

Visual Analytics— Prototyping

Dr. Ab Mosca (they/them)

Slides based off slides courtesy of Jordan Crouser (<https://jcrouser.github.io/>)

Plan for Today

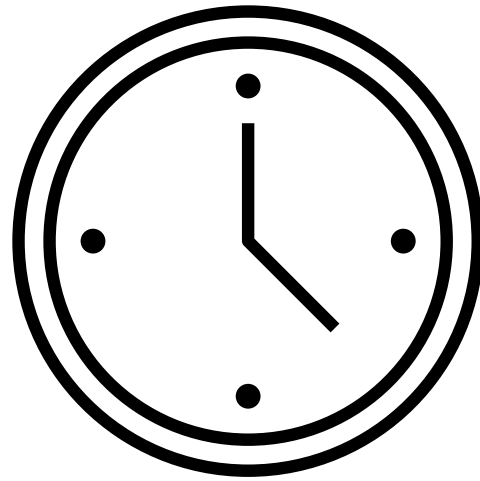
- User-centered design
 - What it is
 - Why do it
 - Ways to do it
- Paper prototypes
- Architecture diagrams

Hypothetical
Example

“Where should I get
lunch?”

Hypothetical example

Overview: ~2500 students to feed, 75 min lunch block, 10 dining halls



Hypothetical example

- **Overview:** Menu page is not very helpful...

The screenshot shows a web browser window with the URL https://www.smith.edu/diningservices/menu_poc/cbord_menus.php. The page displays a menu for four dining locations: Chase/Duckett, Comstock, Haynes, and Cutter/Ziskind. Each location has a table listing breakfast, lunch, and dinner options. The Chase/Duckett menu includes breakfast items like sauteed onions and mushrooms, lunch items like minestrone soup and buffalo cauliflower, and dinner items like mashed potatoes and grilled vegetables. The Comstock menu includes dinner items like mini spring rolls and spicy eggplant. The Haynes menu includes a dinner item, Haynes Stir Fry Bar. The Cutter/Ziskind menu is currently empty.

Chase/Duckett
BREAKFAST Sauteed Onions & Mushrooms Egg, Bacon And Cheese Bagel Just Egg On Bagel Sandwich Cherry Strudel Hot Oatmeal Peach Halves
LUNCH Minestrone Soup Potato Chips Buffalo Cauliflower Vegan Cutlet Grilled Chicken Parmesan Cheese Caesar Salad w/House Dressing Pickles Spears Garlic Croutons Mediterranean Herb Wraps
DINNER Mashed Potatoes Grilled Vegetables Baked Chicken Breast w/ Sundried Pesto Grilled Tofu w/ Sundried Tomato Pesto Dinner Rolls Chocolate Chip Cookies

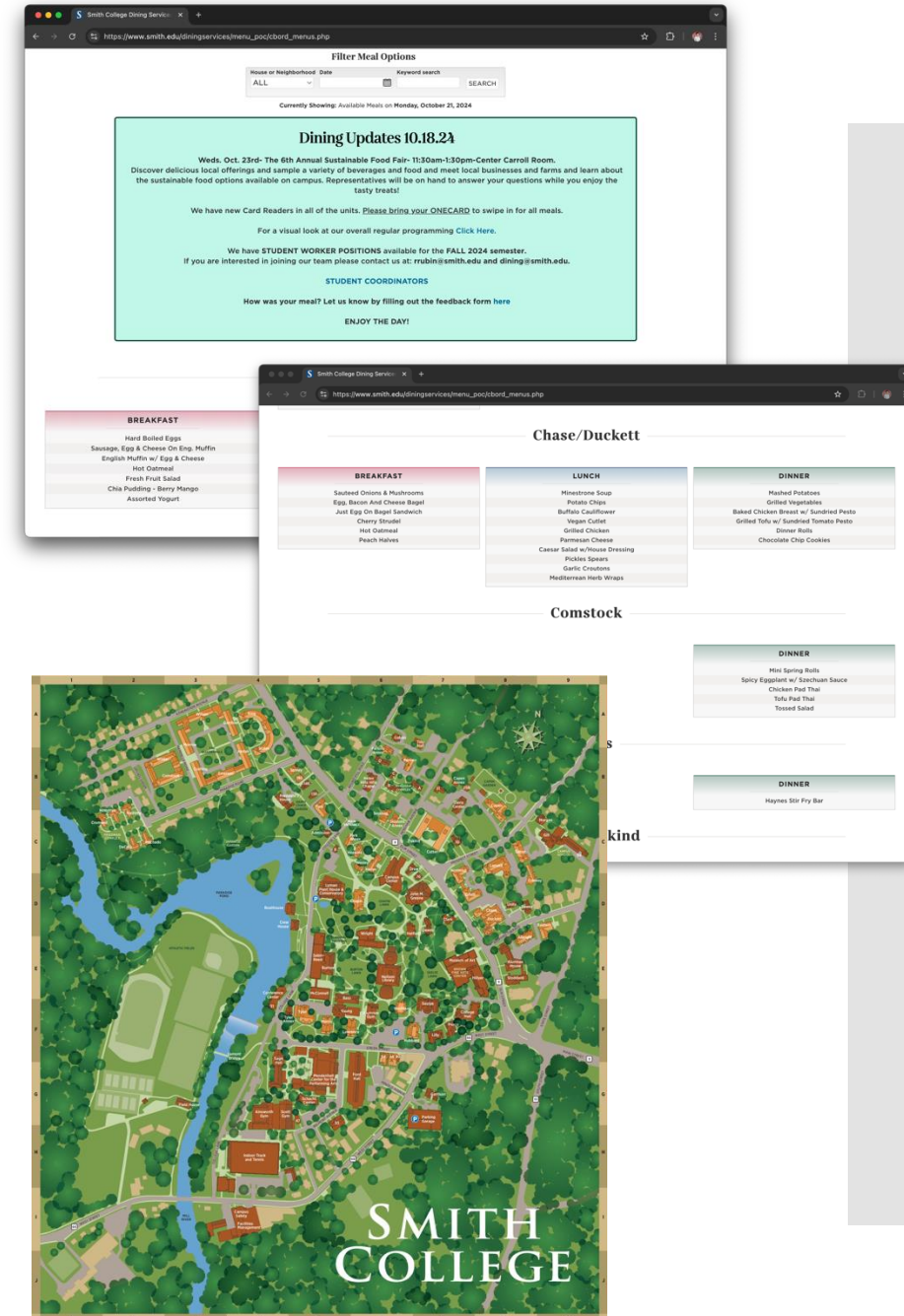
Comstock
DINNER Mini Spring Rolls Spicy Eggplant w/ Szechuan Sauce Chicken Pad Thai Tofu Pad Thai Tossed Salad

