MICHIGAN STATE UNIVERSITY

01/15: Risks and Prototypes

The Capstone Experience

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From Students…
…to Professionals

Agenda

- Reminder re MAPP
- Risks and Prototypes
- What's ahead?
- Team Status Reports

Meeting Attendance, Preparation & Participation (MAPP) [1 of 6]

"Meeting-Ready"

- In Person
  - Ready
    - Seated with Team in Correct Room in Assigned Seat
    - Coat and Hat Off
    - All Mobile Devices in Airplane Mode and Stowed
  - Not Ready
    - Entering the Room
    - Walking to a Seat
    - Taking off Coats and/or Stowing Devices
- Online
  - Ready
    - Joined to Microsoft Teams Meeting in Correct Channel
    - In Appropriate Location
  - Not Ready
    - Joined Using Only a Phone
    - In Inappropriate Location (Car, Bar, In Line at the RIV, etc.)

Meeting Attendance, Preparation & Participation (MAPP) [2 of 6]

Attendance Process

- In Person
  - By TM
  - Sign a Form
- Online
  - Microsoft Teams
    - Who
    - When Joined/Left the Meeting
  - Google Forms
    - One or More at Random Time During Meeting
    - One at End of Meeting
    - 60 Seconds to Complete

Google Form Attendance Check

↑↑↑↑↑↑↑↑

Only An Example

Meeting Attendance, Preparation & Participation (MAPP) [3 of 6]

MAPP Point Deductions

- All-Hands / Split-Hands
  - Meeting-Ready≤ 3:00:00 p.m.
    - Present
    - -0.0 MAPP Points
  - 3:00:01 p.m. ≤ Meeting-Ready ≤ 3:05:00 p.m.
    - Late
    - -0.5 MAPP Points
  - Meeting-Ready > 3:05:00 p.m.
    - Absent
    - -1.0 MAPP Points
  - Leave Meeting
    - In Person: Leave the Room for Extended Period
    - Online: Miss Google Form (During or At End)
    - -1.0 MAPP Points
  - Weekly Triage Google Form and Google Slides
    - Late or Not at All
    - -0.5 MAPP Points
  - MAPP grade may become negative.

Meeting Attendance, Preparation & Participation (MAPP) [4 of 6]

- Almost No Excuses Accepted
  - One or Two Excused Possible for Interviews
  - Must Provide Information
    - Date, Company, Recruiter Name & Contact Info
    - In Advance
    - To Instructors
- Must Attend (No Excuses Accepted)
  - Your Team Presentations
  - All Project Video Viewing
  - Design Day
  - Design Day Wrap Up

Do NOT schedule interviews.
Do NOT schedule ANYTHING.
Do NOT buy plane tickets. ←**Note**

-5.0 MAPP Points Per Absence

- Read the syllabus.
  - Meeting Attendance, Preparation and Participation (MAPP) Grade
  - Meeting Attendance Policies and Procedures

Meeting Attendance, Preparation & Participation (MAPP) [5 of 6]

- Excused Meeting Absences
  - Job Interviews
    - Documentation Deemed Valid
    - In Advance
  - Sickness Including COVID
    - Documentation Deemed Valid
      - Stating Not Able to Attend Due to Illness
      - By Local Medical Professional
    - ASAP
    - Read the Syllabus
  - Grief Absence
    - See MSU Policy
    - Done in Advance
  - Some MSU Events
- Cannot Accommodate Most Conflicts
- No Accommodations for Personal Reasons Other Than Above
- Cannot Be Excused from Doing Work

Meeting Attendance, Preparation & Participation (MAPP) [6 of 6]

- Requesting Excused Absences
  - Handled by James and TM
    - Email James and TM
    - CC Dr. D.
      (Dr. D. will not respond.)
- Taking or Retaking Capstone in Fall 2024
  - Due to Dropping or Failing
  - Extremely Limited Enrollment
  - First-time eligible students will get first priority.
  - You may not be able to take capstone in the fall. **←Note**
    - Re-enroll After Dropping
    - Re-take After Failing

Meeting and Work Expectations

- Meetings
  - In Person
  - Possibly Excused but Very Limited
  - If Miss Team Presentation, Must Give Presentation to Instructors
- Work
  - Entire Semester
  - Cannot Excuse Work Even if Meeting is Excused
- Example
  - Miss Week
    - Attendance
      - Excused: -0
      - Unexcused:
        - -3+ MAPP Points == 3+% of Final Grade
        - -10 MAPP Points == 10% of Final Grade
    - Work
      - Attendance Excused or Unexcused
      - At Least -7% of Team Contribution Grade == At Least -4.9% of Final Grade
- See syllabus.

Risks and Prototypes

- Risks

- Prototypes

Identifying Risks

- What You Don't
  - Know
  - Understand
  - Know How to Do
- Normally
  - Major Project Features
  - "Showstoppers"
  - Can't Do Feature Means Can't Do Project
- 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

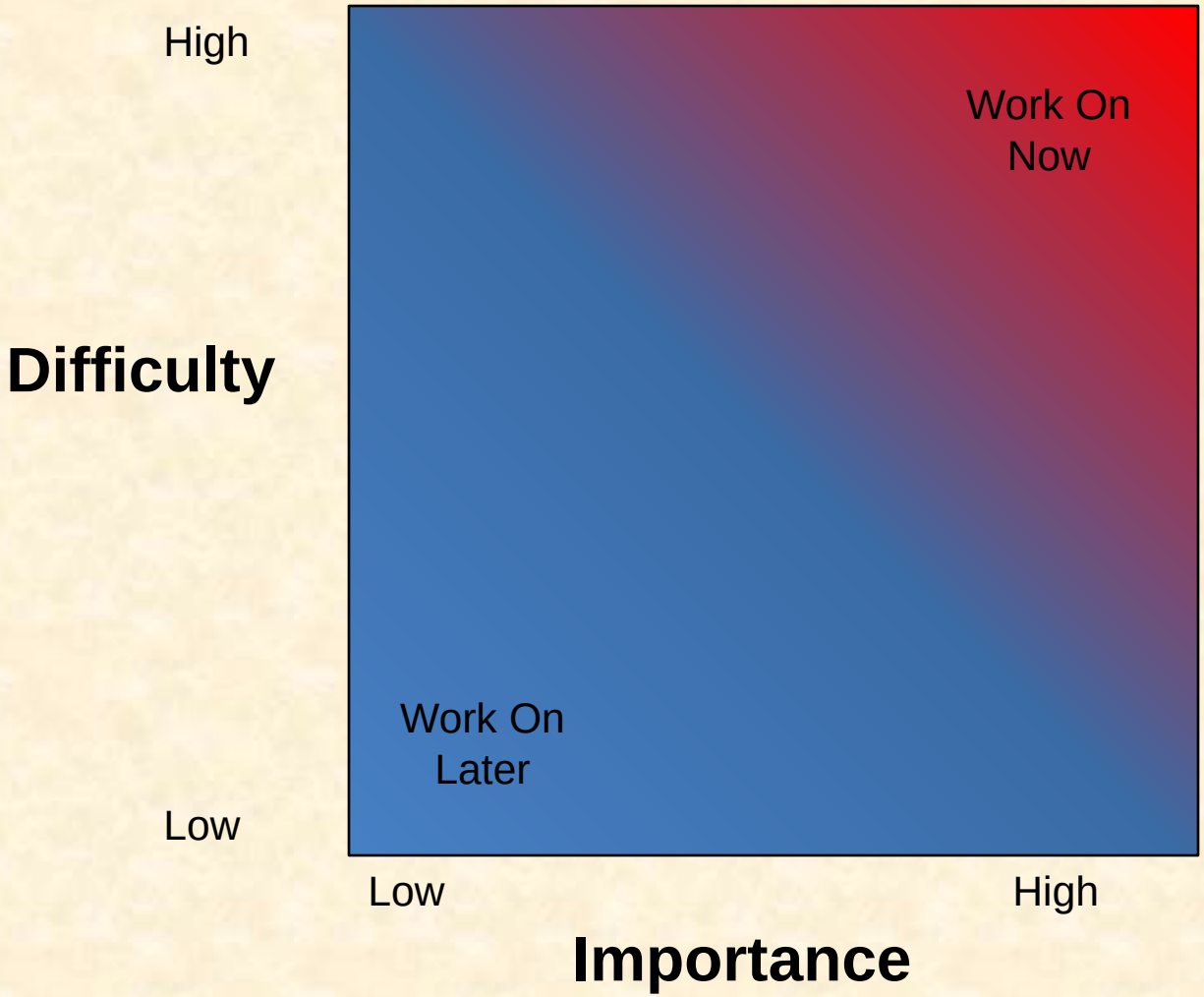
Including but not limited to...

