UX Design & Prototyping

CSCI 5040: Professional Master's Project (1 of 2)

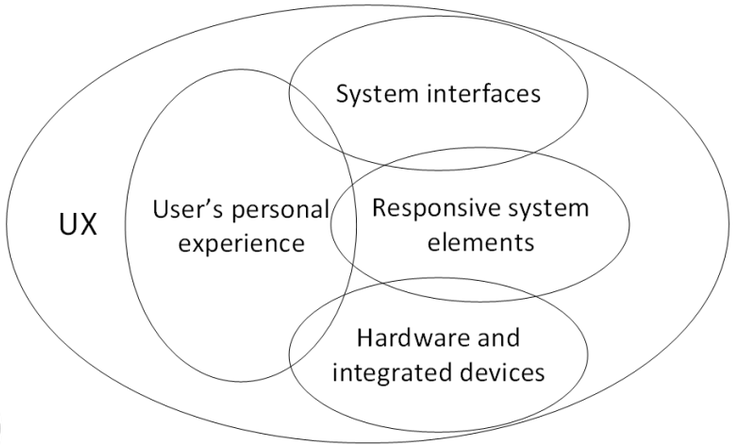
Lecture 10

Learning Objectives

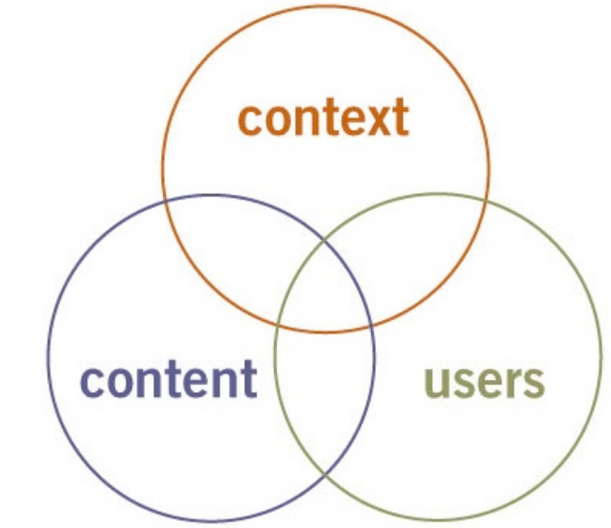
- Review best practices for UX Design throughout a SDLC
- Review prototyping best practices
- Review design team activities/class schedule & deliverables

- Full disclosure: Many materials for this discussion from my ECEE course on Embedded Interface Design, which I'm currently pushing out to Coursera
- I usually cover this material over six to eight weeks, you're getting the condensed version
- Feel free to hit me up for more information on anything here or related

UX Design



- User Experience (UX)
  - Overall effect of interactions and perceptions someone has when using a product or service (or embedded device)
  - The cumulative effect of many factors, some you can control, some you can't
    - User Experience Team of One, Buley, 2013, Rosenfeld
- Three circles of information architecture →
- Seven facets or qualities of user experience →
  - From http://semanticstudios.com/user_experience_design/
- UX > UI
  - UI = User Interface, screen or method of interacting with a program or device
- UX > Usability
  - Usability is ease of access or use within the user's context (goals and environment)
  - Learnability, visibility, efficiency, errors and error handling, satisfaction



Danger: The Engineer’s Conceit

- “I know what the user wants.”
- “If I do my best work and design an interface, it’ll be perfect.”
- “My whole team likes this design, it’s great!”
- “I know some people make mistakes in interface and product design, but I won’t.”

- The real answer:
  - Iterative user involvement
  - UX processes, user profiles, prototypes…
  - A path to making the right designs and decisions

Buley's UX Principles

- Base Process
  - Understand work to be done
  - Get to know the users
  - Start designing

- Key Principles:
  - #1 Invite People In
  - #2 Make Things Together
  - #3 Truly Listen
  - #4 Know When It's Good Enough

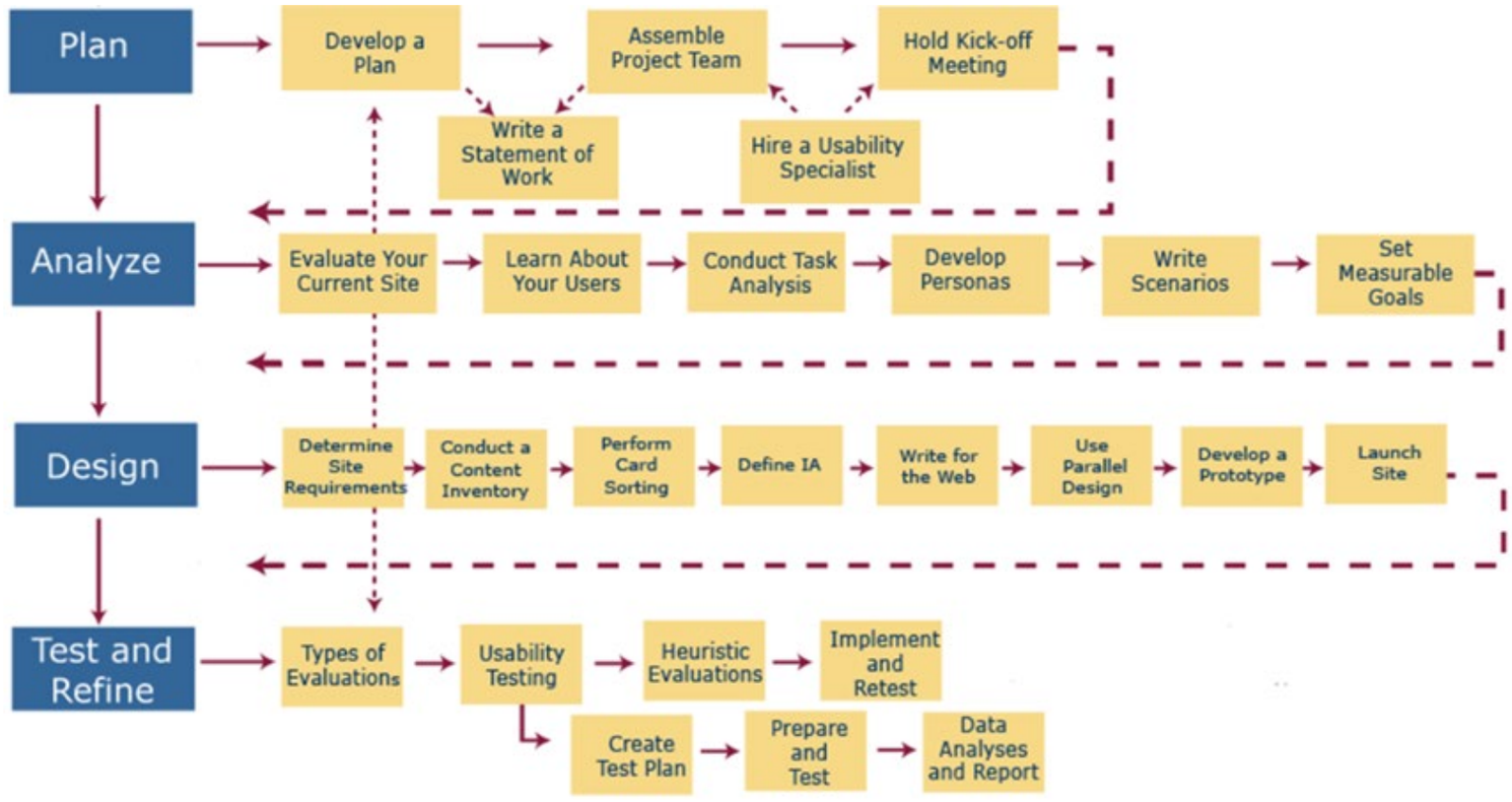
- User Experience Team of One, Buley, 2013, Rosenfeld

