MICHIGAN STATE UNIVERSITY

01/17: Risks and Prototypes

The Capstone Experience

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Spring 2023

From Students…
…to Professionals

Agenda

- Reminder re MAPP

- Risks and Prototypes

- What's ahead?

- Team Status Reports

"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.)

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

MAPP Point Deductions

- All-Hands / Split-Hands
  - Meeting-Ready≤ 3:00:00 p.m.
    - Present
    - -0.0 MAPP Points
  - 3:0:01 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.

- 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

- Excused Meeting Absences
  - Job Interviews
    - Documentation Deemed Valid
    - In Advance
  - Sickness Including COVID
    - Documentation Deemed Valid
    - ASAP
  - Grief Absence
    - See MSU Policy
    - Done in Advance
  - Some MSU Events
- Accommodating Student Schedules
  - Only Reasonably
  - Not for Students
    - Working > 20 Hours Per Week
    - Commuting Long Distance to Campus
- Cannot Be Excused from Doing Work

- 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 2023
  - 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

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

- 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
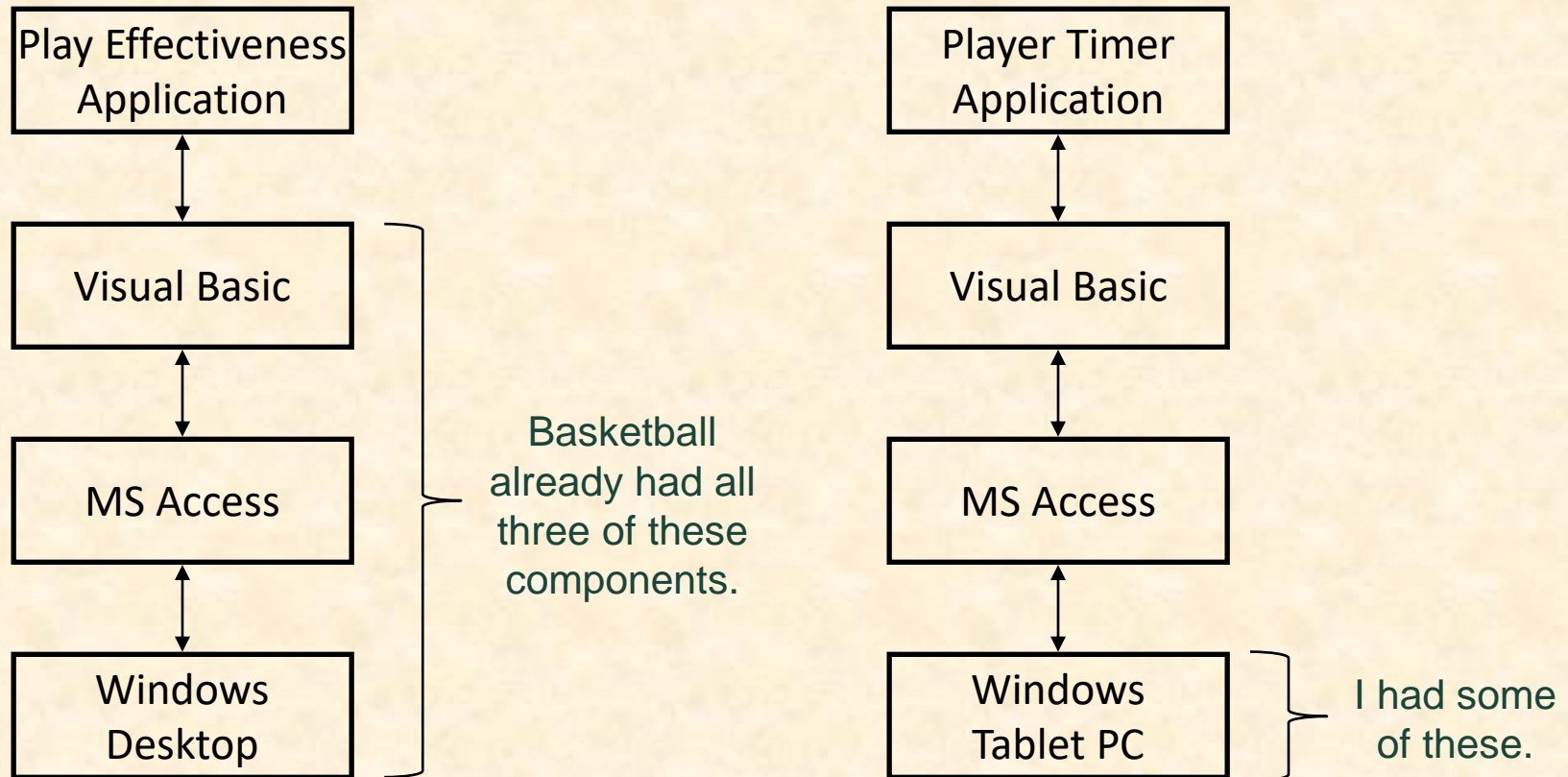 - Medium
  - Low   Not Vital, Nice to Have

