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# The Impact of Mobile Technology on the Viewing Experience of the Avid Sports Fan

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UNIVERSITY OF CONNECTICUT

Storrs, Connecticut

THE IMPACT OF MOBILE TECHNOLOGY ON THE  
VIEWING EXPERIENCE OF THE AVID SPORTS FAN

by

Kimberley Hansen

A thesis submitted in partial fulfillment  
of the requirements for the HONORS PROGRAM and the degree of  
BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION in  
MANAGEMENT INFORMATION SYSTEMS

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## **I. Abstract**

Viewing sports on television is a very different experience than viewing a game in-person. Sports commentators on television are seemingly able to pull up random statistics as soon as something unexpected happens during a game. Because these statistics are discussed on television, any sports fan who wants to watch a game in-person misses out on the opportunity to hear them during the game. This study identifies what statistics, both common and uncommon, are considered important or interesting by avid sports fans who watch a particular sport at least two times per week. In addition, it considers the rise of mobile technology and the effects that this change of trend will have on business opportunities and experiences. The purpose of the project is to find a way to mimic the television viewing experience for fans who are watching in-person through the use of mobile technology, and in particular through the use of iPhone applications.

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### III. Introduction and Background

On April 6, 2010, the University of Connecticut women's basketball team won the National Championship to become the first team in the history of college basketball to complete two back-to-back undefeated seasons. They have now won seventy-eight games in a row, second only to John Wooden's historic stretch of eighty-eight games in a row in the 1970s. With this historic stretch has come an outpouring of statistics from the television sports commentators during both in-game and out-of-game discussions.

UConn won seventy-seven games in a row with a margin of at least ten points until beating Stanford in the national championship game by only six points. The sophomores and freshman on the team have not yet lost a game during their college career, while Maya Moore and the other juniors hold a record of 114-2. Statistics such as these are not hard for the commentators to prepare before game time, but what about statistics referencing, for example, the number of free throws made in a row by a certain player or team? Sports announcers can seemingly rattle off numerous statistics even if they are atypical and not foreseen before the start of a game.

Watching an athletic event in-person is significantly different than watching on television. Besides the difference in viewing perspective and atmosphere, the statistics that one can learn by watching a game on television rather than in-person largely account for the distinction in experience. Thus, the question arose: is it possible to mimic the television viewing experience in some way for fans who desire to have access to these statistics while watching a game in-person?

With the rise of mobile technology, the possibility of mimicking aspects of the television experience is very realistic. The use of cellular telephones has risen from "roughly 35% of the total U.S. population in 2000 to an expected 90% or higher by the end of 2009."<sup>1</sup> The technology used in cellular phones has drastically changed from the time of introduction, shifting away from being used solely for

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<sup>1</sup> (Mobile Communications Services – US)

making calls to having the capability for users to send email and text messages and surf the Web. The results of a survey conducted at Ball State University show that twenty-seven percent of college students have a smart phone, compared to a national average of nineteen percent among working adults.<sup>2</sup> Thus, because the younger generations have embraced smart phone technology more so than the average adult, mobile technology will continue to gain significance as these generations grow and their spending power increases.

Mobile technology is extremely important to study in the contemporary United States and even worldwide because it presents business opportunities that differ from those that existed in the past. According to Michael Hanley, an assistant professor at Ball State, “companies wanting to peddle the latest clothing trends, newest vehicles and cutting-edge computer technology to college-age students and recent graduates have little choice but to turn to cell phones.”<sup>3</sup> As these younger generations get older, it will become increasingly apparent that companies need to work with smart phone and mobile technology so that their customers will be able to easily access their products and/or use their services.

Because the trend of increased mobile technology and smart phones will continue to rise and the technology will continue to evolve, it was possible to design a realistic solution so that avid sports fans have the ability to receive the same statistics that the announcers are saying on television by way of their mobile phone. The solution discussed in this paper involves a back-end database that works with a front-end application for a smart phone. In particular, this design focuses on an iPhone application because their growing popularity presents a multitude of opportunities for businesses to provide a variety of services to their customers.

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<sup>2</sup> (Ransford)

<sup>3</sup> *Ibid.*

## **IV. Case Study**

### **1. Identification of Problem**

The thousands of applications (apps) available for download from the iTunes music store provide a wide variety of services for the extremely unique needs of iPhone users. For sports statistics, however, the options are limited. Companies such as ESPN and Fox Sports both have created apps that provide users with the basic statistics about a wide variety of sports; however, these statistics are generally limited only to box scores. The “ESPN Scorecenter” App does provide random, usually statistical, facts as it is loading, but there is no opportunity to choose the player, team or sport to which these random statistics are related.

On the other end of the spectrum, apps such as “UConn Basketball Live” and “Hoops (Connecticut)” limit their services to the coverage of solely the UConn Men’s Basketball Team. Although these applications allow for a more individualized experience, the statistics are still the typical box score statistics rather than the more random statistics that may be announced by sports commentators during a game on television. In addition, they do not cater to users who may be fans of multiple teams or sports.

In order to mimic the viewing experience of television while watching a game in-person, a new App would need to be created with this particular goal in mind. Because the statistics mentioned on television are not always traditional, the application does not fit into the aforementioned apps that already exist in the App Store.

### **2. Purpose of Study**

The Management Information Systems major is based on the idea that technology can be used to provide solutions to a wide variety of business problems. Thus, the purpose of this study was to



identify the implications of the rise in mobile technology and the opportunities that accompany these shifts in trend. In particular, the goal was to identify what statistics avid sports fans find to be most interesting and based on these results, to identify how practical and beneficial it would be to design a mobile application that would allow for the simulation of watching a television broadcast while attending a sporting event in-person. The idea for this study arose from the observation that sports broadcasters are able to report statistics that are seemingly random that they most likely could not have prepared before the beginning of the event.

### **3. Definitions and Assumptions**

A few definitions and assumptions are important to understanding the results and design of this project. First, the audience for the application is assumed to be avid sports fans who continually want to expand their knowledge of players, teams and sports. In the data collection process, an avid sports fan was determined to be someone who watches a particular sport at least two or three times per week. In addition, they should be able to read a box score and know what the abbreviations for these basic statistics (such as PTS, REB, and TO) are.

Second, the design for this application is based on the features of Apple's iPhone. Although mobile technology is much broader than just this one type of phone, the focus of this study is on the iPhone in particular because of the wide recognition and popularity of the iPhone applications as a way of addressing specific business problems or providing specific services.

## **V. Data Collection**

### **1. Collection of Data**

In order to collect data, two surveys were conducted. The first survey was an anonymous, closed-ended survey of one hundred people, essentially used as an initial screening process to identify which sports could be used as a focus of this project, as well as to identify which traditional statistics people found most interesting.

Following the first survey, the project was narrowed to the sport of basketball, based on its relative popularity in the first survey. With this change of focus, a second survey with voluntary identification was conducted. This survey was much smaller, limited to thirty people who identified themselves as avid sports fans and reported watching a particular sport at least two or three times per week during the season.

