

01/21: Risks and Prototypes

The Capstone Experience

Dr. Wayne Dyksen Prof. James Mariani

Department of Computer Science and Engineering
Michigan State University
Spring 2025



Agenda

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

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
 - o 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

个个个个个个个 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.
 - o 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 Before Ended by Instructor
 - o In Person
 - Must Swipe Spartan ID Cards with TM, Leaving and Returning
 - Must Leave and Reclaim Mobile Devices with TM (Approved by University Ombudsperson)
 - ❖ -1.0 MAPP Points if (Fail to Swipe and/or Leave Mobile Devices) or (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
 - o -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
- Read the syllabus.

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

-5.0 MAPP Points Per Absence

- 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
 - o In Advance
 - Sickness Including COVID
 - Documentation Deemed Valid
 - Stating Not Able to Attend Due to Illness
 - By Local Medical Professional
 - Not Later Than Two Days
 - If Concerned, May Sit Masked in Back of Meeting Room
 - Read the Syllabus
 - Grief Absence
 - See MSU Policy
 - Done in Advance
 - A Few Other Accommodations
 - See MSU Policies
 - Done In Advance
- Cannot Accommodate Most Conflicts
- No Accommodations for Personal Reasons Other Than Above

The Capstone Experience Capstone Overview

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

- Requesting Excused Absences
 - Handled by Prof. Mariani and TM
 - o Email Prof. Mariani and TM
 - o CC Dr. D.
 - (Dr. D. will not forward or respond.)
- Taking or Retaking Capstone in Fall 2025
 - 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 spring. ←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 ⇒ 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

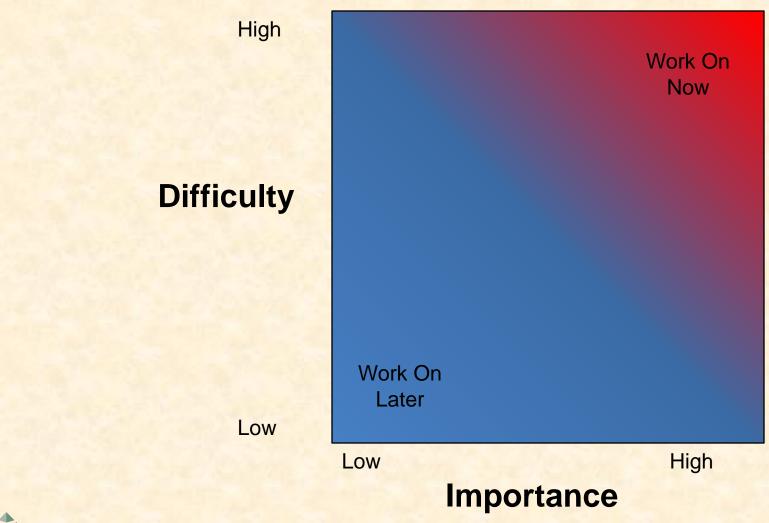
Classify Importance

High Showstopper, Must Have

Medium

Low Not Vital, Nice to Have

Prioritizing Risks



The

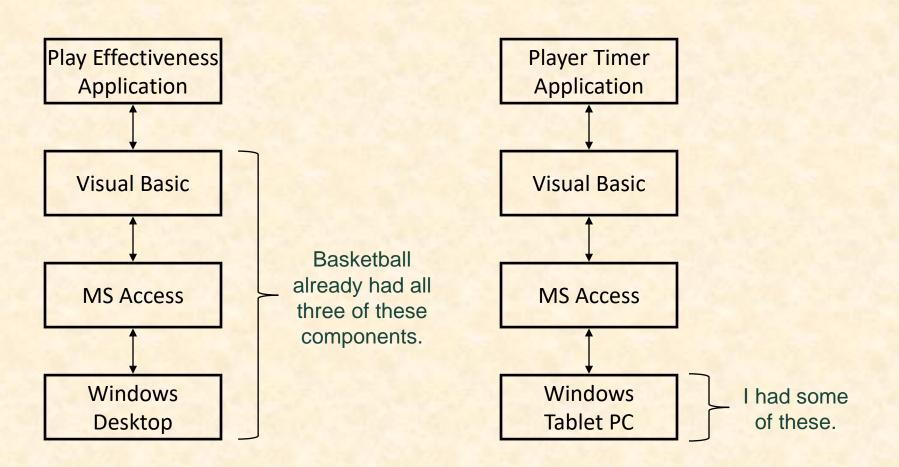
The Capstone Experience Risks and Prototypes

13

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
 - Online Examples
 - o LLMs
 - o Etc...
 - Test Drive
 - o Install
 - Compile
 - Extend
 - o 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



> Prototypes

[1 of 2]

20

- 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



Risks and Prototypes

Aside: Capstone Transition

[2 of 2]

Coding

← Valuable

- Implement Piece of Architecture
- Based On Detailed Specification
- Architecture

← More Valuable

← Most Valuable

- Identify Parts and Pieces
- Organize Into Comprehensive System
- o Based On Design
- Design (Not UX)

- Create Solutions to Problems
- 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....

he Capstone Experience



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...