Haynes
DINNER Haynes Stir Fry Bar

Cutter/Ziskind

Hypothetical example

- **Overview:** current process is manual
- **Goal 1:** Automatically show only open dining halls
- **Goal 2:** Give an overview of locations and repeat menus
- **Goal 3:** Show how busy open dining halls are



Hypothetical example

- **Ideal:** we would like to build an application that pulls data from the menu page, campus map, and location data to show open dining halls, menus, and business
- **Issue:** Big brother vibes, privacy concerns, disparate data sources
- **Strategy:**
 - Scrape data from menu page
 - Find shapefiles for campus map
 - Combine data sources
 - Build authenticated front-end for current Smithies

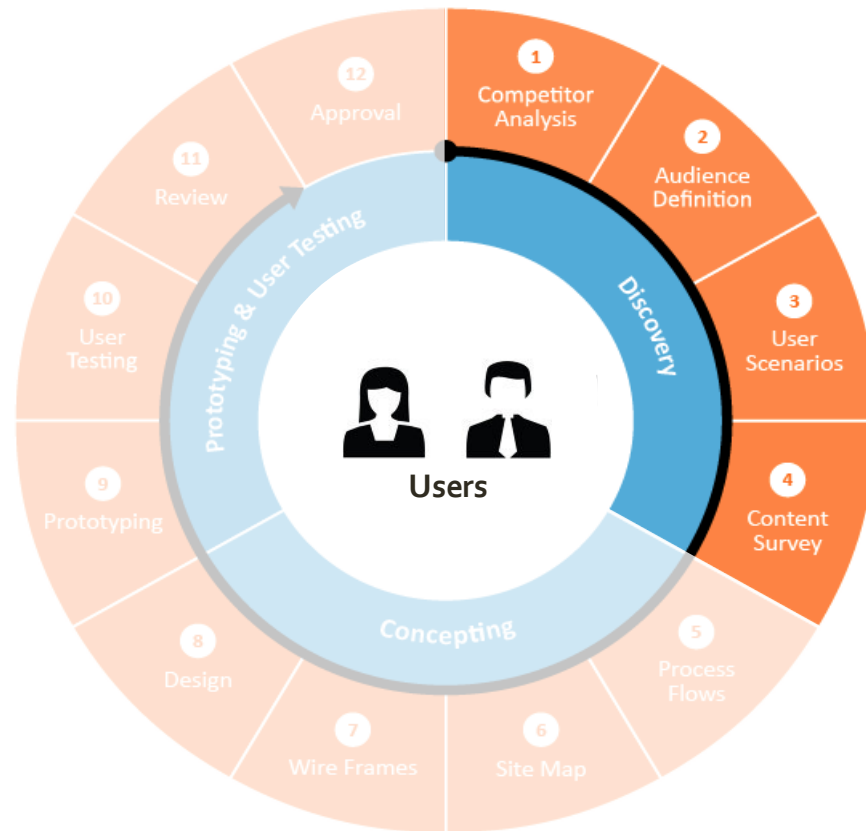
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Discussion

Let's say you want to implement this front-end;
where do you start?

User-centered design framework



1) Discovery

- Learning about your users
- Modeling your users
- Analyzing your users' tasks
- Eliciting and defining clear product requirements

2) Concepting Phase

- Developing conceptual models
- Solving design problems through ideation
- Detailed design activities