UX Processes: Formal vs. Discount

- Formal UX processes
  - Generally, elaborate higher-budget studies
    - usability experts, larger numbers of participants, designed experiments, specialized tools and laboratories, a mix of qualitative and quantitative metrics
- Discount UX processes
  - Focuses on
    - Simplified user testing with a handful of participants
    - Use simple paper or other prototypes over multiple rounds of design
    - Inspect designs using heuristic evaluation
  - Find key issues through early and rapid design iteration
- Term “discount” is attributed to Jakob Nielsen
  - 1989 paper, “Usability Engineering at a Discount”

A More Formal UX Process: Usability.gov

- Divided into Plan, Analyze, Design, Test and Refine phases
- Web-centric
- Standard set of methods
- Public domain
- Well-supported with literature references
- https://www.usability.gov/



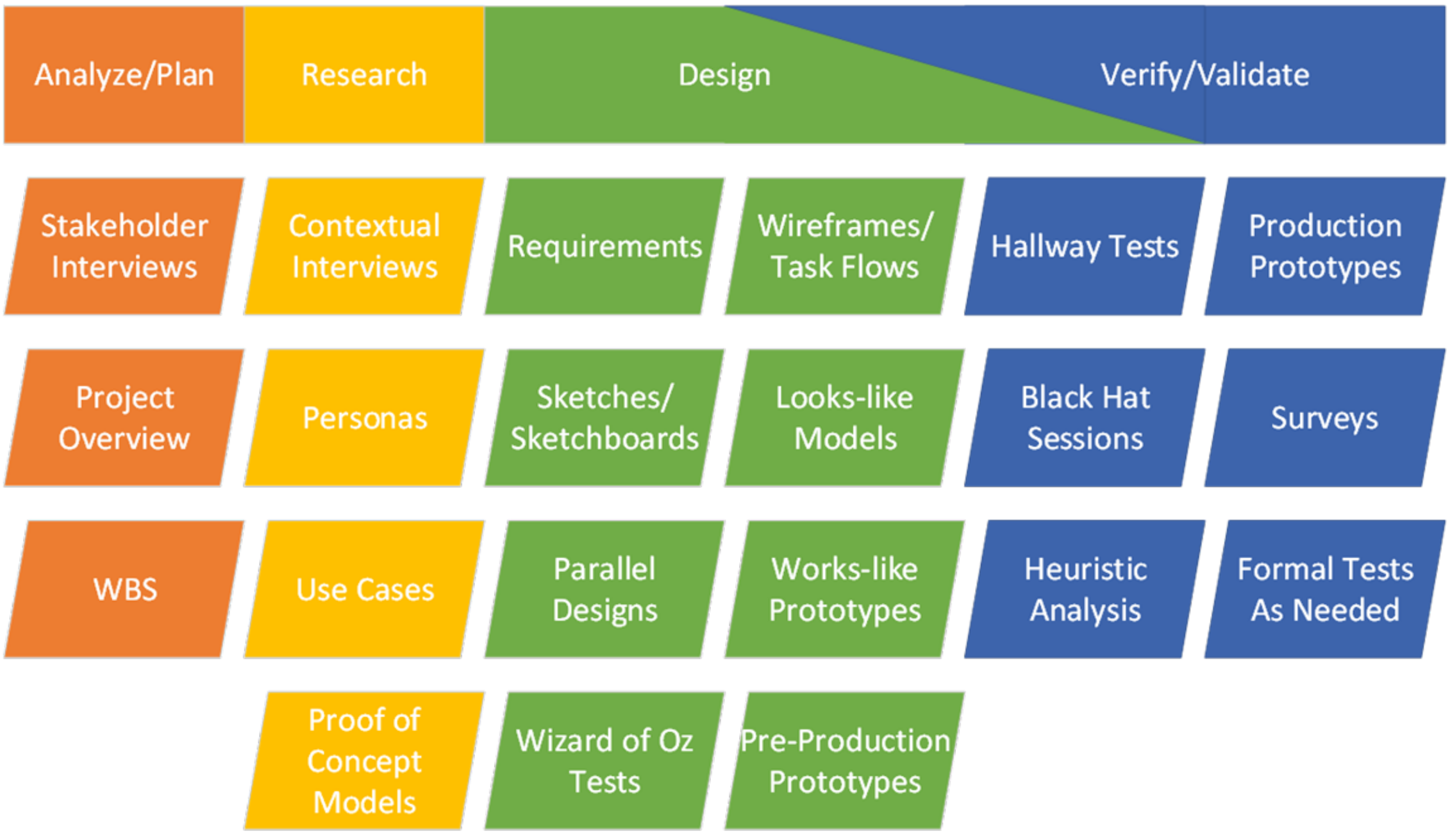
A Discount UX Process: Steve Krug

- Low numbers of participants, qualitative assessment, iterative
- Do-it-yourself testing
  - Test one morning a month
  - Test continuously throughout the development process
  - Test sessions with three users
  - Use user surrogates if actual users are not available (frequency is more important)
  - Test on-site using screen sharing to let observers watch
  - Report out is an informal list of observed issues
  - Team and stakeholders review issues and decide on actions or fixes the same day
- Rocket Surgery Made Easy, Krug, 2010, New Riders

