MICHIGAN STATE UNIVERSITY

09/09: Risks and Prototypes

The Capstone Experience

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Department of Computer Science and Engineering
Michigan State University

Fall 2019

From Students…
…to Professionals

Risks and Prototypes

- Risks

- Prototypes

Identifying Risks

- What You Don't
  - Know
  - Understand
  - Know How to Do
- Normally
  - Major Project Features
  - "Showstoppers"
- Varies From
  - Not Familiar With But (Probably) Can Learn to
  - Absolutely No Idea How to Do It

What are you worried about?

What should you be worried about?

Example Risks

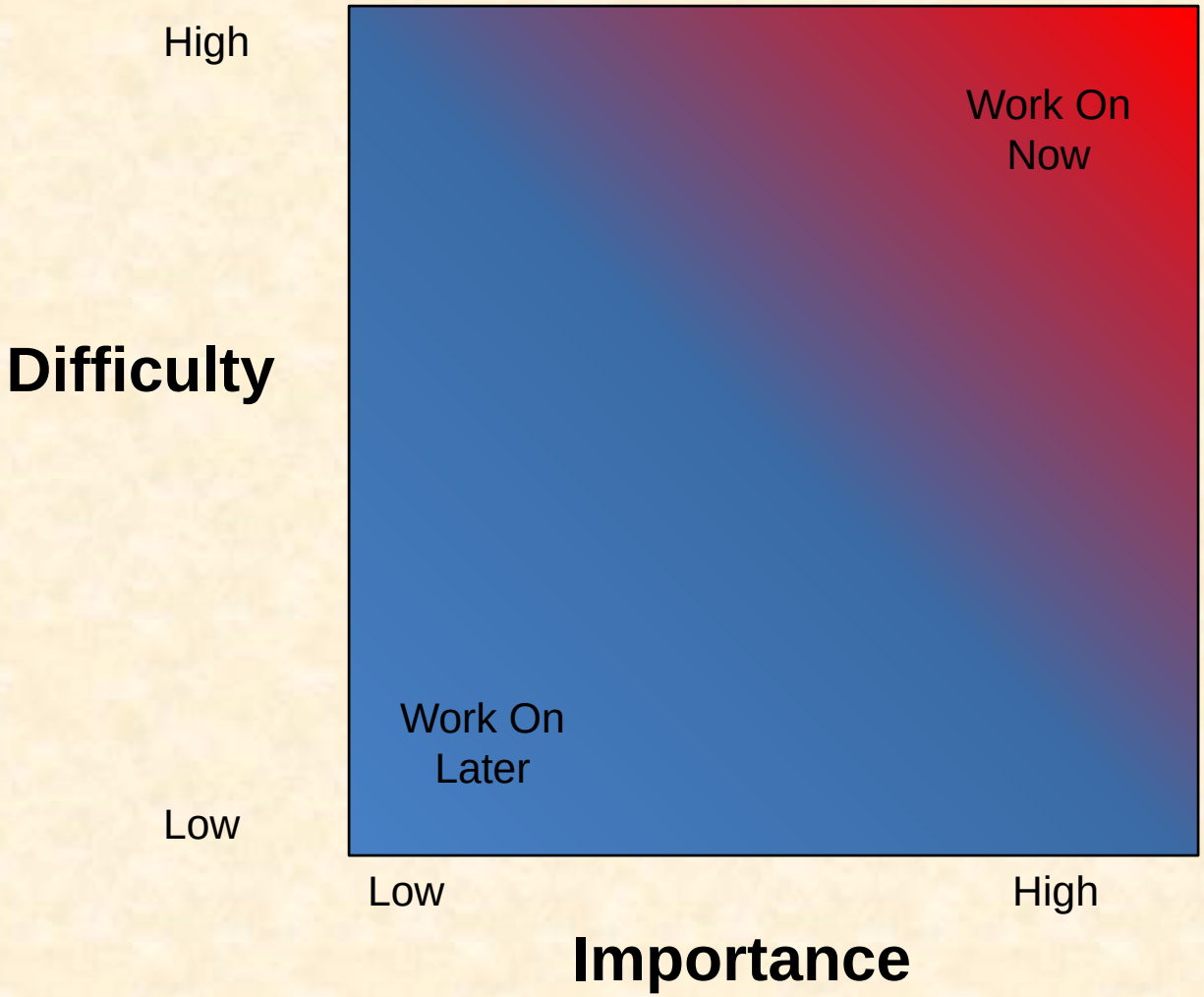
Including but not limited to...

- Business Processes
- Key Application Features
- Hardware Systems
- Software Systems
- Development / Programming Environments
- Programming Languages
- Etc...

Prioritizing Risks

- Classify Difficulty
  - High — Very Hard, No Idea How to Do
  - Medium
  - Low — Not Hard, Probably Doable
- Classify Importance
  - High — Showstopper, Must Have
  - Medium
  - Low — Not Vital, Nice to Have

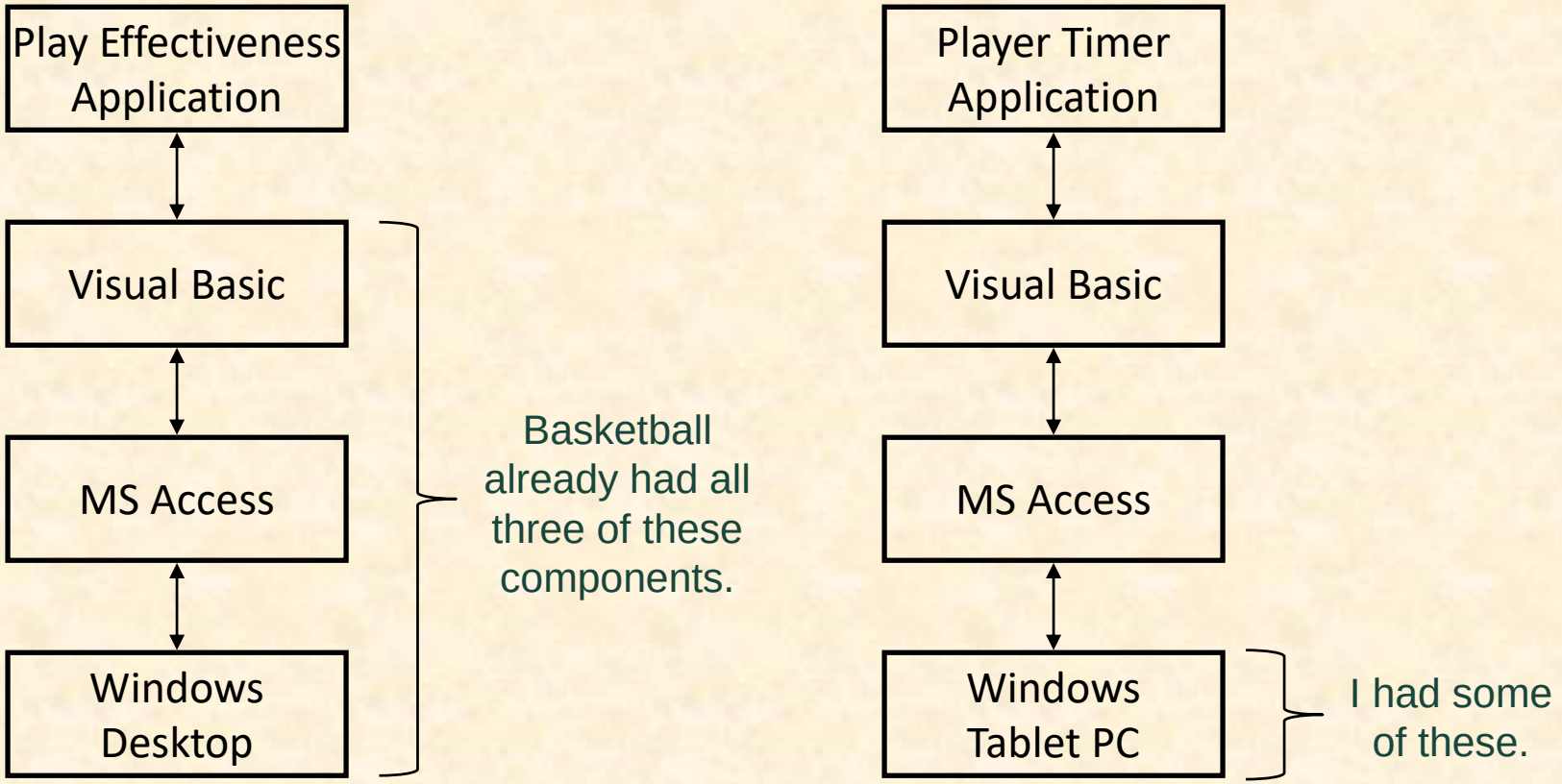
Prioritizing Risks



Case Studies: Basketball Apps

- Play Effectiveness
  - Determine Effectiveness of Plays
  - Record All Plays with Results
  - Produce Reports of Effectiveness
- Player Timer
  - Keep Track of Player Times
  - Record Minutes Played and Rested
  - Use On the Bench, During the Game

Basketball Apps Architectures



Basketball Apps Risks

- What SDK should I use?
- Can I write this in Visual Basic?
- How do I make a GUI in VB?
- How do I interface VB with Access?
  - Create/Open/Save a Database?
  - Read/Write Records?
  - Traverse Records?
- How do I implement clocks in Windows?
  - Game Clock?
  - Wall Clock?
- How do I generate a report from Access?

