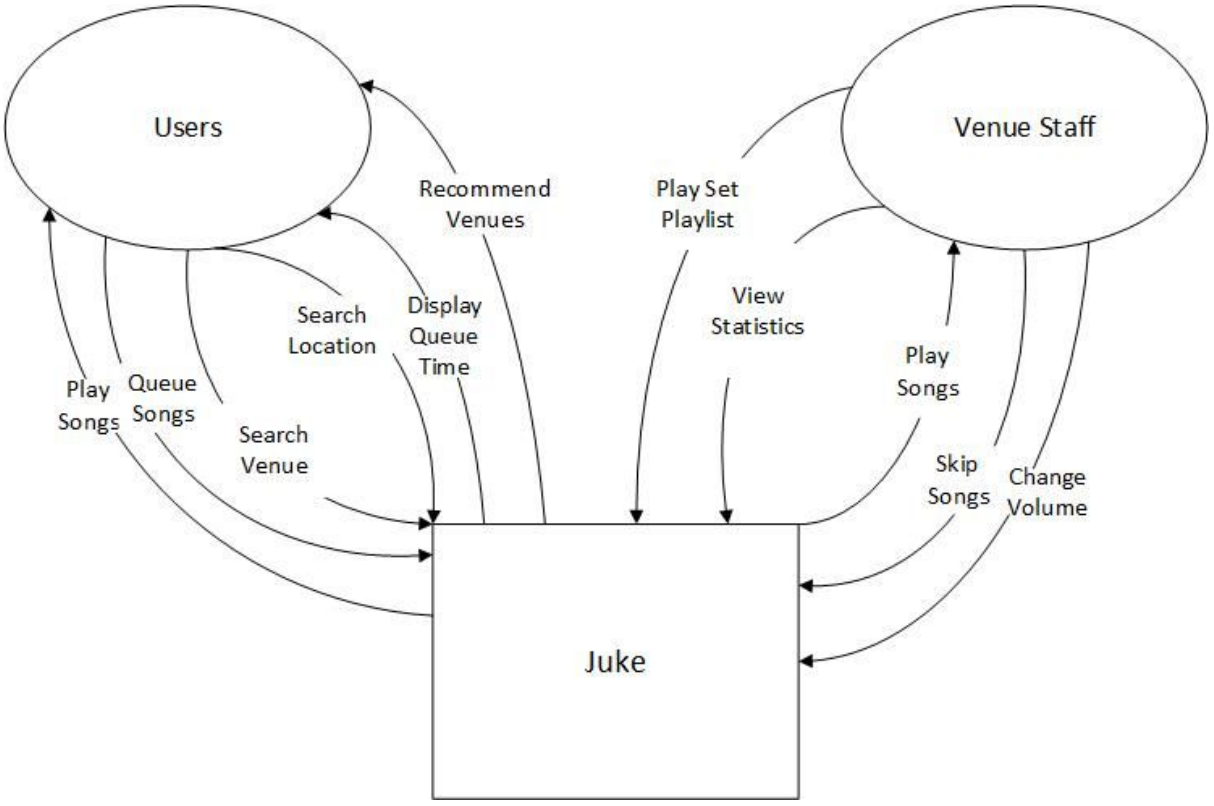
5. High-Level Design

This section should set out the high-level design of the system. It should include one or more system models showing the relationship between system components and the systems and its environment. These might be object-models, DFD, etc.

