

## A. Web planning process

### a. 7 steps

#### i. Note:

1. Not every step is clear-cut
2. Some steps are grouped/collected together into one
3. Generally, this is the progression you'd like to see
4. Ideally, each step is well-documented so all parties can see the progression of planning!

### b. Product requirements

### c. Information architecture

### d. User flows

### e. Wireframes

### f. Visual designs/look and feel

### g. Prototypes

### h. Usability testing

### i. As you get closer to development phase, the fidelity/resolution of the step gets higher

- i. IA, user flows, wireframes = low resolution, quick, cheap sketches
- ii. Visual designs, prototypes = higher resolution, closer to actual product

## B. Product requirements

### a. Stakeholders/product owners create product requirements

- i. Generally a direct product of business goals or user feedback

### b. As developer, you may be called to give input/help organize

### c. Document generated is PRD = product requirements document

#### i. Content varies

1. Rationale for feature/product
2. Timelines
3. Functionality description
4. Data/backend/API/hardware needs
5. Timeline
6. Business objectives
7. User goals/needs

## C. Information architecture

### a. <https://www.webfx.com/blog/web-design/information-architecture-101-techniques-and-best-practices/>

### b. Definition

- i. organizing, structuring, and labeling content in an effective and sustainable way in order to help users find information and complete tasks
- ii. specifying how items relate to each other within the system

### c. Why does IA matter?

- i. Peter Morville, week 1 ("Father of information architecture")
- ii. He says that IA "help users understand where they are, what they've found, what's around, what to expect and what is possible"

1. Sound familiar? Findability!

### iii. IA is the foundational structure that informs the rest of the process

1. If your IA is shaky, the rest of the process is at risk
2. IA --> content strategy & user interface design --> interaction design (wireframing and prototyping processes)

3. Architect : building :: Information architect : website/software/interactive services
- d. First step of IA = organization scheme
  - i. You're either creating a brand new website or redesigning/rebuilding an existing site
    1. May need to come up with content or repurpose existing content
  - ii. Inventory your content
    1. detailed listing of basic information about all the content that exists in a site or will need to be created new
      - a. What do you have already?
      - b. What do you need?
      - c. Use conventions!
        - i. eg business sites need contact pages, open hours
        - ii. Ecommerce site needs a cart
        - iii. Newspaper site needs articles, etc.
    2. Group content into categories, pages, subpages
      - a. Subdivide content down further into smaller units until they represent comfortable, easily understood pieces for a user ("chunking")
      - b. Example: <https://www.nngroup.com/articles/chunking/>
        - i. Apartments.com "wall of text" vs. BBC short paragraphs & subheads
    3. Draw diagrams that show the site structure and rough outlines of pages with a list of core navigation links
      - a. "Site map"
      - b. Multiple hierarchy patterns
        - i. Single page
        - ii. Flat structure
        - iii. Main page w/subpages (most common web pattern)
    4. Keep goals in mind!
      - a. What do you want your users to be able to do/find on the site?
      - b. Test the organization interactively with real users & refine (usability testing)

#### D. User flows

- a. <https://conversionxl.com/blog/how-to-design-user-flow/>
- b. Definition: diagrams that show the steps a user would take to accomplish a goal on website
- c. Start with understanding of user needs + business objectives (ideally from the PRD!)
  - i. business objectives: the action you want visitors to take on the site
  - ii. user objectives: the desires or needs that they want to satisfy
  - iii. match users needs with your business objectives
- d. Map the flow (ie, series of steps) that take users from their entry pages toward the final action (signup, purchase etc)
  - i. final action needs to provide value both to the user as well as the business
- e. Understand how users enter the site
  - i. Search?
  - ii. Social media link?
  - iii. Email link?
  - iv. How user enters may indicate what their goal/need on site is
    1. Different needs = different actions = different flows
    2. Example: overstock.com