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

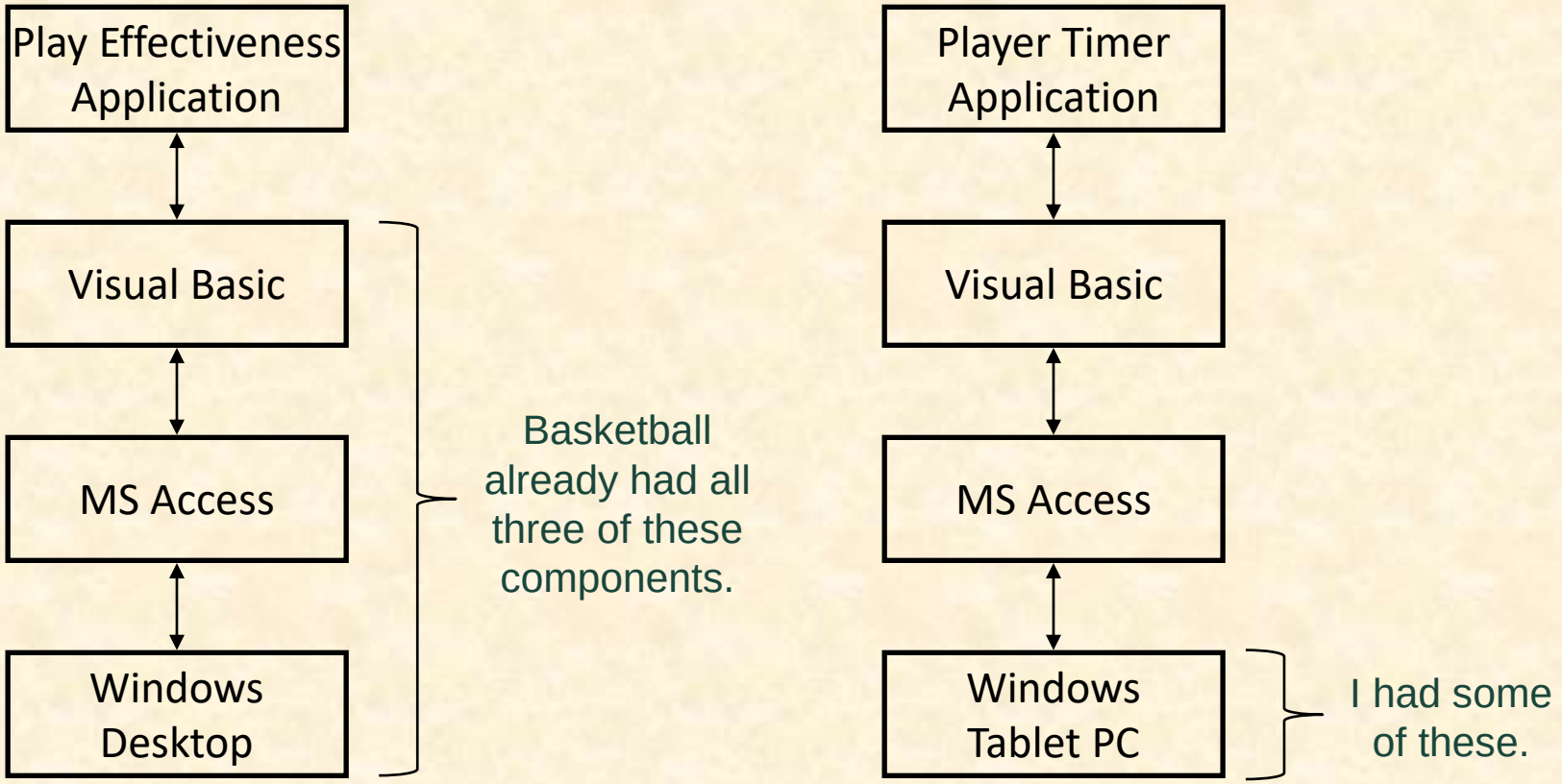
Prioritizing Risks



Case Studies: MSU Men's 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/APIs should I use?
- Can I write this in Visual Basic?
- How do I make a UI in VB?
- How do I interface VB with Microsoft 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

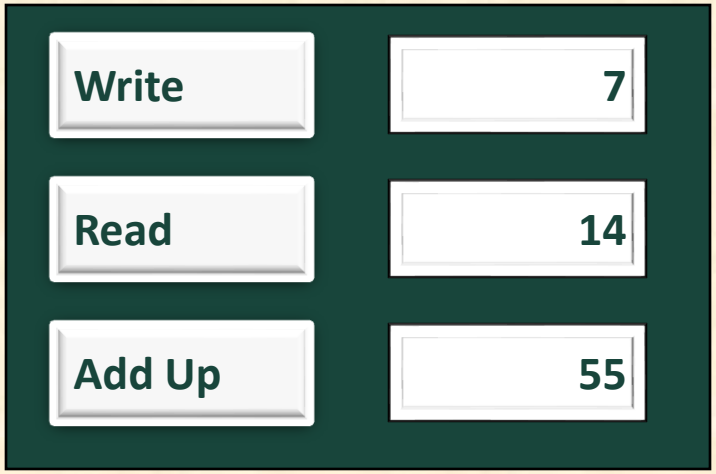
- Use Existing Resources
  - Including But Not Limited To
    - Faculty
    - Other Students
    - Product Demos
    - Book Sample Code
    - Downloadable Examples
    - Wizards
    - Etc...
  - Test Drive
    - Install
    - Compile
    - Extend
    - Etc...
- Build Prototypes
  - Single Purpose
  -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

Nota Bene:

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

Basketball Apps Risk Mitigation

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



Risks and Prototypes

✓Risks

➢Prototypes

Aside: Capstone Transition [1 of 2]

- From… "Make one of these." –CSE Professor
  - Coding
  - Valuable Skills
- …To "Solve my problem." –Customer/Client
  - Gather Requirements
  - Design
    - Architecture
    - User Experience
  - Highly Valuable Skills

Aside: Capstone Transition [2 of 2]

- Coding ← Valuable
  - Implement Piece of Architecture
  - Based On Detailed Specification
- Architecture ← More Valuable
  - Identify Parts and Pieces
  - Organize Into Comprehensive System
  - Based On Design
- Design ← Most Valuable
  - Create Solution to Problem
  - Gather Requirements
  - Based on Working with Users

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

Challenge/Danger

Googling for Answers

- "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.)
- Do not mere copy and paste.

Often My Biggest Frustration

Basketball Prototypes Case Studies

- Play Effectiveness

- Player Timer

Basketball Staff

- Head Coach
- Associate & Assistant Head Coaches
- Video Coordinator
  - Coordinates…
    - …managers preparing video.
    - …video for coaches to watch.
  - Reverse engineers opponents.
    - Players
    - Plays
  - Coaches scouting team.
- Director of Basketball Operations (DOBO)
- Graduate Assistants (GAs)
- Undergraduate Managers

Basketball 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?