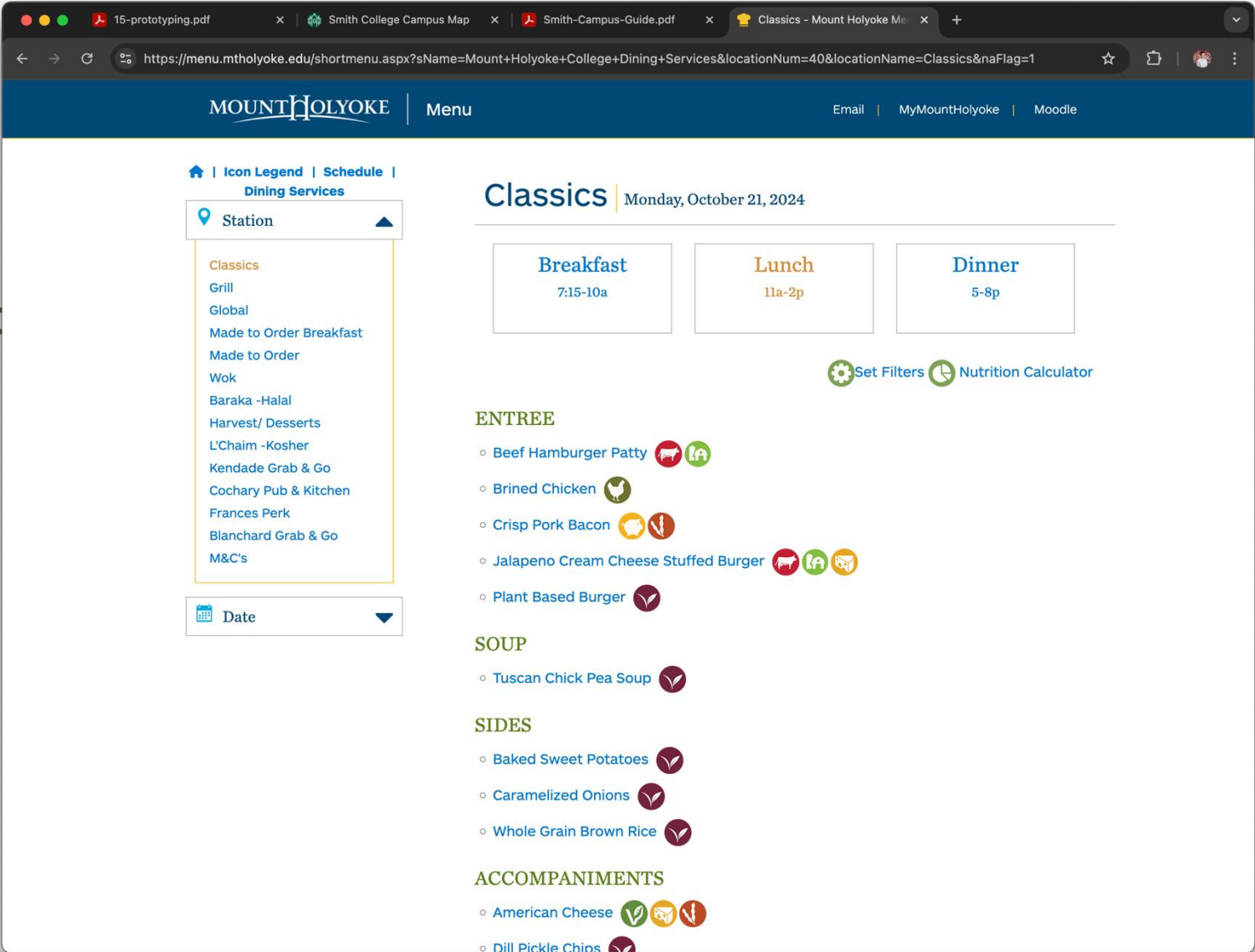
3) Prototyping + User Testing

- Delivery of a high-quality product that meets users' needs and is easy to learn and use

Discovery: Competitor Analysis

- **Why?**
 - If you look at what already exists, you might be able to identify potential issues in advance
 - Also helps establish your unique contribution
- **How?**
 - Literature or product review
 - Analysis
 - What are the existing tools?
 - What is their purpose?
 - What audience are they aiming for?
 - What kinds of strategies are they using?
 - What functionality do they contain?
 - What are their strengths and shortcomings?
 - Identify opportunities and design constraints

Discovery: Competitor Analysis



Discovery: Audience Definition

- Learning about their problem
 - Semi-structured interview
- Analyzing their tasks
 - Hierarchical task analysis
- Modeling users
 - Personas

Semi-structured interviews

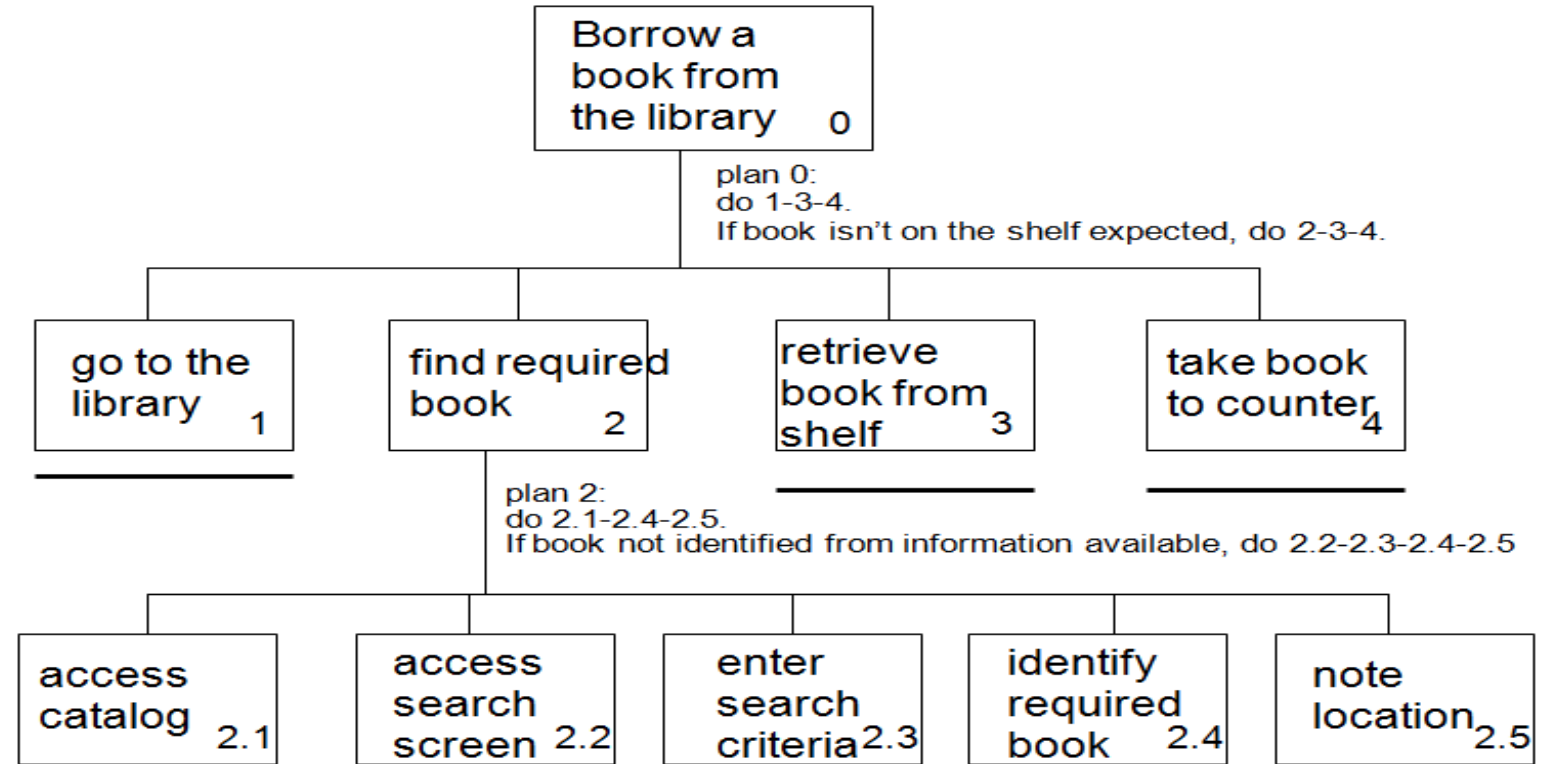
- **Why?**
 - gather qualitative data about users to understand the problem
 - can help identify key differences between designer and target user
- **How?**
 - ask open-ended questions
 - bring along a “cheat sheet” to ensure that you gather all the information you need
- **Some tips:**
 - establish trust at the beginning
 - participant engagement will vary
 - be flexible, but make sure you get what you came for
 - consider recording or note-taking to help with recall