- a. Joe is a user who is actively searching for a rug for his living room. He enters Overstock via a product search link from Google.
  - b. Jane is a user who has been thinking about buying a rug. She has bought tables from Overstock before, so is on their mailing list. Overstock mails her a coupon linking her to a Labor Day sale.
  - c. Jim has never heard of Overstock but he likes buying home goods for his home styling business.
- f. Diagram flow
  - i. Flows = individual screens where interactions take place
  - ii. Each screen is showing something and the user is reacting to it
  - iii. Akin to state diagrams in CS
  - iv. Each flow node shows the connection between what the user sees | what the user does  
→ what the user sees next | what the user does next
  - v. Flows focus on the most wanted action on every screen the users lands on
    - 1. As nice as it would be for usability, a website does not consist of a giant button in the middle of the screen directing the user what to do next!
    - 2. As developers/architects, we need to remember that the user's attention is divided and we need to focus their attention on where we want them to go
  - vi. User flow example
    - 1. <https://cargocollective.com/ameliabauerly/User-Flow-Example>
    - 2. Movie Night app: 'pinterest for films'. Users would follow other users ('critics') and lists of films created by other users. The content they would see displayed on their screens (ie, film recommendations) would be that curated by those they follow.

## E. Wireframes

- a. <https://www.usability.gov/how-to-and-tools/methods/wireframing.html>
- b. What is a wireframe?
  - i. two-dimensional/flat illustration of a page interface
  - ii. middle ground between site map and prototype
  - iii. focuses on space allocation and prioritization of content, available functionality and intended behavior
  - iv. Only a guide to where the major navigation and content elements will appear
    - 1. NOT visual design
    - 2. Should be very basic & generic!
    - 3. Boxes, not pictures!
  - v. Sometimes can be used for usability testing
    - 1. Generic enough that users don't focus on design
    - 2. Can be too basic for real interactivity
    - 3. Often wait to the prototype stage
- c. Why should we have wireframes?
  - i. They provide the bridge/connection of the IA to visual layout
    - 1. You can start determining your consistent system for displaying information in the UI
    - 2. You can determine intended functionality in the interface
  - ii. Wireframes help to prioritize content
    - 1. how much space to allocate
    - 2. where that item is located
- d. Example wireframe, <http://www.reactjs.org>

- i. <http://framebox.org>

## F. Visual design/look and feel

- a. What is design theory?
  - i. The principles designers follow to create effective visual communication
  - ii. I.e. the principles that describe how we see AND perceive visual information
  - iii. Design theory separates ideas of style, taste and trend from universal principles of aesthetics
    - 1. Style, taste and trends are “fads” -- pass by quickly, come and go, tied to time period, country, culture
    - 2. Universal principles of aesthetics -- more hardwired to how humans as a whole process visual information
- b. Everyone is a designer!
  - i. We all design when we plan for something new to happen
    - 1. Paint a picture
    - 2. Come up with a new recipe
    - 3. Rearrange the living room
    - 4. Refactor code
  - ii. Design thinking = inherent to human cognition
  - iii. Professional designers study and understand design principles and apply them consciously
- c. What does the design process look like?
  - i. Start with understanding the context in which the thing will be created and eventually exist
    - 1. Where will it be experienced?
      - a. On the internet?
      - b. In a magazine?
      - c. On a billboard?
      - d. On a bus?
    - 2. By whom?
      - a. Elderly widow?
      - b. New dad?
      - c. First grader?
    - 3. What do those people already know?
    - 4. What is the budget & timeline?
  - ii. The design process is a combination of research, requirements gathering and understanding constraints
    - 1. Requirements from the PRD, perhaps, plus other requirements inherent to the medium, for example
      - a. Creating a website is very different than creating a pamphlet!
- d. Design principles
  - i. <https://www.wix.com/blog/2018/07/7-principles-of-design-websites/>
  - ii. Design principles can be applied to create specific effects and convey an intention via composition of elements
    - 1. Eternal concepts that are universal to human visual perception
  - iii. 7 principles
    - 1. Balance
      - a. keep the visual weight equally distributed on your website
      - b. Many website designs lead from newspaper/magazine design