Mitigating Risks

- Use Existing Resources
  - Including But Not Limited To
    - Faculty
    - Other Students
    - Product Demos
    - Book Sample Code
    - Downloadable Examples
    - Wizards
    - Etc...
  - Test Drive
    - Install
    - Compile
    - Extend
    - Etc...
- Build Prototypes
  - Single Purpose
  - Quick-and-Dirty

Nota Bene:

1. Check license if including in project.
2. Document.
3. Inform client.

Basketball Apps Risk Mitigation

- Game Clock
  - Start /Stop
  - Counts Down
  - By Minutes:Seconds
- Handling Access Records
  - Write Number
  - Read Number
  - Add Up Numbers

Risks and Prototypes

✓Risks

➢Prototypes

Prototypes

- Developed
  - Early
  - Rapidly
- Implement Subset of the Requirements
- Done for Variety of Reasons
- Are Not Finished Goods
- “Hacking” (Good Sense)

Why? Answer Questions

Help Determine…

- Specifications
  - Functional
  - Design
  - Technical
- Usability
- How Existing Code Works
- Programming Languages
- Development Environments
- Operating Environments
- Etc…

Why? Determine Schedule

Determine how long it will take to…

- …learn the new programming language.
- …learn the development environment.
- …learn the existing code.
- …convert the existing code.
- …convert the existing database.
- …get libraries working.
- …deploy the application onto an iOS device.
- …Etc….

Why? Identify Risks

- Operability
  - How do we make a game clock?
  - Where do we store the data?
- Interoperability
  - How does the game clock work with other tablets?
  - How do the tablets all write to the same database?
- Scalability
  - Will the game clock propagate in real time?
  - Will the database engine keep up?
- Reliability
  - What happens if the clock tablet dies?
  - What happens if the database tablet dies?
- Etc-Ability…

Speed (to Write)

- Critical
- 2-3 Day Tasks
- Use Whatever Works
  - RAD Languages
  - SDK's
  - IDE's
  - Design Tools
  - Wizards
  - Sample Code
  - Etc…
- Stop When Questions Answered

Tradeoffs: Speed (to Write) vs…

- Speed vs Best Practices
  - Testing
  - Documentation
  - Security
  - Software Engineering
  - Usability
  - Performance
  - Coding Standards
  - User Interface Standards
  - Using Real Data
  - Etc…
- Hence, May Not Be Appropriate in Final Deliverable

Challenge/Danger

- "Hack" Solution
  - It works.
  - It's *__a__* way to do something.

vs

- "Correct" Solution
  - It works.
  - It's the *"__right__"* way to do something.
    (There may be more than one "right" way to do something.)

Often My Biggest Frustration

Basketball Prototypes Case Studies

- Play Effectiveness
- Player Timer
- Radio Stats
- Real Time Play Stats
- Plus/Minus

Play Effectiveness App

- Functional Specifications
  - Determine Effectiveness of Plays
  - Record All Plays with Results
  - Produce Reports of Effectiveness
    - Each Play
    - # of Successes / # of Attempts
- Design Specifications?
- Technical Specifications?

Initial Meeting with Video Coordinator

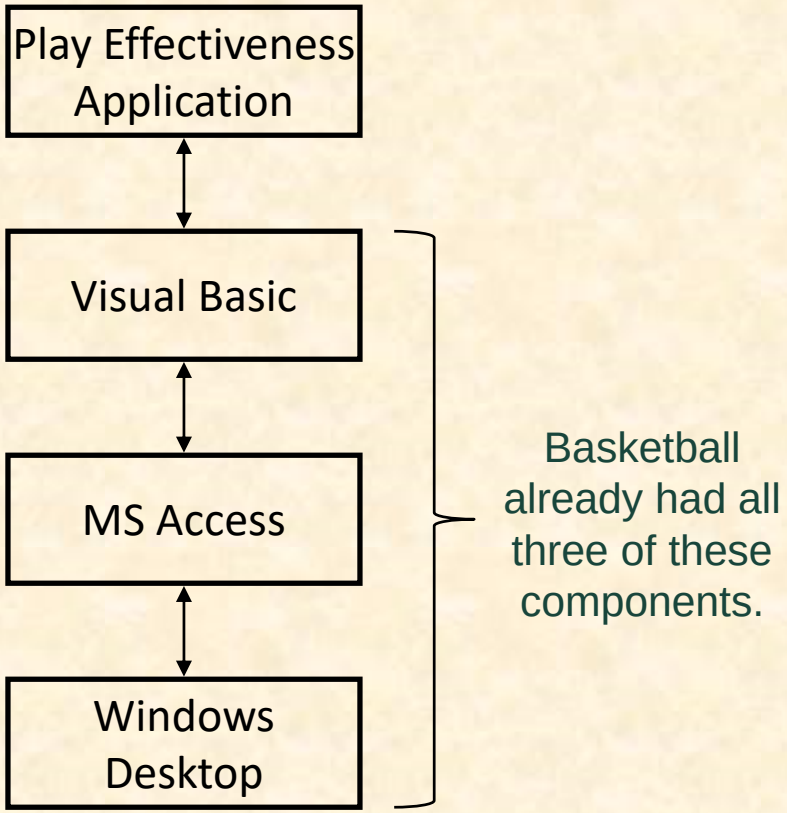
I Learned…

- Done After Game
  - On Desktop Computer
  - From DVR-Like App
- Lots of Plays (~ 200) in Play Book
- ~20-40 Plays Run Per Game
- Plays Categorized
  - Early Offense 1,2 (i.e., Fast Breaks)
  - Offense 1,2 (i.e., Half Court Plays)
  - Special Situations 1,2 (i.e., Out of Bounds)
- Overwhelming

Can you relate?

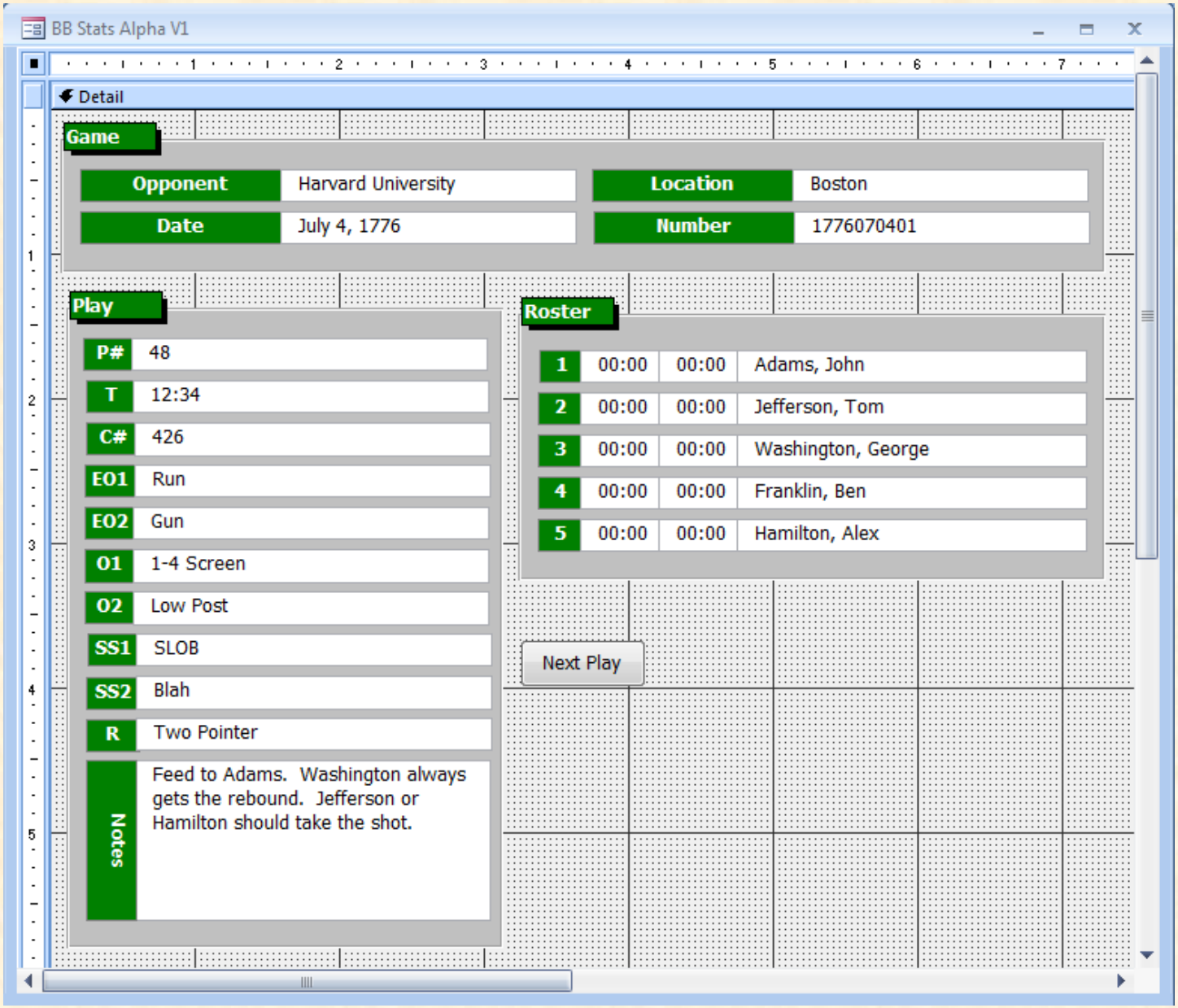
The Business Processes

Play Effectiveness Architecture



Risks

- Learning Basketball Business Processes
- Programming in Visual Basic
  - Can this be done in VB?
  - ! Can I learn VB?
- Making a GUI in VB
- Interfacing VB with Access
  - Creating/Opening/Saving a Database
  - Reading/Writing Records
  - Traversing Records
- Generating Reports in Access
- Etc…



BB PE PV1

(Prototype Version 1)

Fields

- P# Play Number
- T Time
- C# Clip Number
- EO Early Offense
- O Offense
- SS Special Situations
- R Result

Nota Bene

- Just Screen Layout
- No Code (Underneath)
- Never Have All Entries Filled at Once

