



MICHIGAN STATE UNIVERSITY

10/10: [Prototyping](#)

[The Capstone Experience](#)

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From Students...
...to Professionals

Prototypes

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

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Why? Answer Questions

Help Determine...

- Specifications
 - Functional
 - Design
 - Technical
- Usability
- How Existing Code Works
- Programming Languages
- Development Environments
- Operating Environments
- What to Panic About
- Etc...

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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.
- Etc....

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Why? Reduce Risk

- 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...

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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

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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, Normally Not 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

Prototypes: Case Studies

Basketball

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

Basketball Play Effectiveness

- Coaches Desired
 - Determine Effectiveness of Plays
 - Record All Plays with Result
 - Produce Report of Effectiveness
 - Each Play
 - # of Success / # of Attempts
- I Learned (During First Meeting)
 - Done After Game from DVR
 - Lots of Plays (~ 200) in Play Book
 - ~60-80 Plays Run Per Game
 - Plays Categorized
 - Early Offense 1,2 (E.g., Fast Breaks)
 - Offense 1,2 (E.g., Half Court Plays)
 - Special Situations 1,2 (E.g., Out of Bounds)
- Overwhelming ← Can you relate?

Basketball App Architecture

Basketball Play Effectiveness

```

    graph TD
      BPE[BPE Application] <--> VB[Visual Basic]
      VB <--> ACC[Access]
      ACC <--> WXP[Windows XP Desktop]
      subgraph Existing [Basketball already had all three of these components.]
        VB
        ACC
        WXP
      end
  
```

Risks

- Learning Basketball Processes?
- Programming in Visual Basic?
- Access?
- Building a GUI with Access/VB?
- Interfacing VB with Access?
- Generating Reports in Access?
- Etc...



BB Stats AV1

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 AV1 (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 AV1 (2 of 2)

- Results Coded
 - XN Missed N Pointer (X1, X2, X3)
 - ONMade 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

BB Stats AV1

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 Stats AV2

Fields

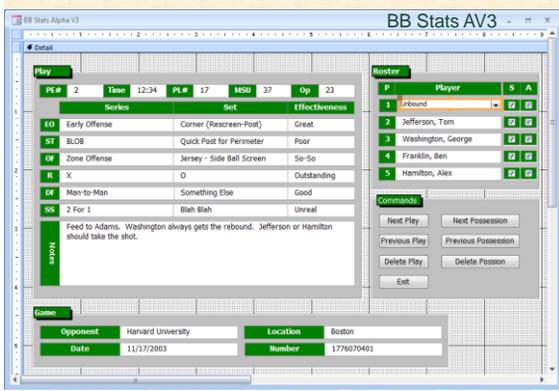
- P# Possession Number
- PL# Play Number
- SS Special Situations
- DF Defense

Nota Bene

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

What I Learned From AV2

- Wanted to Grade Effectiveness of Plays
- Wanted to Record Player Steals and Assists (Remember this...)
- Needed to Navigate Plays and Possessions



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What I Learned From AV3

- Wanted...
 - Grades to Be A, B, C, D, F
 - Results to Be X1, O1, X2, O2,...
 - Results Associated With Players
 - Series/Set Combined ("Thumbs Up" Rather Than "Thumbs", "Up")
 - To Record Player Rebound
- Video Coordinator, GAs, and Managers
 - Will Use Software
 - Very Familiar with DVR Controls
- Did NOT Want to Record Player Steals or Assists 😊

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BB Stats Beta 1
First Version With Code

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What I Learned From Beta 1

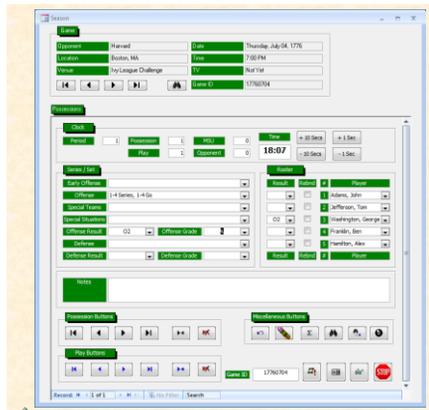
- Entering a Play
 - Some Things Calculated Automatically
 - Play/Possession Number
 - Score
 - Most Things Entered With Mouse Via Pull-Down Menus
 - Series / Set
 - Result
 - But Time Entered With Keyboard Via Typing Numbers
- Need Mouse-Only Input
- Need Easy Way to Adjust Clock