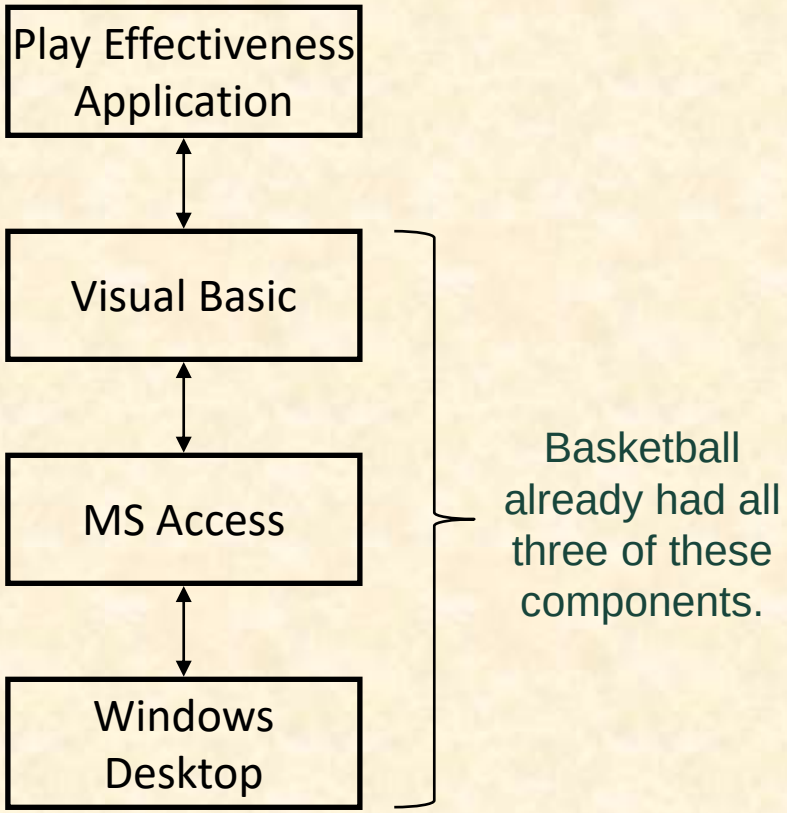
Initial Meeting with Video Coordinator

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?**

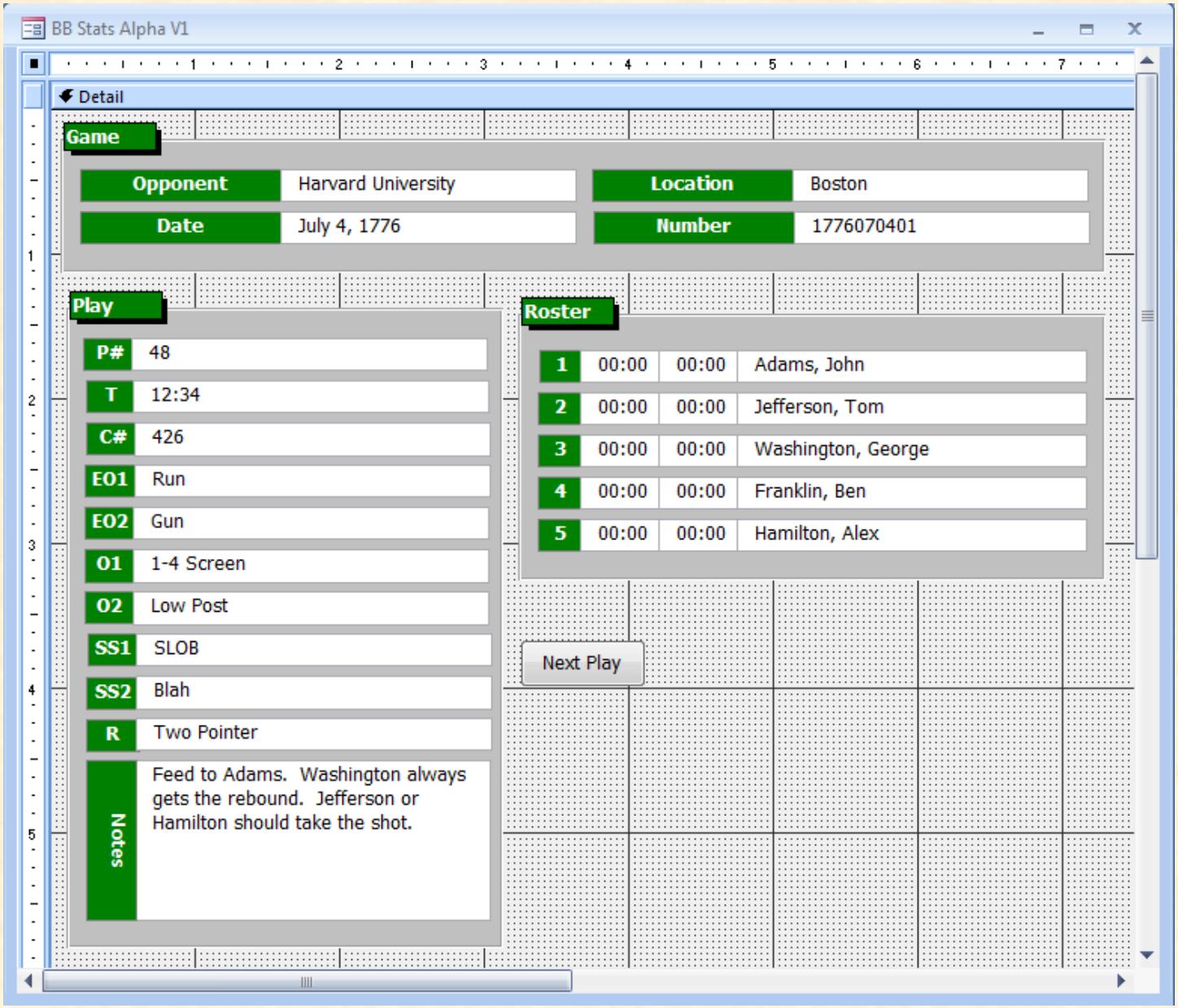
The Business Processes

Play Effectiveness Architecture



Risks

- Learning Basketball Business Processes
- Programming in Visual Basic
  - Not: Can I learn VB?
  - Can this be done in VB?
- Making a UI 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

