

A INTUITIVE SYSTEM TO FACILITATE THE CREATION OF PICK UP BASKETBALL GAMES USING SOCIAL NETWORKING SYSTEMS

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ABSTRACT

In British Columbia, suburban sprawl has created limitations for basketball players in discovering pick-up games within their community [1]. To address this ongoing issue, Park Rec was developed to offer pick-up games, fostering a thriving basketball community in BC. Built on a foundation of social media components, Park Rec aims to unite players by facilitating the creation and discovery of pick-up games [2]. We have developed an easy-to-use game organization system for the user to customize and play within. The additional chat and highlight feature also are used to enhance the experience. Although there were limitations to build a connective system to local Rec Centers, we've chosen a few local public outdoor courts to build up the experience of pick up games. – Experiment–. Ultimately Park Rec is here to connect players around the community and bring them together.

KEYWORDS

Social Network, Basketball, Matchmaking, Social Media

1. INTRODUCTION

Despite the immense popularity of basketball, particularly in major cities like Los Angeles or New York, finding fellow players to play with in British Columbia can pose a significant challenge. This difficulty stems from the sprawling suburban landscapes that dominate the B.C. Lower Mainland, making it difficult to connect with like-minded players [3]. Consequently, many of us find ourselves isolated and hesitant when attempting to approach new potential players. A noticeable barrier tends to form between players when they encounter an unfamiliar group, and one prominent factor contributing to this discomfort is sport performance anxiety [4]. When players join a new group, the fear of not performing at their best often triggers social anxiety in anticipation of meeting new people. These collective issues develop a sense of division within our community, driven by the fear and anxiety that invades our interactions. If this issue continues to persist in the community, it will only push players further away from each other. By helping those who have performance and social anxiety, it can foster and bring our basketball community tighter together [5].

All three methodologies revolve around the idea of aiding in player development for shooting skills. One approach assists users with a wristband, another immerses players in virtual reality, and the last utilizes an online program. These solutions are excellent for those new to basketball or isolated from others. However, the primary issue with all three solutions is their inability to

simulate real games and fail to develop players in actual game situations. The most effective way to develop players is through participation in physical games because training does not always translate to game. Park Rec contributes to player development by organizing pick-up games that complement their training. Additionally, basketball involves all five members of the team, and a player cannot truly reach their potential without the coordination of all five members. Real physical games are invaluable for player development, and this is why Park Rec aims to enhance this aspect within our community [6].

The proposed method for this problem is a mobile application for smart phones and smart tablets that will use social media functions to facilitate the creation of pick up basketball games [7]. Using this application, users will create an account, and will be able to set up a pick-up basketball game at a specified date in an uploaded park location. For the scope of a minimum viable product the locations will only be those around British Columbia, Canada, but in the future this can easily be expanded to include parks around other regions as well. Players can set up their matches to include a player count as well as the expected skill level of players, from a casual player to a competitive player. Other players who use the app would be able to join these matches and engage in private message discussions with other players prior to the match. Players can also send friend requests to others and post highlights from their games in a feed system not dissimilar from that of other popular social media applications, such as Instagram or TikTok [8]. Ultimately the goal of this application is to make the process of making a pick up game easy and accessible, especially for newcomers. By using many social media features such as a user-generated feed, messaging groups, and a friend system, this application aims to make basketball a more encouraging activity to partake in as well as associate physical well being and fitness with the same variety of social media applications that people tend to use.

The experiment aimed to assess user perceptions of an app's usability and effectiveness through a survey. Multiple users participated, and the primary goal was to identify patterns in their responses. Most users found the app useful and effective, but there was a notable outlier. The lowest ratings (1) in questions one and two were given by this outlier, who had a negative initial impression due to the app's physical features and couldn't understand its purpose. This highlights the importance of first impressions and clear app functionality.

In question three, users mostly emphasized "game organization" as the app's crucial feature, except for the same outlier who expressed confusion. Question four indicated that various app features were well-received, demonstrating the app's comprehensive presentation. Similar trends continued in questions six and seven.