Hierarchical task analysis

- **Why?**
 - Understand user workflow
 - Identify pain points and areas for optimization
- **How?**
 - Decompose tasks into 4-8 sequential steps
 - Identify patterns, sequences and skips in the tasks
 - An example:

Task analysis example



Personas

- **Why?**
 - mechanism for reasoning about user needs
 - model behavioral characteristics of target users
 - doesn't require access to ACTUAL users
- **How?**
 - fictionalization
 - narrative, goals, needs, "pain points"
 - attributes specific to the problem space
 - data-driven method* using info from interviews
 - mapping persona to software features

Personas

Example for the dining app

- Ellis is a first year Smithie who lives in in Wilson. They do cross country and have 6am practice before their 9:25am art history class in the art museum on MWF. On TR, they have engineering 101 in Ford Hall until 12:05, and their work study job at the campus school that starts at 12:45pm sharp. Ellis is a “live to eat” kind of person, and likes to optimize the “yum” factor in their meals. In addition, they are vegan. They are comfortable using apps on their phone like GoogleMaps, but are struggling to find the time to survey dining hall menus and get to the appropriate dining hall for the meal they want between their various other activities.

Pain Point:
Limited time

Goal/Need: Eating
what they like

Pain Point:
Limited time

Pain Point: Distilling
current menu list

Technical skills: Comfortable
with basic apps

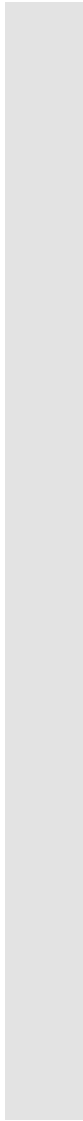

Pain Point:
Walking far & fast

Goal/Need:
Minimize walk
distance

Activity: personas

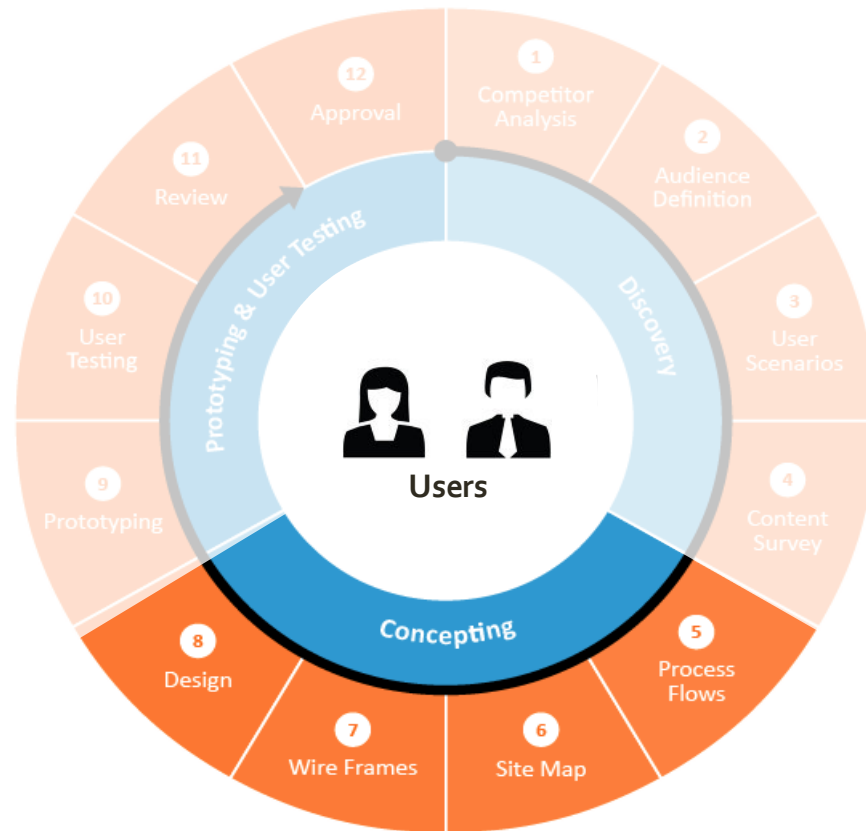
Goal: come up with a **persona** that characterizes a user of a visual analytic system for exploring energy usage on campus.





Now that we've got some end users in mind,
what would the system look like?