The second survey went more in-depth with open-ended questions, asking participants to describe their statistical interests, both basic and otherwise, while watching sporting events. In addition to questions that determined the amount of sports watched by each respondent, the questions were asked in the following order:

- What kind of basic team statistics do you find interesting to know when watching a basketball game?
- What kind of basic individual statistics do you find interesting to know when watching a basketball game?
- Are there any statistics that you feel should be mentioned more often during a basketball game? (These can be either common or uncommon)

- How interested are you in statistics about things such as streaks (of wins or of free throws made in a row, for example) and records (such as all-time career points leaders)? What streaks/records are you most interested in?

## 2. Findings

The first survey identified the number of people who could be considered “avid sports fans” for the purpose of this project. Out of the one hundred respondents, thirty reported watching sports a few times per week, while twenty-seven reported watching every day. Together, these parties make up fifty-seven percent of all participants, showing that this application could potentially have a widespread impact. It is possible, however, that this number is too high based on the fact that because the subject of the study was known in advance, respondents may have been more inclined to participate in the study if they were already sports fans than if they had no previous interest in sports.

The second survey provided more insight into the variety of interests of different sports fans. The respondents agreed most on their answer to the question about whether or not they enjoyed hearing about streaks. Of the thirty participants, twenty-eight enjoyed hearing about team streaks or records, such as number of wins in a row. Sixteen people also specifically mentioned individual streaks or records, such as number of free throws made in a row. One anonymous respondent stated,

“I think streaks of anything, good or bad, show consistency, which is a rarity in sports because so much can happen, especially in the collegiate level with continuous turnover as players graduate...Records are also an indicator of consistency, and it is also one of the few ways it can objectively differentiate top players from different eras. I think that both streaks and records are extremely enlightening to reveal the type of player or team that set the streak or record.”

Because so many people agreed on their interest in streaks and records, it was made a priority to incorporate this aspect of the game into the design of the database and mobile application.

In addition to identifying common statistics as being important, such as points and rebounds, the survey participants identified a large number of less common statistics that they would be interested in hearing about. Although some of these can be identified and reported based on basic statistical evidence, some of them would certainly require a more advanced interface and data entry process in order for an application to be effective. Among the less common statistics reported were:

- Second-chance opportunities
- Points in the paint
- Previous match-up statistics
- In-conference vs. out-of conference records
- Records vs. ranked and unranked teams
- Home record vs. away record
- Player point average in previous five games
- Where on the court shots are made/missed
- First half vs. second half points
- Average points per game in wins vs. losses
- Rating Percentage Index (RPI)
- Strength of schedule
- Opponent field-goal percentage
- Average time per possession
- High school statistics vs. college statistics

The variety present in these aforementioned statistics shows the differences in interests that can be present even among fans who are watching the same game. Because of these differences, it is important to create an application that includes a wide variety of data so as to address the needs of the various parts of every fan base.

## VI. Implementation and Design

### 1. Product Definition Statement

According to Apple's development guidelines, it is essential to create a product definition statement before beginning to design an iPhone application. A product definition statement is "a concise declaration of your application's main purpose and its intended audience."<sup>4</sup>The statement should outline known information about the application's users, as well as address exactly what the application intends to accomplish with its existence.

The original intention for this application was to create an App that provided random statistics for any desired sporting event. Although this would definitely be possible, for the sake of this project, the scope was narrowed so that it focuses only on women's college basketball. The reason for choosing this sport was because of the current record-setting streak of the UConn Women's Basketball Team. This streak makes the desired features of the application very relevant and easy to understand.

In order to create a product definition statement, the detailed user information and intended uses need to be outlined. This application is intended for use by avid sports fans that understand the basic statistical abbreviations for the sport of basketball and watch the sport at least two or three times per week. These fans may be a variety of ages, but should all be familiar with the iPhone user interface, off of which the features of this application will be based. In addition, according to Apple, all iPhone users have some common characteristics that need to be addressed. First, iPhone users are mobile and want to see useful content immediately upon open applications. Finally, they need to be able to successfully use an application with only a few taps. The application will feature a simple user interface that provides users with real-time information and statistics about the game that they are watching. In particular, the goal of the application is to provide the more uncommon statistics that are not readily available when looking at a box score during or after a game.

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<sup>4</sup> (iPhone Human Interface Guidelines)

Based on this information, an appropriate product definition statement for this application is “A statistically-based sports application for avid sports fans that desire to increase their understanding of the game through both common and uncommon statistics.”

## **2. Database Design for Sports Statistics**

### **A. Introduction**

In order to be able to readily view sports statistics, it is necessary to have access to a database in which all of the relevant data is stored. Storing statistical information in a database makes retrieval very easy and methodical through the use of queries. The database created for this project stores statistical information about women’s college basketball and queries and forms are used to display this data in a more visually-pleasing way.

This database contains some sample data, all of which is accurate. The information stored in the tables, however, is limited, thus meaning that the queries and forms only fully function for certain records. If this database and iPhone application were to be put into full use, it would require a much larger set of data than could be feasibly collected by a single person. Because of this, there are limitations on what this database can actually accomplish. Nonetheless, the ultimate goal was not to create a fully functional database for all of women’s college basketball. Instead, it was to come to an understanding of how the sports announcers are able to report the uncommon statistics and to create a design that could potentially be expanded so that it would be fully functional.

### **B. Design Specifications: Tables**

This database stores information in five tables: Game, IndividualStats, Play, Player, and Team. The Game table stores specific information about every division-1 women’s college basketball game that is played. Table 1 shows the information and specifications for this table.

Table 1: Design specifications for Game table in the sports statistics database

Field	Caption	Data Type	Field Size	Comments
GameID	Game ID	AutoNumber	Long Integer	Game's automatically assigned unique ID number
Season	Season	Text	10	The two year span of a women's basketball season, for example: "2009-2010"
GameDate	Game Date	Text	25	The date that the game is played; Short Date input mask, for example "9/27/2009"
GameTime	Game Time	Text	25	The time that the game is played; Long Time input mask, for example "07:00:00 PM"
TeamID	Team ID	Number	Long Integer	The unique ID of the team from which is primary in the user's viewing perspective
TeamRank	Team Rank	Number	Long Integer	The team's ranking at game time based on the ESPN/USA Today Coaches Poll
OpponentID	Opponent ID	Number	Long Integer	The unique ID of the team from which is secondary in the user's viewing perspective
OpponentRank	Opponent Rank	Number	Long Integer	The team's ranking at game time based on the ESPN/USA Today Coaches Poll
OpponentGameID	Opponent Game ID	Number	Long Integer	The unique ID of the same game for viewers with reversed primary and secondary viewing perspective
Win	Win?	Yes/No		Did the primary team win the game?
Arena	Arena	Text	100	The name of the arena at which the game was played
GameCity	City	Text	100	The name of the city in which the game was played
GameState	State	Text	2	The abbreviation for the state in which the game was played
ConferenceGame	In-Conference?	Yes/No		Was the game a conference game?
Site	Site	Text	255	Was the game played at Home, Away, or a Neutral site?
TV	On TV?	Text	20	If the game was shown on TV, what channel is it on?
GameNotes	Game Type	Text	100	Any additional notes about the game,

				for example, if the game is exhibition or a tournament game.
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The Game table is important because it allows the display of basic information about every game that occurs. The information in this table is used in queries that return some of the less-common statistical information in which the survey respondents were interested. For example, this table allows the operation of queries that return in-conference schedules in comparison to out-of-conference schedules, home record versus away record, and record against ranked or unranked teams.