In questions eight and nine, users reported varying ease of navigation and willingness to recommend the app. The overall survey message is that the app needs to become more user-friendly, as one user's confusion reflects a broader issue. Clearer physical features and a more apparent purpose are essential for improving user satisfaction and the app's success.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. The Implementation of the Game Creation System

One of the biggest challenges we encountered was during the implementation of the game creation system. Since it forms the foundation of this app, creating games efficiently was a top priority. However, we faced challenges when attempting to upload information about the

available courts to the app. Ideally, playing pick-up basketball games indoors is the preferred option. However, most public indoor courts are located in recreational centers to which we had no access. Our initial plan was to enable users to rent out courts for a specific time period, but this required cooperation from the recreational centers, which were operated by the city government. We decided to reach out to the city to explore the possibility of a partnership regarding basketball court access. After a series of discussions, the city couldn't provide the necessary information due to security concerns, which was understandable. While this was a significant disappointment, we ultimately shifted our focus to outdoor parks. Athletic parks, although also owned by the city, are typically open to anyone at any time. As a result, we narrowed our scope to include ten local parks in the British Columbia area [9]. In the end, this change actually worked in our favor, as traditional pick-up games are supposed to be played outdoors in parks.

2.2. Connecting Players

Another challenge faced by the application is connecting players. Initially, there were concerns about the authenticity of individual players. While we don't want to assume the worst in people, there is a high likelihood that some players may join but not participate. We needed a method to verify the legitimacy of each player. Our initial solution was to implement a point system: players would earn points for each completed game, proving their legitimacy to others. However, a potential issue rises because new players would start with no points, potentially creating an imbalance. Eventually, we landed on a game chat system that helps to prove legitimacy. For example, before each game, the host can pose a simple question in the game chat. Those who do not respond can be removed by the host, and their legitimacy can be judged based on their reactions. In addition, for this component, it is crucial to ensure that communication through the chat system is user-friendly. The app's primary aim is to keep all game-related communication within the app itself; users should not rely on external messaging services such as Messenger, Discord, or WhatsApp [14]. Consequently, we will design our chat screen with a minimalistic and user-friendly UI, making it easy to distinguish who is saying what.

2.3. Join Games that Matched

Finally, we needed a way for each player to join games that matched their age, skill level, and preferred game types (casual or competitive). Initially, determining the specifics of these customizations was challenging as we reviewed a list of potential criteria. However, deciding how to assist users in finding games that aligned with their skill level (whether they were beginners or professionals, for instance) presented a particular challenge. In response, we considered implementing a grading system for each player, one that would be established after every game based on their performance. In this system, after each game, hosts could assign grades to the players based on their judgment. However, we soon realized the potential drawbacks of such a system. Granting hosts the authority to grade players might result in undue influence in each match and the potential of biased grading. Furthermore, if hosts could grade players, many would seek to become hosts themselves, potentially flooding the system with game creations. Lastly, we aimed to provide a relaxed playing environment for our users, and the introduction of a grading system could inadvertently promote a more competitive and heated environment, which was not our intention. In the end, we settled on implementing a casual-to-competitive scale for players to choose from. Within this scale, players can determine for themselves the type of games they would like to join, as users are often better at assessing their own preferences than the app would be, resulting in a more personalized and enjoyable gaming experience.

3. SOLUTION

Upon opening the app and successfully signing up using the correct procedure, the user is greeted by the home page, also referred to as the highlight feed. Here, they are exposed to a feed of short highlight videos uploaded by other players. The user themselves can also upload videos of their games by pressing the upload button located at the center of the navigation bar; All users also have the ability to comment on these videos. On the navigation bar, there are three additional options: games, search, and profile. On the games page, users are given the ability to create games, view upcoming user-created games, or join pre-created games. When the 'create games' button is pressed, the user will be greeted with 10 parks that they can use and plan. The games that users create will appear on their 'upcoming games' page, where they can view the game details. For the hosts (users who created the games), they have the ability to edit their games by adjusting the time, the number of participants, and even delete the game itself. Furthermore, on the 'join games' page, users can explore and discover new games created by others, which they can join. On the home page, in the top right corner of the screen, you'll find the chat section, where users can select and engage in conversations. Users have the ability to add and chat with their friends (only friends) on this page. Moreover, when a user creates or joins a game, they automatically enter into a game chat. Lastly, within the navigation bar, users can access the search page. On this page, users have the option to search for other users and add them as friends. After playing games, users can connect with others and expand their social circle.