Menlo’s High-Tech Anthropologists

- From Menlo Innovation, Rich Sheridan’s software contract house in Ann Arbor, Michigan
- Goal: “to end human suffering in the world as it relates to technology”™
- “The only way to understand what makes a new system successful is to study and observe the potential end users in their native environment.”
- A balanced UX process, it includes:
  - job shadowing, personas, use cases, hand-drawn screen mockups, object models, workflow assessments, and high-level screen designs
- Ensure that the user's needs are met before development
- https://www.infoq.com/articles/joyinc-hightech-anthropology/

Typical Phases of UX Development



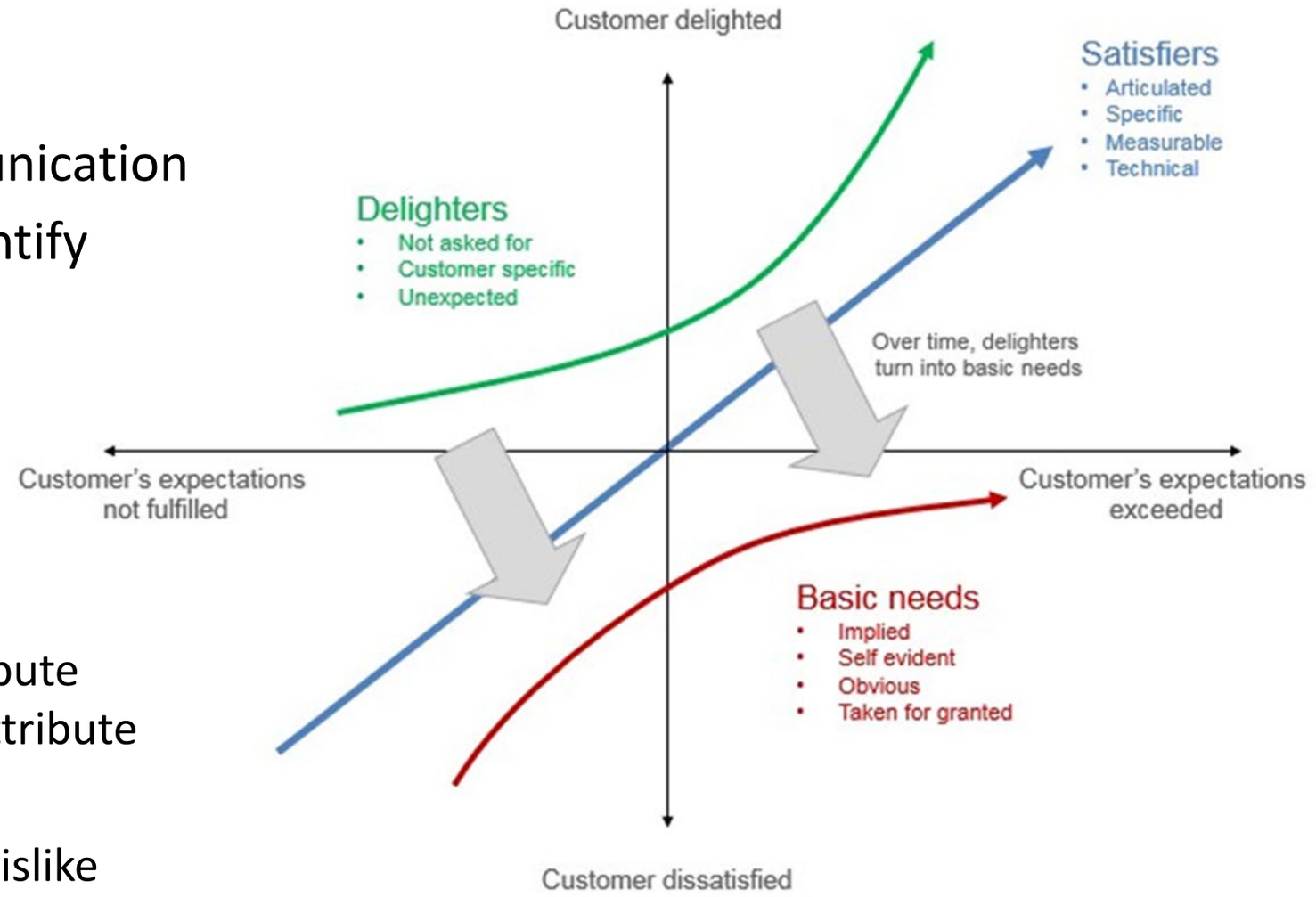
Methods for UX Planning and Analysis

- Project Plan
- Project Overview
- Project Brief
- Stakeholder Interviews
- Elevator Pitch
- Artifacts from the Future
- Kano Model
- Pecha Kucha
- Kickoff Meeting
- Work Breakdown Structure

- You've seen some of these methods in just generally planning and preparing your projects
- The same pre-work is important for UX to make sure you know what the problems are, how you'll approach the work, and to get buy-in from the customers
- Some of these elements are more for communication than planning or analysis
- A WBS is still the most effective way, in my opinion, to dig into actual scope of work

Kano Models

- Time: one to a few hours
- Goal: learning/analysis, communication
- What do users care about? Identify which features are:
  - Delighters
  - Satisfiers
  - Basic needs
  - Indifferent
- Two Questions:
  - Satisfaction if product has attribute
  - Satisfaction if it doesn't have attribute
- Answers:
  - Like, Must Have, Neutral, OK, Dislike



- https://www.interaction-design.org/literature/article/the-kano-model-a-tool-to-prioritize-the-users-wants-and-desires