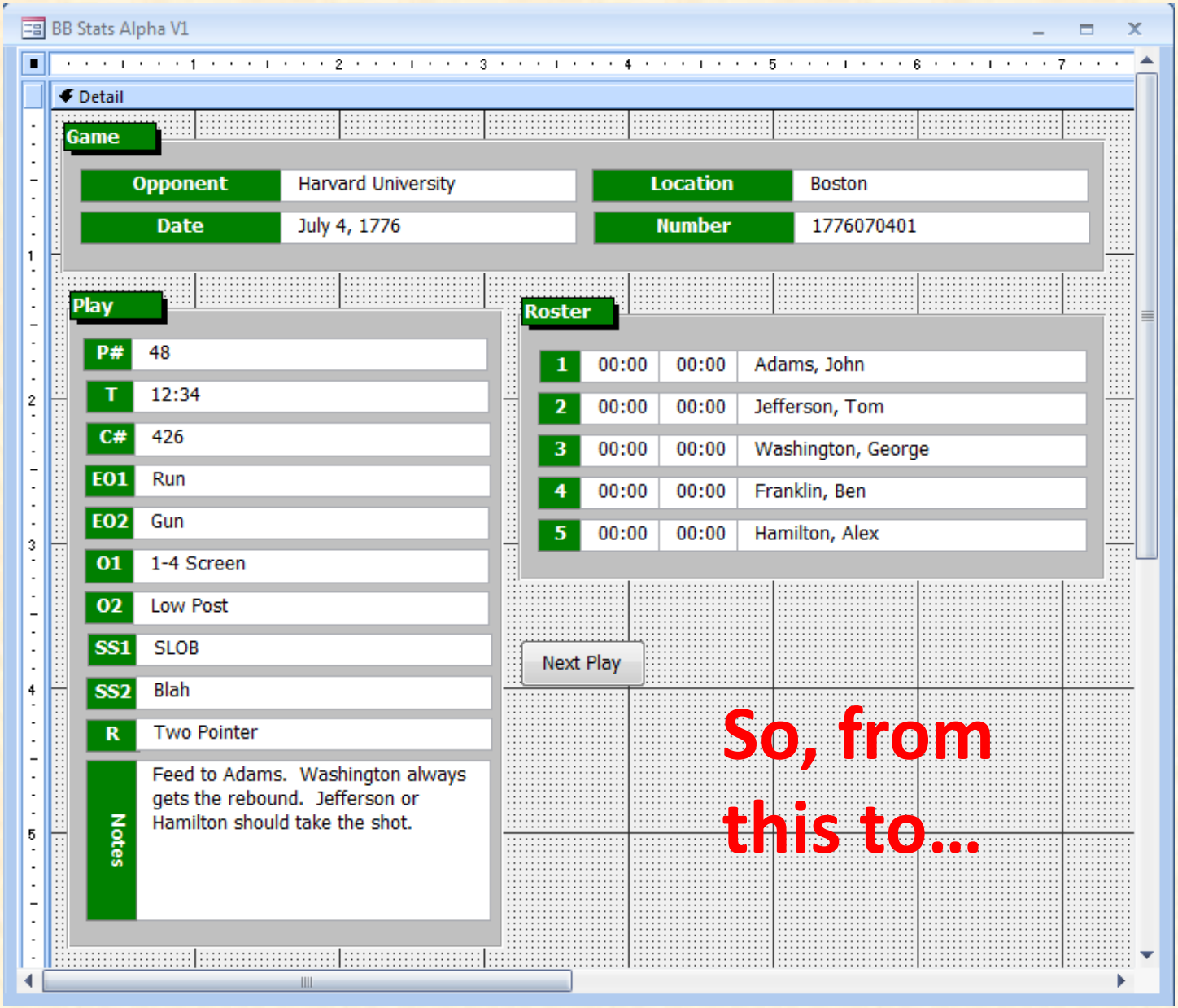
[1 of 2]

- 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
    - CS Paradigm: 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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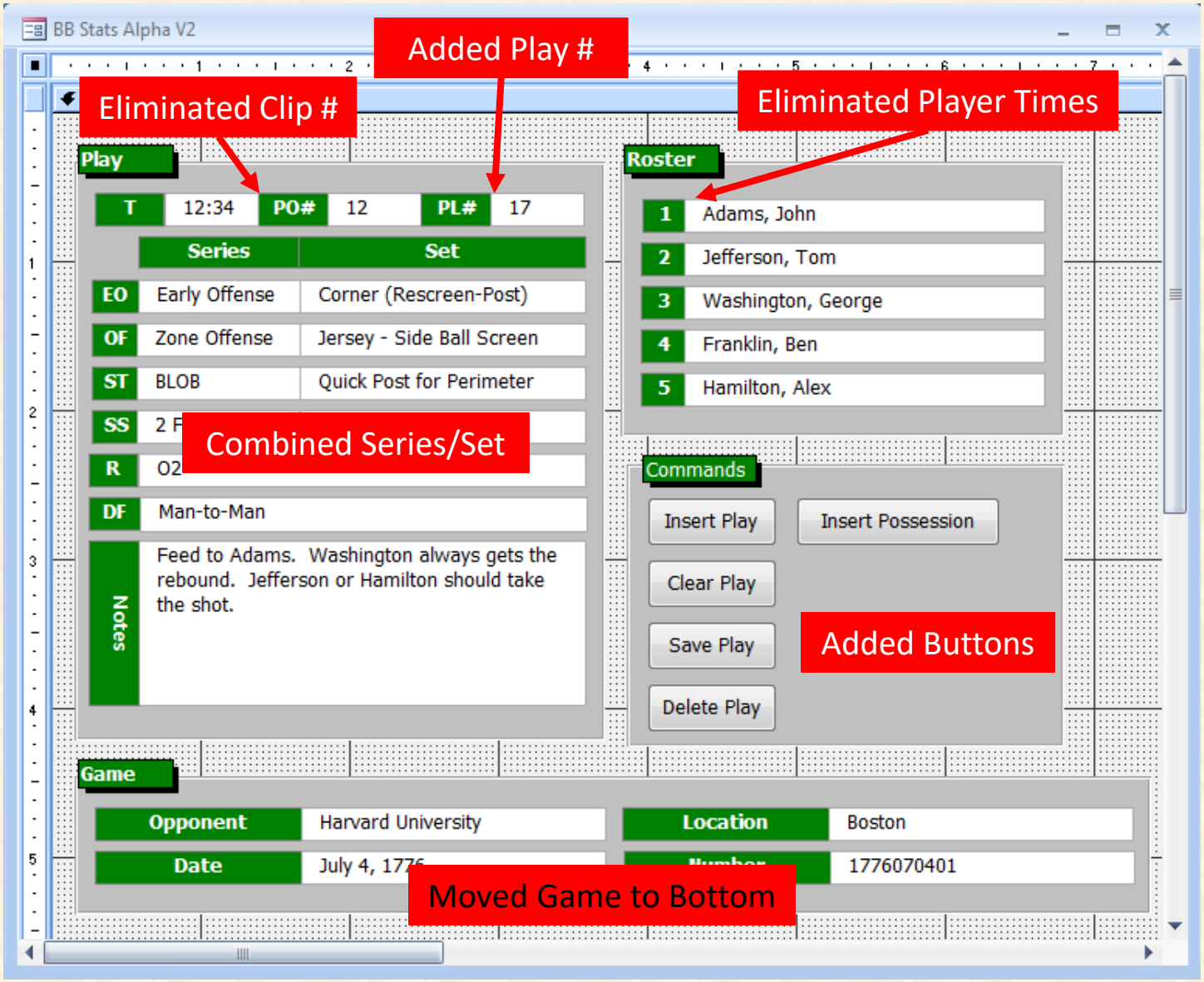