- i. Example: <https://www.nytimes.com/>
  - ii. Strong grid
  - iii. Centered elements
  - iv. Symmetry
- c. Balance makes sure that one element does not stand out accidentally, which will lend unintentional importance to it
- d. Balance makes users feel grounded and centered, which produces a feeling of confidence
- e. Can have asymmetrical balance
  - i. Features/elements not visually identical but visually equivalent in “weight”
- f. Difference between asymmetrical + symmetrical balance:  
<https://blog.hubspot.com/marketing/asymmetrical-balance>
- 2. Contrast & Emphasis
  - a. Applying elements that are inherently opposite of each other in order to draw the eye or create visual interest
  - b. Examples
    - i. round vs. sharp shapes
    - ii. negative vs. positive space (whitespace)
    - iii. smooth vs. rough textures
    - iv. Contrasting type styles (bold vs. regular, large type vs. small)
    - v. Contrasting colors (Reactjs.org get started)
- 3. Movement
  - a. Think of movement/animation as a way to guide the user to elements you want them to see in a certain order
  - b. Motion can illustrate processes with a series of steps
  - c. Motion/animation can give a website a tactile experience, ie the feeling that the website is an object in the real world that can be touched and manipulated
    - i. Things move when we interact with them in real life
    - ii. Example: <http://omnisense.net/>
- 4. Repetition
  - a. <https://vissscom.wordpress.com/2013/04/16/principle-of-repetition-pattern/>
  - b. Consistency = create a sense of certainty & reassurance
  - c. Elements create rhythm through the repetition of certain design elements
  - d. Consistent line spacing
  - e. Consistent typography/fonts
  - f. Templates so that users can locate information in the same place
  - g. Excessive repetition/consistency = monotony, boredom
    - i. Combine with other design principles
    - ii. add visual breaks and white spaces to give viewers’ eyes rest
- 5. Hierarchy
  - a. Effective composition = three levels of hierarchy
    - i. the most important
    - ii. the middle stuff
    - iii. the least important
  - b. Human brains can’t give same level of importance to every element
    - i. We place more importance on the first element that we perceive

ii. Z scanning

1. <https://webdesign.tutsplus.com/articles/understanding-the-z-layout-in-web-design--webdesign-28>
2. super-impose the letter Z on the page
3. Western readers will scan a site the same way that they would scan a book - top to bottom, left to right
  - a. Most important = top left
  - b. Least important information = middle of the page (scanned quickly)
  - c. Call to action (ie, what you want the user to do) = bottom right (end of Z)

6. Similarity

- a. <https://www.smashingmagazine.com/2016/05/improve-your-designs-with-principles-similarity-proximity-part-1/>
- b. Repetition = using the same or similar elements over and over
- c. Similarity = how the elements themselves compare to one another
- d. Humans assign relationships to like elements in several ways
  - i. Color
    1. Color is often strongest indicator of relationships, can override things like shape & size
  - ii. Shape
  - iii. Visual weight
  - iv. Size
  - v. Orientation

7. Proximity

- a. <https://www.smashingmagazine.com/2016/05/improve-your-designs-with-principles-similarity-proximity-part-1>
- b. When items are in close proximity, humans assume that the items are connected or have a relationship to each other
- c. Placing related design elements together become one visual unit
- d. Logically grouped content near each other is easier to read and scan
- e. Unrelated elements should be placed further apart to emphasize lack of relationships

8. White space

- a. Empty space
- b. natural inclination is to spread out the content evenly to fill the space
- c. White space can help group and organize
- d. Can make users create divisions/perceived differences if white space is separating elements that actually are related

G. Color theory

- a. <http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm>
- b. What do I mean by color theory?
  - i. The interaction of colors in a design
  - ii. Human eye can see approximately 7 million colors
  - iii. Monitors can display 16.8 million colors or more
  - iv. Given all these possible colors and color combinations: How do we know how to use colors to communicate effectively?
- c. Color theory is the collection of rules and guidelines regarding the use of color in art and design.