What I Learned From PV1

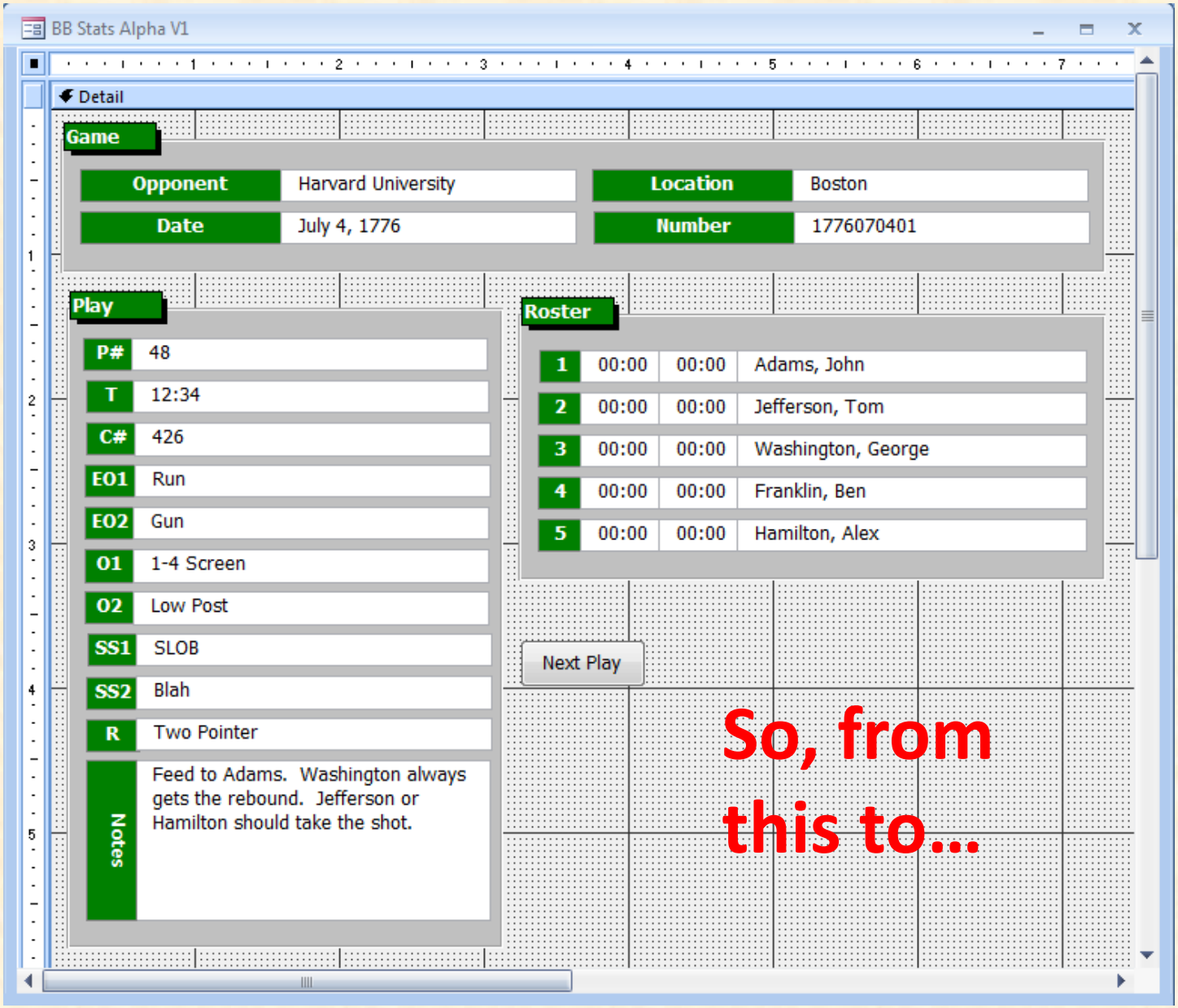
[1 of 2]

- Wanted to Identify Plays Within a Possession
- Plays Categorized Series / Set
  - Set is Variation on Series (“Parameterized Plays”)
  - E.g.
    - Series: Thumbs
    - Sets: Up, Down, Circle
    - Plays: Thumbs Up, Thumbs Down, Thumbs Circle
  - 1, 2 Notation
    - EO1 = Early Offense Series
    - EO2 = Early Offense Set
  - ST (Special Teams) Missing

Huge Impact On Design

What I Learned From PV1 [2 of 2]

- Results Coded
  - X*N* Missed *N* Pointer (X1, X2, X3)
  - O*N* Made *N* Pointer (O1, O2, O3)
  - FF Foul on the Floor
  - TO Time Out
  - Etc…
- Wanted to Record Notes on Defense
- Didn’t Care About
  - Player Times
  - Video Clip Number (C#)



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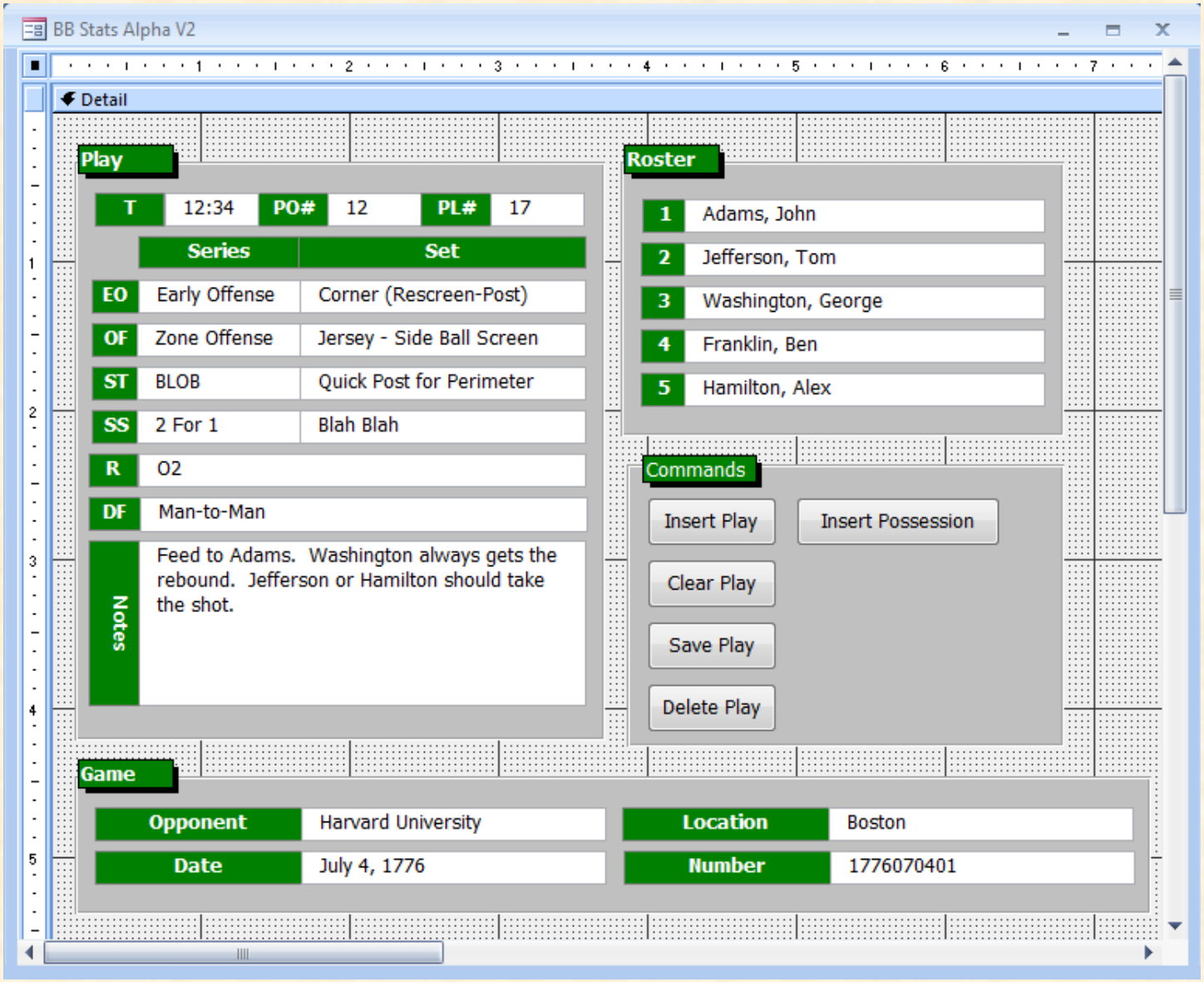