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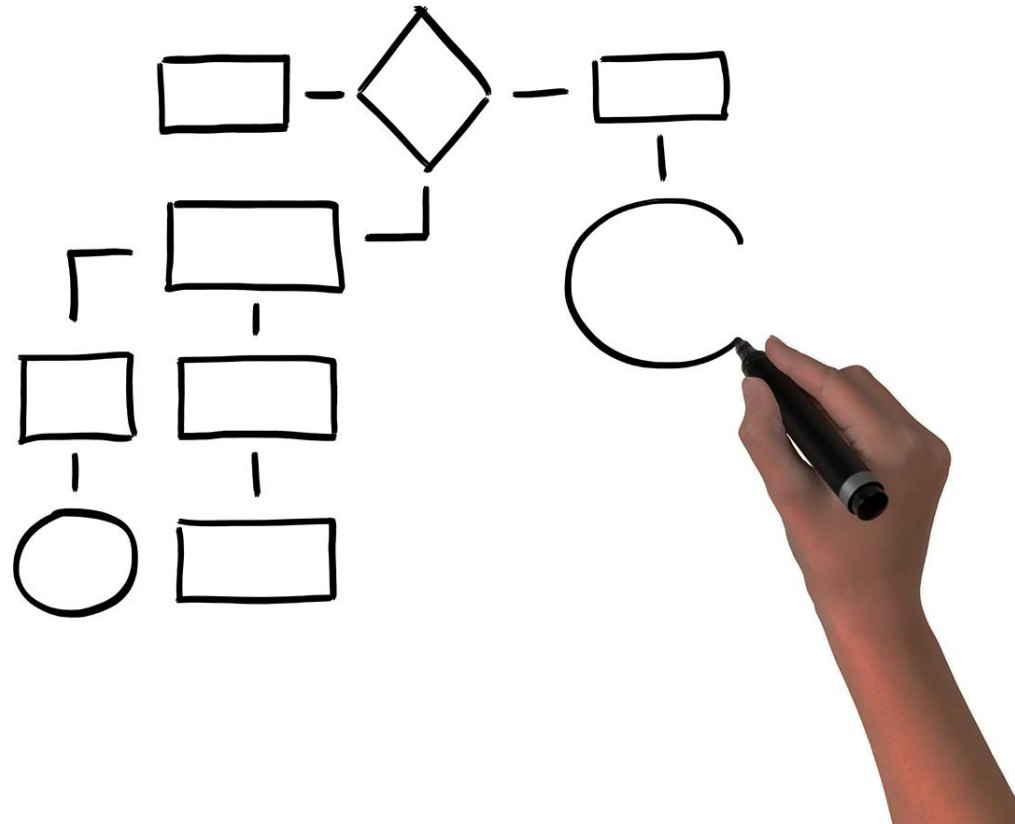
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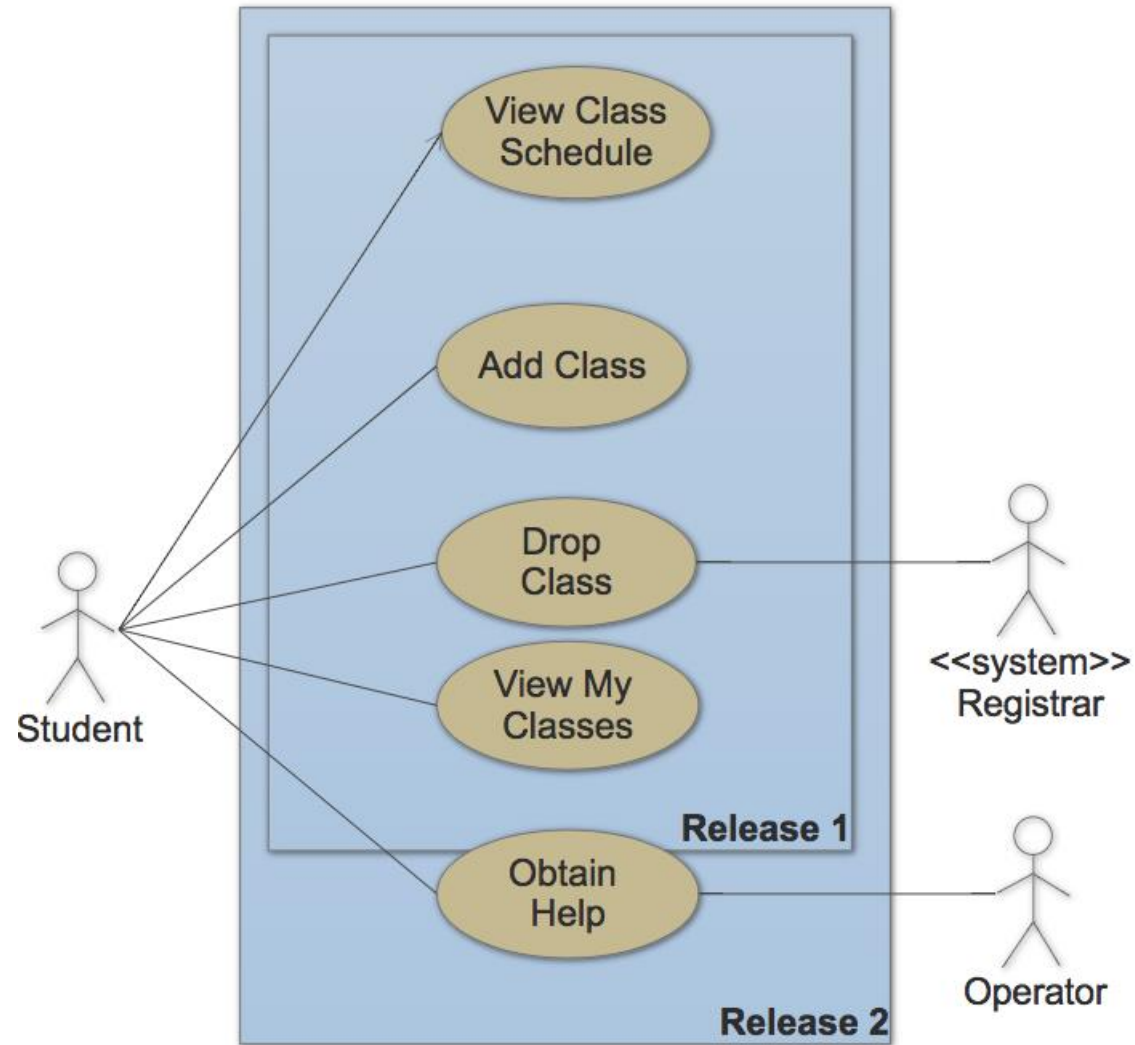
Concepting: Architecture diagrams