The IndividualStats table stores information about a player's performance in a specific game.

Table 2 shows the information and specifications for this table.

**Table 2: Design specifications for IndividualStats table in the sports statistics database**

Field	Caption	Data Type	Field Size	Comments
PlayerID	Player ID	Number	Long Integer	The unique ID that identifies the player whose statistics are being recorded
GameID	Game ID	Number	Long Integer	The unique ID that identifies the game for which the statistics are being recorded
Starter	Starter?	Yes/No		Did the player start the game?
MIN	MIN	Number	Long Integer	Number of minutes played
FGM	FGM	Number	Long Integer	Number of field goals made
FGA	FGA	Number	Long Integer	Number of field goals attempted
3PM	3PM	Number	Long Integer	Number of three pointers made
3PA	3PA	Number	Long Integer	Number of three pointers attempted
FTM	FTM	Number	Long Integer	Number of free throws made
FTA	FTA	Number	Long Integer	Number of free throws attempted
OREB	OREB	Number	Long Integer	Number of offensive rebounds
REB	REB	Number	Long Integer	Number of total rebounds
AST	AST	Number	Long Integer	Number of total rebounds
STL	STL	Number	Long Integer	Number of total steals
BLK	BLK	Number	Long Integer	Number of total blocks
TO	TO	Number	Long Integer	Number of total turnovers
PF	PF	Number	Long Integer	Number of personal fouls
PTS	PTS	Number	Long Integer	Number of total points



The IndividualStats table provides the most common statistical data that is reported about a basketball game. The statistics in this table are generally considered to be the most useful statistics because they give a very good idea about a player's or team's single game performance. This information can be used in addition to compile streak information. For example, one of the survey respondents stated that it was desirable to know a player's averages for the previous five games. This information can be compiled using a query based on this table.

The Play table stores information about specific plays that occur during a game. Table 3 shows the information and specifications for this table.

**Table 3: Design specifications for Play table in the sports statistics database**

Field	Caption	Data Type	Field Size	Comments
PlayID	Play ID	AutoNumber	Long Integer	Play's automatically assigned unique ID number
GameID	Game ID	Number	Long Integer	The unique ID that identifies a specific game in which the play occurred
TimeLeft	Time Remaining	Text	10	The amount of time remaining in the game when the play occurred; Short Time input mask, for example: "19:02"
PlayerID	Player ID	Number	Long Integer	The unique ID that identifies the player who was involved in the play
Category	Category	Text	255	A lookup field for the category into which the play falls. The choices are: "Field Goal", "Three Pointer", "Free Throw", "Rebounds", "Assists", "Steals", "Blocks", "Fouls", "Turnovers"
CategorySpecifics	Category Specifics	Text	255	A lookup field for more detailed information about the categories. The choices are: "Made (PTS)", "Missed (PTS)", "Offensive (REB)", "Defensive (REB)"
TeamScore	Team Score	Number	Long Integer	The primary team's score at the time of the play
OpponentScore	Opponent Score	Number	Long Integer	The secondary team's score at the time of the play

The Play table provides information that allows for the return of individual players' statistical streaks because the information shows every play that occurs during a game so that it is possible to track the order in which events occurred, such as when points were scored or when rebounds were grabbed. This table and queries are hard to create with the sample data because much more data would be required in order for the returned information to be realistic.

The Player table contains basic personal information about every player on a team. Table 4 shows the information and specifications for this table.

**Table 4: Design specifications for the Player table in the sports statistics database**

Field	Caption	Data Type	Field Size	Comments
PlayerID	Player ID	AutoNumber	Long Integer	Play's automatically assigned unique ID number
TeamID	Team ID	Number	Long Integer	The unique ID that identifies which team a player is on
PlayerName	Name	Text	255	The player's first and last name
Number	Number	Number	Long Integer	The player's number
Position	Position	Text	5	The player's abbreviate position: C (center), F (forward), or G (guard)
Class	Class	Text	10	The player's class/year: FR (freshman), SO (sophomore), JR (junior), SR (senior), and/or RS (redshirt)
Hometown	Hometown	Text	100	The player's hometown
HomeState	Home State	Text	2	The player's abbreviated home state
Height	Height	Text	6	The player's height, for example 6'1"
HighSchool	High School	Text	100	The player's high school
Birthday	Birthday	Text	25	The player's date of birth; Short Date input mask, for example: "9/27/1989"
Major	Major	Text	255	The player's major(s)

The Player table is important for identification of which players are involved in the uncommon statistics that are being reported. This table isn't used to create any statistics, but is used in many queries because the statistics involve specific players.

The Team table stores basic information about all of the women's college basketball teams.

Table 5 shows the information and specifications for this table.

**Table 5: Design specifications for Team table in the sports statistics database**

Field	Caption	Data Type	Field Size	Comments
TeamID	Team ID	Autonumber	Long Integer	Team's automatically assigned unique ID number
UniversityName	University/College Name	Text	255	The name of the university or college with which a team is associated
Mascot	Mascot	Text	100	The mascot associated with the team
LocationCity	City	Text	100	The city in which the university is located
LocationState	State	Text	2	The abbreviation of the state in which the university is located
Conference	Conference	Text	100	The conference that the team is a part of

As was the case with the Player table, the information stored in this table is not used to return any specific statistics. It is, however, used in many queries so that the information that is returned makes sense and is identifiable.

### **C. Design Specifications: Queries**

The queries that can be run in this database are essential to achieving the goal of mimicking the experience of watching a basketball game on television. They allow for the manipulation of the data to return the desired results that would provide users with the common and uncommon statistical information about the game in which they are interested.

Although many more queries could potentially be created, there are nine that have been created in the sports statistics database to give an idea of what type of information can be returned and calculated. Most of these queries function as opposites, for example, one query returns the in-conference schedule while a different query returns the out-of-conference schedule. Table 6 shows the information that is returned by each of the queries in the database.