- i. Color theory forms the basis of the thought behind color schemes/palettes
  - ii. Involves BOTH aesthetic appeal and the effective communication of a design message on both the visual level and the psychological level
- d. Colors have meaning/psychology
  - i. impart a tone and emotional impact
  - ii. powerful design tool
  - iii. vary dramatically across cultures and regions, know your culture/audience!
  - iv. Examples are primarily US/Western Europe
  - v. <https://www.canva.com/learn/100-color-combinations/>
- e. Red
  - i. vibrant, aggressive
  - ii. Danger = stop signs, error messages, blood
  - iii. Red + black --> masculinity, aggression eg sports cars
  - iv. Red + whites or gold --> love and passion (think valentines day)
- f. Orange
  - i. less aggressive than red
  - ii. Highly visible → construction, safety, and hunting equipment
  - iii. Represents fall → leaves, pumpkins, and Halloween
  - iv. warmth→ fun and energetic without red danger
- g. Yellow
  - i. sun, warmth, and summertime
  - ii. most visible color on the spectrum
  - iii. highest visibility especially combined with white or black
  - iv. safety equipment, school buses, and taxis
- h. Blue
  - i. Celestial, heavens, sky, the tropical, water
  - ii. Professional, stability (IBM = Big Blue)
  - iii. refreshing and cleansing
  - iv. darker shades can convey sadness
- i. Green
  - i. plant life, growth and health --> organic, environment
  - ii. Greens + blues + browns = nature
  - iii. wealth and finance in the U.S.
  - iv. Serenity, success -- green for go, success messages
- j. Brown
  - i. Not often used on the web, implies dirtiness (except when evoking nature with green and/or blue)
  - ii. earthiness and luxury, esp food
    - 1. Chocolate: <https://www.godiva.com/>
    - 2. Coffee: <https://thehumanbean.com/>
    - 3. Beer: <https://reubensbrews.com/>
  - iii. Can also imply a certain do-it-yourself-ness, maybe alluding to brown cardboard and making things? <http://www.molecube.ca/>
- k. Purple
  - i. In ancient Rome, only the rich could afford purple
  - ii. Still strong association w/luxury & creativity brands
    - 1. Milka <http://www.milka.com>
    - 2. Cadbury <http://www.cadbury.co.uk>

- 3. Yahoo! <http://www.yahoo.com>
  - 4. Asprey <https://www.asprey.com/us/>
- iii. Here in Seattle, also strong association with UW
- I. White
  - i. purity, innocence, and sterility
  - ii. weddings, healthcare, science, and spirituality
  - iii. cleanliness and freshness, eg laundry, clean sheets
- m. Black
  - i. strength, luxury, evil, death, and the unknown
  - ii. Good vs. evil = white vs. black
  - iii. Yin & yang
- n. Color categorizations
  - i. Colors can be combined/blended in almost infinite ways, but there are certain basic colors that we talk about
  - ii. Primary colors
    - 1. basis for all other shades
    - 2. Humans perceive three base colors: red, blue, and yellow
    - 3. All other colors = combination of these in varying brightnesses, tints, and shades
  - iii. Secondary colors
    - 1. Green, orange and purple
    - 2. Formed by mixing combinations of primary colors
  - iv. Tertiary colors
    - 1. Yellow-orange, red-orange, red-purple, blue-purple, blue-green & yellow-green
    - 2. Primary + secondary
- o. Color temperature (hot/cold)
  - i. Colors have warmth associated with them
  - ii. Think about how you feel when you think about a color or think about what colors you associate with certain temperatures/seasons
    - 1. People are blue with color or turn red when they're overheated/sunburned, for example
  - iii. Warm/hot colors
    - 1. higher amounts of reds and yellows
    - 2. evoke sense of warmth and passion
    - 3. aggressive and bold → stand out, catch the eye
      - a. Eg stop signs
      - b. Eg red is often used in error messages
      - c. Danger! Pay attention!
  - iv. Cool/cold colors
    - 1. higher amounts of blue
    - 2. evoke sense of chilly climates, ice, winter, water, nighttime, death, and sadness
    - 3. can connote loneliness, coldness, and fear
    - 4. less aggressive and more soothing/relaxing
      - a. Eg green success messages
  - v. Increasing temperature = increasing orange levels
    - 1. warmer and happier
    - 2. eg world looks happier when the sun is shining
  - vi. Reducing temperature = decreasing orange levels
    - 1. colder and less inviting, like an overcast day wheel