- **Big idea:**

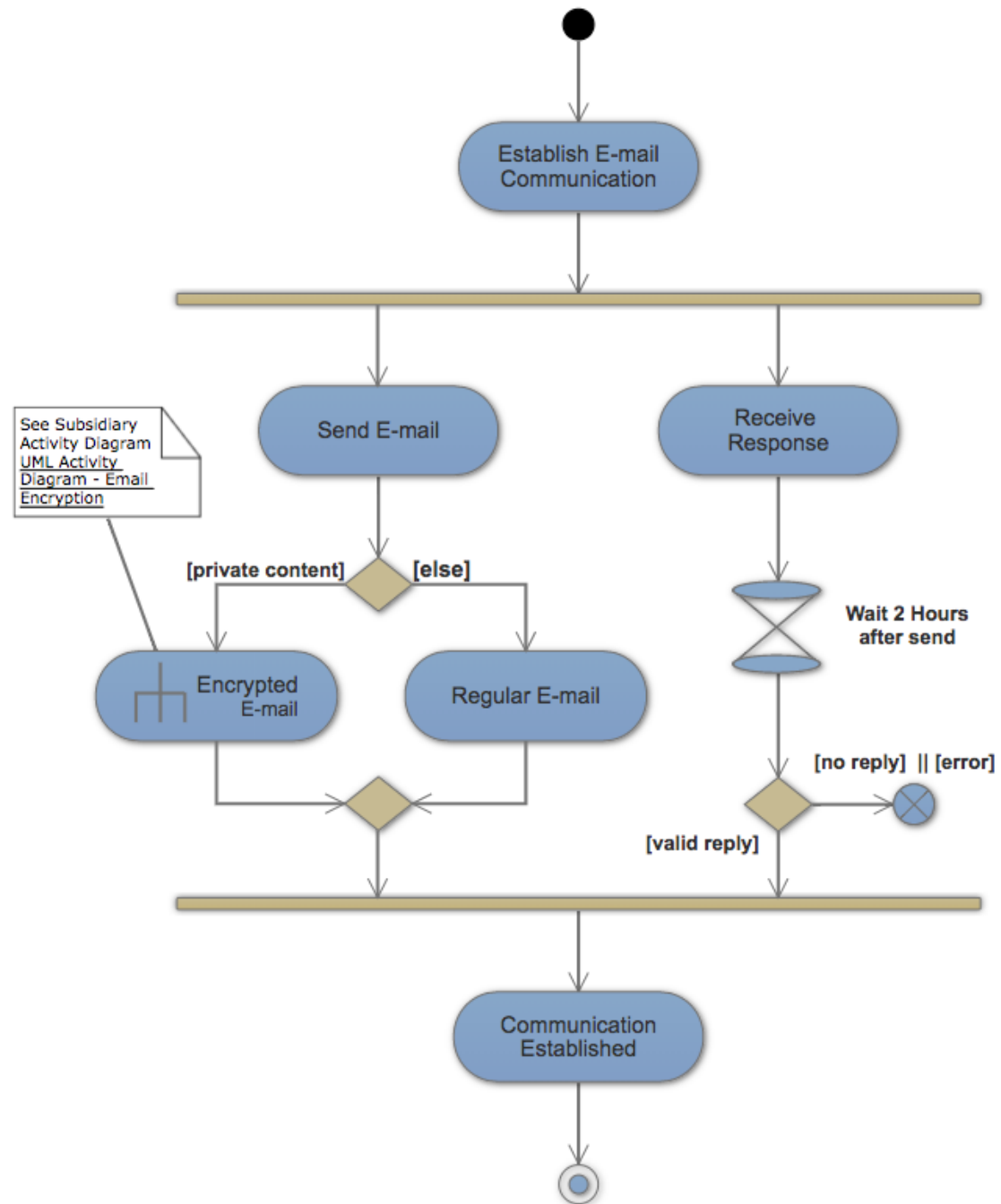
- Now that you've got an idea of what your tool should do, break that down into **manageable pieces** so you can get started
- This can happen at **several levels of detail**



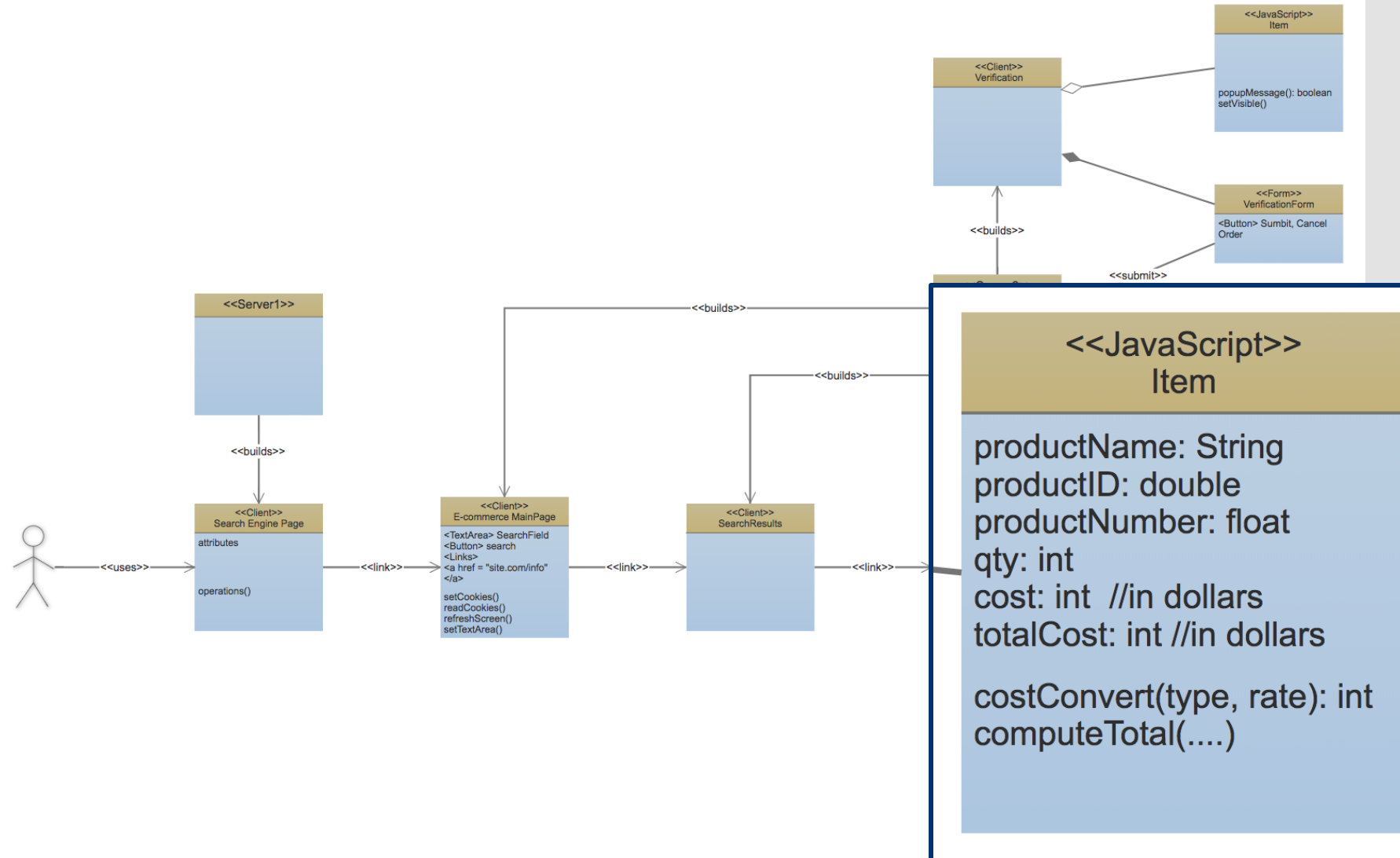
Example: use
case diagram
(high level)