Table 6: Specifications for all queries in the sports statistics database

Query Name	Fields Returned	Run Specifications
Opponent Box Score	<p><b>From GAME table:</b> GameID</p> <p><b>From INDIVIDUAL STATS table:</b> Starter, Min, FGM, FGA, 3PM, 3PA, FTM, FTA, REB, AST, STL, BLK, TO, PF, PTS, PlayerID, GameID</p> <p><b>From PLAYER table:</b> PlayerName</p> <p><b>Calculations:</b> FG PCT, 3PT PCT, FT PCT</p>	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> <li>Query is run when the Box Score form is opened</li> </ul>
Player Avg Last 5 Games	<p><b>From GAME table:</b> OpponentID, GameDate</p> <p><b>From INDIVIDUALSTATS table:</b> PlayerID, Starter, Min, FGM, FGA, 3PM, 3PA, FTM, FTA, REB, AST, STL, BLK, TO, PF, PTS</p>	<ul style="list-style-type: none"> <li>Requires Player Info form to be open</li> </ul>
Team Away Schedule	<p><b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, Win, Arena, GameCity, GameState, ConferenceGame, Site ("Away"), TV, GameNotes</p>	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>
Team Box Score	<p><b>From GAME table:</b> GameID</p> <p><b>From INDIVIDUAL STATS table:</b> Starter, Min, FGM, FGA, 3PM, 3PA, FTM, FTA, REB, AST, STL, BLK, TO, PF, PTS, PlayerID, GameID</p> <p><b>From PLAYER table:</b> PlayerName</p> <p><b>Calculations:</b> FG PCT, 3PT PCT, FT PCT</p>	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> <li>Query is run when the Box Score form is opened</li> </ul>
Team Home Schedule	<p><b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, Win, Arena, GameCity, GameState, ConferenceGame, Site</p>	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>

	("Home"), TV, GameNotes	
Team In Conference Schedule	<b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, Win, Arena, GameCity, GameState, ConferenceGame ("Yes"), Site, TV, GameNotes	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>
Team Out of Conference Schedule	<b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, Win, Arena, GameCity, GameState, ConferenceGame ("No"), Site, TV, GameNotes	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>
Team Schedule vs. Ranked	<b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, OpponentRank ("Is Not Null"), Win, Arena, GameCity, GameState, ConferenceGame, Site, TV, GameNotes	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>
Team Schedule vs. Unranked	<b>From GAME table:</b> GameID, Season, GameDate, GameTime, TeamID, OpponentID, OpponentRank ("Is Null"), Win, Arena, GameCity, GameState, ConferenceGame, Site, TV, GameNotes	<ul style="list-style-type: none"> <li>Requires GameDetails form to be open</li> </ul>

Most of these queries are designed to be run while a form is open so that the query can pull information about a specific player or team that is being viewed by the user. For example, when a user is viewing information about a specific player, the Player Avg Last 5 Games query can be run and it will provide the information for the player's past five games and in addition with calculate the average of these numbers.

Noticeably missing from these queries is any query that pulls data to show player or team streaks. The database does contain queries that can show streaks with wins and losses, but because of the nature of the project, it is impossible to enter in enough data that such a situation could be modeled. If there were to be a query, however, it would pull information from the player table (such as

the player's name) as well as from the Play table. Theoretically, it could display information about number of rebounds, number of points, or the overall score of the game.

#### D. Design Specifications: Forms

Another important aspect of the database is forms. Two main forms have been created in this database, off of which other forms and queries can be run. The first form, Game Details, displays information about every game that is stored in the database. The user can pick a game and detailed information will be showed in the top pane of the window about that game. The Game Details form is displayed in Figure 1.

The screenshot shows the 'Game Details' form. The top section displays the selected game: University of Connecticut vs. College of Saint Rose. Below this, there are fields for Team Rank (1), Win? (checked), Opponent Rank, Game Date (11/05/2009), Arena (Gampel Pavilion), Game Time (07:30:00 PM), City (Storrs), State (CT), In-conference? (unchecked), Site (Home), On TV? (unchecked), and Game Type (Exhibition). A 'View Box Score' button is located to the right of the Opponent Rank field.

The bottom section is a table listing all games in the database. The table has columns for Game Date, Game Time, Team Name, Opponent Name, Win?, Arena, City, State, In, Site, On TV?, and Game Type. The first row is highlighted, corresponding to the game shown in the top section.

Game Date	Game Time	Team Name	Opponent Name	Win?	Arena	City	State	In	Site	On TV?	Game Type
11/05/2009	07:30:00 PM	University of Connecticut	College of Saint Rose	1	Gampel Pavilion	Storrs	CT		Home		Exhibition
11/09/2009	07:00:00 PM	University of Connecticut	Vanguard University	1	XL Center	Hartford	CT		Home		Exhibition
11/14/2009	02:00:00 PM	University of Connecticut	Northeastern University	1	Gampel Pavilion	Storrs	CT		Home		CPTV
11/17/2009	09:30:00 PM	University of Connecticut	University of Texas	13	AT&T Center	San Antonio	TX		Away		ESPN2
11/20/2009	07:00:00 PM	University of Connecticut	College of the Holy Cross	1	DCU Center	Worcester	MA		Away		CPTV
11/27/2009	07:00:00 PM	University of Connecticut	Hofstra University	1	Gampel Pavilion	Storrs	CT		Home		CPTV
11/28/2009	07:30:00 PM	University of Connecticut	University of Richmond	1	Gampel Pavilion	Storrs	CT		Home		CPTV
11/29/2009	07:00:00 PM	University of Connecticut	University of Clemson	1	Gampel Pavilion	Storrs	CT		Home		CPTV
12/03/2009	07:00:00 PM	University of Connecticut	University of Vermont	1	Gampel Pavilion	Storrs	CT		Home		CPTV
12/10/2009	07:00:00 PM	University of Connecticut	University of Hartford	1	XL Center	Hartford	CT		Home		CPTV
12/20/2009	06:00:00 PM	University of Connecticut	Iona College	1	Gampel Pavilion	Storrs	CT		Home		CPTV
12/23/2009	05:30:00 PM	University of Connecticut	Stanford University	2	XL Center	Hartford	CT		Home		ESPN2
12/28/2009	07:00:00 PM	University of Connecticut	Florida State University	11	Tucker Center	Tallahassee	FL		Away		CPTV
01/02/2010	02:00:00 PM	University of Connecticut	Seton Hall University	1	Prudential Center	Newark	NJ		Away		CPTV
01/04/2010	07:00:00 PM	University of Connecticut	University of South Florida	1	XL Center	Hartford	CT		Home		CPTV
01/07/2010	07:30:00 PM	University of Connecticut	University of Cincinnati	1	Gampel Pavilion	Storrs	CT		Home		CPTV

Figure 1: Game Details form

From the Game Details form, a user can click to view the Box Score from the selected game. When this button is clicked, a new form, Box Score, is opened and displayed, showing information about the game that the user has selected. Figure 2 is a display of the Box Score form that is accessed directly via the Game Details form. The Box Score form shows the basic, common statistical data that is reported both during and after a game.