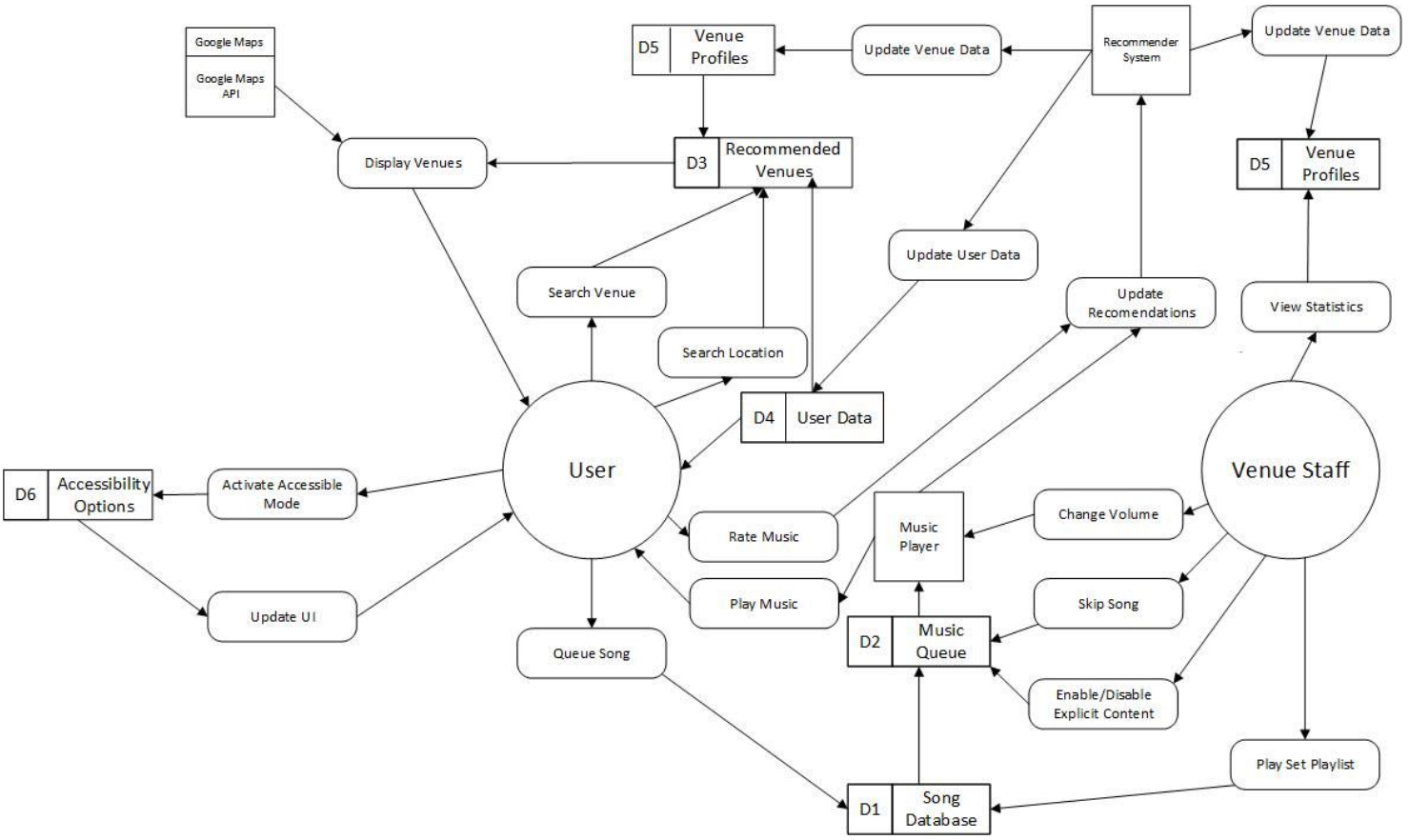
5.1 Context Diagram

The figure below shows a level 0 Context Diagram, outlining the interactions between the system and its external users, User and Venue Staff.