p. Color combinations

- i. Color theory covers not only the colors themselves but the way that the colors are combined
- ii. Colors are often grouped into color wheel
  1. <https://www.canva.com/colors/color-wheel/>
  2. <http://www.tigercolor.com/color-lab/color-theory/color-harmonies.htm>
  3. Colors are picked from the wheel in combinations based on how they play against each other
    - a. Complementary colors
      - i. colors that are contrasting and located opposite of each other on the color wheel
        1. blue and orange
        2. purple and yellow
        3. red and green
      - ii. high contrast combinations
      - iii. vibrant look when at full strength
      - iv. **Poor combination for text background + foreground – produce throbbing effect that can cause eyestrain**
    - b. Analogous colors
      - i. colors that are next to each other on the color wheel
        1. Purple and red
        2. Orange and yellow
        3. Blue and green
      - ii. match well
      - iii. create serene soothing designs
    - c. Triadic
      - i. Colors at the points of an equilateral triangle on color wheel
        1. Red yellow blue
        2. Orange green purple
      - ii. Fine artists often use triads in works of art
      - iii. triads can create a combination of vibrant colors that also bring a sense of order and balance because of the equal distance between them on the wheel
    - d. Split-complementary colors
      - i. Uses base + colors on either side of complementary color
      - ii. strong visual contrast
      - iii. less tension/vibrancy

q. Color theory in terms of accessibility/usability

- i. <https://www.invisionapp.com/inside-design/color-accessibility-product-design/>
- ii. High/low contrast
  1. Certain colors (like green/red) have a tendency to produce combinations that are extremely hard to discern/differentiate, especially for people with visual challenges or people who have contrast challenges

2. Avoid difficult-to-discern color combinations

- a. Green & Red
- b. Green & Brown
- c. Blue & Purple
- d. Green & Blue
- e. Light Green & Yellow
- f. Blue & Grey
- g. Green & Grey
- h. Green & Black

3. Use high contrast

- a. Background-to-text contrast ratio should be at least 4.5:1
  - i. Can be measured with tools like Colorable (<https://colorable.jxnblk.com/ffffff/000000>)
- b. Color blind people can perceive contrast, differences in hue, saturation and brightness
- c. Body text should be very high contrast -- black & white (unless you know that a significant portion of your audience needs low luminance)
  - i. Make sure your site works with color changes by user!

4. Use thicker lines

- a. Give borders more thickness so that they're easier to see -- provide more contrast

5. Don't assume colors will signal emotions in and of themselves

- a. As we've seen, different colors have different meaning in different cultures
- b. You might not be saying what you think you are!
- c. consider adding another symbolic element (icon) to convey meaning to color

6. Use texture in addition to color to differentiate

- a. ensures that those who are colorblind can distinguish between them without having to worry about color affecting their perception of the data

## H. Prototyping

- a. Designers design based on descriptions/product requirements from stakeholders
- b. Sometimes requirements are not clear/poorly understood
- c. Prototypes provide a visual overview of what is actually going to be made before developers get involved
  - i. Takes visual design or wireframes and hooks them together via buttons, links, etc. to produce interactive UI
    - 1. Allows stakeholders to start using the website
    - 2. builds understanding of how users will behave
    - 3. Lets designers explore options
    - 4. identifies barriers that become obvious when UI is built
  - ii. Often used at usability testing stage since users are able to click and explore UI and move through flows
  - iii. Biggest benefit is mitigating risk at design step
    - 1. Failing earlier = learning earlier
    - 2. Still have opportunity to validate, iterate and improve before development begins
- d. Can prototype in many ways
  - i. Either dedicated prototyping tool like InVision, Fluid, Adobe InDesign

- ii. Could also create rapid prototypes with a web framework like Bootstrap
- iii. Some designers also use wireframes on paper for prototyping
- iv. Just need something that helps you rapidly set up interactive elements/screens
- e. Prototype example
  - i. <https://www.justinmind.com/usernote/tests/17386057/17386059/36027864/index.html#/screens/993d5081-ce5b-42bd-9a93-4c8daca4fbbe>