BB PE PV2

Fields

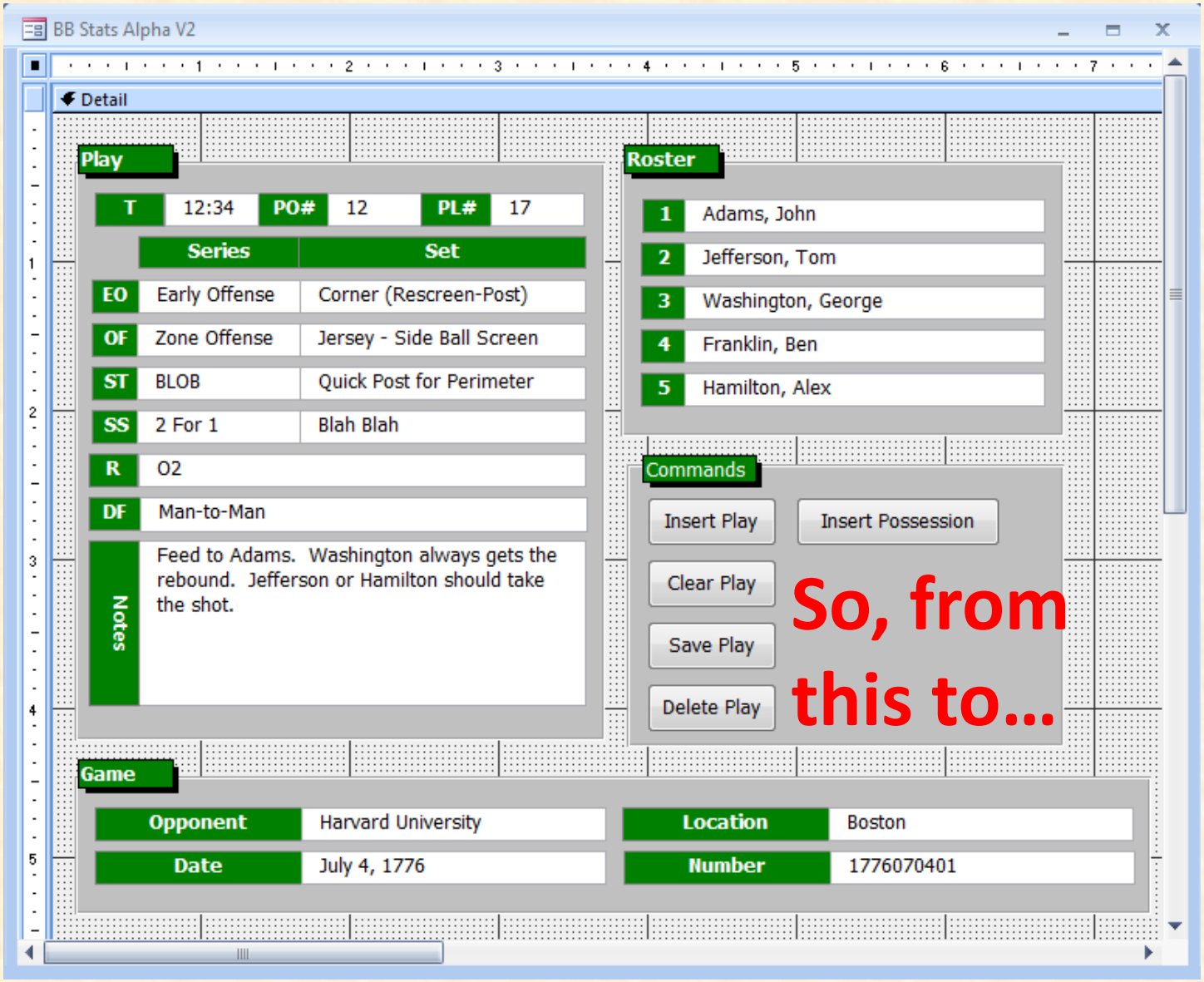
- PO#
  Possession Number
- PL#
  Play Number
- SS
  Special Situations
- DF
  Defense

Nota Bene

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

What I Learned From PV2

- Wanted to Grade Execution 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#
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  Defense

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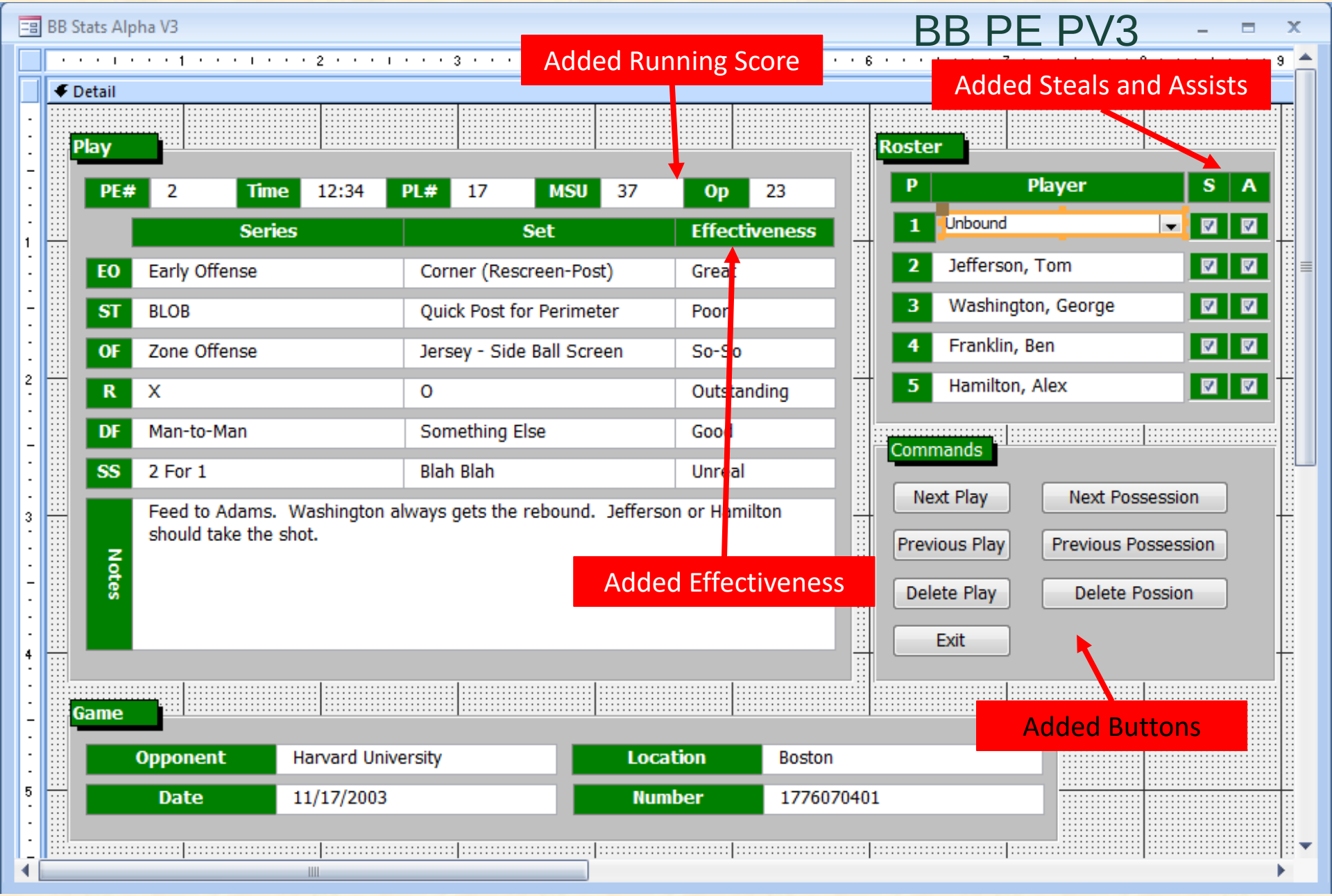
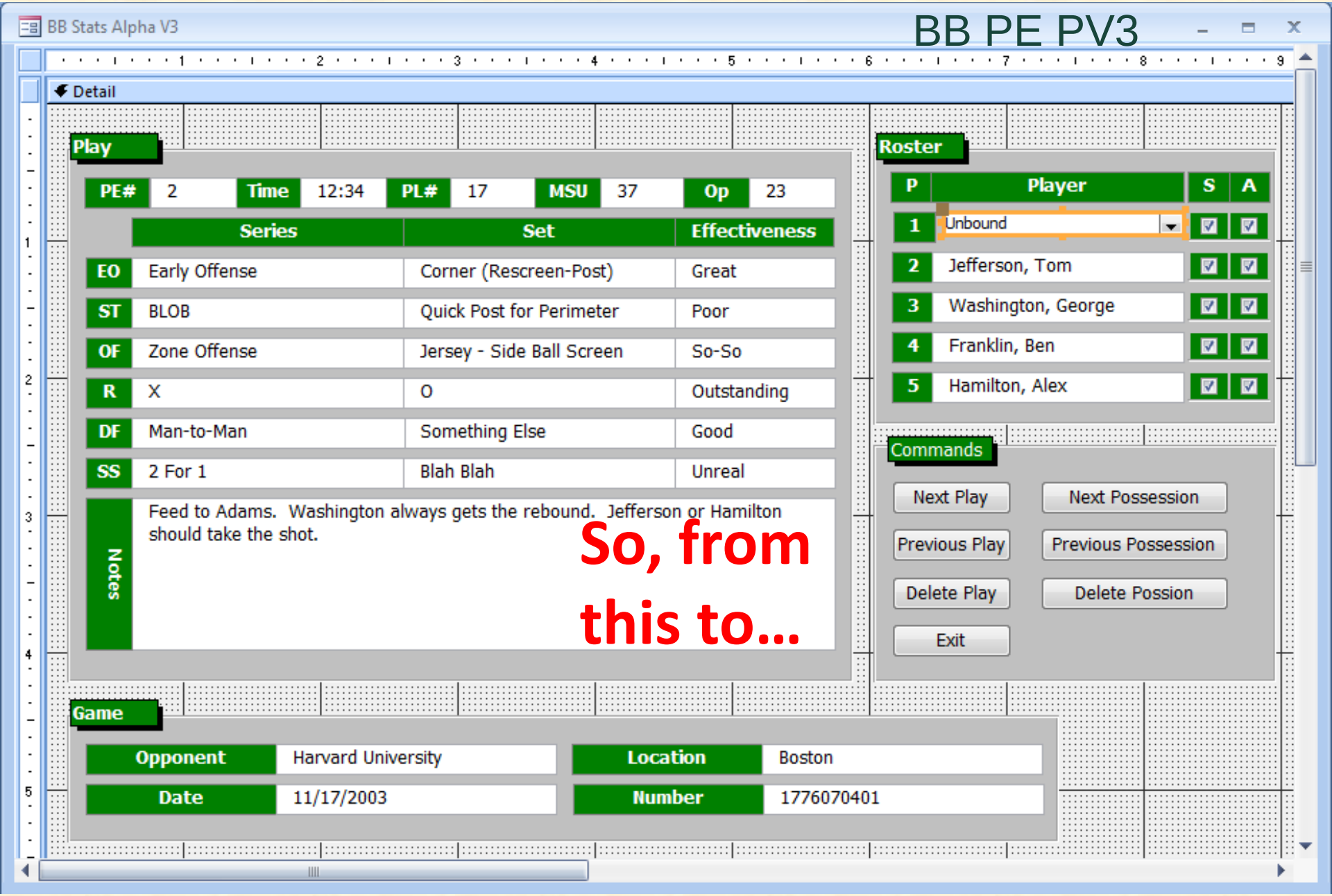