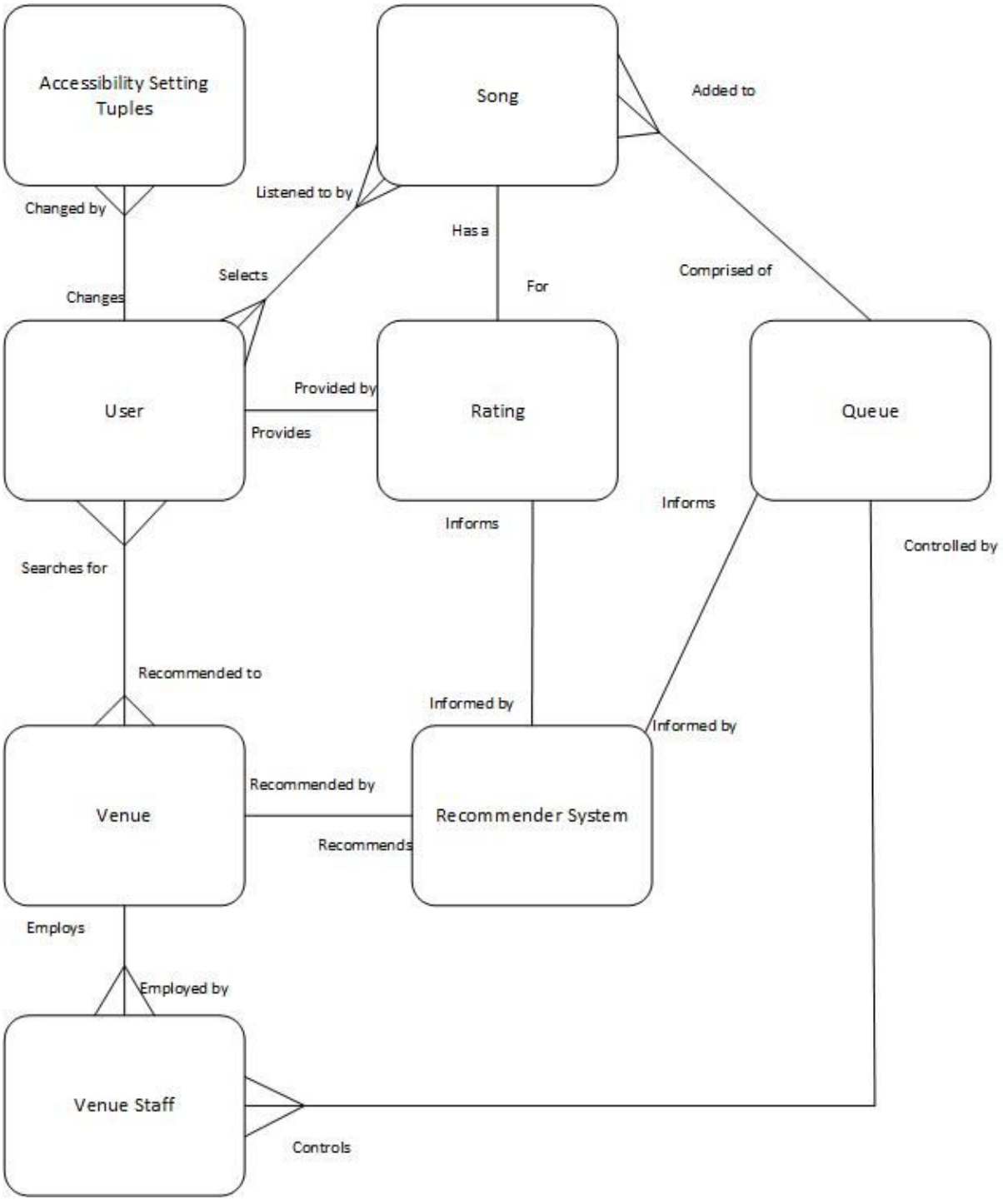
5.2 Data Flow Diagram

Below is a data flow diagram showing the data flow for Juke.



5.3 Logical Data System

Below is a Logical Data System Diagram for Juke which shows the relationship between entities by cardinalities.



6. Preliminary Schedule

This section provides an initial version of the project plan, including the major tasks to be accomplished, their interdependencies, and their tentative start/stop dates. The plan also includes information on hardware, software, and wetware resource requirements. The project plan should be accompanied by one or more PERT or GANTT charts.

7. Appendices

Specifies other useful information for understanding the requirements