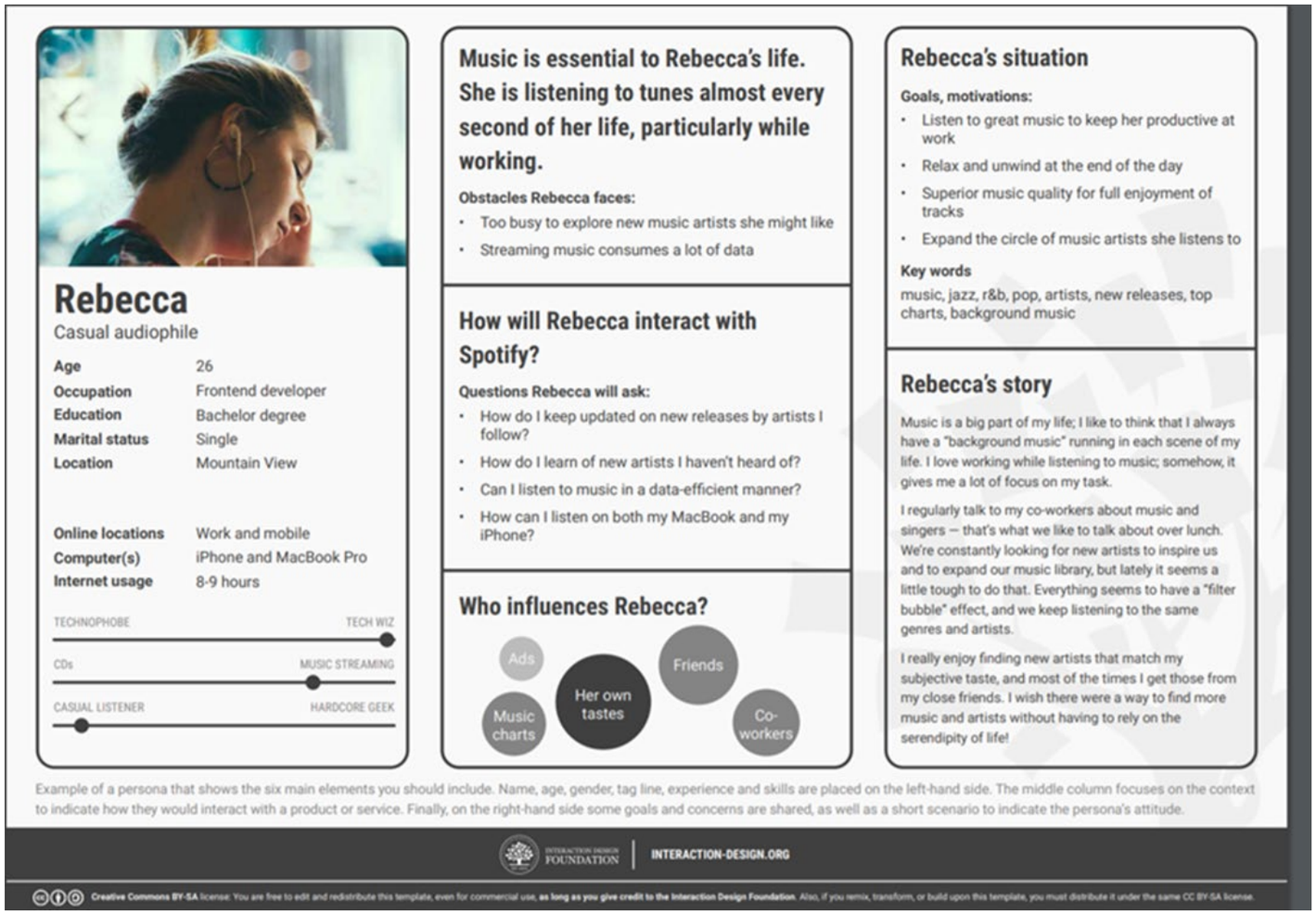
Methods for UX and User Research

- Contextual Interviews
- Focus Groups
- Journey Lines
- Surveys
- Task Analysis
- Comparative Assessment
- Proof of Concept Models
- Personas or Persona Mapping
- Use Cases & UML

- The goal here is to learn about the users, who are they, what tasks do they need to do, what environment do they do it in
- A clear understanding and prioritization of user's tasks is the best thing you can do to provide a foundation for designing a UI
- Contextual interviews are talking to (and observing) users in their actual use environment – no substitute for the benefit here
- Use cases, whether graphical or text-based, are a solid tool for defining tasks

User Personas

- Purpose of personas is to create reliable and realistic representations of your key audience segments for reference
- Personas generally include some key pieces of information:
  - Persona Group (i.e. web manager, audiophile, driver)
  - Fictional name
  - Job titles and major responsibilities
  - Demographics: age, education, ethnicity, and family status
  - The goals and tasks they are trying to complete
  - Their physical, social, and technological environment
- Roles/benefits for Personas
  - Determine what a product should do or how it should behave
  - Communicate across a project team
  - Build consensus and commitment to a design
  - Measure a design's effectiveness
  - Contribute to sales, marketing, and other activities



- About Face (4th edition), Cooper et al., 2014, Wiley

Methods for UX Design

- Design Requirements
- Sketching
- Wireframes
- Prototypes (more later)
- Sketchboards
- Style Guides
- Parallel Design
- Heuristic Evaluations
- Design Principles

- The fun part – making the UIs
- Progressive elaboration from paper sketches, to wireframes, to higher fidelity prototypes, each with increasing levels of interactivity, is typically the path taken
- Learn to test each one – otherwise why are you doing it?
- Don’t just ask “do you like it?”, plan to have the user try their most important tasks and talk about how the UI works or doesn’t work for them
- Iterative user involvement at each stage is the key to successful UX

Heuristic Evaluations

- The one assessment technique that is not with users, but with designers…
- Assess a design against known UI principles by walking through the elements of the design
  - Often performed by experts, but also effective for novices focusing on one or two heuristics at a time
- Can be done at any design or test stage
- Will find different issues than will be found in user-based testing
- Many custom heuristics sets have been developed for different usage domains, but most start with Nielsen's base heuristic set

Standard Usability Heuristics (Jakob Nielsen)

1. Visibility of system status
2. Match between system and real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalistic design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Methods for UX Testing, Verification, Validation