BB PE PV2

Fields

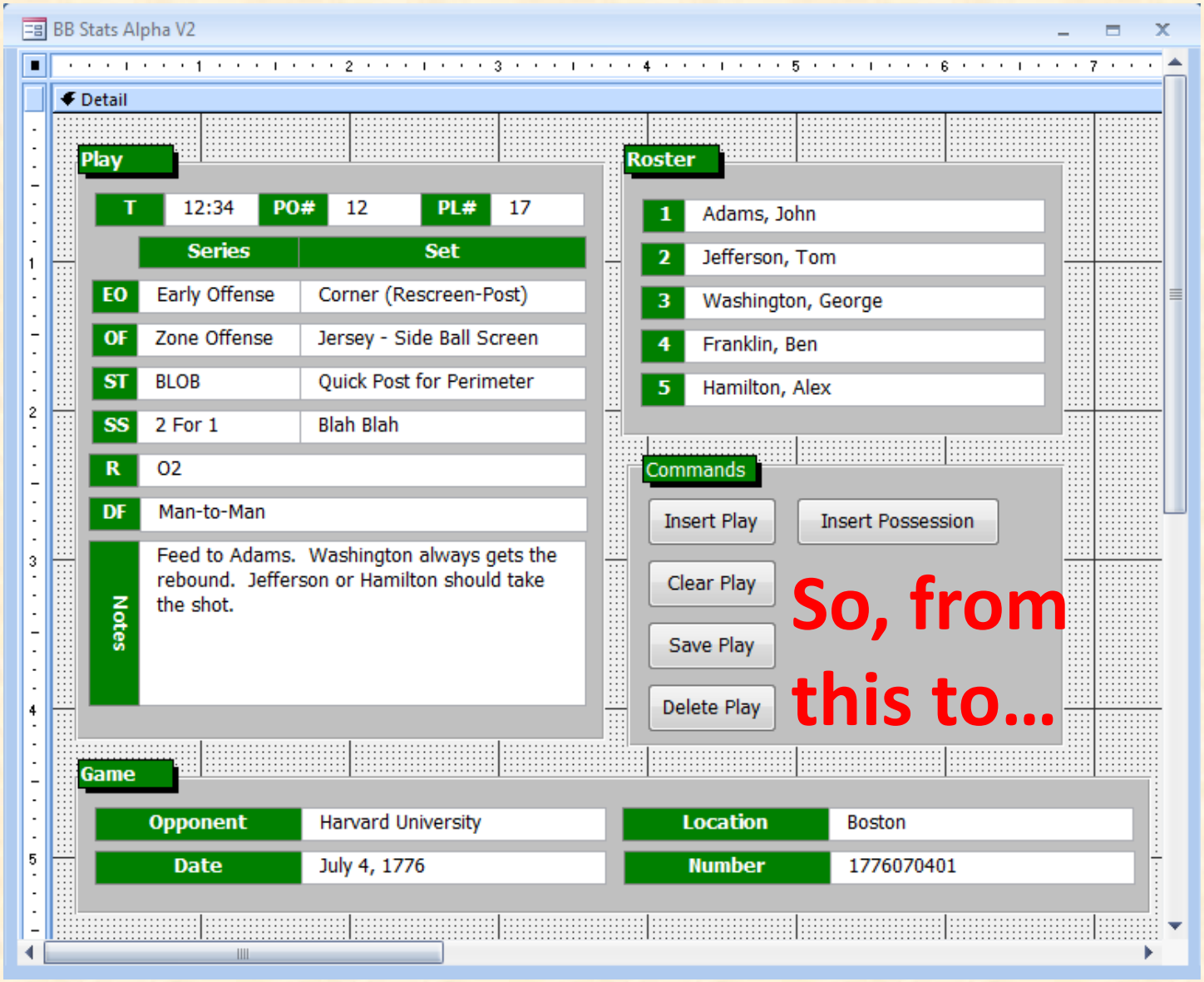
- PO#
  Possession Number
- PL#
  Play Number
- SS
  Special Situations
- DF
  Defense

Nota Bene

- Just Screen Layout
- No Code (Underneath)
- Would **NOT** Have Entries in All Fields

What I Learned From PV2

- Wanted to Grade Effectiveness of Plays
- Wanted to Record Player Steals and Assists (Remember this…)
- Needed to Navigate Plays and Possessions
- Wanted to See Running Total Score



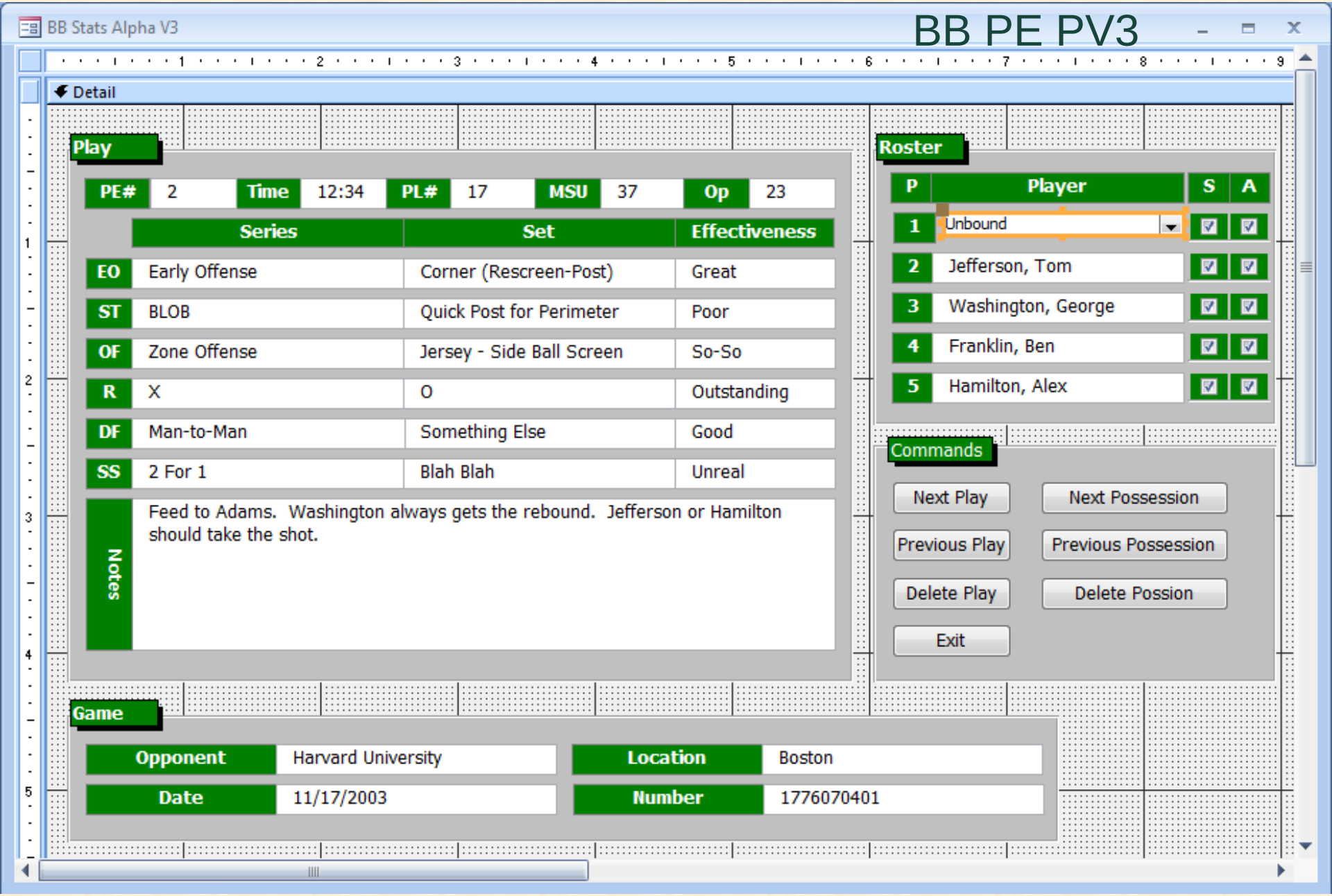
BB PE PV2

Fields

- PO#
  Possession Number
- PL#
  Play Number
- SS
  Special Situations
- DF
  Defense

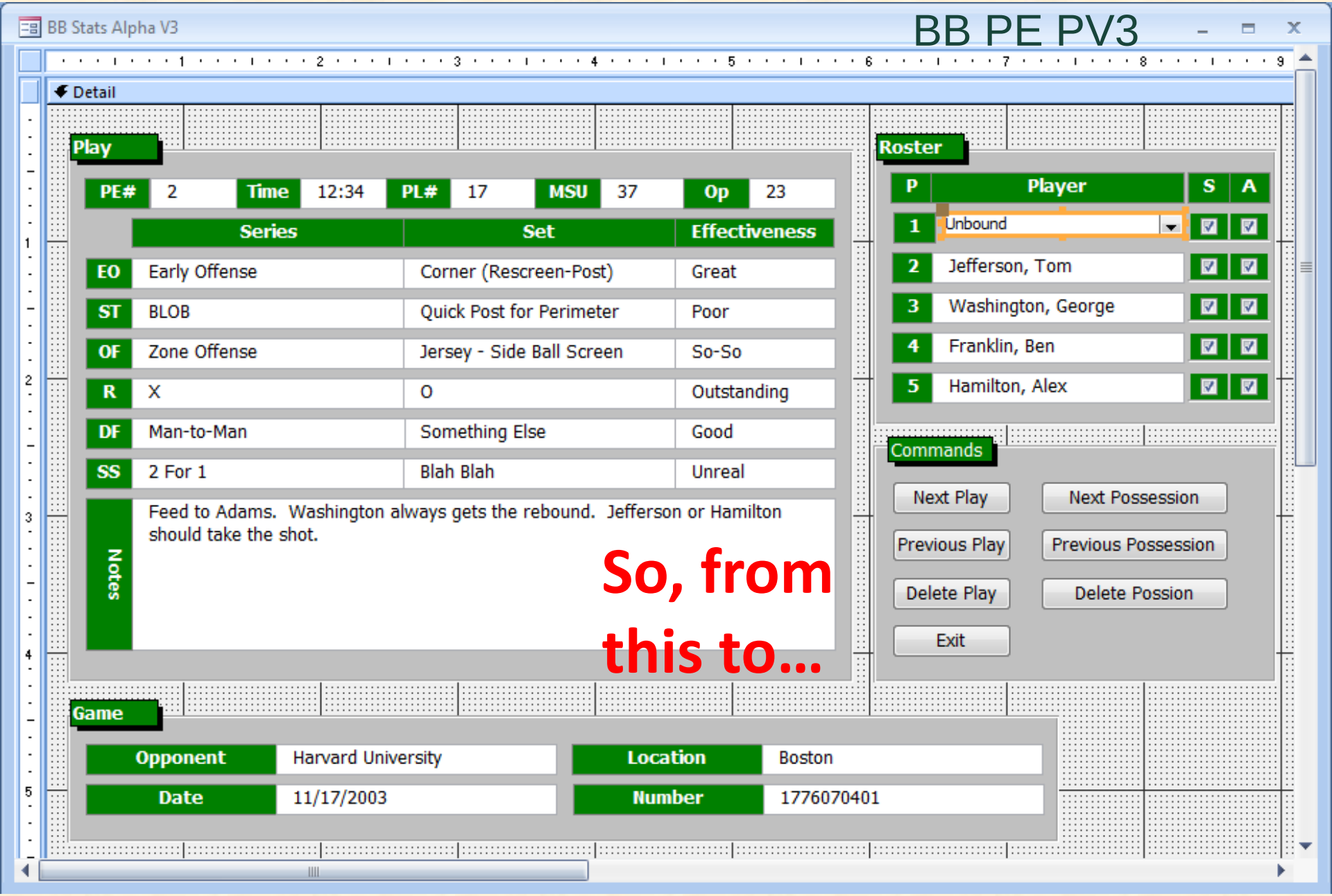
Nota Bene

- Just Screen Layout
- No Code (Underneath)
- Would **NOT** Have Entries in All Fields