Box Score

University of Connecticut vs. University of Notre Dame

Name	Starter?	Min	FGM	FGA	FG PCT	3PM	3PA	3PT PCT	FTM	FTA	FT PCT	REB	AST	STL	BLK	TO	PF	PTS
Caroline Doty	<input checked="" type="checkbox"/>	33	3	9	33.33	1	7	14.29	0	0		4	1	1	0	2	0	7
Heather Buck	<input type="checkbox"/>	1	0	0		0	0		0	0		0	0	0	0	0	0	0
Jacque Fernandez	<input type="checkbox"/>	2	0	0		0	0		0	0		0	0	0	0	0	0	0
Kaili McLaren	<input type="checkbox"/>	10	2	4	50	0	0		0	0		4	1	0	0	0	2	4
Kalana Greene	<input checked="" type="checkbox"/>	31	5	11	45.45	0	0		3	4	75	4	2	3	1	1	3	13
Kelly Faris	<input type="checkbox"/>	9	0	0		0	0		0	0		0	0	0	0	2	1	0
Lorin Dixon	<input type="checkbox"/>	17	0	1	0	0	1	0	3	4	75	5	3	2	1	2	0	3
Maya Moore	<input checked="" type="checkbox"/>	31	8	18	44.44	1	7	14.29	3	4	75	11	3	0	2	5	1	20
Meghan Gardler	<input type="checkbox"/>	3	0	1	0	0	1	0	0	0		1	0	0	0	0	0	0
Tiffany Hayes	<input checked="" type="checkbox"/>	30	0	4	0	0	2	0	0	0		2	8	3	2	2	2	0
Tina Charles	<input checked="" type="checkbox"/>	33	9	12	75	0	0		5	5	100	13	1	0	1	4	3	23
TOTALS	<input type="checkbox"/>	200	27	60	45	2	18	11.11	14	17	82.35	45	19	9	7	18	12	70

Record: 14 - 1 of 12

No Filter

Search

Name	Starter?	MIN	FGM	FGA	FG PCT	3PM	3PA	3PT PCT	FTM	FTA	FT PCT	REB	AST	STL	BLK	TO	PF	PTS
Ashley Barlow	<input checked="" type="checkbox"/>	30	4	13	30.77	1	6	16.67	1	2	50	6	0	2	0	3	2	10
Becca Bruszewski	<input checked="" type="checkbox"/>	18	1	7	14.29	0	3	0	2	2	100	1	0	3	0	0	3	4
Brittany Mallory	<input type="checkbox"/>	19	0	6	0	0	3	0	3	4	75	1	1	1	0	1	3	3
Devereaux Peters	<input type="checkbox"/>	21	6	11	54.55	0	0		0	2	0	8	0	2	0	1	3	12
Erica Williamson	<input type="checkbox"/>	14	1	3	33.33	0	0		1	2	50	3	0	0	1	2	2	3
Kaila Turner	<input type="checkbox"/>	2	1	1	100	0	0		0	0		1	0	0	0	0	0	2
Lindsay Shrader	<input checked="" type="checkbox"/>	27	3	9	33.33	0	0		0	0		1	2	0	0	3	2	6
Melissa Lechlitner	<input checked="" type="checkbox"/>	25	0	3	0	0	0		0	0		1	1	0	0	4	1	0
Natalie Novosel	<input type="checkbox"/>	10	0	1	0	0	0		0	0		1	1	0	0	1	0	0
Skylar Diggins	<input checked="" type="checkbox"/>	34	2	13	15.38	2	7	28.57	0	0		1	2	5	0	4	2	6
TOTALS	<input type="checkbox"/>	200	18	67	26.87	3	19	15.79	7	12	58.33	32	7	13	1	19	18	46

Record: 14 - 1 of 28

No Filter

Search

Num Lock

Figure 2: Box Score form

The second main form available in the sports statistics database is the Team Info form. This simple form provides basic information about a team, including college or university association and mascot. In addition, by clicking the Roster button on the Team Info form, the Player Info form can be accessed. The Player Info form displays a team's roster and by clicking on a single player, their record is selected and more details can be viewed. Screenshots of these tables can be viewed in Figures 3 and 4, respectively.

Team Information	
University/College Name:	University of Connecticut
Mascot:	Huskies
City:	Storrs
State:	CT
Conference:	Big East
<input type="button" value="View Roster"/>	

Figure 3: Team Information form

**Player Info**

Name: Maya Moore Number: 23

Position: F Class: JR Height: 6-0

Hometown: Lawrenceville Home State: GA

High School: Collins Hill

Birthday: 06/11/1989

Major: Individualized

View Past 5 Games

Opponent Name	Game Date	Starter?	MIN	FGM	FGA	3PM	3PA	FTM	FTA	OREB
University of Notre Dame	01/16/2010	<input checked="" type="checkbox"/>	31	8	18	1	7	3	4	5
Georgetown University	02/27/2010	<input type="checkbox"/>	31	4	12	0	4	2	2	2
University of Notre Dame	03/01/2010	<input checked="" type="checkbox"/>	33	6	13	1	5	4	5	1
Syracuse University	03/07/2010	<input checked="" type="checkbox"/>	25	8	16	0	3	0	0	3
University of Notre Dame	03/08/2010	<input checked="" type="checkbox"/>	38	4	13	3	10	0	0	2
West Virginia University	03/09/2010	<input checked="" type="checkbox"/>	29	4	17	0	3	2	2	4

PlayerID	Team ID	Name	Number	Position	Class	Hometown	Home State	Height	High School	Birthday	Major
1	1	Heather Buck	21	C/F	RS FR	Stonington	CT	6-3	Stonington	08/21/1990	Exploratory
2	1	Tina Charles	31	C	SR	Jamaica	NY	6-4	Christ the King	08/05/1988	Psychology
3	1	Lorin Dixon	30	G	JR	Springfield Gar	NY	5-4	Christ the King	03/29/1989	Psychology
4	1	Caroline Doty	5	G	SO	Doylestown	PA	5-10	Germantown A	08/15/1989	Pre-Kinesiology
5	1	Kelly Faris	34	G	FR	Plainfield	IN	5-11	Heritage Christ	01/16/1991	Exploratory
6	1	Jacque Fernandes	13	G	SR	Pawcatuck	CT	5-9	Stonington	10/08/1988	Individualized
7	1	Meghan Gardler	22	F	SR	Springfield	PA	6-0	Cardinal O'Hara	04/11/1988	English
8	1	Kalana Greene	32	G	SR	Saint Stephen	SC	5-10	Timberland	07/13/1987	Urban Studies
9	1	Tiffany Hayes	3	G	SO	Lakeland	FL	5-10	Winter Haven	09/20/1989	Pre-Individualized
10	1	Kailli McLaren	41	F	SR	Washington	DC	6-2	Our Lady of Go	05/12/1988	Individualized
11	1	Maya Moore	23	F	JR	Lawrenceville	GA	6-0	Collins Hill	06/11/1989	Individualized
25	1	TOTALS									
(New)											

Figure 4: Player Info form with Individual Stats subform

In addition to viewing the basic player profile information, the Player Info form also allows for viewing of career statistical information. The subform, Individual Stats, shows the basic box score information for every game that a player has played in her career. It is also possible to view average statistical information from a player's last five games by clicking the appropriate button on the Player Info form.