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 or LLM-ing for Answers

- "Hack" Solution
 - It works.
 - It's *a* way to do something. Often My BiggestVSFrustration
- "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 merely copy and paste.

Basketball Prototypes Case Studies

> Play Effectiveness

Player Timer

Basketball Staff

- Head Coach
- Associate & Assistant Head Coaches
- Video Coordinator
 - Coordinates...
 - ...student managers preparing video.
 - o ...video for coaches to watch.
 - Reverse Engineers Opponents
 - Players
 - o Plays
 - Coaches Scout 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
 - o# of Successes / # of Attempts
- Design Specifications?
- Technical Specifications?

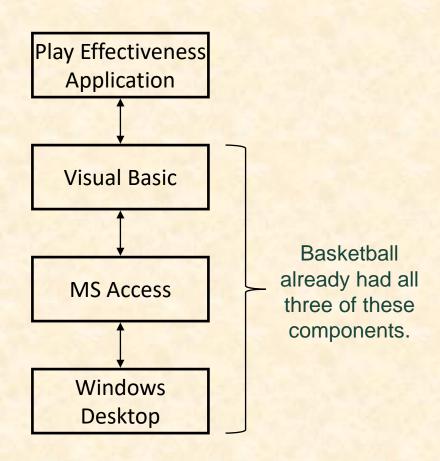
Initial Meeting with Video Coordinator

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)

The
Business
Processes

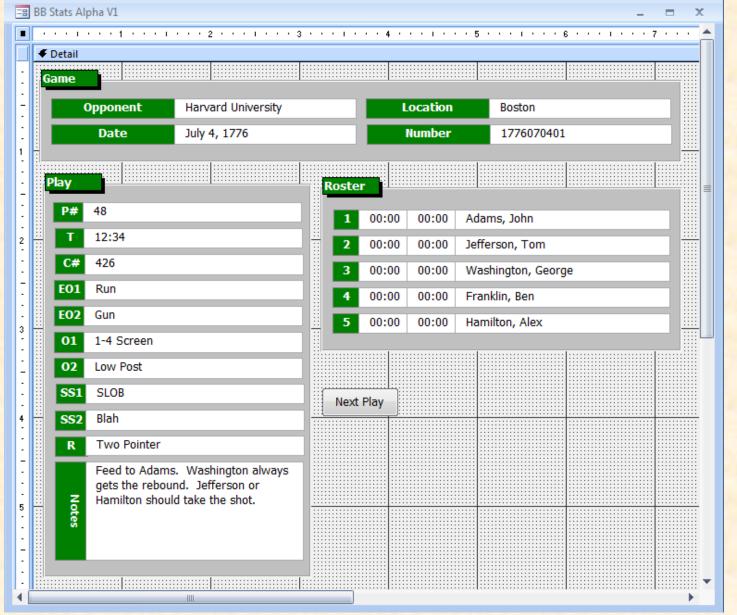
Play Effectiveness Architecture



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

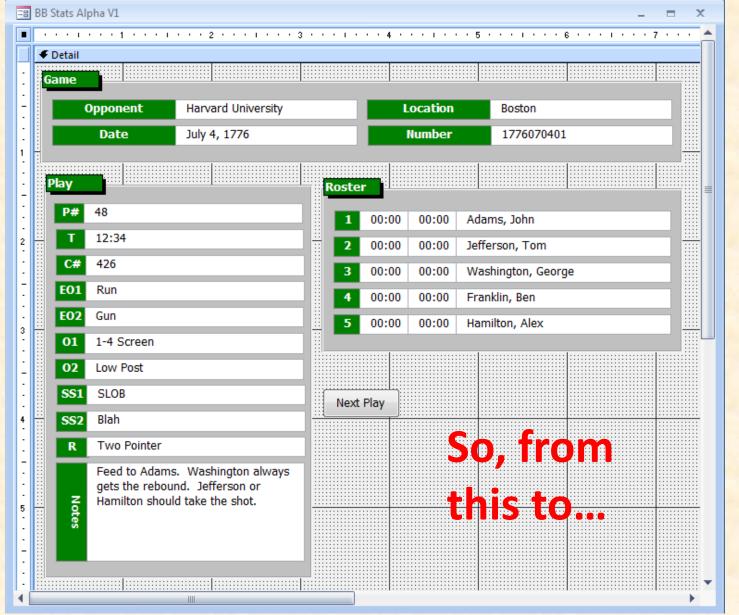
[1 of 2]