BB Stats Alpha V3
BB PE PV3
Detail
Play
PE# 2
Time 12:34
PL# 17
MSU 37
Op 23
Series
Set
Effectiveness
EO Early Offense Corner (Rescreen-Post) Great
ST BLOB Quick Post for Perimeter Poor
OF Zone Offense Jersey - Side Ball Screen So-So
R X O Outstanding
DF Man-to-Man Something Else Good
SS 2 For 1 Blah Blah Unreal
Notes
Feed to Adams. Washington always gets the rebound. Jefferson or Hamilton should take the shot.
Roster
P Player S A
1 Unbound
2 Jefferson, Tom
3 Washington, George
4 Franklin, Ben
5 Hamilton, Alex
Commands
Next Play
Next Possession
Previous Play
Previous Possession
Delete Play
Delete Possion
Exit
Game
Opponent Harvard University
Location Boston
Date 11/17/2003
Number 1776070401

What I Learned From PV3

- Wanted…
  - Grades to Be A, B, C, D, F
  - Results Associated With Players
  - Series/Set Combined
    (“Thumbs Up” Rather Than “Thumbs”, “Up”)
  - To Record Player Rebound
- Will be used by…
  - Video Coordinator, GAs, and Managers
  - Very Familiar with DVR Controls
- Did NOT Want to Record Player Steals or Assists 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So, from this to…
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Commands
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Next Possession
Previous Play
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Delete Play
Delete Possion
Exit
Game
Opponent Harvard University
Location Boston
Date 11/17/2003
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BB PE AV1

(Alpha Version 1)

First Version With Code

Not Much Implemented

What I Learned From Alpha 1

- Entering a Play
  - Some Things Calculated Automatically
    - Play/Possession Number
    - Score
  - Most Things Entered With Mouse Via Pull-Down Menus
    - Series / Set
    - Result
  - But Time Entered With Keyboard Via Typing Numbers
- Need
  - Mouse-Only Input
  - Easy Way to Adjust Clock

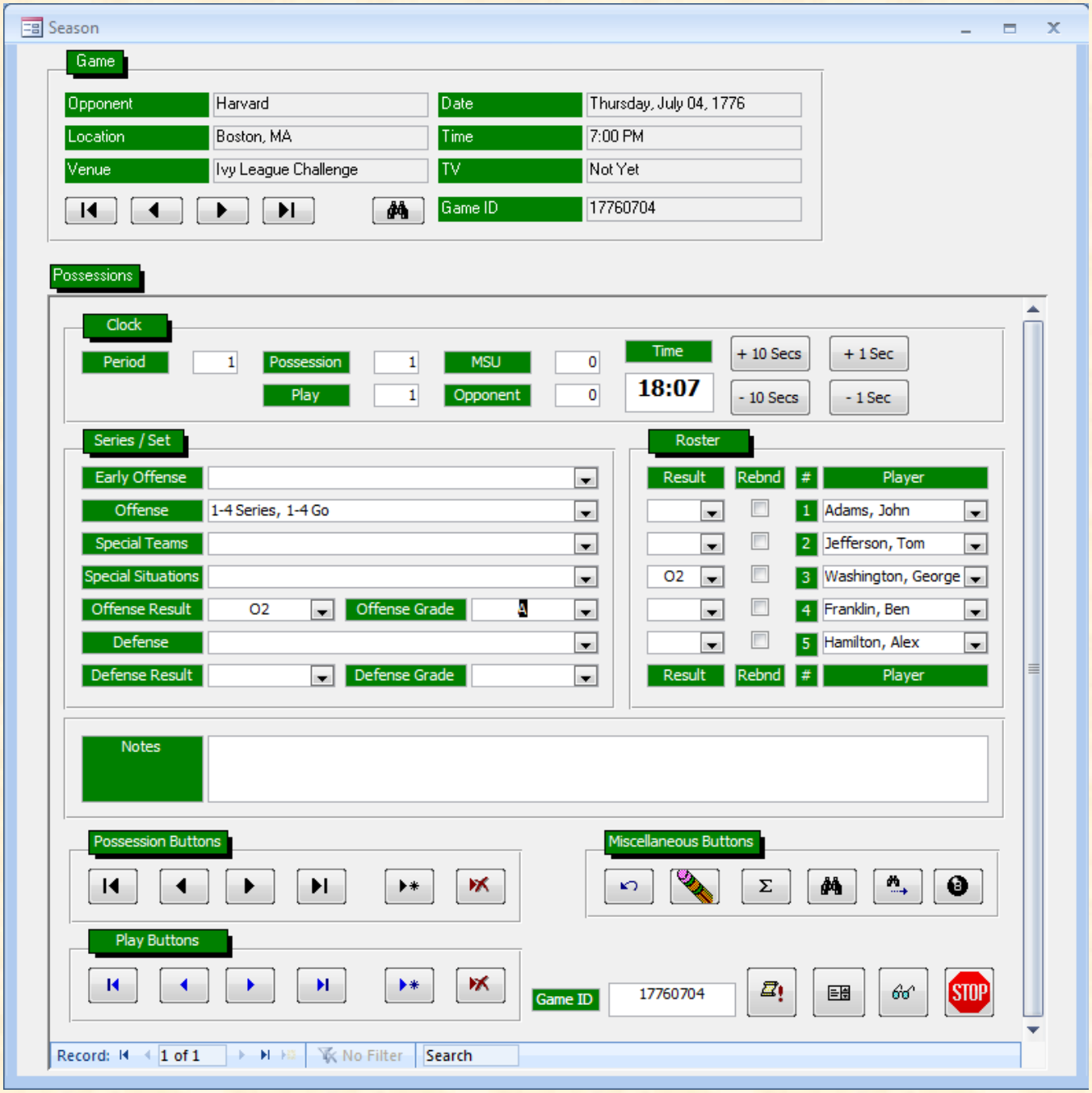
BB PE AV1

(Alpha Version 1)

First Version With Code

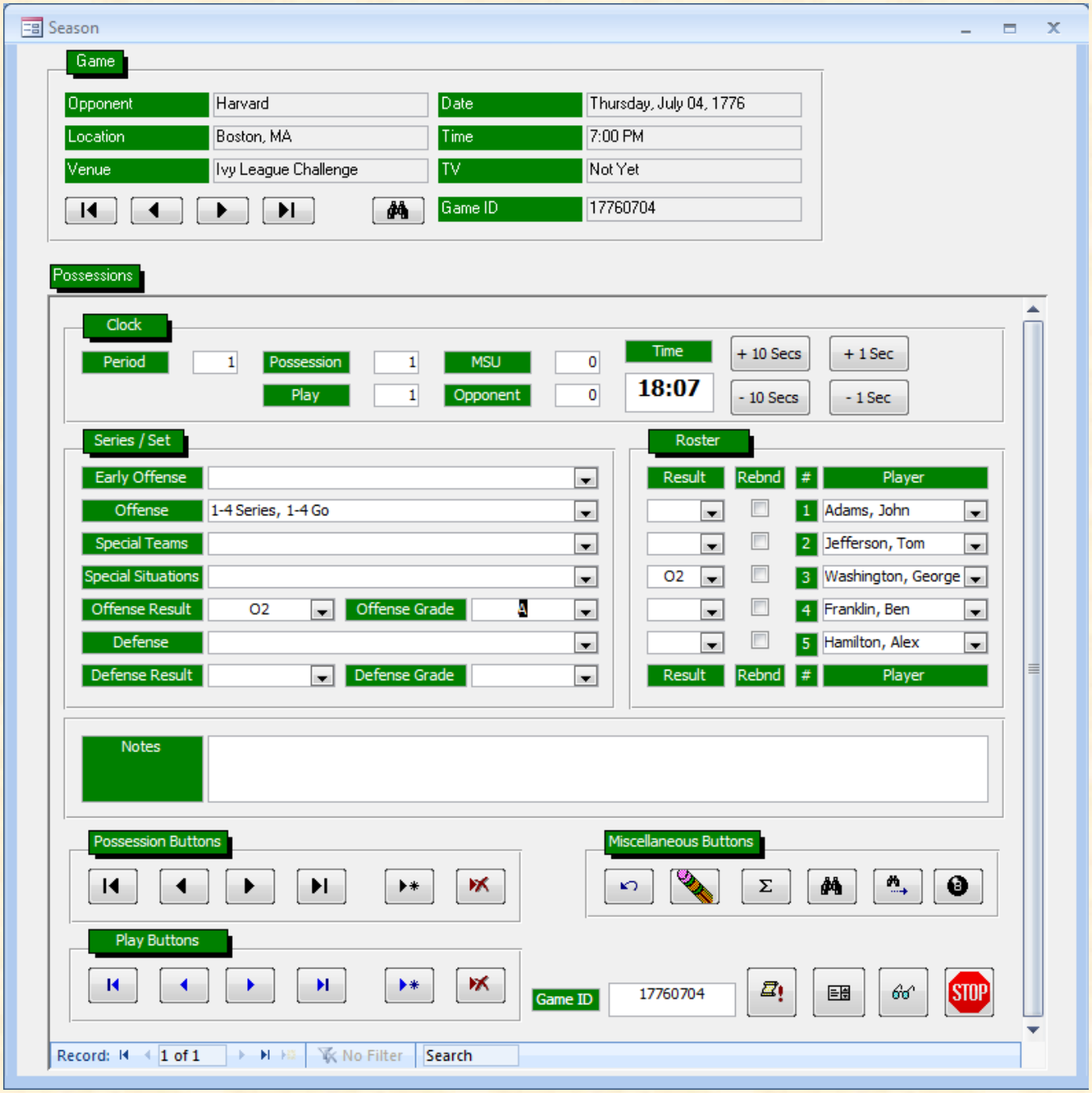
Not Much Implemented

So, from this to…



BB PE AV2

Still Not Much Implemented



BB PE BV1

(Beta Version 1)