Prioritizing Risks

High

Difficulty

Work On Now

Work On Later

Low

Low   High

Importance
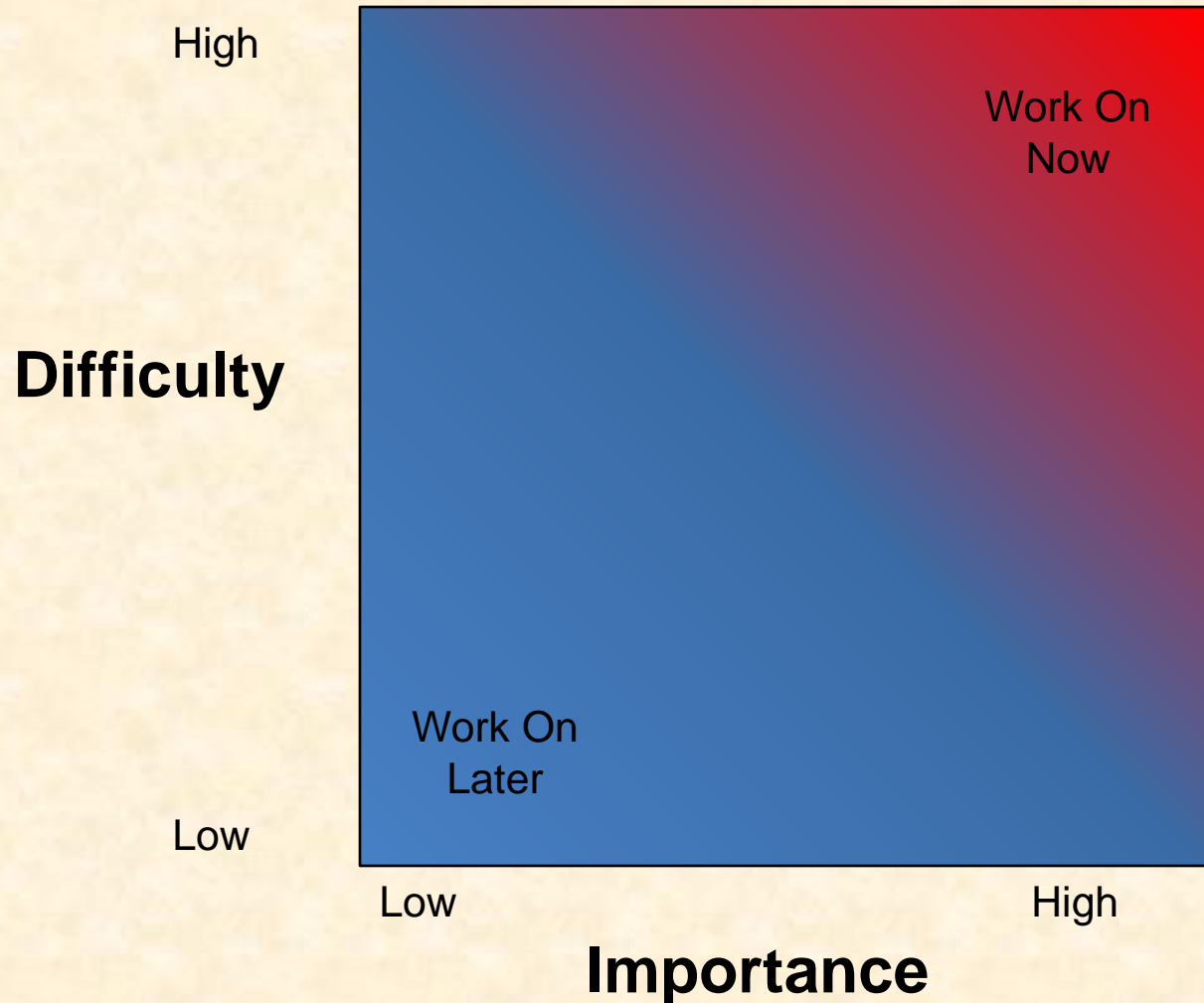
Case Studies: MSU Men's Basketball Apps

- 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

```
┌─────────────────────┐              ┌─────────────────────┐
│  Play Effectiveness │              │    Player Timer     │
│     Application     │              │     Application     │
└─────────────────────┘              └─────────────────────┘
          ↕                                    ↕
┌─────────────────────┐              ┌─────────────────────┐
│    Visual Basic     │              │    Visual Basic     │
└─────────────────────┘              └─────────────────────┘
          ↕                                    ↕
┌─────────────────────┐              ┌─────────────────────┐
│     MS Access       │              │     MS Access       │
└─────────────────────┘              └─────────────────────┘
          ↕                                    ↕
┌─────────────────────┐              ┌─────────────────────┐
│      Windows        │              │      Windows        │
│      Desktop        │              │     Tablet PC       │
└─────────────────────┘              └─────────────────────┘
```

Basketball already had all three of these components.