- 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
 - o Plays: Thumbs Up, Thumbs Down, Thumbs Circle
 - CS Paradigm: Thumbs(Up), Thumbs(Down), Thumbs(Circle)
 - 1, 2 Notation
 - O EO1 = Early Offense Series
 - EO2 = Early Offense Set
 - ST (Special Teams) Missing

Huge Impact On Design

[2 of 2]

- 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#)



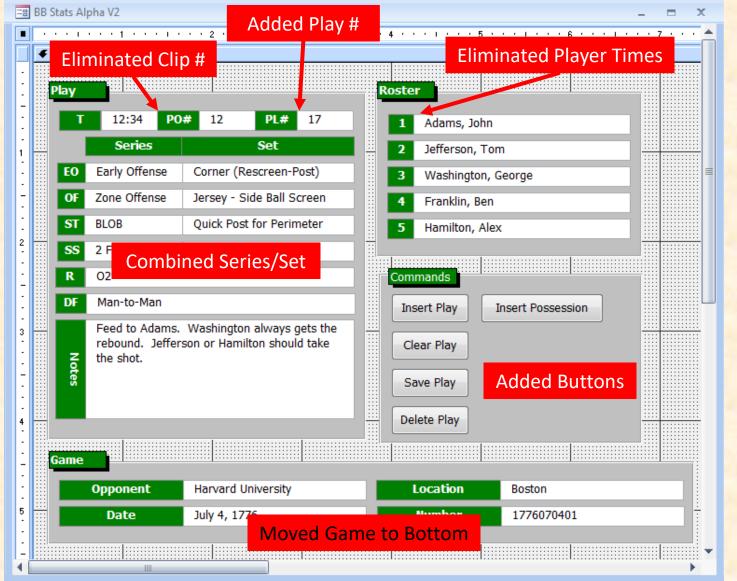
BB PE PV1

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

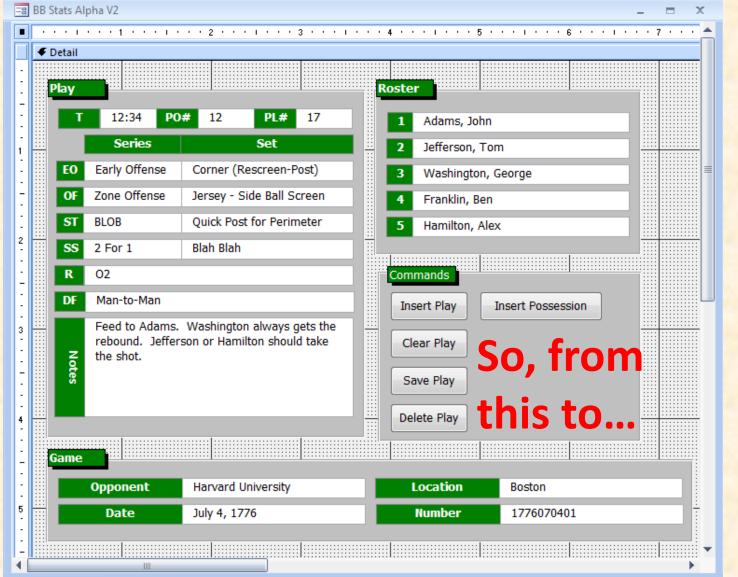
- Just Screen Layout
- No Code (Underneath)