Example: activity diagram (mid level)



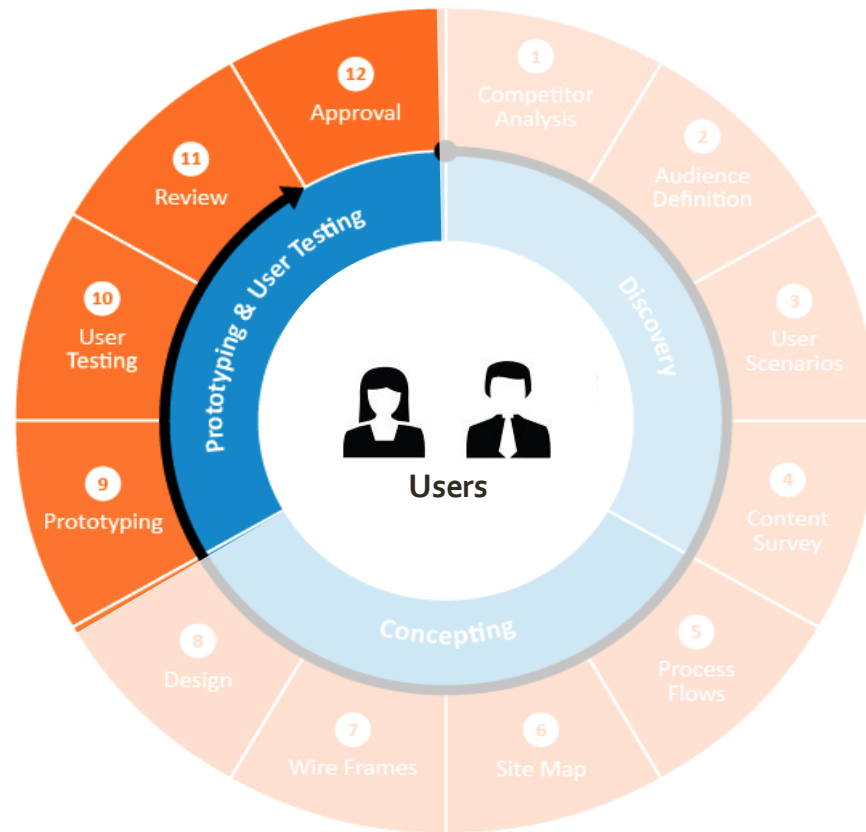
Example: class diagram (low level)



Case Diagram Practice

- What would the case diagram look like for the dining hall app?

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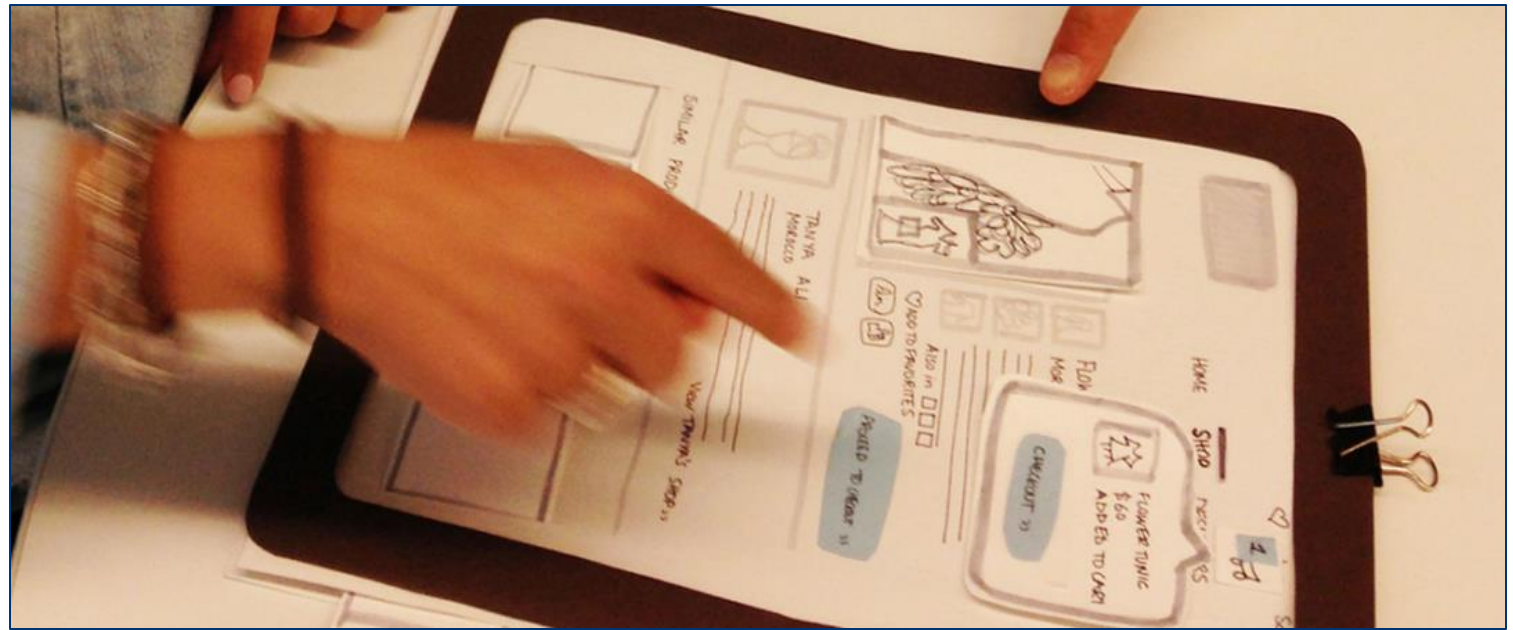
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Prototyping and Testing: Low-fidelity paper prototyping