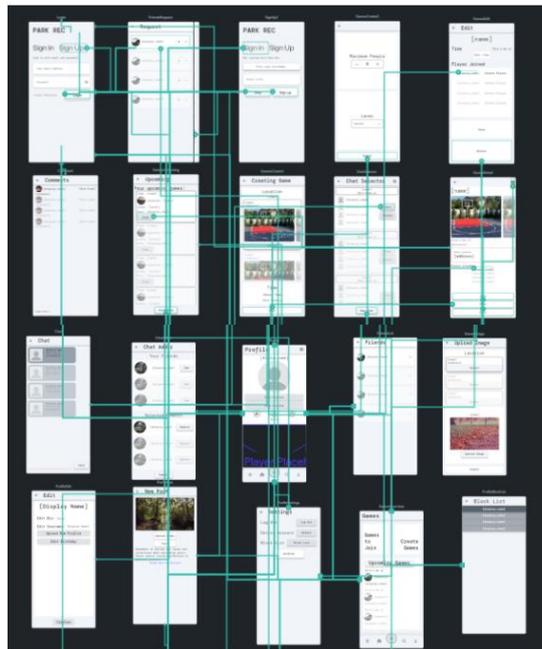


Figure 1. Overview of the solution

The primary issue that this app aims to address is the organization and creation of local pick-up basketball games. In the 'game creation' page, users can both create and edit their entries using uploaded parks through Firebase [10]. They have the ability to adjust the preferred time, maximum number of players, and the preferred style of pick-up game: whether it is casual, intermediate, or competitive. Once a game is created, it will be listed on the 'join game' page, allowing other users to join and participate.



Figure 2. Creating game

```
onPressed: () async {
  var chatRecordReference = ChatRecord.collection.doc();
  await chatRecordReference.set({
    ...createChatRecordData(
      gameChat: true,
    ),
    members: [currentUserReference],
  });
  _model.chat = ChatRecord.getDocumentFromData({
    ...createChatRecordData(
      gameChat: true,
    ),
    members: [currentUserReference],
  }, chatRecordReference);
  var gameRecordReference = GameRecord.collection.doc();
  await gameRecordReference.set({
    ...createGameRecordData(
      level: _model.level.value,
      time: widget.time,
      user: currentUserReference,
      maxplayers: _model.countController.value,
      chat: _model.chat.reference,
      description: "",
      center: widget.center,
    ),
    players: [currentUserReference],
  });
  _model.createGame = GameRecord.getDocumentFromData({
    ...createGameRecordData(
      level: _model.level.value,
      time: widget.time,
      user: currentUserReference,
      maxplayers: _model.countController.value,
      chat: _model.chat.reference,
      description: "",
      center: widget.center,
    ),
    players: [currentUserReference],
  }, gameRecordReference);
  await _model.createGame.chat!.update(createChatRecordData(
    game: _model.createGame.reference,
  ));
}
```

Figure 3. Screenshot of code 1

As mentioned earlier, on the 'create games' page, we have provided information for several local parks. Once users have made their selections, they can simply press 'submit.' The actions triggered by the 'submit' button are visible in the code above. The first action initiated when the button is pressed is the game chat. With the creation of each game, a corresponding game chat is also generated. While for users joining existing games, the game chat will include the players who were already part of that game. Next, the user enters a list of members, and the created game also incorporates any selections the users made earlier on in the 'create game' page (such as level time, max players, description, etc.). These modifications are uploaded to the Firebase server, culminating in the generation of a new game document through Firebase, which allows other users to join via the 'join games' page.