39

 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

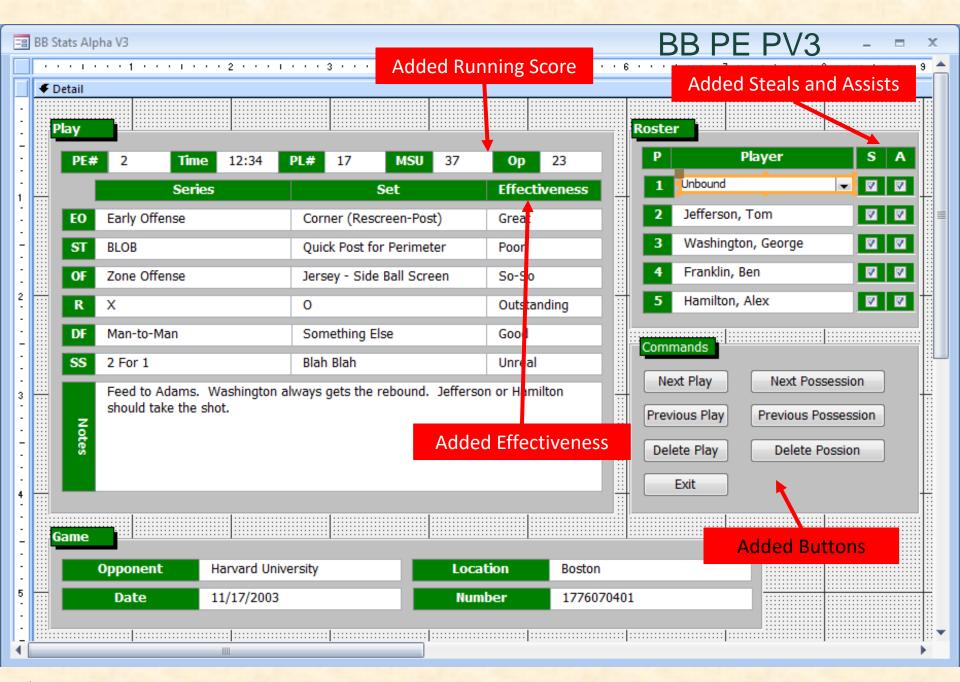
- PO#
 Possession Number
- PL# Play Number
- SS
 Special Situations
- DF Defense

Nota Bene

- Just Screen Layout
- No Code (Underneath)