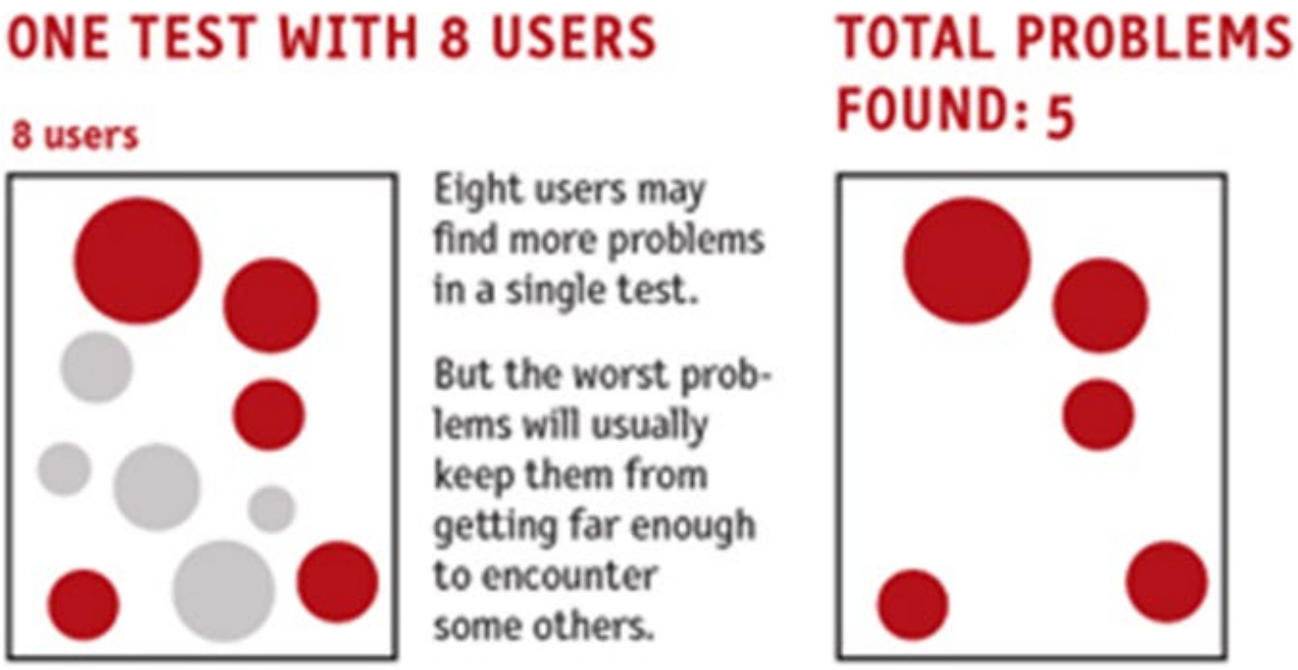
- Paper Prototype Testing (aka Wizard of Oz Test)
- “Hallway” Usability Test
- Black Hat Session
- First Click Test
- UX Health Check
- A/B Testing
- Heuristic Evaluation (again)
- Formal Usability Tests
- Surveys
- Statistics and Measures

- Can be mixed with your UX Design work
- Methods ensure that real users (or at least user surrogates) give you feedback on your designs
- Usually qualitative, but you can gather quantitative measures (time on task, errors, etc.) or rankings from survey scoring if you need them

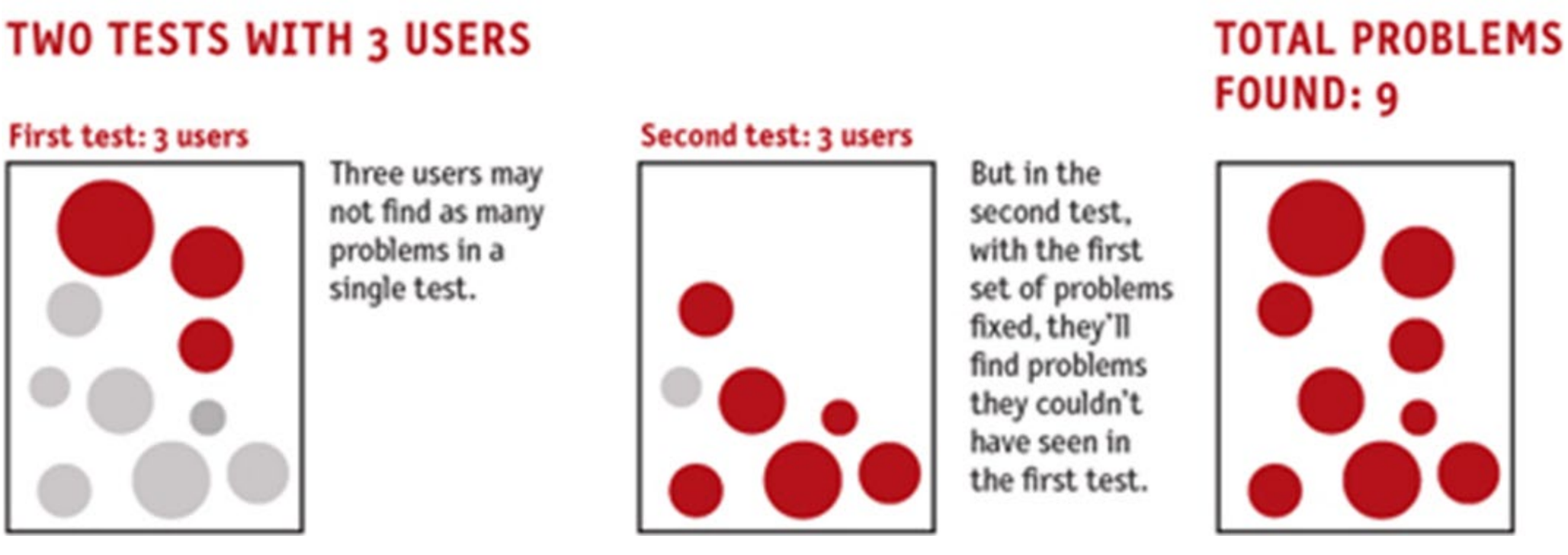
Running a UX Test

- Have a plan for what you're testing; use realistic tasks for realistic scenarios
- Introduce what you expect the user to do
- Do not introduce yourself as the designer
- Always blame the prototype, not the user
- Observe quietly; ask open questions and lots of "Why?"
- Don't lead the user or ask leading questions
- Ask about this test, not another hypothetical situation
- Ask the user to think for their situation, not for others
- Stay neutral and encourage thinking aloud
- Try to understand what was expected vs. what actually happened
- https://hci.stanford.edu/courses/cs377e/2016/sp/lectures/12%20-%20usabilty%20testing.pdf

How many users do I test?