In order to help players connect with others throughout the community, the chat feature stands as a crucial component contributing to the success of Park Rec. As mentioned, upon adding other users as friends or joining a game, you'll gain the ability to connect with other players through the chat feature. Through these chats, players can discuss and plan future games or simply get to know each other better, helping to bring the community closer together.

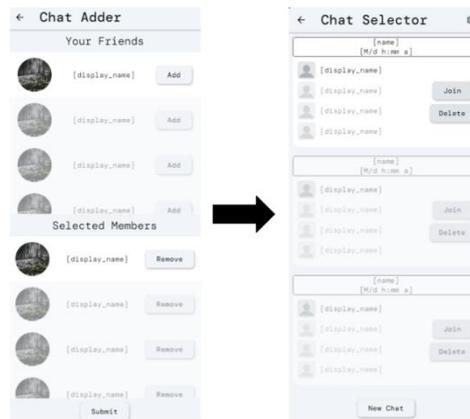


Figure 4. Chat

```

child: FlatButton(
  onPressed: () async {
    var chatRecordReference = ChatRecord.collection.doc();
    await chatRecordReference.set({
      ...createChatRecordData(
        gameChat: false,
        members: _model.groupMembers,
      )});
    _model.createdDocument = ChatRecord.getDocumentFromData({
      ...createChatRecordData(
        gameChat: false,
        members: _model.groupMembers,
      ), chatRecordReference});
    await _model.createdDocument.reference.update({
      'members': FieldValue.arrayUnion([currentUserReference]),
    });
    context.safeGet();
    setState(() {});
  },
  text: 'Submit',
  onTap: () {
    context.safeGet();
    setState(() {});
  },
  text: 'Submit',
  onTap: () {
    context.safeGet();
    setState(() {});
  },
  padding: EdgeInsetsDirectional.fromSTEB(24, 8, 24, 0),
  iconPadding: EdgeInsetsDirectional.fromSTEB(0, 0, 0, 0),
  color: FlutterInkTheme.of(context).primaryColorGroup,
  textStyle: FlutterInkTheme.of(context).titleSmallOverride(
    fontFamily: 'DM Mono',
    color: FlutterInkTheme.of(context).primaryText,
  ),
  elevation: 3,
  borderRadius: BorderRadius(
    color: Colors.transparent,
    width: 1,
  ),
  borderRadius: BorderRadius.circular(0),
),
),
),

```

Figure 5. Screenshot of code 2

After adding players in the 'your friends' section, the user gains the ability to press the 'submit' button and establish a new chat for the added players. Depending on the number of players added, the chat could either be private or a group chat: if a single player is added, then a private chat will be created; on the other hand, if multiple players are selected, a group chat will be formed. In the code above, upon pressing the 'submit' button, all the selected players are added to a member list. Subsequently, a new chat document with all of the members will be created in Firebase, enabling the members to chat and connect. Alongside the 'chat adder' page, the 'submit' button on the 'create games' page goes through a similar process when players join or create a new game. The game chat created allows users to chat and clarify information for their future game. However, these game chats become redundant once the games are over. Consequently, players who have found new connections and relationships can continue their conversations by creating their own chats.

As soon as users open the app, they are greeted with the mentioned highlight page. Here, users are presented with highlights uploaded by other players. They can interact with these highlights by leaving comments under specific posts, which are visible to the public. Users can also share highlights from their own games, helping to the exposure of players within the community.