41

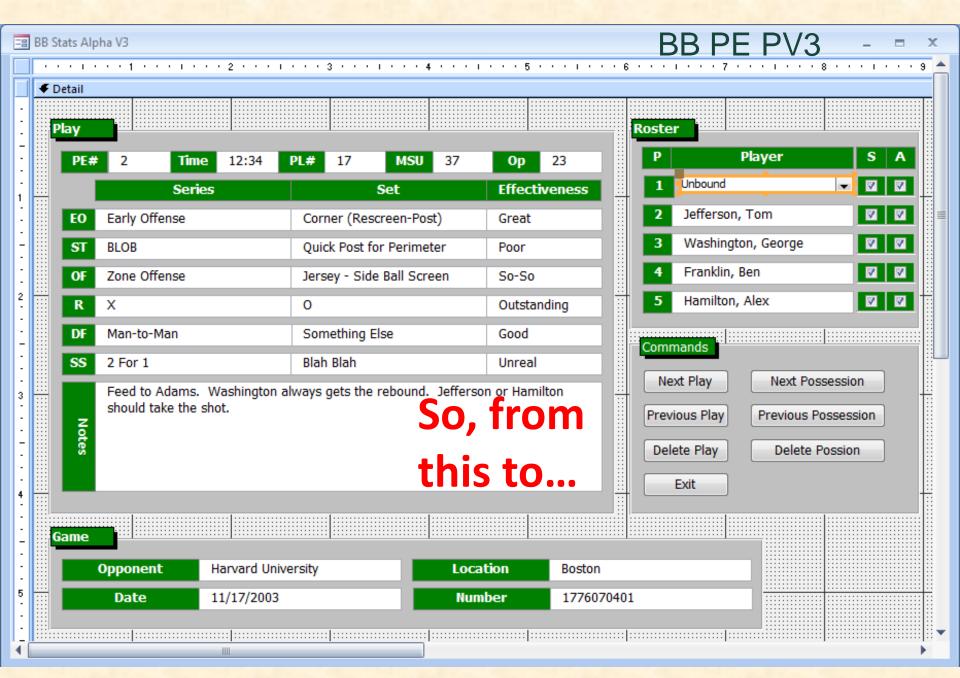
 Would NOT Have Entries in All Fields

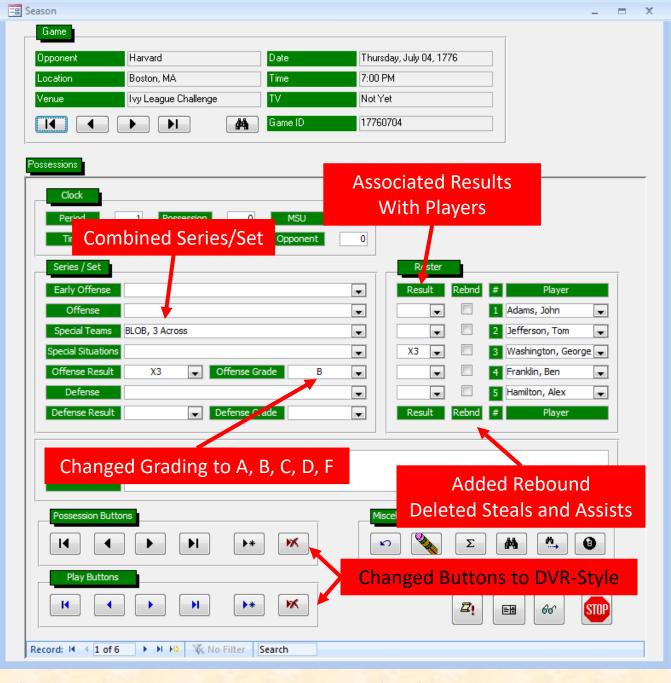


What I Learned From PV3

- 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 NOT Want to Record Player Steals or Assists







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
 - o 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

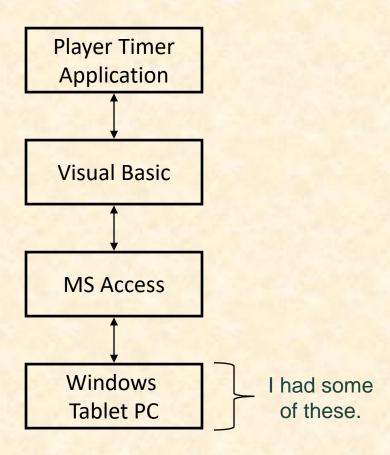
➤ Player Timer

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

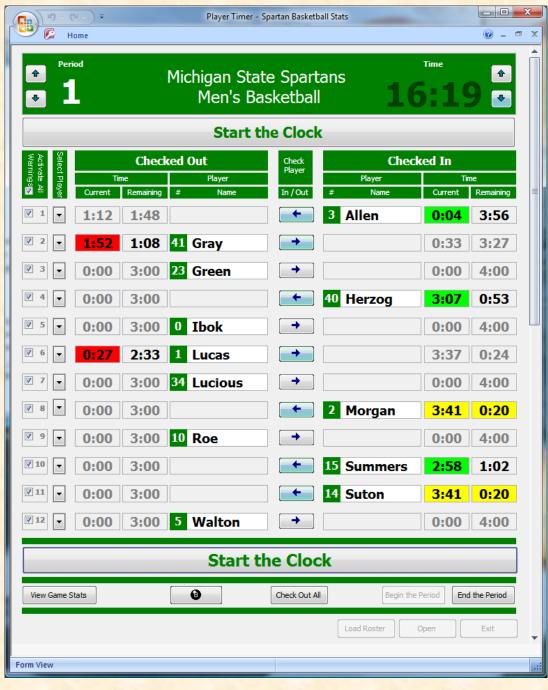
- Learning Basketball Processes
- Implementing Clocks in Windows?
 - Game Clock
 - Wall Clock
- Very Limited Screen Real Estate
 - Different Problem Than Mobile App
 - Must Feel Like Clipboard and Single Piece of Paper
- Computing and Displaying Cumulative Times
- Hidden Risk ("Danger Will Robinson!")