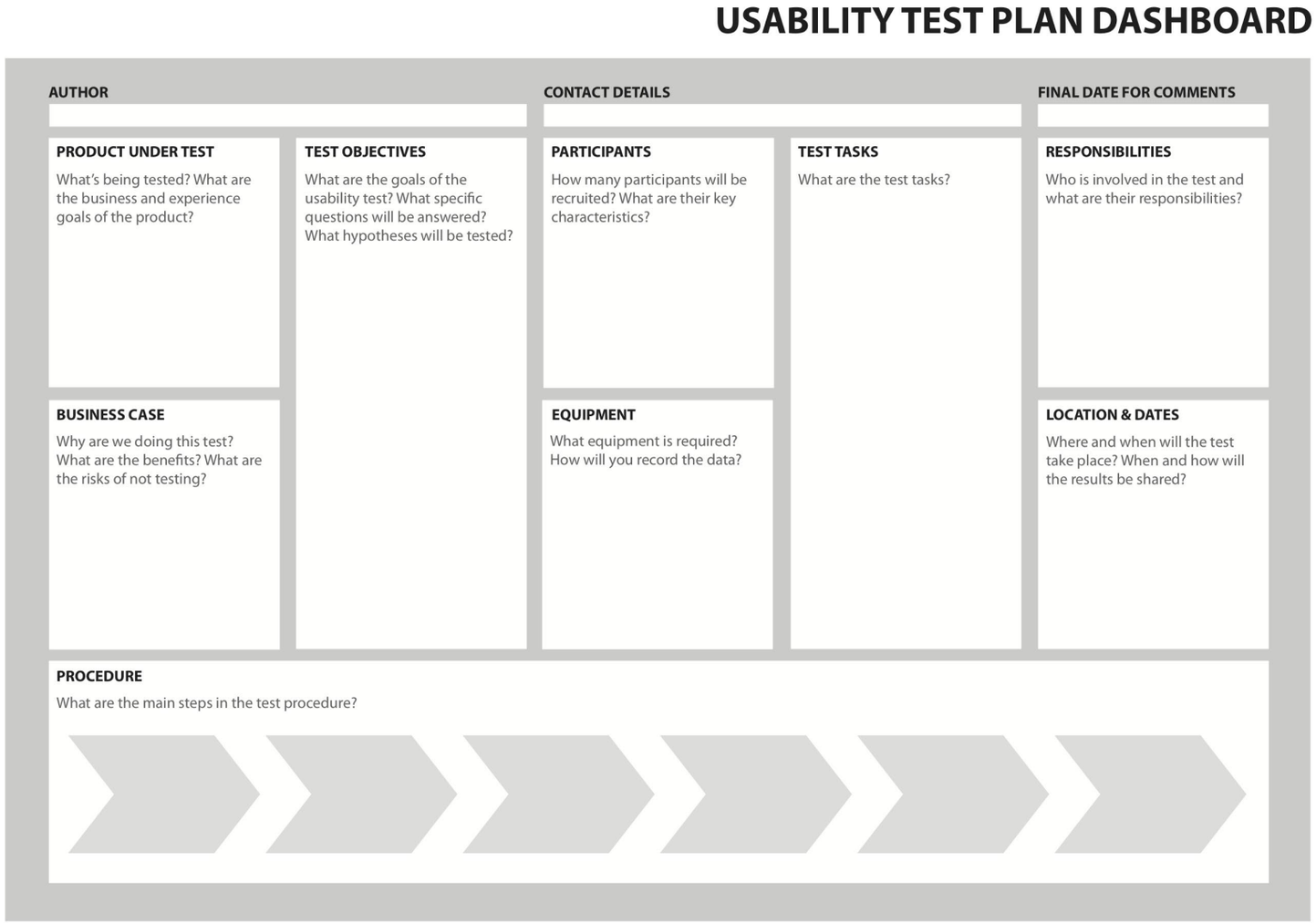
- Krug recommends two tests with three users over one test with eight (IF the worst problems from the first test are fixed before the second test…)
- Don’t Make Me Think, Krug, 2013, New Riders



Strengthening UX Tests

Checklist for Usability Studies

- Define goals and format for the testing
- In lab, office, field; moderated or unmoderated; in-person or remote, etc.
- Determine number of users; recruit appropriate users
- Write tasks to match study goals: exploratory or specific
- Conduct a pilot test
- Decide on any metrics to collect
- Write a test plan
- Motivate other team members to observe test sessions
- https://www.nngroup.com/articles/usability-test-checklist/



https://www.userfocus.co.uk/articles/usability_test_plan_dashboard.html

Do you want me to do ALL THAT!

- Yes! No, of course not…
- Be honest with yourself about what you need to do
- Look at the problem you're solving for your user
  - Do you really know what the problem or job is? UX Analysis
  - Do you have a plan for how you're going to do it? UX Planning
  - Do you know what the user is really trying to do? UX Research
  - How will you make a design that works for the user? UX Design
  - How will you confirm you've done it right? UX Test
- Pick tools that will get you the answers you need and are appropriate to your design
  - Time (preparation, execution, follow-up)
  - Complexity
  - Goal (communication, learning/analysis, planning, authorization)
  - Fit to your overall project – available resources, skills, level of detail, etc.
- Always have a reason for doing the work – expected outcomes

Favorite UX Design Resources

- The UX Team of One: Buley
  - https://rosenfeldmedia.com/books/the-user-experience-team-of-one/
- Don’t Make Me Think and Rocket Surgery Made Easy: Krug
  - https://rosenfeldmedia.com/books/the-user-experience-team-of-one/
- Usability Heuristics
  - https://www.nngroup.com/articles/ten-usability-heuristics/
- Usability.gov (https://www.usability.gov/)
  - Surprisingly strong US gov site on literature-based usability practices
- Interaction Design Foundation (https://www.interaction-design.org/literature)
  - Good resource for open source UX literature
- Balsamiq (my favorite UI design tool)
  - https://balsamiq.com/
  - “Life’s too short for bad software!”
- UX Design of Lego UI Interfaces ☺
  - Surprisingly good review of UI considerations (plus Legos!)
  - https://www.designedbycave.co.uk/2020/LEGO-Interface-UX/

Prototyping

- The Oxford definition: “A first, typical or preliminary model of something, especially a machine, from which other forms are developed or copied.”
  - The definition misses the usual intent to test and improve and detail over time, or to increase scope
  - From Prototyping for Designers, McElroy, 2016, O’Reilly
- Realize that a prototype can be anything from a rough paper sketch to a functional combination of hardware and software (from low to high fidelity)
- In some cases you may want it to be testable or be interactive
- Using any prototype allows you to test your design assumptions to iterate improvement and user feedback

Prototyping in Practice

- Many people have discomfort at showing unfinished work
- But you must be able to be open to feedback, as each interaction strengthens a design
- As prototyping skills improve, ideas can be shared more quickly, which will allow more iterative test and improvement cycles, allowing focus on features that will satisfy users and differentiate products