## E. Design Specifications: Relationships

The relationships in the sports statistics database that was created for this project are all one-to-many relationships. Listed below is a list of relationships between tables in the sports statistics database. Figure 5 shows the Access version of an Entity-Relationship Diagram for this database.

- TEAM to GAME:** Every team must play one or many games, but each game can only have one "team" (there are two instances of this table, so technically each game has exactly two teams, but one is listed as the "team" and one is listed as the "opponent").



- **TEAM\_1 to GAME:** Every team must play one or many games, but each game can only have one “opponent” (or team\_1).
- **TEAM to PLAYER:** Every team must have one or multiple players, but a player can only have one team.
- **PLAYER to INDIVIDUAL STATS:** Every player can have one or multiple sets of individual statistics, but each set of individual statistics is only related to one specific player.
- **GAME to INDIVIDUAL STATS:** Every game can have multiple sets of individual statistics, but each set of individual statistics can only be related to one game.
- **GAME to PLAY:** Every game can have multiple plays, but a play can only occur in one game.

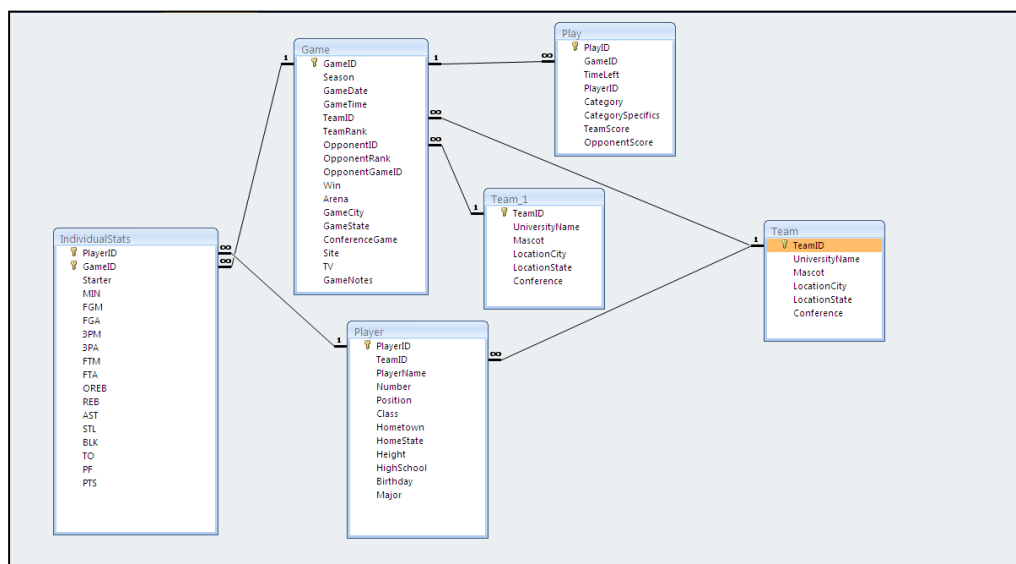


Figure 5: Microsoft Access Entity-Relationship Diagram for the sports statistics database

## F. Feasibility and Limitations

The sports statistics database in its current form has a couple of limitations. First, the database cannot produce real-time statistics because in order to do so, the information would have to be entered into the database in real-time, and it is not realistic to expect that one person could accomplish this task

alone. Even if the database were limited solely to one team, all of the archived data that would need to be entered into the system in order for it to function correctly would take a very long time to process.

Second, because the database does not have a full set of data, and instead contains only sample data, many of the queries and calculations that can be run are meaningless. If, for example, the entirety of a basketball program's archives were inputted into the system, queries could be run that would find the all-time school records based on this information. If data were entered that covered the whole spectrum of NCAA basketball teams, it would allow for cross-team comparisons as well.

In order to feasibly function, the database would need to be kept up with data entry by numerous people, especially during the season when multiple games are occurring simultaneously. At major news stations, there are numerous people solely responsible for entering data into the system. It is not feasible to imagine that one person could accomplish the same thing alone. In addition, the data from the past would need to be entered so that all of the records and information would be stored in the same place so that queries could be run on data from multiple seasons as well as multiple teams and players.

## **G. Application to Case**

The problem outlined in this case study is that of mimicking the television viewing experience of a sports event while watching the game in person. At this stage of the project, a solution has not yet been accomplished. This database does, however, serve as an integral part of a mobile application because without it, or a database similar in structure, it would be impossible to provide mobile users with data. This sports statistics database will serve as a back end, and will work along with the mobile iPhone app to accomplish this goal.

## **H. Alternate Solution**

There are multiple ways that the storage of the statistical data could have been organized. The way that it is currently organized focuses on the idea that the data itself can be queried in order to find out a variety of statistics that are relevant to the game, but are more uncommon than the normally-reported box scores. Another possible approach that could have been taken to store this data would be to have data entry specialists follow specific streaks and record them as they happen. Although this data would provide the same information to the user, it would mean that the people doing data entry would have to do the analysis themselves. This alternate approach is likely not as strong as the approach that is taken in the current database design because if the streaks were being counted by data entry specialists there would be more room for human error, whereas a computer could make the same calculations to a much more accurate degree.

## **3. Sports Statistics and Mobile Technology**

### **A. Background of iPhone Applications**

Since the release of the original iPhone in the summer of 2007, iPhone Apps have become a way for companies to reach their customer base to provide new services. With the upgrade to the iPhone 3G in the summer of 2008 and to the iPhone 3GS in the summer of 2009, application developers have increasingly been able to provide useful services as more features, such as video, have become available to iPhone users.

The type of application intended for design in this project is called a native application. “Unlike a web application, which runs in Safari, a native application runs directly as a standalone executable on an iPhone OS-based device.” Native applications are able to access all of iPhone’s features and can save

data to the local file system, as well as communicate with other applications that a user may have downloaded.<sup>5</sup>

Like programs created for Mac OSX, iPhone Apps are created using the Cocoa application environment. Cocoa is compatible with several programming languages, but the essential language is Objective-C. The environment contains many ready-to-use user-interface objects to make creating applications fairly simple.<sup>6</sup>

On the Apple Developer website, three application styles are defined to be used as guidelines when creating an App. The first style is a productivity application, which “enables tasks that are based on the organization and manipulation of detailed information.” The data in these applications is usually ordered hierarchically so that users can input increasing amounts of detail in order to get the information that they want. These applications generally use multiple view, with one level of the hierarchy displayed per view. The second application style that is defined is called a utility application. These applications provide services that require minimum input from the user. Utility applications are more attractive visually than are productivity applications, but in such a way that they do not take away from the displayed information. The data stored in this type of application is typically stored in a sequential format that does not have a hierarchical structure. The third style is called an immersive application, which offers a full screen experience that is extremely visually pleasing, such as playing a game or watching a video. These applications typically hide much of the iPhone’s user interface so as to “[strengthen] the user’s sense of entering the world of the application.”<sup>7</sup>

Of the three application styles outlined by the Apple Developer website, the most fitting design for the sports statistics application is the hierarchical productivity application. Within the application,

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<sup>5</sup> (Introduction)

<sup>6</sup> (What is Cocoa?)