I had some of these.

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

| Start | 19:55 |
| Stop | |

Write	7
Read	14
Add Up	55
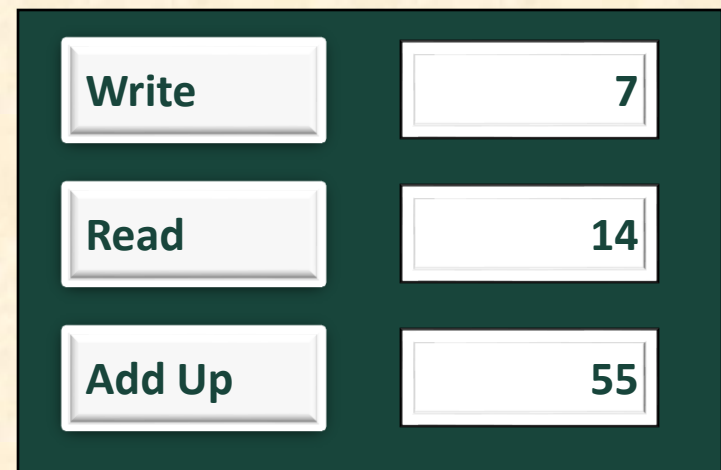
Risks and Prototypes

✓Risks

➢Prototypes

Aside: Capstone Transition

- 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

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.

  <div align="center">vs</div>

- "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

```
┌─────────────────────┐
│  Play Effectiveness │
│     Application     │
└─────────────────────┘
          ↕
┌─────────────────────┐ ┐
│    Visual Basic     │ │
└─────────────────────┘ │
          ↕             │   Basketball
┌─────────────────────┐ │   already had all
│     MS Access       │ │   three of these
└─────────────────────┘ │   components.
          ↕             │
┌─────────────────────┐ │
│      Windows        │ │
│     Desktop         │ │
└─────────────────────┘ ┘
```
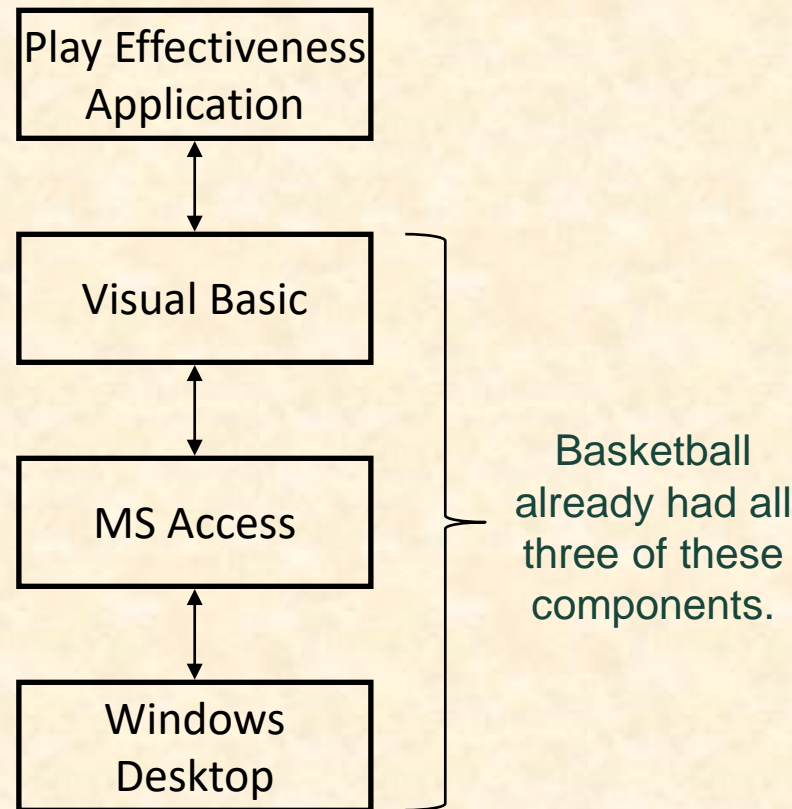
Risks