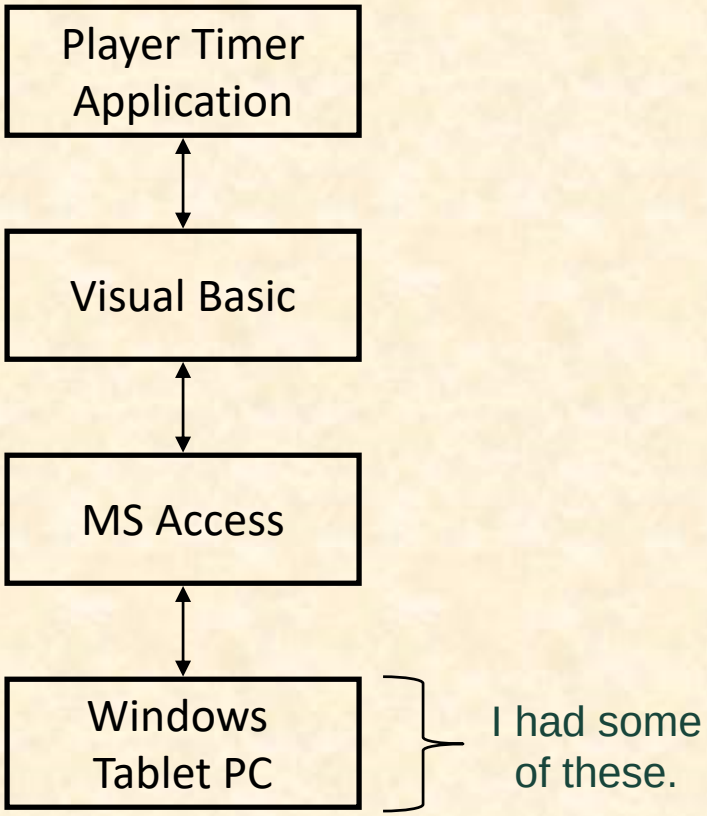
Basketball Prototypes Case Studies

- ✓Play Effectiveness
- Player Timer
- Radio Stats
- Real Time Play Stats
- Plus/Minus

Player Timer App

- Keep Track of Player Times
- For Each Player Record
  - Minutes Played
    - Game Clock Time
    - Consecutive & Total
  - Minutes Rested
    - Wall Clock Time
    - Consecutive
- Must
  - Be Usable on the Bench, During the Game
  - Be Portable and Not Require Electrical Outlet
  - Feel Like a Pen and a Clipboard

Player Timer App



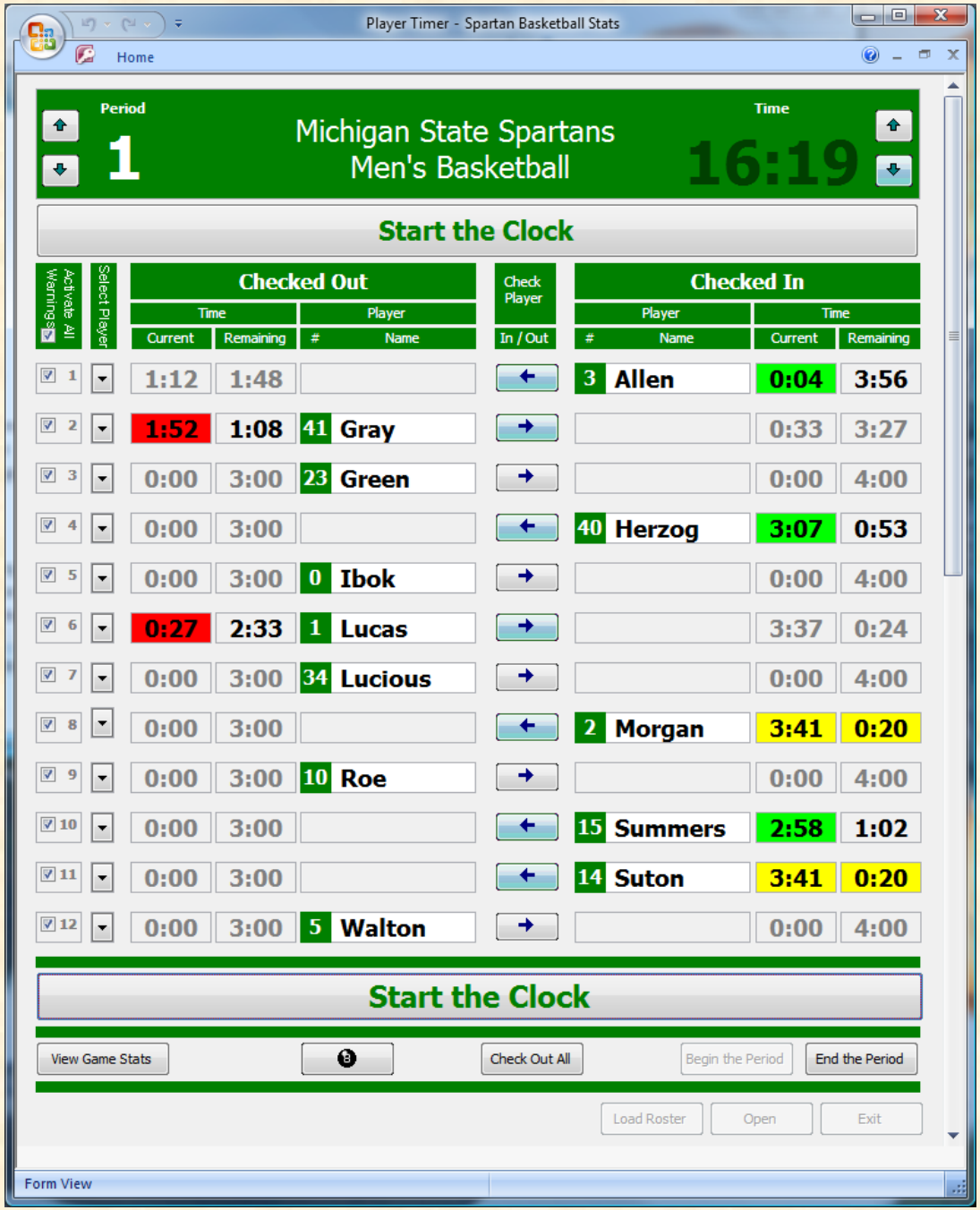
Risks

- Learning Basketball Processes
- Implementing Clocks in Windows?
  - Game Clock
  - Wall Clock
- Very Limited Screen Real Estate (Different Problem Than Mobile App)
- Computing and Displaying Cumulative Times
- Hidden Risk (“Danger Will Robinson!”)

Player Timer Development

- Knew Exactly What They Wanted, So…
- Designed “Final” Version
  - User Interface
  - Data Base Schema
  - Etc…
- Coded “Final” Version
- Bench Tested “Final” Version
- Field Tested “Final” Version
  - In Practice Scrimmage
  - Totally and Completely Unusable
- Scrapped “Final” Version UI and Started Over

Huge Mistake!