<sup>7</sup> (iPhone Human Interface Guidelines)

this will allow users to pick an increasingly specific team, player, or game on which they would like to receive real-time information and statistics.

## B. iPhone Application Structure and Interface Design

Because of the hierarchical nature of the sports statistical application, the productivity design makes most sense because it allows users to choose increasingly specific information to indicate their preferences for the application. Apple recommends that minimal input should be required from the user, so the structure of the application is set up in such a way that users just need to make choices, rather than type anything into a search.<sup>8</sup> Figure 6 shows the structure of the screen sequence in the iPhone application.

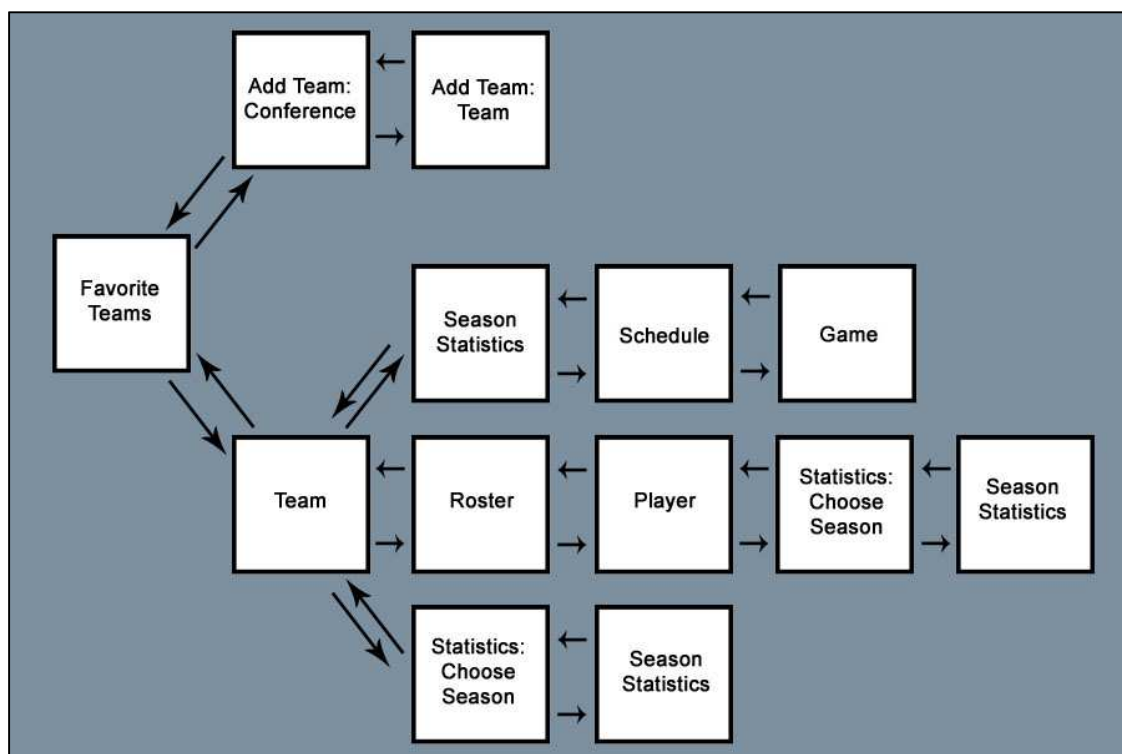


Figure 6: iPhone App screen sequence

<sup>8</sup> (iPhone Human Interface Guidelines)

The screen sequence allows progression through the screens both forward and backward and asks for more information as a user gets further into the sequence.

In addition to ensuring that the order of the screens makes sense, another important part of the application structure is the support of gestures. The iPhone works using a touch screen, and Apple requires that the typical gestures are supported. This means that certain functions need to be universal on the iPhone and that every application must work with them. For example, if a user swipes the phone with a finger, the screen should scroll up or down so that the user can see another part of the screen.

The unique interface of the iPhone makes it necessary for certain guidelines to be followed. The screen is 480 by 320 pixels, so the screen should only display the information that is absolutely necessary for the application to function and the information that is displayed needs to be displayed concisely. In addition, Apple recommends that the targets are finger-sized because it makes the application easier to use.<sup>9</sup>

When the application is first loaded, the screen that is displayed is similar to the actual application interface, but without any information on the screen. This screen is shown in Figure 7. When loaded, the first screen that is displayed is the “Favorite Teams” screen. This screen is shown in Figure 8.

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<sup>9</sup> (iPhone Human Interface Guidelines)



Figure 7: iPhone App load screen



Figure 8: iPhone App home screen

From the Favorite Teams home screen, a user can choose either to add a new favorite team or to view more specific information about a team that they've already chosen as a favorite. If the user chooses to add a favorite team, they are first presented with a screen that allows them to choose a conference. This screen is shown in Figure 9. From there, they are presented with a screen that shows all of the teams in that particular conference that they chose. They can then choose a team and it is added to the Favorite Teams screen. This screen is shown in Figure 10.



Figure 9: iPhone App add team (conference) screen



Figure 10: iPhone App add team screen

Once the user has added a favorite team, they can choose that team and they will be directed to a Team screen that shows more detailed information about that team.

The team screen provides three options for users to choose from: View Schedule, View Roster, and View Team Statistics. This screen is shown in Figure 11. If the user selects the option to view the schedule, they are taken to a screen that shows all of the seasons on record for that team and they select the season for which they want to view the schedule. This screen is shown in Figure 12. After choosing a season, they are taken to another screen that shows the games that are available for that season. This screen is shown in Figure 13. From the season schedule, the user can choose a specific game and they are taken to a screen that shows more detailed information. This screen is shown in Figure 14.



