5. Prototyping

Prototypes

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

Why? Answer Questions

Help Determine
- Functional Specs
- Design Specs
- Usability
- Market
- How Existing Code Works
- Programming Language(s)
- Development Environment(s)
- Operating Environment(s)
- Etc...

Why? Determine Schedule

Determine how long will it take to...
- Install/learn the development environment.
- Install/learn the existing code.
- Convert the existing code.
- Convert the existing database.
- Get libraries working.
- Build 100 interfaces.
- 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
  - RAD Languages (Warning: "RAD" Overloaded)
  - SDK’s
  - IDE’s
  - Design Tools
  - Wizards
  - Sample Code
  - Etc...
- Stop When Question(s) Answered
Tradeoffs: Speed 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.
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

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

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

Nota Bene
- Just Screen Layout
- No Code (Underneath)
- Never Have All Entries Filled at Once

Huge Impact on Design

What I Learned From AV1 (2 of 2)…

- Results Coded
  - XN Missed Pointer (X1, X2, X3)
  - ON Made 1 Pointer (O1, O2, O3)
  - FF Fouled 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

What I Learned From AV3
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 Time
- Player Timer Application
- Visual Basic
- Access
- Windows XP Desktop

Player Timer Prototypes

- Game Clock
  - Start / Stop
  - Counts Down
  - By Minutes/Seconds

- Access Interface
  - Write Number
  - Read Number
  - Add Up Numbers

Player Timer Huge Mistake

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
  - At a Scrimmage
  - Totally Unusable
- Scraped “Final” Version
Your Prototypes

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