## I. Usability testing

- a. What is usability testing?
  - i. evaluating a product or service by testing it with representative users
  - ii. participants will try to complete typical tasks while observers watch, listen and takes notes
- b. Goal is to identify any usability problems before they are coded
  - i. Learn if participants are able to complete tasks successfully
  - ii. Identify how long it takes to complete tasks
  - iii. Find out how satisfied users are
  - iv. Identify changes required to improve user performance and satisfaction
- c. What to test?
  - i. questions about how site will work in practice
    - 1. Try out a particular interaction or workflow
    - 2. What do users notice on your home page?
    - 3. what they would do first?
  - ii. If planning to redesign a website or app, test the current version to understand what's not working
- d. Whom to test?
  - i. consider who will be using your product and how you can reach those people
  - ii. Try to test representatives who will react like your users, but having people test early is better
  - iii. Usually not a good idea to design a site that only target audience can use!
  - iv. Small sample groups are fine!
    - 1. Usability expert Jakob Nielsen  
([https://en.wikipedia.org/wiki/Jakob\\_Nielsen\\_\(usability\\_consultant\)](https://en.wikipedia.org/wiki/Jakob_Nielsen_(usability_consultant)))
    - 2. testing a website with five people will catch 85% of the usability issues with a design, remaining 15% of issues with 15 users
    - 3. The first 3 users are likely to catch the vast majority of problems/errors
- e. How to test
  - i. Determine goals/user flows that you want tester to accomplish
  - ii. Encourage thinking out loud
  - iii. Try not to help too much or give hints
  - iv. Ask probing questions (what are you noticing?)
  - v. Follow up questions on why a user thinks what they do
  - vi. Keep instructions simple!
  - vii. Sample usability session: <https://www.youtube.com/watch?v=QckIzHC99Xc>

## J. Contingency design & other things to consider as a developer

- a. What is contingency design?
  - i. Design for when system deviates from expected/"normal" parameters
    - 1. Real world examples
      - a. Smoke alarms -- alerts you with loud noises when there is unexpected smoke

- b. Life jackets -- keep you afloat should you find yourself in the water
    - c. TV closed captioning/subtitles -- translation of sounds for non-hearing viewers
    - d. Childproof containers -- keep children from accidentally poisoning themselves by not letting them get into medicines they shouldn't
  - b. Empty & too many results state
    - i. Empty results
      - 1. Search that returns no results
        - a. Good: <https://www.apple.com/us/search/qwerty?src=serp>
        - b. Good: <https://www.target.com/s?searchTerm=qerty>
        - c. Good: <https://www.target.com/s?searchTerm=xapatos>
        - d. Improve: <https://www.nytimes.com/search?query=the>
      - 2. Close enough guess -- "did you mean"?
      - 3. Clear explanations for no result or displaying inexact matches
      - 4. Enable users to expand search
      - 5. Provide helpful tips on how to improve results
    - ii. Too many results
      - 1. Search that returns way too many results to be useful
        - a. Good: <https://www.target.com/s?searchTerm=clothes>
        - b. Good: <https://www.google.com/search?q=the>
      - 2. Categories
      - 3. Pagination
      - 4. Lazy-loading chunks
- c. Text entry form design
  - i. Form design is difficult to get right and very easy to get very wrong!
  - ii. We spend lots of time filling out forms, we should try to make text inputs/forms for our users as painless as possible
    - 1. Highlight required & optional fields
      - a. Conventions bold, asterisks
      - b. HTML "required" attribute
    - 2. Chunk data logically!
      - a. Ask details logically from the user's perspective not from the application or DB perspective (or alphabetically!)
      - b. <https://cloud.netlifyusercontent.com/assets/344dbf88-fdf9-42bb-adb4-46f01eedd629/11a25465-3f60-4a15-8038-f79ea3be523a/1-designing-more-efficient-forms-preview-opt.png>
    - 3. Accept entries in common formats
      - a. Number/textpad input -- only allows numbers
      - b. [https://storage.googleapis.com/twg-content/original\\_images/form-entry-nugget-3.png](https://storage.googleapis.com/twg-content/original_images/form-entry-nugget-3.png)
      - c. Be smart enough to be able to format to your needs
        - i. Eg telephone numbers, dates, etc.
      - d. Know your audience re: formatting! (ie international area codes, mm/dd/yyyy format order, etc.)
      - e. Provide sample entries, dropdown menus instead of text, formatting hints for clean data
        - i. <https://css-tricks.com/wp-content/csstricks-uploads/top-aligned.png>