- 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...
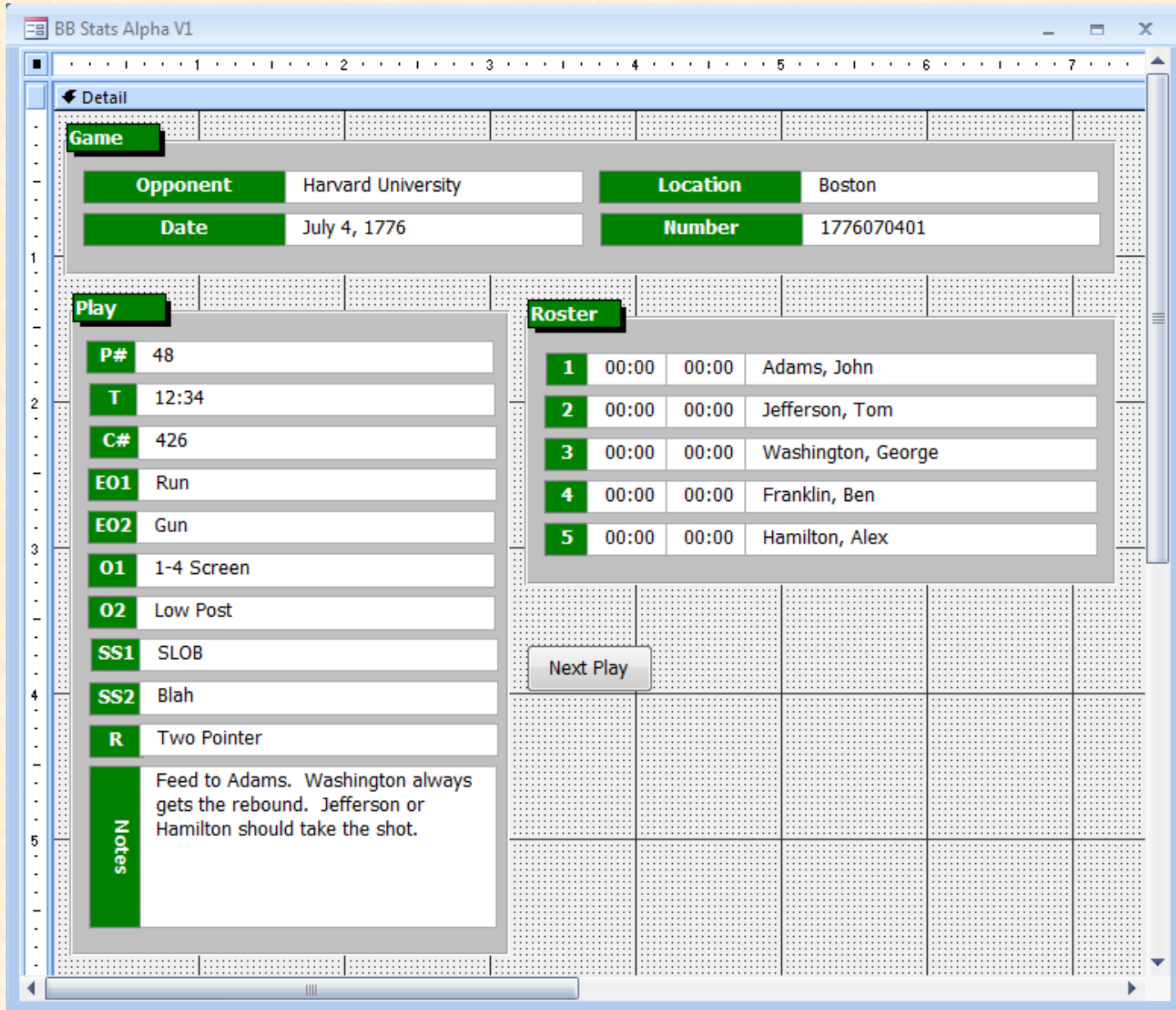
BB PE PV1

(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

- 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

- Results Coded
  - *XN*   Missed *N* Pointer (X1, X2, X3)
  - *ON*   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#)

