01/12: Project Plan

The Capstone Experience

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Spring 2017
Project Plan

- Functional Specifications
  - Design Specifications
  - Technical Specifications
Functional Specifications

• What does it do?
  (Not “how” does it do it?)
  ▪ What’s your client’s problem?
  ▪ What’s your solution?

• Includes
  ▪ List of Objectives
  ▪ Use Cases

• Not Necessarily Complete

• Understandable by End User

• Initial Problem Statement

• Usually Refined
Functional Specifications

• Amazon
  ▪ Improve Amazon Customer Shopping Experience
  ▪ Enable More Informed Purchase Decisions
  ▪ Provide Automatic Analysis of Product Reviews

• MSUFCU
  ▪ Expand Digital Banking Offerings
  ▪ Build Amazon Alexa Service
  ▪ Develop Apple Watch App

• Spectrum Health
  ▪ Assist Resident Physicians Becoming Doctors
  ▪ Enable Residents to Track Their Shift Times

Understandable by End User
Functional Specifications

Interactions With Your Client

• Derived With/From Client
• Documented For Client
• Presented to Client
• Agreed Upon With Client
• Your Job to Capture the Client’s Intent!
Project Plan

✔ Functional Specifications

➢ Design Specifications

• Technical Specifications
Design Specifications

• What’s the user experience (UX)?
  ▪ How does a user use it?
  ▪ How does it look and feel?
• Includes
  ▪ Business Process Flow
  ▪ Specific Features
  ▪ Use Cases
  ▪ Screen Mockups
  ▪ Data Flow Diagrams
  ▪ Data Organization
  ▪ Etc...
• Identifies All the Parts and Their Interactions
• (Mostly) Understandable by End User
• Usually Refined
Design Specifications

- **Auto-Owners**
  - Support Role-Based Authentication and Authorization
  - Handle Location Based on Address or GPS
  - Enable Claims Submission
  - Visualize Mapping of Customers Nearby
    - Policyholders
    - Claims
    - Proposals
  - Provide Administrative Web Portal
- **Humana**
  - Usable by 6 – 12 Year Olds
  - Implement as Android Launcher
  - Handle Various Interactions
    - Surveys for Parents and Kids
    - Tips for Parents
    - Quizzes for Kids
  - Include Coins and Badges as Awards
  - Utilize Natural Language Processing and Machine Learning
  - Provide Web App for Parents
- **Urban Science**
  - Analyze Real-Time In-Flight Digital Marketing Data
    - Consumer Engagement
    - Demographic Inclusion
    - Delivery Effectiveness
    - Overall Performance
    - Return on Investment
  - Leverage Machine Learning to Recommend Actions
  - Enable Changes to Active Campaign Variables

Mostly Understandable by End User
Screen Mockups

• User Interface Only
  ▪ Shows Layout, Buttons, Pull-Downs, Etc...
  ▪ Non-Functional
  ▪ No Back End
• Helpful for Developing
  ▪ Functional Specifications
  ▪ Look-and-Feel
  ▪ Use Cases
• Can Create with...
  ▪ Pencil and Paper
  ▪ PowerPoint (Developer View)
  ▪ Photoshop
  ▪ Etc...
• NOT Screen Captures of Other Software
Screen Mockups

• “Use” with Clients
  ▪ Show to Clients
  ▪ Go Through Use Cases with Clients

• “Cruder” may be better.
  ▪ What?
  ▪ Why?
Screen Mockup Example
Screen Mockups Example
Screen Mockups Example

Vehicle Management

Scan Vehicle

Vehicle Management

<table>
<thead>
<tr>
<th>Make</th>
<th>Ford</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Focus</td>
</tr>
<tr>
<td>Year</td>
<td>2015</td>
</tr>
<tr>
<td>Trim</td>
<td>SE Hatch</td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
</tbody>
</table>