- ii. Eg passwords -- tell your users what acceptable format is, don't make them guess!
- f. For limited list of options, provide dropdown instead of freeform (eg, countries, states) or calendar selection for dates
- 4. Eliminate invalid selections
  - a. Don't let a user choose an invalid selection, remove from the UI (childproof caps -- don't let them pick something wrong)
  - b. Eg, out of range dates, deprecated selections
- 5. Validate the entries as soon as possible
  - a. As soon as they enter a value or leave the input field
  - b. Immediate feedback instead of when they're submitting the entire form
- 6. Disable submit on click
  - a. We've all seen website that tell us that our credit card will be charged twice if we click again
  - b. Disable buttons that shouldn't be clicked again!
  - c. Protect the user from themselves
- 7. For very long forms, consider caching information wherever possible in case the user drops out of the flow
  - a. Browser form fills
  - b. Temporary localStorage
- 8. Give users the most useful error messages possible
  - a. Tell them:
    - i. Error occurred
    - ii. What the error is
    - iii. How to recover
  - b. Example: <https://www.landsend.com/co/account/register> (click submit without filling)
  - c. Give errors that are noticeable at a glance
  - d. Use color, icons and text to clearly highlight and explain problem AND problem area
  - e. Clearly state the error at the top of the page and at the point where the error occurred
  - f. Indicate the problem with bold red text
    - i. Remember those color blind contingencies! Use bold AND red to cover both
  - g. Draw attention to the error with icons or other indicators
  - h. Offer possible solutions/mitigations
  - i. Don't make users re-enter information that was correct
  - j. Always identify errors in the same way
    - i. Consistency!
  - k. Eliminate the need for back and forth clicking
    - i. Collect errors and display them on a page that lets the user correct them without backtracking
- d. Helpful server-side errors
  - i. Customized 404 pages
  - ii. <https://www.amazon.com/baz>
- e. Navigation
  - i. Search box

- ii. Redirect commonly misspelled urls
- f. Transitional states
  - i. [http://michaelsoriano.com/wp-content/uploads/2014/05/ui-mistakes\\_14.png](http://michaelsoriano.com/wp-content/uploads/2014/05/ui-mistakes_14.png)
  - ii. Server processes can take time, even with asynchronous requests
  - iii. Show users that something is happening
    - 1. Website is still functional and not stuck!
    - 2. Spinners, progress bars
    - 3. Modal letting user know what process is happening
    - 4. Checklist of steps happening to gauge progress
    - 5. Animation = usability, grabs attention (movement!)
    - 6. Notify users as to what's happening
  - iv. Disable UI until interaction can happen
    - 1. Use when clicking multiple times could kick off harmful process, eg, clicking twice charges credit card twice
- g. I18n
  - i. "Internationalization"
  - ii. For global sites, text needs to be translated into different languages
    - 1. Might involve change from ltr to rtl
    - 2. Not every language will have same word length
  - iii. UI needs to be able to flex/adapt to different text sizes plugged in
  - iv. Try not to set UI sections/elements to fixed widths
    - 1. Buttons, dropdowns, input fields
  - v. UI should be able to adapt to text orientation in terms of readability
    - 1. Z-scanning, still work rtl?

## K. Summary

- a. Taking website through planning phases can ensure a much more thorough, well-thought-out website
- b. As a developer, you may be called on to give input into various phases of the design process!
- c. As a developer, it's your responsibility to make sure that site is promoting good accessibility, usability
  - i. Some designers are not experienced in app/interactivity design and might not think of some of the contingency designs
  - ii. You should be aware of missing pieces of design like empty states, transitions, etc. and give guidance/input if needed!