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BB Stats Beta 2
Still Not Much Implemented

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BB Stats V1.0

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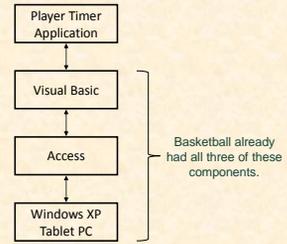


Player Timer

- For Each Player, Track
 - Minutes Played
 - Game Clock Time
 - Consecutive & Total
 - Minutes Rested
 - Wall Clock Time
 - Consecutive
- Must
 - Be Usable
 - On the Bench
 - In Real Time
 - Portable and Not Require Electrical Outlet
 - Feel Like a Pen and a Clipboard

Basketball App Architecture

Player Time



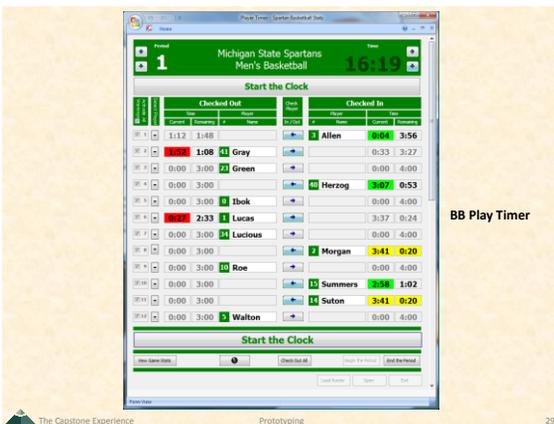
Player Timer Prototypes

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



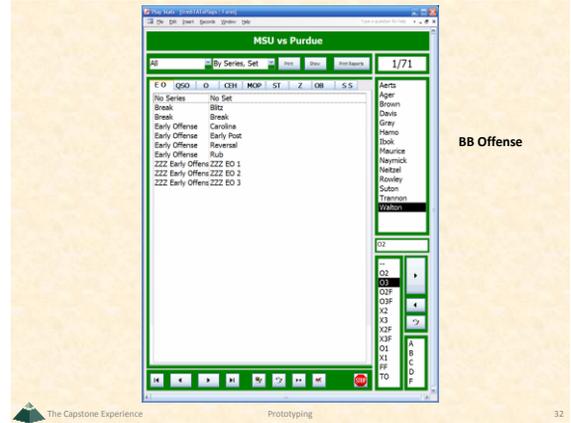
Player Timer Development

- Knew Exactly What They Wanted, So...
 - Designed "Final" Version
 - User Interface
 - Data Base Schema
 - Etc...
 - Coded "Final" Version
 - Lab Tested "Final" Version
 - Field Tested "Final" Version
 - At a Scrimmage
 - Totally and Completely Unusable
 - Scrapped "Final" Version UI and Start Over
- Huge Mistake!



Software Updates

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



BB Offense



Plus/Minus

Your Prototypes

- What?
- Why?
- How?
- When?
- Where?

What's ahead? (1 of 2)

- Creating and Giving Presentations
- Design Day Booklet Team Page Content
 - Read instructions over and over.
 - Your Tasks
 - Write project description.
 - ✦ Magazine Style
 - ✦ Edit Carefully
 - Create, insert and provide artwork.
 - ✦ Screen Capture, Screen Mockup, Etc..
 - ✦ 1 or 2 PNG images, 1 Unified PNG per Artwork
 - ✦ Inserted into Team Page and High Resolution Original
 - ✦ Possible Opportunity to Update Later
 - Check everything else, highlighting changes in yellow.
 - Due by Midnight, Thursday, October 13.
 - Zip Folder team-<team-name>-design-day-booklet-page.doc
 - team-<team-name>-design-day-booklet-page.doc
 - team-<team-name>-artwork-1.png
 - [team-<team-name>-artwork-2.png]

What's ahead? (2 of 2)

- Team Alpha Presentations
 - PowerPoint Template
 - Due Noon, Monday, October 17
 - All Teams
 - Email to Dr. D.
 - Read Submission Instructions in Template
 - Schedule Posted Evening, October 16
 - Each Team Presents
 - Using a Team Laptop or Team Desktop (Coordinate Desktops with Meredith)
 - Test Meeting Room Network Connection
 - At Most 15 Minutes (Rehearse Timing)
 - Single or Multiple Presenters (Your Choice)
 - Dress is business casual for presenting teams.
 - Checkpoint Alpha Code for Alpha Presentation
 - 10% of Your Final Grade