BB PE PV1

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

BB PE PV2

Fields

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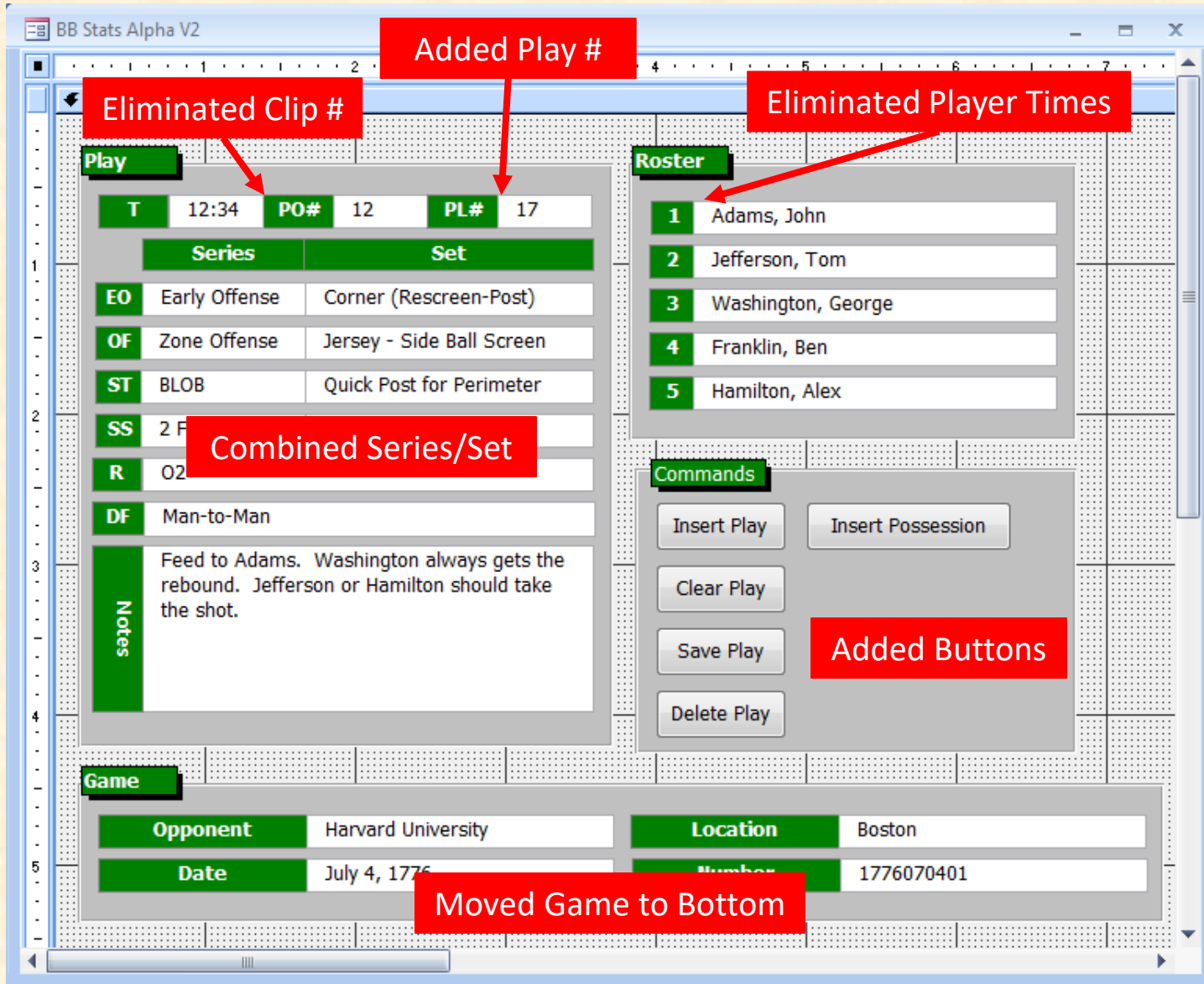
Nota Bene

- 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#
  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 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 <u>NOT</u> Want to Record Player Steals or Assists ☺