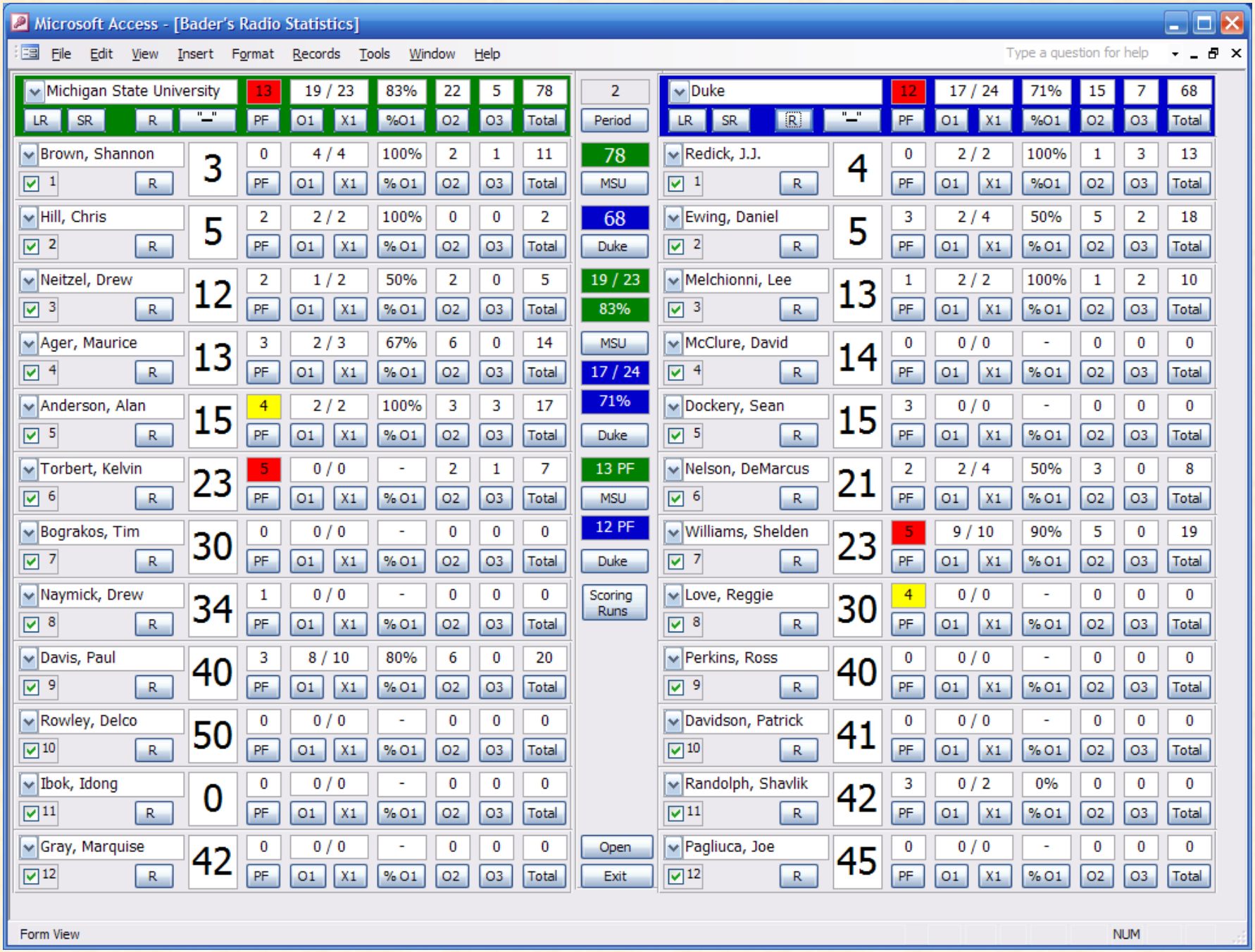
Player Timer

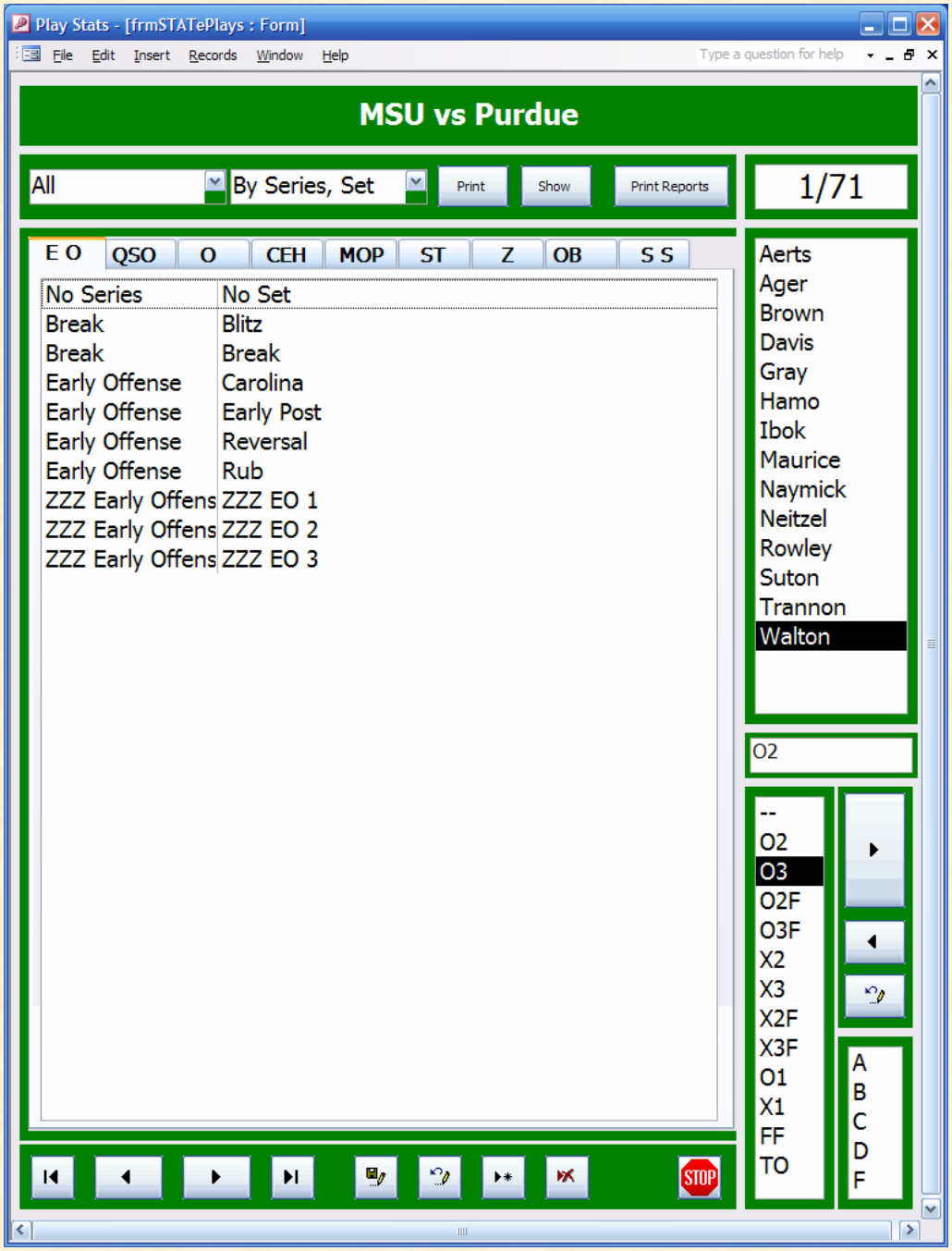
Software Updates

- Enable Clock Adjustments (While Clock Stopped)
- Enable Check In/Out By Touching
  - Check In/Out Button
  - Player Name
  - Player Slot
- Allow > 5 Players Checked In (While Clock Stopped)
- Enable Pending Check In (While Clock Running)
- Eliminate All Modal Dialog Boxes

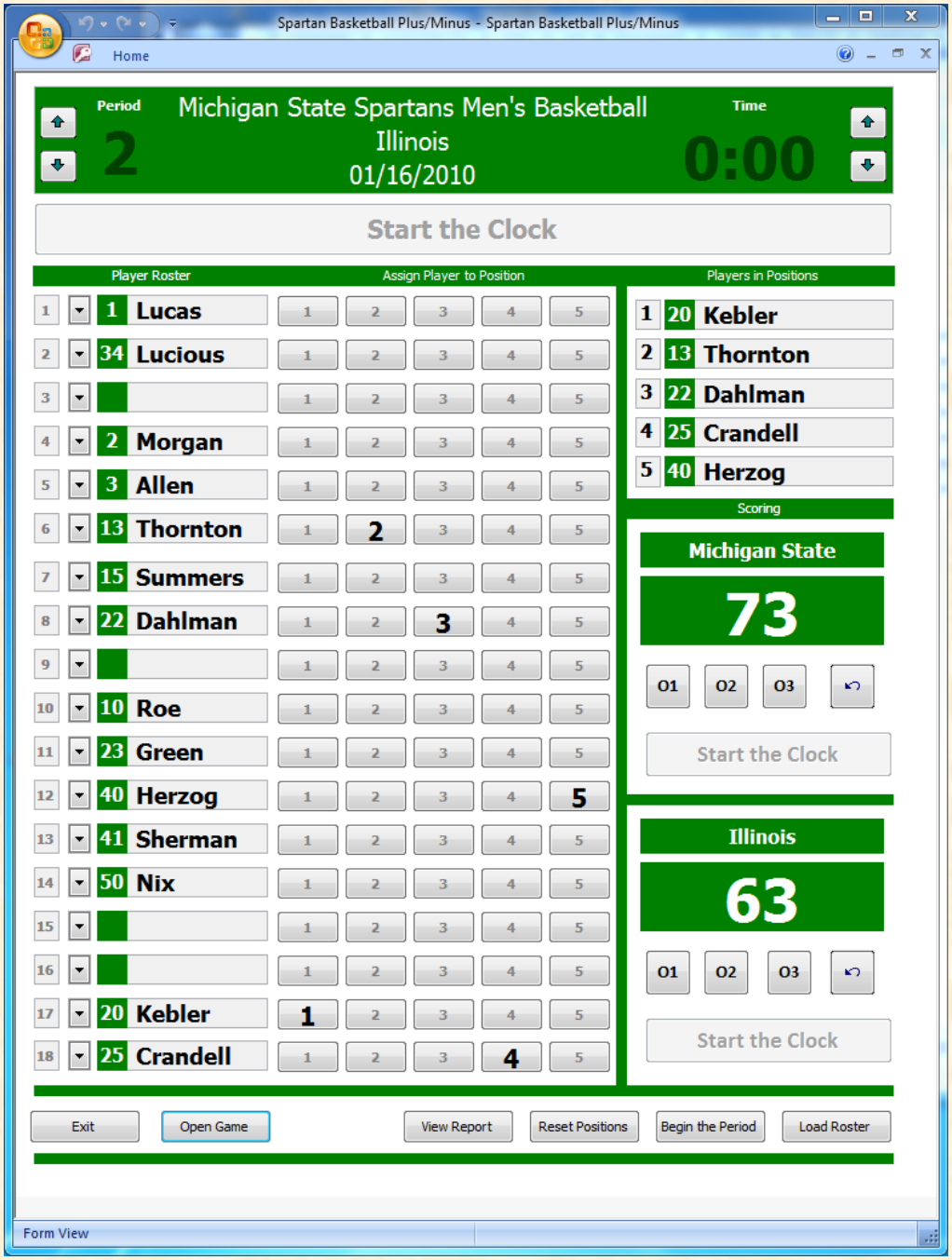
Basketball Prototypes Case Studies

- ✓Play Effectiveness
- ✓Player Timer
- Radio Stats
- Real Time Play Stats
- Plus/Minus