BB Stats Alpha V3
BB PE PV3
Added Running Score
Added Steals and Assists
Detail
Play
PE# 2
Time 12:34
PL# 17
MSU 37
Op 23
Series
Set
Effectiveness
EO Early Offense Corner (Rescreen-Post) Great
ST BLOB Quick Post for Perimeter Poor
OF Zone Offense Jersey - Side Ball Screen So-So
R X O Outstanding
DF Man-to-Man 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.
Added Effectiveness
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
Added Buttons
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" or Thumbs(Up)
  - To Record Player Rebound
- Will be used by…
  - Video Coordinator, GAs, and Managers
  - Very Comfortable with DVR Controls
- Did NOT Want to Record Player Steals or Assists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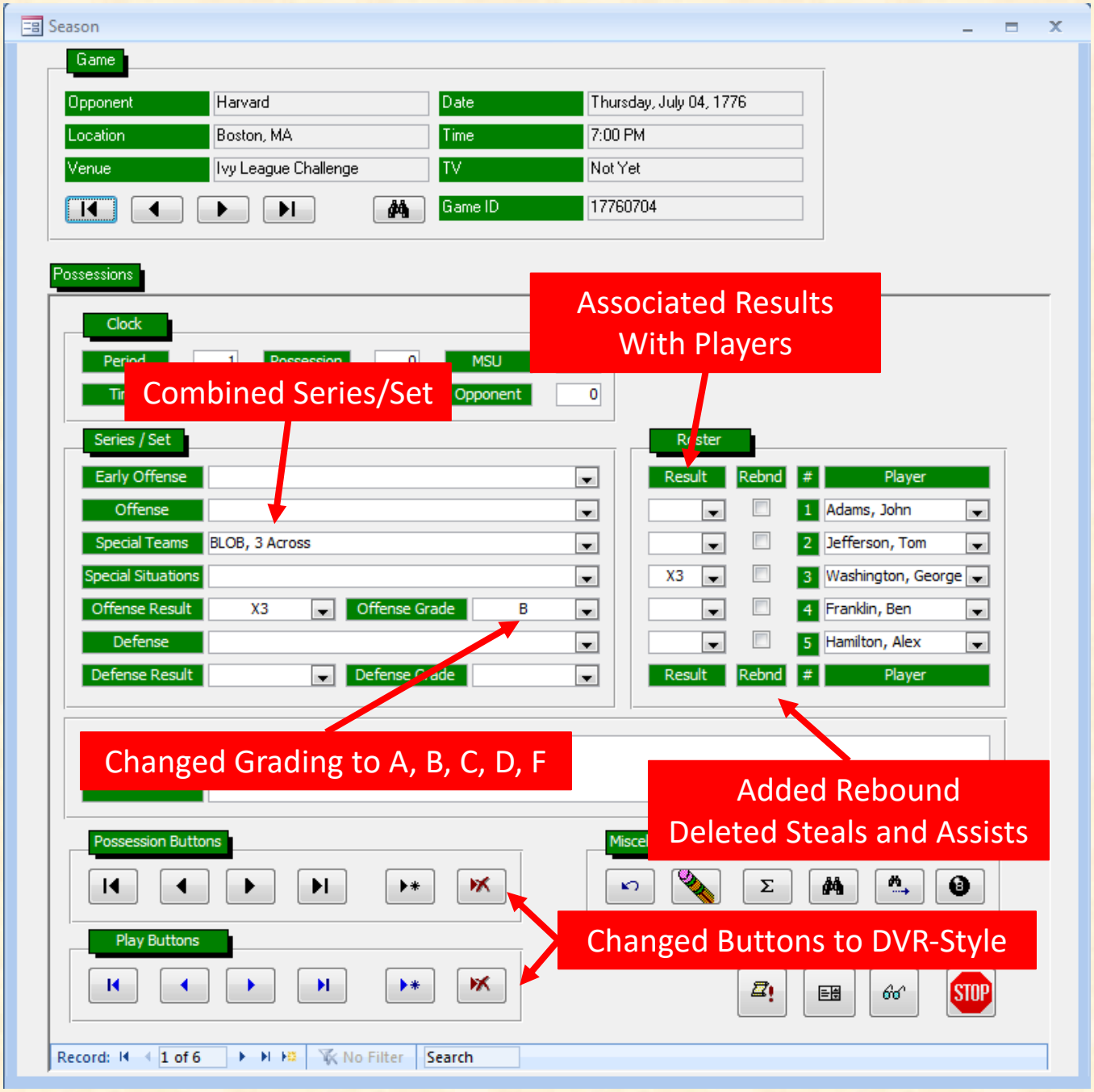


BB PE AV1

(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)