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
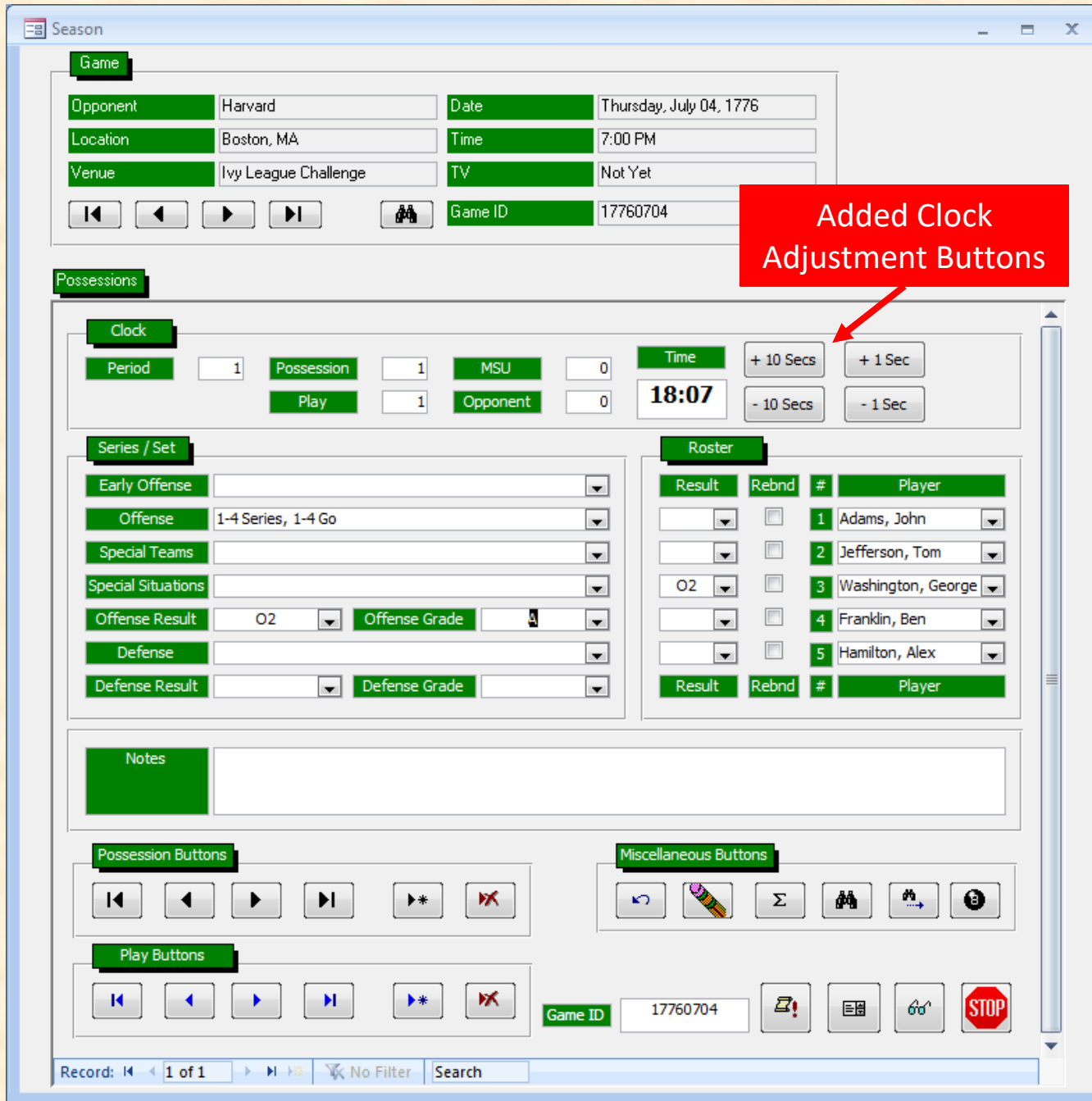 - Mouse-Only Input
  - Easy Way to Adjust Clock
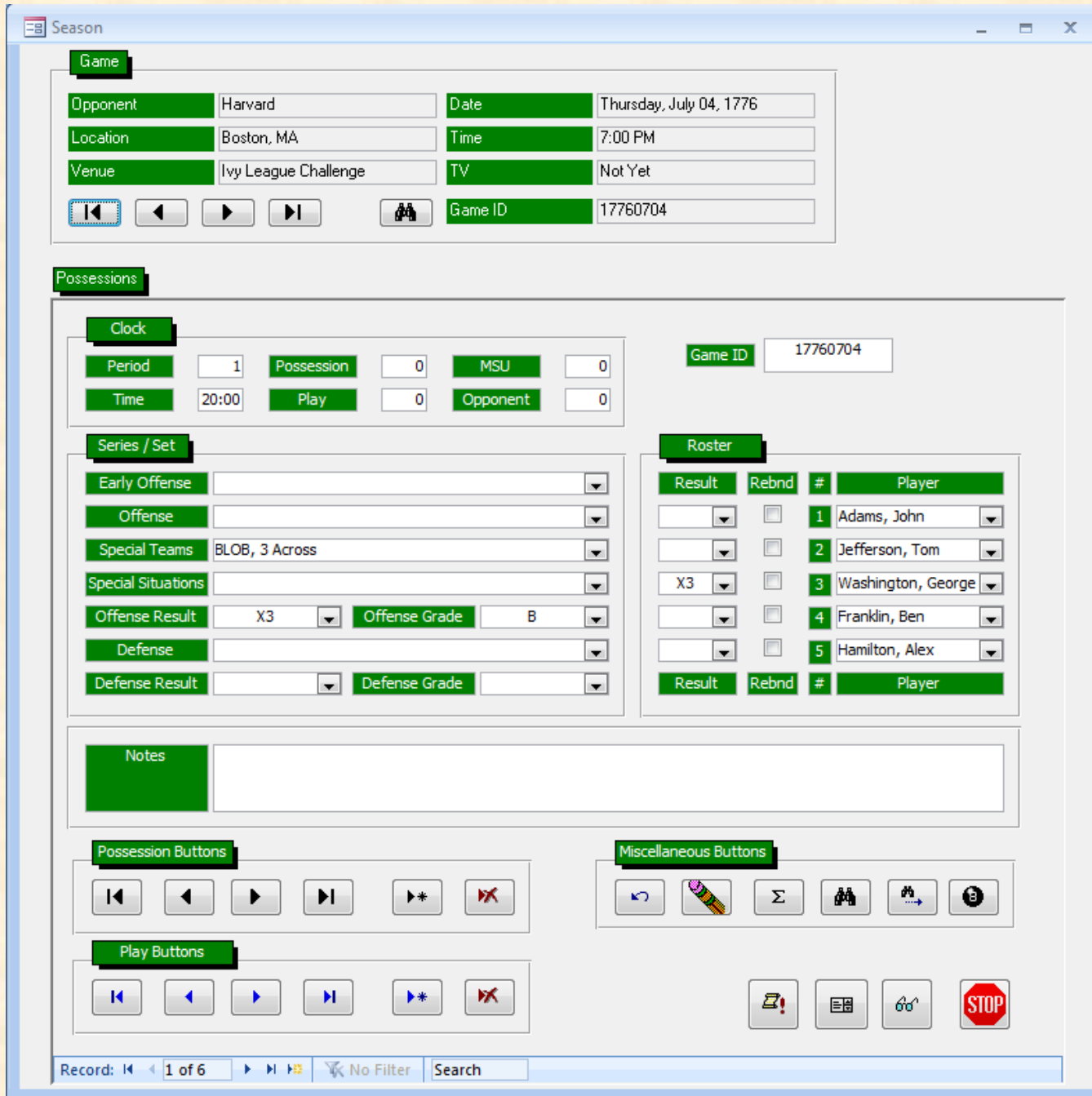
BB PE AV1