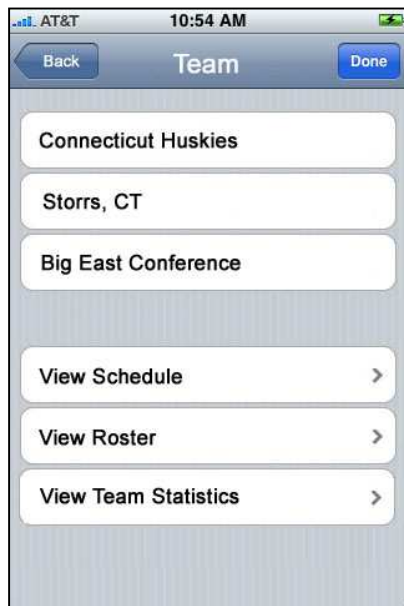


Figure 11: iPhone App team screen



Figure 12: iPhone App season screen



Figure 13: iPhone App schedule screen



Figure 14: iPhone App game screen

Also from the team screen, the user can choose to view the roster for that team. When they choose this option, they are taken to a screen that shows all of the players on the team in which they are interested. This screen is shown in Figure 15. From the roster screen, the user can choose a player for which they want to view more information. This screen is shown in Figure 16.



Figure 15: iPhone App roster screen

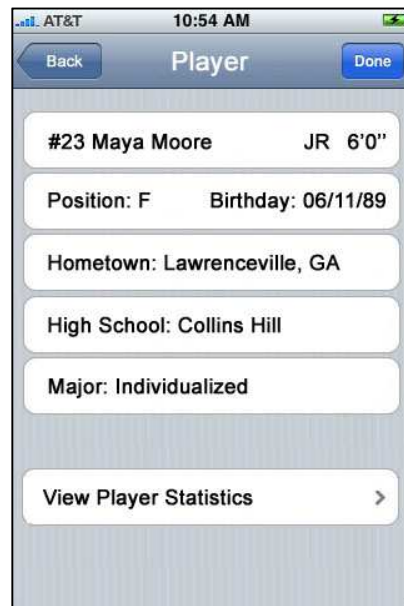


Figure 16: iPhone App player screen

From the player screen, the user has the option to view player statistics. If this option is chosen, the user is taken to a screen that allows the user to choose a season. This screen is shown in Figure 17. From there, the user is taken to the screen that shows that player's season statistics, including both common and uncommon statistics that a user desires to know. This screen is shown in Figure 18.



Figure 17: iPhone App season choice screen

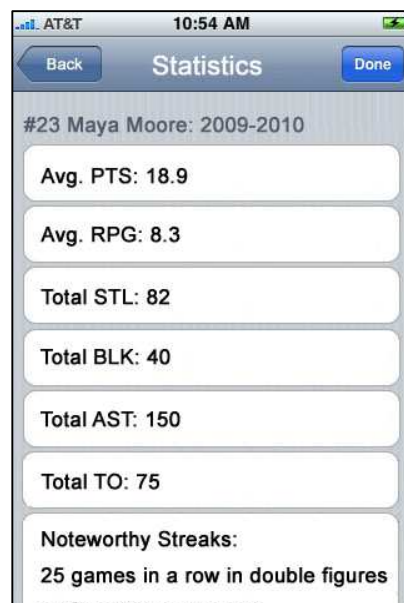


Figure 18: iPhone App statistics screen

Also from the team screen, a user can choose to view team statistics. In order to do so, the user is brought to a screen that allows them to choose the season for which they are viewing the team statistics. This screen is shown in Figure 19. After choosing a season, they are brought to a screen that displays the season statistics. This screen is shown in Figure 20.



Figure 19: iPhone App choose season screen



Figure 20: iPhone App season statistics

Also present on the team screen is an option to remove from the team from favorites. This option would be near the bottom of the screen however, and is not shown in any of the figures.

The structure of this application is designed to be easy for the user to interact with and understand. The main way that this is done is by eliminating text input. In addition, the interface is simple and incorporates finger-sized buttons so that the user does not struggle when trying to choose an option. All of the information in this application can be drawn from the back-end database created earlier in the project. If actually created, this application would allow for a user to watch a game in-person and still have a similar experience to that of a television viewing audience. This application allows users to access both common and uncommon statistical information about teams and individual players.

### **C. iPhone Application Feasibility and Limitations**

In order to function as an iPhone application, the database would need to be accessible from users' phones, and the data would thus need to be stored on a server that was accessible from the Internet. It would require a large amount of storage space because of the large number of records that would need to be stored in every table. Even just with the one sport of women's basketball, there would be millions of records if information was stored for every season.

In addition, as discussed previously, it would be very hard to upkeep the database because of the required manpower for statistical data entry. Because the data would need to be entered in real-time, there would need to be enough data entry specialists to cover every game that was being played. These specialists would need to input and upload this data quickly so that users could refresh their screens and see the data almost instantaneously.

Because of these limitations, the database and iPhone App in their current form are not feasible designs to actually create for the use of multiple users. If these problems were addressed, however, the database and iPhone application are designed so that they provide the function of mimicking a television viewing experience.

## VII. Conclusion

The purpose of this study was to come to an understanding of how the television sports announcers are able to report seemingly random statistics so quickly when unexpected events may occur during a game. In addition, the goal was to create a way for mobile users to have access to the same information when watching a game in-person. Through the use of this back-end database and front-end iPhone application, this experience can be mimicked so as to allow users to gain knowledge about the same information. The ability of users to access this information is extremely useful because this information is often desired when watching a game, whether in-person or on television.

Although this study was focused only on women's basketball, this application could be created for numerous sports. By creating an additional home screen that allowed for choice of sport, the same format could be added and followed so as to expand the App and make it more applicable to the interests a variety of avid sports fans. Statistics are recorded in every sport and users with television-experience-like access will be able to watch any game in-person without losing out on the potential opportunity for increasing their sports knowledge.

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## **IX. Acknowledgements**

Writing my Honors Thesis has been a challenging, yet extremely interesting, experience. Though the hours of work were long, being able to put my love for and knowledge of both technology and sports into a single project was very exciting and enjoyable. Applying technology to any business idea or business problem is an exciting process and the problem-solving experience that is involved was a great learning experience. This opportunity has helped me grow academically and personally, but I would not have been able to do it on my own. I would thus like to take this opportunity to thank those who have helped me along the way.

First I would like to thank my family for helping me get through my years at the University of Connecticut. I looked to them for support many times, especially when I first arrived at the University that was so unfamiliar and far from my Minnesota home. I would also like to thank both my academic and thesis advisors, Dr. Jan Stallaert and Dr. Ramesh Sankaranarayanan for their support of me throughout this project. Both acted as guides, whether it was making sure I was on schedule to complete the project in time or to challenge my ideas and provide me with support when necessary so that I could come up with the best possible solution to the problem that was being studied.

Working on this project has provided me with another opportunity to learn and grow academically and personally. I have been able to develop time-management and problem-solving skills, and also have gotten some idea of what applying technology to a real-life business problem can entail. Recently I had the opportunity to travel to San Antonio, Texas to watch the women play in the Final Four and the National Championship games. While at that game, a woman behind me commented on the real-time statistics provided on the scoreboard, saying that she really liked being able to see the statistics in real-time. This statement just made me smile because I realized that the problem that I was addressing really was something that people would potentially be interested in as a way to enhance their viewing experiences of any sporting competition.