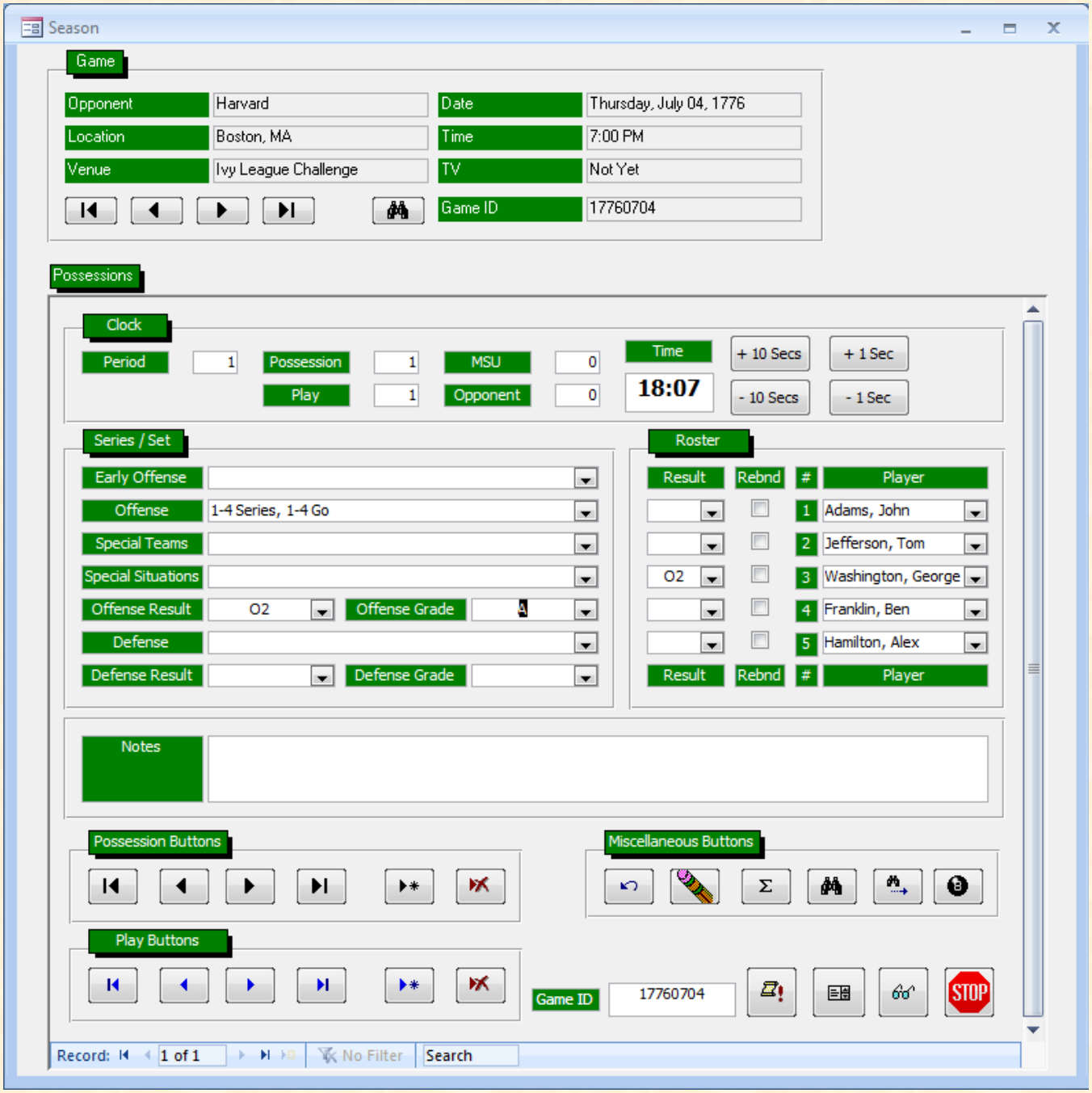
First Version With Code

Not Much Implemented

So, from this to…

BB PE AV2

Still Not Much Implemented



BB PE BV1

(Beta Version 1)

Basketball Prototypes Case Studies

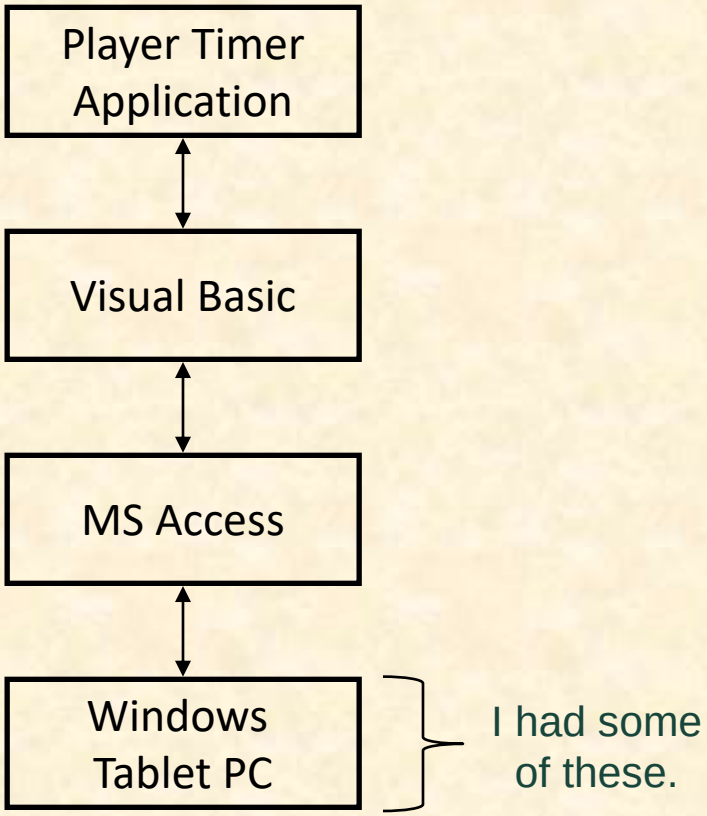
✓Play Effectiveness

➢Player Timer

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

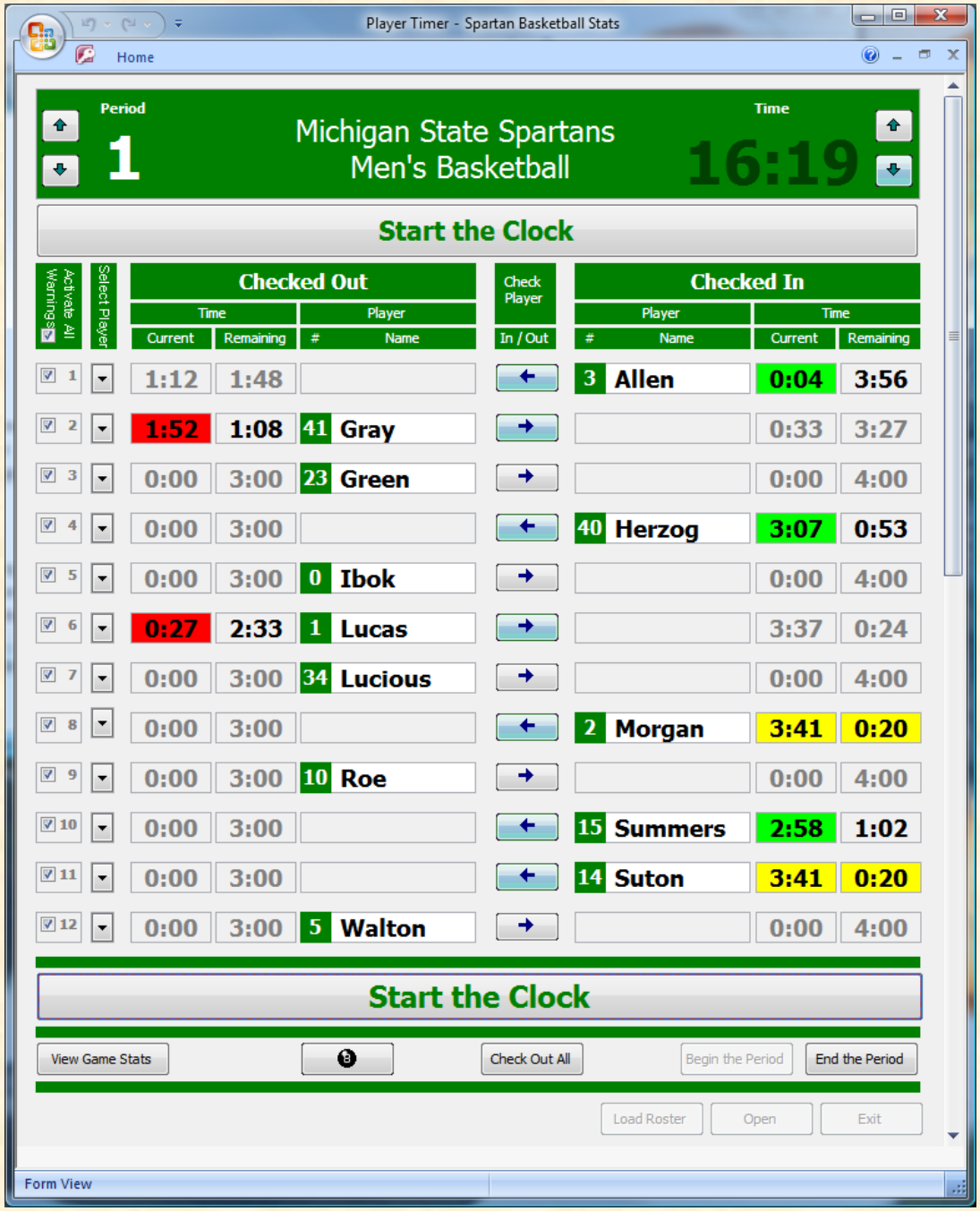
- Learning Basketball Processes
- Implementing Clocks in Windows?
  - Game Clock
  - Wall Clock
- Very Limited Screen Real Estate
  - Different Problem Than Mobile App
  - Must Feel Like Clipboard and Single Piece of Paper
- Computing and Displaying Cumulative Times
- Hidden Risk (“Danger Will Robinson!”)