(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

Player Timer
Application

↕

Visual Basic

↕

MS Access

↕

Windows
Tablet PC

} I had some
of these.
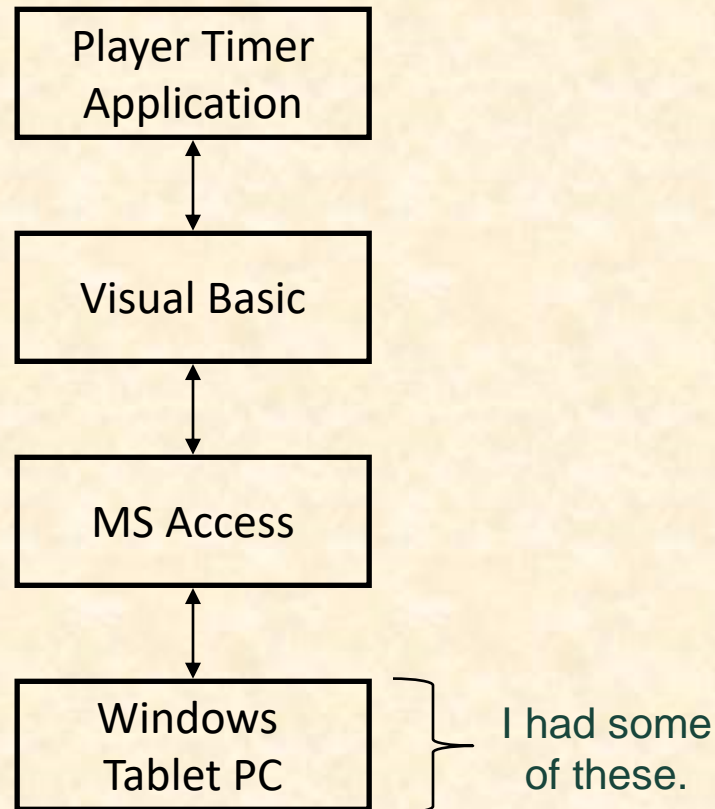
Risks

- 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?

- Upcoming Meetings
  - ~~01/17, Tu: Risks and Prototypes~~
  - 01/19, Th: Team Status Report Presentations
  - 01/20, Fr: Team Photos (10:00 a.m. – 3:00 p.m.)
  - 01/24, Tu: Project Plan
  - 01/26, Th: Schedule and Teamwork
  - 01/31, Tu: Team Project Plan Presentations
  - 02/02, Th: Team Project Plan Presentations   **10% of Team Grade**
  - 02/07, Tu: Team Project Plan Presentations

What's ahead?

- Team Photos
  - Coordinated by James
  - Friday, January 20, 10:00 a.m. – 3:00 p.m.
    - ❖ On-Time Attendance Required
    - ❖ Team should create a method…
      - » …to contact everyone.
      - » …to ensure everyone is on their way to be on time.
    - ❖ Engineering 3112
  - Dress
    - ❖ Business Preferred
    - ❖ At Least Business Casual
    - ❖ Team Coordinated

What's ahead?

- Split-Hands Meetings
  - Used On Presentation Days
    - 01/19: Team Status Report Presentations
    - 01/31, 02/02, 02/07: Team Project Plan Presentations
  - Three Locations
    - Luke: STEM 3202
    - Griffin: STEM 2202
    - Tommy: Anthony 1281
  - Find the rooms in advance.
  - Attendance Taken As Usual Including Lateness

What's ahead?

- 01/19: Team Status Report Presentations
  - Thursday←**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, Tomorrow, Wednesday, 01/18
  - 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

Aside: Filenames

- Convention
  - Use all lowercase.
  - Delete non-numeric and non-alphabetic characters.
  - Replace blanks by dashes.
- Examples
  - Team Amazon
    team-amazon-status-report-presentation.pptx
  - Team Kellogg's
    team-kelloggs-status-report-presentation.pptx
  - Team Roosevelt Innovations Knowledge Science
    team-roosevelt-innovations-knowledge-science-status-report-presentation.pptx
- Misnamed files may not be processed. ←**Note**