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

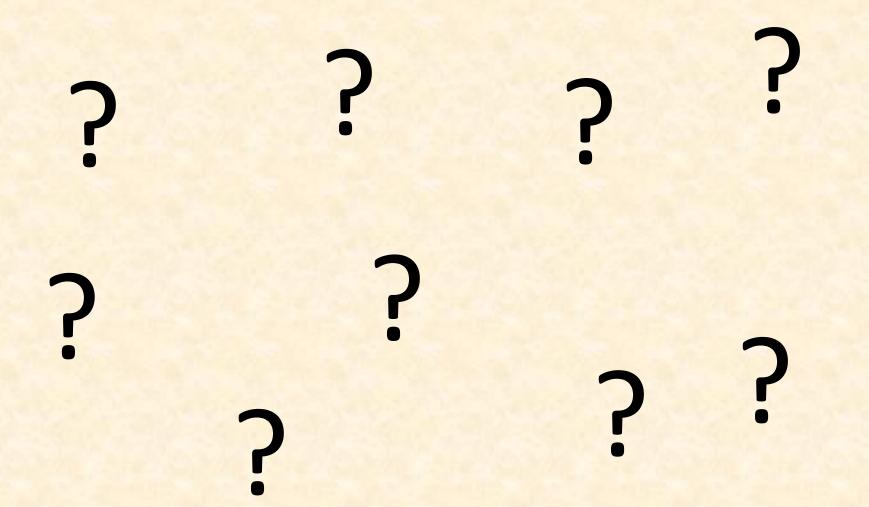
✓ Player Timer

Risks and Prototypes



✓ Prototypes

Questions?





- Upcoming Meetings
 - **■** 01/21, Tu: Risks and Prototypes
 - 01/23, Th: Project Plan
 - 01/24, Fr: Team Photos (8:00 a.m. 5:00 p.m.)
 - 01/28, Tu: Team Status Report Presentations
 - 01/30, Th: Schedule and Teamwork
 - 02/04, Tu: Team Project Plan Presentations
 - 02/06, Th: Design Day Booklet Process
 - 02/11, Th: Team Project Plan Presentations

10% of Team Grade

- Coordinated by Prof. Mariani
- Friday, January 24, 9:00 a.m. 5:00 p.m.
 - Schedule Has Been Distributed
 - On-Time Attendance Required by All Team Members
 - On-Time == 15 Minutes Prior to Scheduled Photo Time ← Note
 - Put on your calendar now. ← Note
 - Do not plan travel. ← Note
 - Outside of Engineering 3105 (CSE Conference Room)
 - O Missing == Up to -5.0 MAPP Points
- Dress
 - Business Preferred
 - At Least Business Casual
 - Team Coordinated

[3 of 5]

- Split-Hands Meetings
 - Used On Presentation Days
 - 01/28: Team Status Report Presentations
 - 02/04,11: Team Project Plan Presentations
 - Three Locations
 - Luke: 158 Natural Resources
 - o Griffin: B115 Wells Hall
 - Sam: 1279 Anthony Hall
 - Find the rooms in advance.
 - Attendance Taken As Usual Including Lateness

[4 of 5]

- Website, Email and Team's Messages
 - Check Constantly
 - Read Carefully
 - Not Seeing and/or Reading Email ≠ Valid Excuse
- Triage Meetings
 - Scheduled
 - Attendance & Preparation
- 02/04, 02/11: Team Project Plan Presentations
 - Slide Deck Posted Online
 - Read and Review
 - Discuss in Triage Meetings

[5 of 5]

66

- 01/28: Team Status Report Presentations
 - Less 2 Weeks From Today ←Note
 - Split-Hands Meeting
 - Slide Deck Template Posted on Downloads Page
 - o 4 Slides
 - Presentation 6 Minutes Max
 - Must Use Windows Version of Office 365 ← Note
 - Read Submission Instructions Carefully
 - Due by 11:59 p.m. ET, Monday, 01/27
 - 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

The Capstone Experience Capstone Overview

Read Me

[1 of 2]

Presenting

- The Status Report Presentations will be given on Tuesday, January 28.
- 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 158 Natural Resources, Griffin's teams will meet in B115
 Wells Hall, and Sam's teams will meet in 1279 Anthony Hall.
- Dr. D. will combine the individual team slide decks into multiple slide decks, one for each TM.
- Your TM will project the combined slide decks using their laptop, which your team will use for your presentation.
- Your team may have one or more presenters.
- The order in which the teams will present will be random.

READ ME

[2 of 2]

Creating and Editing

- Read and follow the instructions in "Editing Documents and Presentations Using Office 365" of our course syllabus.
- 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., Monday, January 27.
- 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-kohls-status-report-presentation.pptx" and "team-wk-kellogg-co-status-report-presentation.pptx". 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".
- 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., Monday, January 27. 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. 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., Monday, January 27. 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 UNIVERSITY

Status Report Presentation [Project Title 36pt]

Status Information:

Think clicking "Status" on an Amazon order.

- You bought this on Monday, January 13. 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 2025



Status Report

[1 of 4]

[Project Title]

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

Describe your sponsor is 30 seconds or less.

Delete this textbox and the brace to the left.

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.



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
- 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.



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.

Include status information.

Who's doing what?

Delete this textbox and the brace to the left.



Status Report

[4 of 4]

[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.