Remove Vehicle

Add Update Vehicles Location

The Capstone Experience

Project Plan
Design Specifications
Interactions With Your Client

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Project Plan

✓ Functional Specifications

✓ Design Specifications

➢ Technical Specifications
Technical Specification

• How does it do it?
• Identifies All the Parts and Their Interactions
• Everything a Developer Needs to Write the Code
• Includes Things Like...
  ▪ Overall System Architecture
  ▪ Machine Architectures
  ▪ Software Technologies
  ▪ Production Environments
  ▪ Development Environments
  ▪ SDK’s (Software Development Kits)
  ▪ Network Topology
  ▪ Database Schema
  ▪ Continued...
Technical Specification

• Includes Things Like...
  ▪ Object Models and Class Diagrams
  ▪ UML Diagrams
  ▪ Pseudo Code
  ▪ Function Prototypes
  ▪ Schedule
  ▪ Test Plan
  ▪ Risk Analysis
  ▪ Etc...

• Probably Not Understandable by End User
• Usually Refined
Technical Specifications

- **Michigan State University**
  - Apple iPads and iPhones (iOS) / Swift
  - Google Android Tablets and Phones / Java
  - Global Positioning Systems
  - RESTful Web Services
- **Microsoft**
  - Google Android Tablets and Phones / Java
  - Apple iPads and iPhones (iOS) / Swift
  - Microsoft Windows / C#
  - Microsoft Bot Framework
  - Natural Language Processing
  - RESTful Web Services
- **Mozilla / Firefox**
  - XUL
  - XHTML
  - JavaScript / EcmaScript 2016 & 2017
  - CSS
  - IRC
  - Bugzilla
  - Mercurial

*Probably Not Understandable by End User*
System Architecture Example

Server architecture designed with current Ford infrastructure in mind.

Vehicle Audit Analytics Architecture

Internet

HTTPS used for encrypted transport

Server-Side Architecture

Apache PDFBox
CSV Exporter
Tomcat (running J2EE)

MS SQL Server 2012

Structured Query Language (SQL)

Client-Side Web App

Front End UI
- HTML5 Tablet Interface
- Reports / Data Exporter
- Bootstrap CSS
- Input Forms
- JSON text objects

Form Data Cache
- SJCL
- 128-bit AES
- localStorage (html5)

The client-side application is capable of running both with and without an internet connection. All form data saved locally for submission at a later time.
System Architecture Example

- **Product catalog**
  - Converts to element tree
- **Server Architecture**
  - SQL Based
  - Catalog Table
  - Secured by SSH
- **Mobile Devices**
  - Parsed into SQL server
  - Update each week
  - Pulled from server
  - Cache in device memory
System Architecture Example

- **Mobile App**: Xamarin
  - Sends item/price info to Web Services
  - Gets 3rd party prices from Web Services
  - App allows user to scan barcode on items and bring up a list displaying prices from other vendors

- **Web Services**:
  - Get 3rd party prices from 3rd Party Services
  - Lookup data for Website
  - Sends item/price info to Mobile App

- **3rd Party Services**:
  - Best Buy, Kroger, Walmart, Amazon, Target
  - 3rd party APIs used to get prices information from outside vendors
  - Sends 3rd party prices to Web Services

- **Website**:
  - ASP.net, HTML5, C#
  - Internal Meijer website to display data and trends about the items scanned, including top items, top vendors, highest/lowest price differences, etc.
  - Sends lookup data to Web Services

- **Server**:
  - Microsoft SQL Server 2012
  - Microsoft Azure
  - Server stores the items scanned and the price information, also stores 3rd party prices

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The Capstone Experience

Project Plan 21
Approach

• Break Big Problems Into Smaller Problems
• Identify Constraints
• Identify “Risks” — Things You Don’t...
  ▪ ...Know
  ▪ ...Understand
  ▪ ...Know How To Do
• Consider Tradeoffs
• Select Appropriate Technologies
• Identify Core Features for a Prototype
Technical Specifications
Interactions With Your Client

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Cannot be emphasized enough!
Project Plan Summary

• Specifications
  ▪ Functional: What does it do?
  ▪ Design: How does it look and feel?
  ▪ Technical: How does it do it?