Figure 6. New post

```

if (_model.uploadedFileUrl != null || _model.uploadedFileUrl != '')
  padding: EdgeInsetsDirectional.fromSTEB(0, 5, 0, 5),
  child: FFButtonWidget(
    onPressed: () async {
      await HighlightRecord.collection.doc().set(creatHighlightRecordData(
        video: _model.uploadedFileUrl,
        user: currentUserReference,
        time: getCurrentTimestamp,
      ));
      context.safePop();
    },
    text: 'Post',
    options: FFButtonOptions(
      width: 100,
      height: 40,
      padding: EdgeInsetsDirectional.fromSTEB(0, 0, 0, 0),
      iconPadding: EdgeInsetsDirectional.fromSTEB(0, 0, 0, 0),
      color: Colors.white,
      textStyle: FlutterFontTheme.of(context).titleSmall.override(
        fontFamily: 'DM Mono',
        color: Colors.black,
      ),
      elevation: 2,
      borderSide: BorderSide(
        color: Colors.transparent,
        width: 1,
      ),
      borderRadius: BorderRadius.circular(0),
    ),
  ),
)

```

Figure 7. Screenshot of code 3

Within the app's interface, users can access the 'upload page' by tapping the plus button located at the center of the toolbar [15]. Upon entering this page, users are presented with the option to upload videos from either their personal gallery or directly from their device's camera. After uploading, the media undergoes necessary adjustments before being uploaded under the user's account. As indicated in the code provided above, upon pressing the 'post' button, the app generates a new document within Firebase, containing the uploaded media, 'user reference,' and the upload time. Both personally uploaded media by the user and content contributed by others become visible on their individualized feed. The content displayed is custom to that specific user; One's feed is influenced by their added friends and the most recently uploaded media by other users. Finally, the highlight feed also serves as a platform for community engagement, allowing anyone to react by leaving comments beneath the shared videos.

4. EXPERIMENT

4.1. Experiment 1

The aspect of Park Rec that requires examination is user satisfaction with the app's features, navigation, and utility. We need to determine whether the app effectively addresses the problem at hand and genuinely assists the user.

Being the most important aspect of the app, Park Rec's features and functions are at the center of the experiment. In order to test out the effectiveness of the app's functionalities, we've brought in ___ local basketball players to test out the app and complete the following tasks: sign up for an account, create a game, customize your profile, upload any media, and try out the chat feature. After completing the tasks without any direction or guidance from us, the users will complete a survey regarding their experience:

- How would you rate the overall quality of the app?

The user will provide an overall impression of the app, with 1 indicating poor and 5 signifying outstanding. This response will reflect how the user might feel when approaching the app for the first time, which is extremely important, as apps rely on a strong first impression.

- How much did the app help solve your problem/achieve your goal?

As mentioned, our ultimate goal is to help players find pickup games and develop relationships. Therefore, we need to understand whether or not users genuinely feel a level of competency with Park Rec. (Scaled 1 to 5)

- Which features of the app are most important to you?
- Which features of the app do you like the most?
- Which features of the app are least important to you?
- Which features of the app do you dislike the most?

Functions are a huge part of Park Rec. There needs to be a mutual understanding between what the user wants from an app such as Park Rec. If there are features that are regarded as the most important then we will look to enhance it, while if there are any features that are deemed useless then we will look to eliminate them. In the end, it is the users that indicate whether or not Park Rec is useful. (List of features are featured)

- How easy is it to find different features?

It is important for first-time users to be able to understand the navigation and functionality of each feature without any assistance. Therefore, we aim to determine if users find Park Rec easy to use and navigate. This is the reason why we do not provide any help or guidance during the experiment. (Scaled 1 to 5)

- How likely are you to recommend this app to a friend or colleague?

To facilitate Park Rec's growth within the community, we must assess whether users are inclined to share the app with others. Given its focus on social media, we need to determine whether the app is prepared for promotion or if further development is necessary. (Scaled 1 to 5)

- Do you have any additional comments/suggestions? (Optional)

This question is used to gather further insight into the user's experience and additional comments.

