09/20: Prototyping

The Capstone Experience

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 will it 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....

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....

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...**

- Testing
- Documentation
- Security
- Software Engineering Best Practices
- 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.
  - Often My Biggest Frustration

- "Correct" Solution
  - It works.
  - It’s the “right” way to do something.
  - (There may be more than one "right" way to do something.)

**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

**Basketball App Architecture**

**Basketball Play Effectiveness**

- BRE Application
- Visual Basic
- Access
- Windows XP Desktop

Basketball already had all three of those components.

**Risks**

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

What I Learned From AV1

1. Wanted to Identify Plays Within a Possession
2. 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

What I Learned From AV1

(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

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

Dr. Wayne Dyksen
Professor of Computer Science and Engineering
Michigan State University
East Lansing, Michigan 48824
The Capstone Experience

What I Learned From AV3

- Wanted Grades to Be A, B, C, D, F
- Wanted Results to Be X1, O1, X2, O2,…
- Wanted Results Associated With Players
- Wanted Series/Set Combined
- Wanted to Record Player Rebound
- Did NOT Want to Record Player Steals and Assists

What I Learned From Beta 1

- Entering a Play
  - Some Things Calculated Automatically
    - Play/Possession Number
    - Score
  - Most Things Entered Via Pull-Down Menus
    - Series / Set
    - Result
  - But time Entered Manually (On Keyboard)
- Need Mouse-Only Input
- Need Easy Way to Adjust Clock
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 Timer

- Player Timer Application
- Visual Basic
- Access
- Windows XP Tablet PC

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 Unusable
- Scrapped “Final” Version UI

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 Almost All Modal Dialog Boxes
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Michigan State University
East Lansing, Michigan 48824

Your Prototypes

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

What’s next?

- Team Status Report
  - PowerPoint Template
  - Due Noon, Monday, September 27
    - All Teams, Document and PowerPoint
    - Email to Dr. D.
    - Read Submission Instructions in Template
- Each Team Presents
  - Using a Team Laptop
  - At Most 15 Minutes (Rehearse Timing)
  - Single or Multiple Presenters (Your Choice)
- Dress is business casual.
  - “Formal” Team Pictures Right After Meeting