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!

Aside: Great Example of Front-End / Back-End Architecture and Design



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

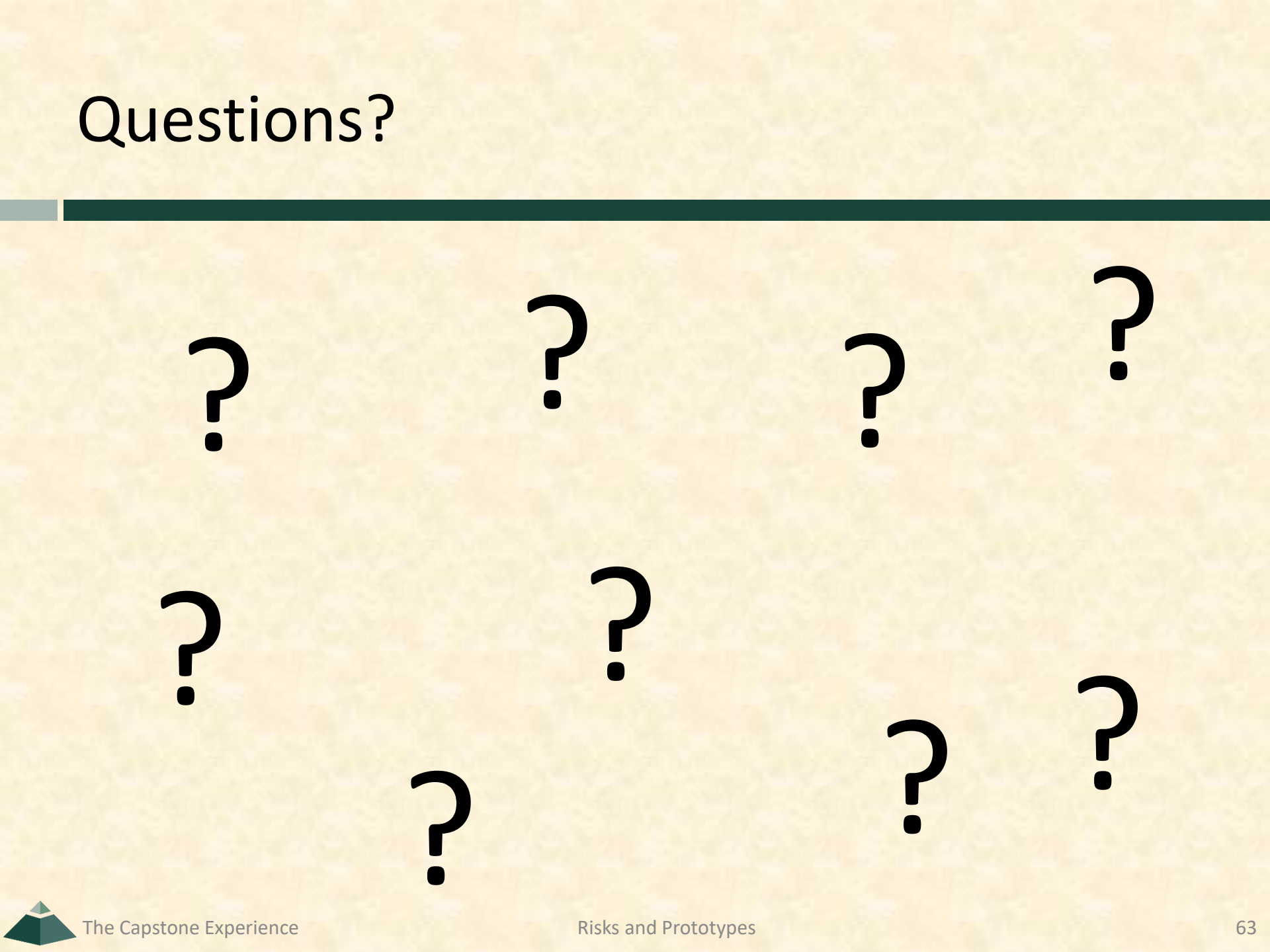
- ✓Play Effectiveness
- ✓Player Timer

Risks and Prototypes

✓Risk

✓Prototypes

Questions?



What's ahead? [1 of 3]

- Upcoming Meetings
  - ~~01/16, Tu: Risks and Prototypes~~
  - 01/18, Th: Project Plan
  - 01/23, Tu: Team Status Report Presentations
  - 01/25, Th: Schedule and Teamwork
  - 01/26, Fr: Team Photos (10:00 a.m. – 4:00 p.m.)
  - 01/30, Tu: Team Project Plan Presentations
  - 02/01, Th: Team Project Plan Presentations

10% of Team Grade

What's ahead? [2 of 3]

- Split-Hands Meetings
  - Used On Presentation Days
    - 01/23: Team Status Report Presentations
    - 01/30, 02/01: Team Project Plan Presentations
  - Three Locations
    - Luke: 152 Natural Resource
    - Griffin: 2250 Engineering
    - Sam: 158 Natural Resources
  - Find the rooms in advance.
  - Attendance Taken As Usual Including Lateness

What's ahead?

[3 of 3]

- 01/23: Team Status Report Presentations
  - 1 Week From Today **←Note**
  - Split-Hands Meeting
  - Slide Deck Template Posted on Downloads Page
  - Must Use Windows Version of Office 365 **←Note**
  - Read Submission Instructions Carefully
  - Due by 11:59 p.m. ET, Monday, 01/22
  - Upload Two Times to Microsoft Teams
    - To General Channel File Space
      Folder "Team Status Report Presentation Slide Decks"
    - To Capstone Team's Private Channel
  - Aggregated Slide Decks by TM
    - On TM's Laptop Used by All Teams
    - One or More Presenters Per Team
    - Random Order