Microsoft Access - [Bader's Radio Statistics]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Michigan State University 13 19 / 23 83% 22 5 78
LR SR R "–" PF O1 X1 %O1 O2 O3 Total
Brown, Shannon 3 0 4 / 4 100% 2 1 11
Hill, Chris 5 2 2 / 2 100% 0 0 2
Neitzel, Drew 12 2 1 / 2 50% 2 0 5
Ager, Maurice 13 3 2 / 3 67% 6 0 14
Anderson, Alan 15 4 2 / 2 100% 3 3 17
Torbert, Kelvin 23 5 0 / 0 - 2 1 7
Bograkos, Tim 30 0 0 / 0 - 0 0 0
Naymick, Drew 34 1 0 / 0 - 0 0 0
Davis, Paul 40 3 8 / 10 80% 6 0 20
Rowley, Delco 50 0 0 / 0 - 0 0 0
Ibok, Idong 0 0 0 / 0 - 0 0 0
Gray, Marquise 42 0 0 / 0 - 0 0 0
2
Period
78
MSU
68
Duke
19 / 23
83%
MSU
17 / 24
71%
Duke
13 PF
MSU
12 PF
Duke
Scoring Runs
Open
Exit
Duke 12 17 / 24 71% 15 7 68
LR SR R "–" PF O1 X1 %O1 O2 O3 Total
Redick, J.J. 4 0 2 / 2 100% 1 3 13
Ewing, Daniel 5 3 2 / 4 50% 5 2 18
Melchionni, Lee 13 1 2 / 2 100% 1 2 10
McClure, David 14 0 0 / 0 - 0 0 0
Dockery, Sean 15 3 0 / 0 - 0 0 0
Nelson, DeMarcus 21 2 2 / 4 50% 3 0 8
Williams, Shelden 23 5 9 / 10 90% 5 0 19
Love, Reggie 30 4 0 / 0 - 0 0 0
Perkins, Ross 40 0 0 / 0 - 0 0 0
Davidson, Patrick 41 0 0 / 0 - 0 0 0
Randolph, Shavlik 42 3 0 / 2 0% 0 0 0
Pagliuca, Joe 45 0 0 / 0 - 0 0 0
Form View
NUM



Real Time Play Stats


Spartan Basketball Plus/Minus - Spartan Basketball Plus/Minus
Home
Period
2
Michigan State Spartans Men's Basketball
Illinois
01/16/2010
Time
0:00
Start the Clock
Player Roster
Assign Player to Position
Players in Positions
1 Lucas
34 Lucious
2 Morgan
3 Allen
13 Thornton
15 Summers
22 Dahlman
10 Roe
23 Green
40 Herzog
41 Sherman
50 Nix
20 Kebler
25 Crandell
1 20 Kebler
2 13 Thornton
3 22 Dahlman
4 25 Crandell
5 40 Herzog
Scoring
Michigan State
73
O1
O2
O3
Start the Clock
Illinois
63
O1
O2
O3
Start the Clock
Exit
Open Game
View Report
Reset Positions
Begin the Period
Load Roster
Form View

Plus/Minus

Risks and Prototypes

✓Risk

✓Prototypes

09/09: Announcements

- Apple Developer License
  - Request Invitation from James or Ryan
  - Team Members are Members
  - James and Ryan are Admins
- PowerPoint Slide Deck Submission Instructions
  - Read Carefully
  - File Name Conventions
    - All Lower Case
    - Replace Blanks with Dashes
    - Examples
      - “Spectrum Health” → “spectrum-health”
      - “team-[team-name]-status-report.pptx” → “team-spectrum-health-team-status-report.pptx”
  - Submit to Dr. D. and your client by the deadline.
  - ! (Submitted Correctly) → !(Processed Correctly)
- Scheduling Client Conference Calls
  - Use Google Calendar
  - Respect Other Appointments
- Absences
  - From Meetings
  - From “Working”
- Does anyone need equipment? See James and Ryan.

What's ahead?

[1 of 5]

- Team Photos
  - Thursday, September 19, 9:00 a.m. -
  - Dress code is business casual or business.
  - TAs will make schedule.
  - Must Have Signed Photo Release Form.
- Setup
  - Team Machines
    - Dell Server If Needed (Ask TAs)
    - Apple iMacs (with Windows 10 VM)
  - Team Software
    - Microsoft Office
      - Word and PowerPoint
      - Microsoft Windows Version ← Required. Use Windows 10 VM.
    - Web Server
    - Code Repository
    - SDK's
    - Etc.
  - Apple Developer's License
    - Request Invitation from James or Ryan
    - Team Members are Members
    - James and Ryan are Admins

What's ahead?

[2 of 5]

- All-Hands Meetings
  - ~~08/28: Capstone Overview~~
  - ~~09/04: Capstone Overview Project Plan~~
  - 09/09: Risks and Prototypes
  - 09/11: Team Status Report Presentations
  - 09/16: Resume Writing and Interviewing
  - 09/18: Career Days
  - 09/23: Team Project Plan Presentations
  - 09/25: Team Project Plan Presentations
  - 09/30: Team Project Plan Presentations
  - 10/02: Team Project Plan Presentations

What's ahead?

[3 of 5]

- Team Status Report Presentations
  - PowerPoint Template
  - Due 11:59 p.m., Tuesday, September 10 ← **Get on it now!**
  - Email to Dr. D. ← **Read the directions!**
    - Subject: Team [Team Name]: Status Report Presentation
      Subject: Team Auto-Owners: Status Report Presentation
    - Attachment: team-[team-name]-status-report-presentation.pptx
      Attachment: team-urban-science-status-report-presentation.pptx
- Dr. D. Will Combine Into Single PowerPoint Slide Deck
  - To Speed Things Up During Meeting
  - Do NOT Modify Master Slide
  - Must Use Windows Version of Microsoft Office
- Each Team Presents
  - Using TAs's Laptop
  - At Most 5.0 Minutes (Rehearse Timing)
  - Single or Multiple Presenters (Your Choice)

What's ahead?

[4 of 5]

- Team Status Report Presentations (Continued)
  - Split All-Hands Meeting
    - Ryan's Teams: Anthony 1279
    - James' Teams: Anthony 1300
  - Sit
    - With Your Team
    - In Front Rows (Both Sides of Room)
  - Each Team Presents
    - Using TAs's Laptop
    - In Alphabetic Order by Team Name
    - At Most 5.0 Minutes (Rehearse Timing)
    - Single or Multiple Presenters (Your Choice)

What's ahead?

[5 of 5]

- Project Plan Presentations
  - September 23, 25, 30
  - Due 11:59 p.m., Sunday, September 22 ← **Get on it now!**
    - PowerPoint Slide Deck
      - Template Posted on Downloads Page
      - Submit Windows PowerPoint Source
      - To Dr. D. and Sponsors via Email
    - Word Document
      - Submit Windows Word Document Source
      - To TA and Sponsor via Email
    - Obtain Approval by Sponsor **In Advance**
    - Read Submission Requirements
  - Split All-Hands Meeting
  - Dress by Presenting Team is Business Casual
  - Clients Often Attend

MICHIGAN STATE UNIVERSITY

Status Report Presentation

Team [Team Name]

The Capstone Experience

Dr. Wayne Dyksen

Department of Computer Science and Engineering
Michigan State University

Fall 2019

From Students…
…to Professionals

Delete this slide.

Status Report Instructions

- Use the Microsoft Windows version of PowerPoint.
- Required Template
  - Do not edit the master slides.
  - Do not change the organization or number of slides.
  - Make your presentation fit within these four slides.
- Content
  - For the slide titles, replace [Team Name] with your company name as in “Team Auto-Owners” and [Project Title] by the project title posted online.
  - All presentations will be posted on the course web site so do not include company confidential information or anything that your client would not want posted.
  - Delete this slide from the presentation.
- Presenting
  - The order of the presentations during our meeting will be team numerical order.
  - The time limit for your presentation is 5 minutes, which will be strictly enforced. Practice your presentation to ensure that you will finish within the allotted time.
- Submission by Email **← Read this carefully.**
  - All presentations are due via email to me and to your client by 11:59 p.m., Tuesday, September 10. Send your presentation to your client in a separate email; do not cc me.
  - For subject, use “Team [Team Name]: Status Report Presentation” as in “Team Urban Science: Status Report Presentation”.
  - Attach the PowerPoint source file named “team-[team-name]-status-report-presentation.pptx” as in team-auto-owners-status-report-presentation.pptx. Use all lower case and replace blanks by dashes in your filename.
  - Include some (professional) text in the body to avoid being sent to my junk folder and to practice being a professional.

Team [Team Name]

Status Report

[1 of 4]

[Project Title]

- Project Overview
  - Description Point 1
  - Description Point 2
  - Description Point 3
  - Description Point 4
- Project Plan Document
  - Status Point 1
  - Status Point 2
  - Status Point 3
  - Status Point 4

Include status information.
What's the status of your project plan document?
Have you started it?
How much have you written?
What percentage complete is it?
Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[2 of 4]

[Project Title]

- Server Systems / Software
  - Description &/or Status Point 1
  - Description &/or Status Point 2
  - Description &/or Status Point 3
- Development Systems / Software
  - Description &/or Status Point 1
  - Description &/or Status Point 2
  - Description &/or Status Point 3

Include status information.
Are all systems up and running?
Have you tested everything?
Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[3 of 4]

[Project Title]

- Client Contact
  - Status Point 1
  - Status Point 2
- Team Meetings
  - Status Point 1
  - Status Point 2
- Team Organization
  - Description Point 1
  - Description Point 2

Include status information.
Have you talked with/met with your client?
Have you scheduled a weekly conference call? When?
Have you scheduled an in-person meeting? When?
How many times has your team met so far?
Have you scheduled team meetings? How often?
Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[4 of 4]

[Project Title]

Risks

- Risk 1
  - Description
  - Mitigation
- Risk 2
  - Description
  - Mitigation
- Risk 3
  - Description
  - Mitigation
- Risk 4
  - Description
  - Mitigation

List only “real” risks. For example, learning a new computer languages is **not** a risk.

Give “useful” explanation of how you are going to mitigate each risk. For example, “we will learn how to do it” is **not** a useful explanation.

Delete this textbox.