How would you rate the overall quality of the app?
16 responses

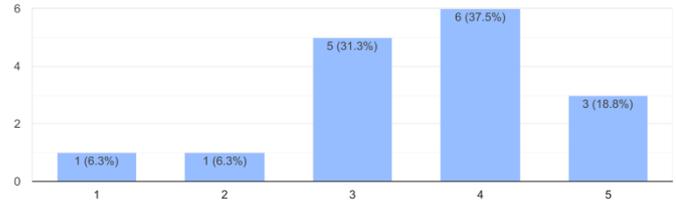


Figure 8. The overall rate

How much did the app help solve your problem/achieve your goal?
16 responses

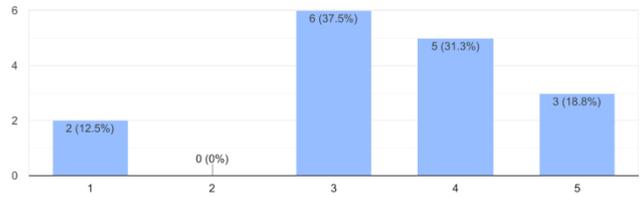


Figure 9. How much app helps

Which features of the app are most important to you?
16 responses

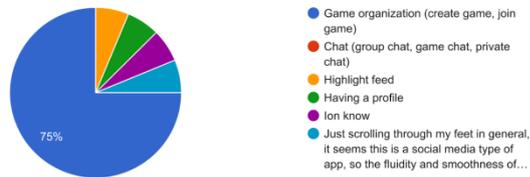


Figure 10. The most important feature

Which features of the app do you like the most?
16 responses

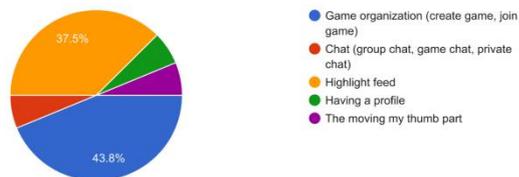


Figure 11. Favourite feature

Which features of the app are least important to you?
16 responses

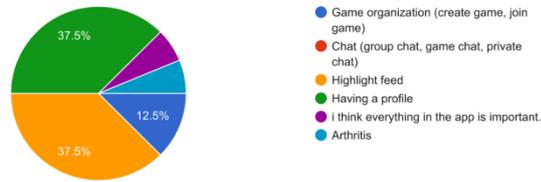


Figure 12. The least important feature

Which features of the app do you dislike the most?
16 responses

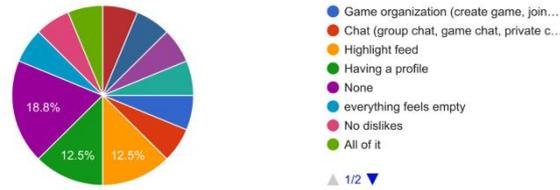


Figure 13. The most dislike feature

How easy is it to find different features?
16 responses

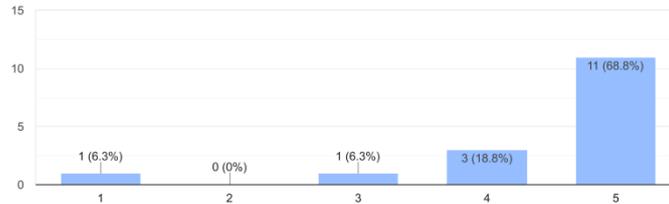


Figure 14. How easy to find different features

How likely are you to recommend this app to a friend or colleague?
16 responses

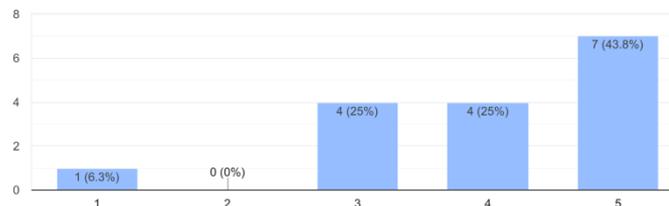


Figure 15. How likely to recommend

After combining results from multiple users, a pattern emerged as users began to answer the survey based on their judgment. While several users declared the app as useful and effective, there was an outlier that believed otherwise. In question one, the lowest rating was a 1. This indicates that the respondent had an immediate negative impression upon opening the app. After further discussion with the respondent, we noted that many of the app's physical features contributed to a lower overall quality rating. It's important to note that physical features often