- Roughly sketch an interface for the dining hall app

Prototyping and Testing: Low-fidelity paper prototyping

- **Big idea:**
 - Not sure yet whether or not an **idea** will work?
 - Making a **paper version** of an interface is a lot faster and easier than coding a working prototype – start there!



Prototyping and Testing: Low-fidelity paper prototyping

- Generate **lots of ideas**
- Engage **other people** in the design process
- Identify **potential problems** before you waste time coding
- Get **feedback** quickly, from lots of different people
- Some tips:
 - Focus on the **big picture**, don't worry about the details
 - **Think about what you want it to do**, rather than what you know how to implement (we'll worry about that later)
 - Not so into arts and crafts? It doesn't have to be **actual paper**... Whiteboard / PowerPoint / Keynote will also do the trick!

Prototyping and Testing: Low-fidelity paper prototyping

Examples:

- <https://www.youtube.com/watch?v=nAgQP9lkl2o>
- <https://www.youtube.com/watch?v=y2oE3qBmHpg>
- <https://www.youtube.com/watch?v=yafaGNFu8Eg>

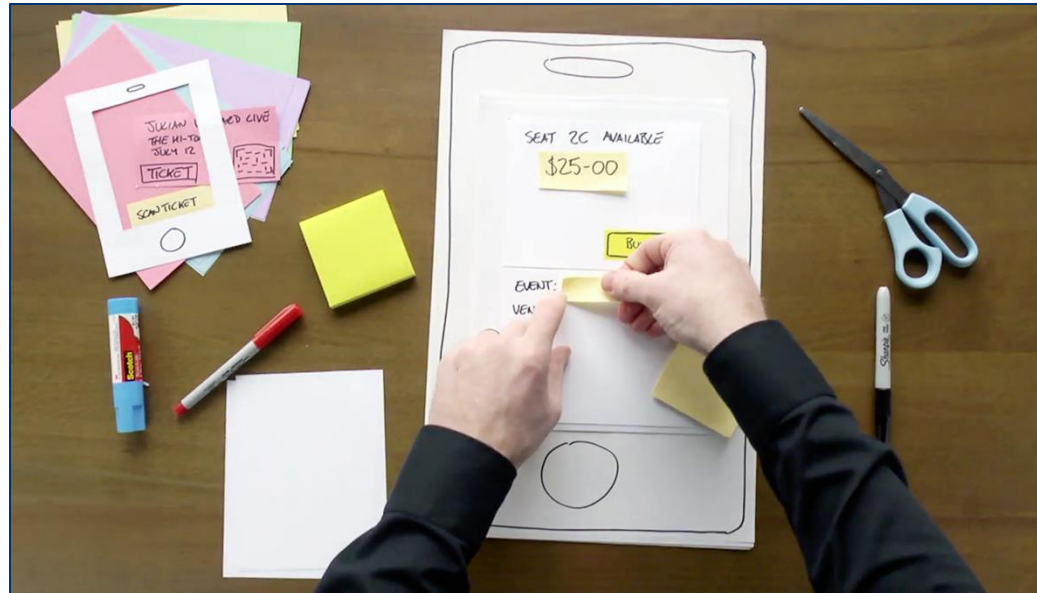
Prototyping and Testing: Soliciting feedback

- One purpose of a prototype is to get feedback on your design idea. We do this through **user testing**:
 - Choose specific tasks your end user should be able to do with your app
 - Ask someone to perform those tasks with your prototype
 - Do not give clues or help while they perform each task
 - Ask the tester to “think out loud” i.e. narrate what they are doing / why
 - Observe where they get stuck and what they like
 - Modify your design based on testing
- What tasks could we ask a user to perform to test the dining hall app design?

Prototyping and Testing: Medium & High Fidelity

- **Medium-fidelity prototype**
 - Typically made once design is more solidified
 - Usually does not involve coding
 - Could be made with:
 - Powerpoint
 - Canva
 - Figma
 - Etc..
 - Same idea -- build, test, adapt
- **High-fidelity prototype**
 - Once you have a solid idea of the design, code your app
 - Test and adapt
 - You might implement one feature at a time

Your turn!



- Work with the group you developed a persona with
- Sketch out the visual analytic system you'd make based on your persona
- Build a paper prototype of the system
- Choose 3 tasks to have another group perform with your prototype
 - Pay attention to where they run into trouble

Takeaways

- Thinking about your end user early → you're more likely to **build something that actually solves the problem**
- **"Low-fidelity" prototyping** saves time and energy by helping identify problems before you commit to code
- **Architecture diagrams** help you plan out your implementation so you don't run out of time
- Also, the process is **kinda fun...**