• Testing Plan

• Schedule
How To’s

• Quickly identify...
  ▪ ...what you don’t know,
  ▪ ...what you don’t understand, and
  ▪ ...what you don’t know how to do.

• Conceptually...
  ▪ Start with functional specifications.
    o Get agreement with client.
    o Include as first part of project plan.
  ▪ Do design specifications.
    o Get agreement with client.
    o Include as 2nd part of project plan.
  ▪ Do technical specifications.
    o Get agreement with client.
    o Include as 3rd part of project plan.
  ▪ Do schedule.
  ▪ Do development, testing, and deployment.

• In CSE498, must do all three in parallel (and iterate).
How To’s

• Approach
  - Make Skeleton Document Immediately
    - Will Get You Organized and Focused
    - Include “Under Construction” Sections (Totally Empty)
  - Develop In Parallel When Possible But…
    - Complete Functional First
    - Complete Design Second
    - Complete Technical Third
  - Refine As Needed
  - Assign Sections to Team Members
  - Share with Client
    - Ask For (Specific) Feedback
    - Highlight What’s New
    - Tricky Balance
      - Not Enough?
      - Too Much?

“Is this what you had in mind?”
How To’s

• Schedule
  ▪ Dictated by Course
  ▪ **Schedules > Major Milestones**
    - 01/19: Status Report Presentations
    - 01/31: Project Plan Presentations
    - 02/21: Alpha Presentations
    - 04/04: Beta Presentations
    - 04/25: Project Videos
    - 04/27: All Deliverables
    - 04/27: Design Day Setup
    - 04/28: Design Day
  ▪ Other Milestones By Educated Guesses
  ▪ Track To It At Least Weekly at Triage Meetings
  ▪ Revisit Often and Revise If Necessary
  ▪ Delivery Slippage == Graduation Slippage
How To’s

• “Living Document”

• Make Sure Your Project Plan Has...
  ▪ Cover Page
  ▪ Title
  ▪ Table of Content
  ▪ Page Numbers
  ▪ Headers and Footers
  ▪ Etc...

(That is, make sure your plan looks professional.)
Interactions With Client

Client May Specify...

• Requirements
  ▪ Functional
  ▪ Design
  ▪ Technical Requirements
    o Operating Systems
    o Programming Languages and Environments
    o Web Technologies
    o Etc...
  ▪ Legacy

• Milestones

• Etc...

(You may explore and propose other ideas.)
Nota Bene: Project Plan

• Must Use Windows Microsoft Office
  ▪ Word and PowerPoint
  ▪ Installed by Spencer.
  ▪ Requires Windows VM. Maybe
  ▪ Get it done now!
  ▪ (Do not attempt to use anything other than Windows Microsoft Office.)

• How many...
  ▪ ...drafts will you write? Many.
  ▪ ...drafts will you share with your client? A Couple.
  ▪ ...final documents will you submit for CSE498? One

• Due Date
  ▪ 4:00 a.m., Tuesday, January 31
  ▪ ~ 2.5 Weeks Get on it, now!

• In Class Formal Presentations
  ▪ January 31 – February 9
  ▪ PowerPoint Template Provided
Resources on the Web

- Other Links > Downloads
  Project Plan Examples
  - Team Amazon
  - Team Rook
  - Team Whirlpool

- High Resolution Sponsor Logo
  www.capstone.cse.msu.edu/2017-01/projects/<sponsor>/images/originals/sponsor-logo.png
  http://www.capstone.cse.msu.edu/2017-01/projects/auto-owners/images/originals/sponsor-logo.png
Project Plan

- Functional Specifications
- Design Specifications
- Technical Specifications

- Risks
- Prototypes
- Schedule

Future Meetings