Read Me

- Presenting
  - The Status Report Presentations will be given on Thursday, January 19.
  - The purpose of your Status Report Presentation is for your team to demonstrate that you have made significant progress on your project. In particular, you will give status reports on a variety of things including the status of project sponsor contact, project sponsor meeting schedules, team meeting schedules, team organization, server systems and software, development systems and software, a brief description of the project, the status of your project plan and the initial identification of risks.
  - The time limit for your presentation is 6 minutes, which will be strictly enforced. Practice your presentation to ensure that your team will finish within the allotted time of 6 minutes.
  - Be ready to answer questions, including tough questions.
  - We will meet in "split-hands" meetings. Luke's teams will meet in STEM 3202, Griffin's teams will meet in STEM 2202, and Tommy's teams will meet in Anthony 1281.
  - Dr. D. will combine the individual team slide decks into multiple slide decks, one for each TM.
  - Your TM project the combined slide decks using their laptop, which your team will use for your presentation.
  - Your team may have one or more presenters. All team members should turn their cameras on during their presentation.
  - The order in which the teams will present will be random.

READ ME

- Creating and Editing
  - Use only the Windows version of Office 365.
  - You must use this PowerPoint slide deck template as is. Do not change the number of slides unless the instructions explicitly allow you to duplicate slides. Do not change the order of the slides. Do not change the styles. Do not edit the master slides.
  - Throughout the template, replace placeholders […] with the appropriate information.
  - Edit the center footer by clicking the Header & Footer button on the Insert ribbon. Change [Team Name] in the footer to your company name as in "Team TechSmith Status Report Presentation". If necessary, extend the width of the center footer textbox on the master slide, making sure that you re-center the enlarged textbox.
  - Do not include any company confidential information in your presentation.
  - Delete every textbox that includes "Delete this textbox" and every slide that includes "Delete this slide."
- Submitting
  - All presentations must be submitted to us and to your client by 11:59 p.m., Wednesday, January 18.
  - Name your PowerPoint slide deck file as "team-[team-name]-status-report-presentation.pptx" replacing "[team-name]" with your team's name normalized by using all lower case, deleting non-numeric and non-alphabetic characters, and replacing blanks by dashes. Examples include "team-kelloggs-status-report-presentation.pptx" and "team-delta-dental-knowledge-science-1-status-report-presentation.pptx" .
  - Upload your PowerPoint slide deck to the folder "Status Report Presentation Slide Decks" in our Microsoft Teams General Channel file space by 11:59 p.m., Wednesday, January 18. In addition, upload your slide deck to your team's private channel file space in case your slide deck is deleted by accident from the General Channel file space, and you need to prove that you did indeed upload your slide deck by the due date and time. Set File Explorer or Finder to show all file extensions to ensure that there are no blanks before the ".pptx" extension as in "team-amazon .pptx".
  - Email a copy of your slide deck to your client as well by 11:59 p.m., Wednesday, January 18. Do not cc us on that email. Include some professional text in the body of your email to practice being a professional and to avoid having your email sent to your project sponsor's junk folder.

MICHIGAN STATE
U N I V E R S I T Y

Status Report Presentation
[Project Title 36pt]

Status Information:
Think clicking "Status" on an Amazon order.
- You bought this on Monday, January 9. Helpful?
- We're going to send this to you. Satisfied?
- People who bought this also bought…. We good?

Where the $*(%($* is my order?

Delete this textbox.

The Capstone Experience

Team [Team Name 24pt]

[Team Member 1 16pt]
[Team Member 2 16pt]
[Team Member 3 16pt]
[Team Member 4 16pt]
[Team Member 5 16pt]
[Team Member 6 16pt]

Department of Computer Science and Engineering
Michigan State University

Spring 2023

From Students…
…to Professionals

[Project Title]

- Sponsor Overview
  - Overview Point 1
  - Overview Point 2
  - Overview Point 3

Describe your sponsor is 30 seconds or less.

Delete this textbox and the brace to the left.

- Project Overview
  - Description Point 1
  - Description Point 2
  - Description Point 3
  - Description Point 4

Describe your project in 30 seconds or less.

What problem does it solve?

Who will use it? How will they use it?

Delete this textbox and the brace to the left.

Team [Team Name]
Status Report

[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
- Project Plan Document
  - Status Point 1
  - Status Point 2
  - % Complete

Include status information.

Are all systems up and running?

Have you tested everything?

Delete this textbox and the brace to the left.

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

[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.

Include status information.

Who's doing what?

Delete this textbox and the brace to the left.

Team [Team Name]

Status Report

[Project Title]

Risks

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

A "Risk" is a significant task that you need to accomplish that you currently do not know how to do. Usually, a risk is a "showstopper," meaning if you cannot complete the task, you cannot complete your project.

"Mitigation" for a particular risk is your plan for eliminating that risk; that is, your plan for figuring out how to accomplish the task.

List only "real" risks. For example, learning new computer languages is **not** a risk for an MSU CSE student.

Give "useful" explanations 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.