From Prototyping for Designers, McElroy, 2016, O'Reilly

- Reasons to prototype:
  - Discover problems and solution correctness, or better understand users
  - Find alternative solutions
  - Understand the business model behind the design
    - Example tool: The Business Model Canvas [2]
    - Reviews key partners, activities, value propositions, channels, etc.
  - Communications and design advocacy
  - Testing at various levels
  - Etc.
- From Prototyping for Designers, McElroy, 2016, O'Reilly

Prototype Fidelity

Fidelity: How close is my prototype to an actual product?
Basic elements of prototypes include
- Visual Design – how close is it to modeling the product's visual aspects
- Content – what's covered – what data is represented
- Level of interactivity – what can the prototype do

- Low-fidelity prototypes have a limited representation of what the final product would look like, selected content or functions represented, and little to no interaction
  - Interactions would be explained by a person who knows the design intent
- The advantages of low-fidelity prototypes include
  - Low cost to create in resources
  - Quick to produce and present alternatives
  - Can be used as a collaborative exercise
  - And helps clarify where the design is headed for designers, users, and stakeholders
- Disadvantages include
  - Lack of clarity on operations, what might work or what wouldn't
  - Limit to interactivity – mostly in the hands of the presenter

- High fidelity prototypes are realistic designs with higher levels of detail, beginning to look like the actual product
  - Containing actual data and capable of some product-level interaction
- The advantages of high-fidelity prototypes include
  - More capable for use in usability or acceptance tests
  - Can target the details of key interactions
  - Easier to provide clarity to stakeholders on what the design is and isn't
- Disadvantages include
  - Higher cost to produce
  - More time to produce
  - May begin to solidify design decisions earlier than intended if done too soon

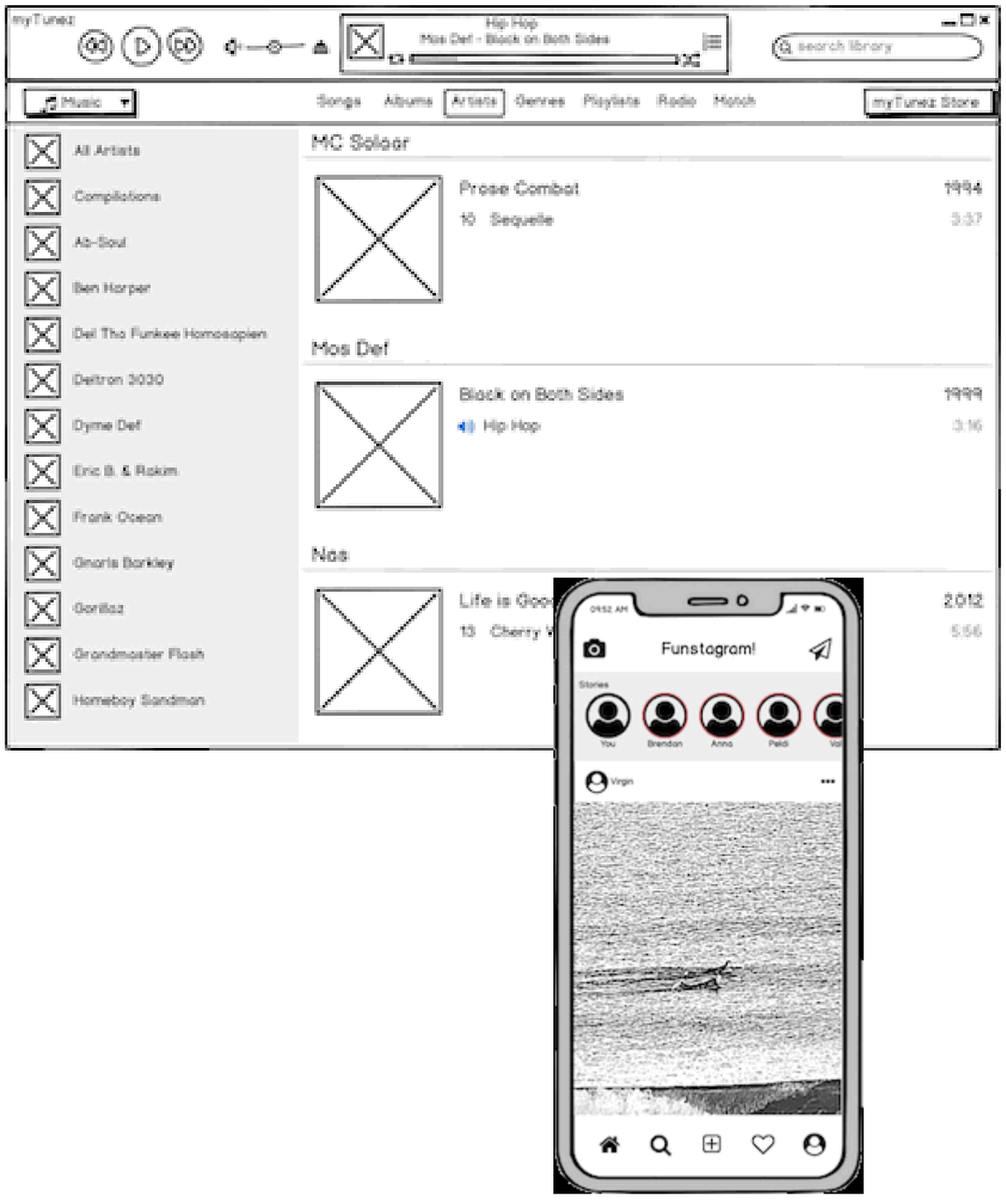
- https://theblog.adobe.com/prototyping-difference-low-fidelity-high-fidelity-prototypes-use/

Prototype Focus

- Minimum Viable Prototype
  - Determine Minimum Viable Product (MVP)
  - Who are users, what is problem
  - Find a user flow that solves problem
  - Make prototype to address flow
  - Test and iterate
- Exploration-Centric Prototypes
  - Generate lots of alternatives to problem
  - Use affinity grouping for similar ideas
  - Select priorities for next design cycles
  - From Prototyping for Designers, McElroy, 2016, O'Reilly
- Audience-Centric Prototypes
  - Determine audience, goal, fidelity level
  - What needs to be shown to reach goal?
  - Considerate of stakeholder needs
  - Consider style of presentation
- Assumption-Centric Prototypes
  - Determine user, problem, and assumptions under test
  - Pick appropriate fidelity
  - Consider type of test to run
  - Build and test appropriate prototype