form the focal point for first impressions. Similarly, in question two, the lowest rating, also a 1, came from the same respondent. When asked why they rated it so low, they mentioned that after multiple attempts to use the app, they couldn't figure out its purpose. Consequently, they gave up, which might also relate to question three. When respondents were asked about the most important feature of the app, most of them answered "game organization." However, one respondent, the same one as before, answered, "I don't know," indicating confusion and frustration. In question four, there were a variety of answers, as all available options were chosen. This can be interpreted positively because it suggests that every aspect and feature of our app successfully presented itself to the user. Furthermore, this trend continued in questions six and seven. As the survey reached its final two questions, the answers were relatively evenly distributed. In question eight, many found it relatively easy to locate a feature, while one user believed it was extremely challenging to navigate the app. Similarly, in question nine, most respondents indicated that they would recommend the app to others, but one person believed it would be a waste of time. In conclusion, the overall message conveyed by the survey is that for the app to be successful, we need to create a more user-friendly environment. If one user fails to understand the purpose of the app, it reflects a failure of the app as a whole.

5. RELATED WORK

In the paper by Adnan et al., his team was determined to help basketball players shoot better free throws, as it is one of the most important shots in the game [11]. Adnan et al. approaches this issue in a very technical and scientific perspective, by breaking the motion of the shot down into physical details. They propose wearing a wristband that would correspond to a sensor providing the force, angle, and acceleration back to the shooter to perfect the shot. Although the team provided a graph of their results, there are a few downsides in wearing such a wristband. By itself, basketball players probably wouldn't want to wear a wristband containing equipment that might hinder their shot. Additionally, wearing a heavy wristband might change and weight down the users motion which wouldn't simulate their real jumpshot and would provide false information. Still, we believe the intention by Adnan et al. is very similar to that of Park Rec: we all want to foster the sport of basketball in our community.

In the paper by Covaci et al., his team incorporates VR into helping basketball players to perfect their shooting motion [12]. They approach this issue with a more modern approach, by putting users in a simulated space and providing feedback. In addition, their solution also engages the user because of their VR approach. However, one major issue with their solution has to do with one of the important parts of basketball, the ball itself. Although Covaci et al. generated a realistic basketball with all the correct physics, it still can't live up to holding the ball in one's hand. Without a real basketball, any techniques taught would go to waste in a physical situation. However, Covaci et al. also had the right attention when it comes to supporting basketball in our community, just like Park Rec.

In the paper by Howard and Wang, they proposed a system that would help promote the sport of basketball virtually [13]. The website system helps players to acquire fundamental skills such as dribbling, shooting, passing, and defense. In order to help with progress, an admin page is established to help administrators to monitor player progress and address any inquiries they might have. Through this method, beginners would be able to engage in basketball online. Although the method is a good way to motivate beginners, this project might be useless once these players move beyond the beginner stage. This was one of the problems that we've considered when creating Park Rec: how to incorporate every level of play. To solve this issue, the game creation allows the user to choose their level of play ranging from casual to competitive. Therefore allowing anyone to use Park Rec.

6. CONCLUSIONS

One of the biggest limitations to Park Rec is its location. As mentioned previously, there were trouble finding locations for Park Rec to use. Eventually we landed in local public parks that are available for everyone. Emphasis on everyone because there can be situations where others might be using the court before our users come. In these situations conflict might arise and because it is a public court, Park Rec can't act upon dissolving the situation. This is why we've tried to contact the Rec Centers to try and establish a reservation system. In the future, we want to expand the app to greater areas outside of Surrey, British Columbia and establish reservations for indoor gyms.

Another limitation with Park Rec is its dependence on other users. As a social media-centric app Park Rec's user base needs to have consistency. Without active users, those who want to use the app will fail to find and create games. This limitation would require us to update the app frequently to satisfy the users with rewards, challenges, and such in order to retain the user base. Moving forward, Park Rec needs to reflect what the users want in order to remain a sustainable app.

As much as basketball is played in North America, British Columbia is lacking the connected basketball community. It is accomplishable using social media components that Park Rec can connect more players together. Ultimately, Park Rec's goal here is to help develop basketball in BC and provide local games for those in the community.

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