Prototyping Software

- Scoping challenges for software
- Screen variations, changes in interface when providing responsive designs
- Layering of applications
- Style guides – ex. Google Material Design
- Different interaction approaches
- Consider accessibility or limited capability users
- Typical prototypes: paper, sketches, flow, digital prototypes of increasing fidelity, wireframes, clickable/testable
- Typical tools: Balsamiq →, Adobe, many others
- https://slickplan.com/blog/top-12-ui-ux-prototyping-tools-for-2020



Rapid Prototyping

- Ways to save time:
  - Remember prototypes are generally made to be disposable
    - Bruce: Prototypes should never go directly into production code
  - Have a reason for making the prototype
  - Define scope and requirements for the prototype
    - Avoid interactivity unless absolutely needed
  - Test as the prototype is built
  - Keep expectations for the prototype realistic
- https://www.invisionapp.com/inside-design/6-ways-to-save-time-in-rapid-prototyping/

Overall PMP Schedule

- Week 3: 9/7
  - Initial and final team assignments
  - Bruce will notify sponsors of team assignments
  - Bruce will send out NDAs for signatures – Due Wed 9/16
  - Teams should hold an initial meeting and discuss team roles
  - Charter and project briefs assigned/initial development
  - Thursday speaker (attendance tracked) – Amy & Rae
  - Request an introductory meeting for your team and the sponsor
- Week 4: 9/14
  - First meetings with sponsors – if you can share initial charters/project briefs all the better
    - Review any process, deliverables, or tool requirements they may have
  - First meetings with Bruce/Preethi for project status updates
    - Begin using status update forms, share with sponsors
  - Charter and project brief due, charter submitted for sign off by sponsors
    - Interim by 9/18, Final signed by 9/23

Overall PMP Schedule

- Week 5: 9/21
  - Start development of WBS & Requirements
- Week 6: 9/28
  - WBS & Requirements – pass 1 reviewed by sponsor
- Week 7: 10/5
  - WBS & Requirements
  - Start to build out your Product Backlog (review with Sponsor when able)
  - Start at least a practice Scrum sprint

- Week 8: 10/12
  - WBS & Requirements – (if needed) pass 2 reviewed by sponsor
  - Complete a practice/short Scrum sprint
  - Submit first Sprint Summary Report Form
  - Midterm exam (take home)

Overall PMP Schedule

- Week 9: 10/19
  - Begin full 2 week Scrum sprint – Architectural/System Design?
- Week 10: 10/26
  - Scrum ends – Submit Sprint Summary Report Form
- Week 11: 11/2
  - Begin sprint – Design/Prototyping?
- Week 12: 11/9
  - Scrum ends – Submit Sprint Summary Report Form
- Week 13: 11/16
  - Begin sprint – Design/Prototyping?
- Week 14: 11/24 (off 11/26-11/27)
  - Sprint ends – Submit Sprint Summary Report Form
- Week 15: 11/30
  - Final sponsor and in-class presentations
  - Assessments: Instructor, GSS, sponsors, peer
- Week 16: 12/7
  - Final exam (take home)

Expectations for your Scrums

- Use your WBS and Requirements to create your initial Product Backlog (identify epics, broken down into stories)
- Someone on the team gets the role of ScrumMaster
- Sprint planning at start of sprint to establish sprint backlog and story assignments and estimates (planning poker)
  - At least review with or send to Product Owner (Sponsor) if they don't directly participate
- Clearly defined, assigned, estimated stories for each Sprint, tracked in a tool
  - 10 hours per team member for initial sprint
  - 20 hours per team member for 2 week sprints
  - 30 hours per team member for 2 week sprints next semester
- Status of each story in the Sprint: To Do, In Progress, Done, Reviewed
  - You can modify the status categories your team uses
- (At least every other day) 15-minute Scrum stand-up for team
- Sprint Review each sprint with Sponsor
  - Show elements that are done, share the good and not good from the sprint
- Sprint Retrospective each sprint with Team
- Turn in Sprint Summary Report Form (every sprint, no firm deadline)

Sprint Summary Report Form

- Artifact for grading each sprint
- Provide ASAP after each sprint ends
- Graded based on thoroughness of report and clear effort on work items, not on any particular misses or deliveries
- Like anything in your team's Sprint processes, if you need to change the format of the report, please do, as long as the basics are shared

CSCI 5040 PMP Project | Sprint Summary Report | Bruce Montgomery

Sprint Description

Sprint Start Date: Sprint End Date:

Project:

Team Members:

Sprint #:

Focus of Sprint:

Burndown Summary

Story points planned to complete:

Story points completed:

Story points added:

Sprint Backlog (stories list): (Story – Owner – Estimate – Actual – Status)

- Code review for Preethi's card sorting module – Bruce – 3 – 2 – Done
- Code review for Bruce's card ordering module – Preethi - 1 – 3 - Done

Comments on Sprint Review (from Team and/or Sponsor): Sponsor Reviewed: Yes / No

-

-

-

-

Top 4 Sprint Retrospective Comments/Actions (Good or bad)

1

2

3

4

Midterm Exam

- Opens on Friday 10/16
- Three Essay Questions related to class topics and experiences
  - May ask for citations to support answers
  - Use good sources; Do not use Wikipedia as a primary citation
- 100 Points
- You may use any resources (other than your fellow students) – the work must be your own
- Take care not to plagiarize sources or other students – do not cut and paste from web sources – work must be original
- Submit as a PDF, due Wednesday 10/21 at 7 PM

Next Steps

- No class on Tuesday 10/13, moved to today
- Sprint summary status form due Friday (lightly grading the first one)
- Regular weekly status updates still required
- Midterm exam posts on Friday 10/16, due Wednesday 10/21 at 7 PM
- Speaker 10/22 – Grady Booch
  - New Discussion Topics up on Piazza to ask Grady questions, you can submit questions during the interview as well
- Please try to visit Discussion Topics weekly for comments (and participation grades)
- Teams should be finishing the first Scrums this week, working toward a full two-week Scrum sprint starting next week
- Standard stuff
  - Regular meetings with sponsor and me/Preethi should be set
    - Project Status Forms, review and turn in weekly!
  - Aligned with sponsors on tools, project processes, deliverables
  - Always cc Bruce & Preethi on sponsor e-mails
  - Preethi and I are available for questions or ANY other support