Faculty of Science
Department of Computing and Information Systems (COIS)

COIS 2830

Multimedia and Design

Danny Papagiannis

Andy Reid

Thomas Hughes

Today

- Agenda
  - Systems Thinking
  - System Models
  - HCI Models
  - Design Thinking
  - UI Design

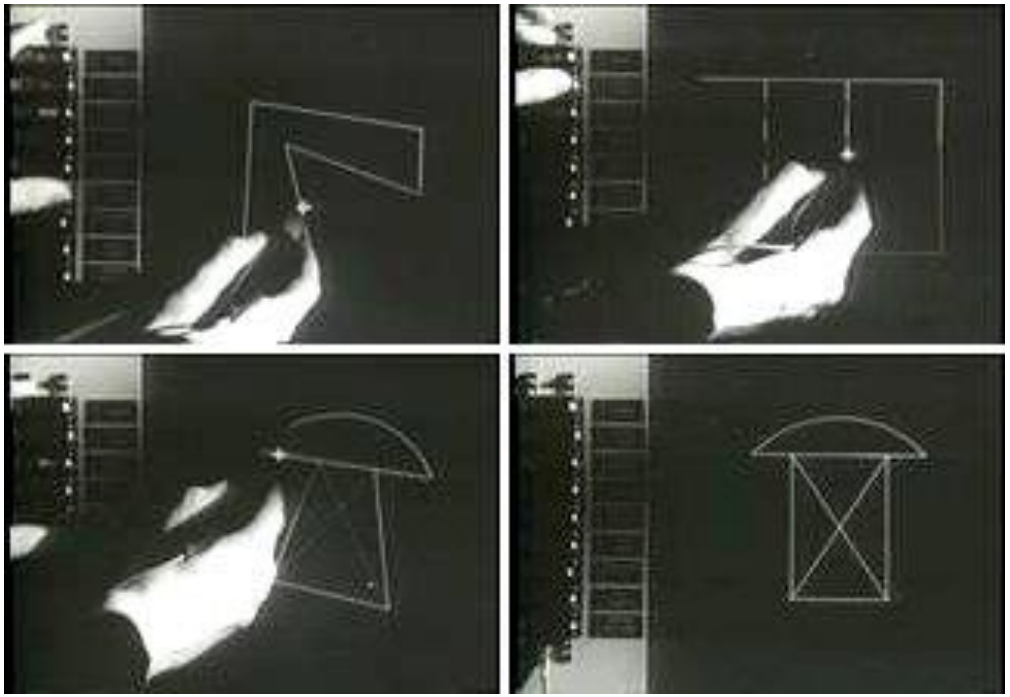
In the Beginning…

https://www.google.com/search?rlz=1C1CHBF_enCA853CA854&biw=1058&bih=546&tbm=isch&sa=1&ei=b6F2XYDOOMjx5gLW1a6IBg&q=the+beginning+big+bang&oq=the+beginning+big+bang&gs_l=img.3...21305.24012..24524...0.0..0.139.1709.11j6.....0....1..gws-wiz-img.....0i24j0.Y9R45l9XaGA&ved=0ahUKEwjAwdjGtsTkAhXIuFkKHdaqC2EQ4dUDCAY&uact=5#imgrc=mmB3CZZGghb4OM:

A Systems View of Project Management

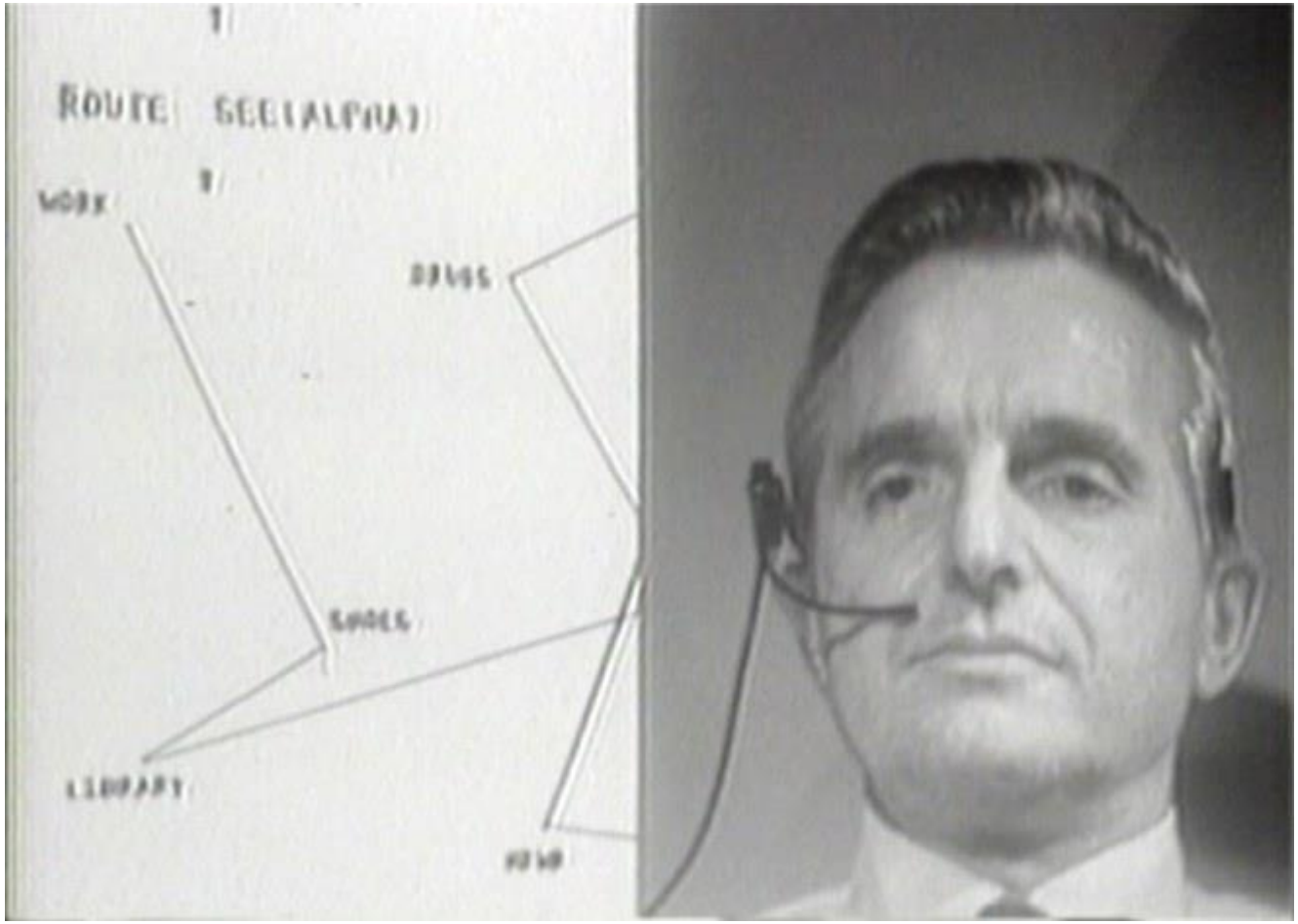
- A **systems approach** emerged in the 1950s to describe a more analytical approach to management and problem solving
- Systems Theory had a ***huge influence*** on Project Management, Product Development, and HCI
- Three parts include:
  - **Systems philosophy**: an overall model for thinking about things as systems
  - **Systems analysis**: problem-solving approach
  - **Systems management**: address business, technological, and organizational issues before making changes to systems

Sketchpad (1963) Sutherland
“First’ GUI



https://en.wikipedia.org/wiki/Sketchpad#/media/File:Sketchpad-Apple.jpg

Mother of All Demos (1968) Engelbart

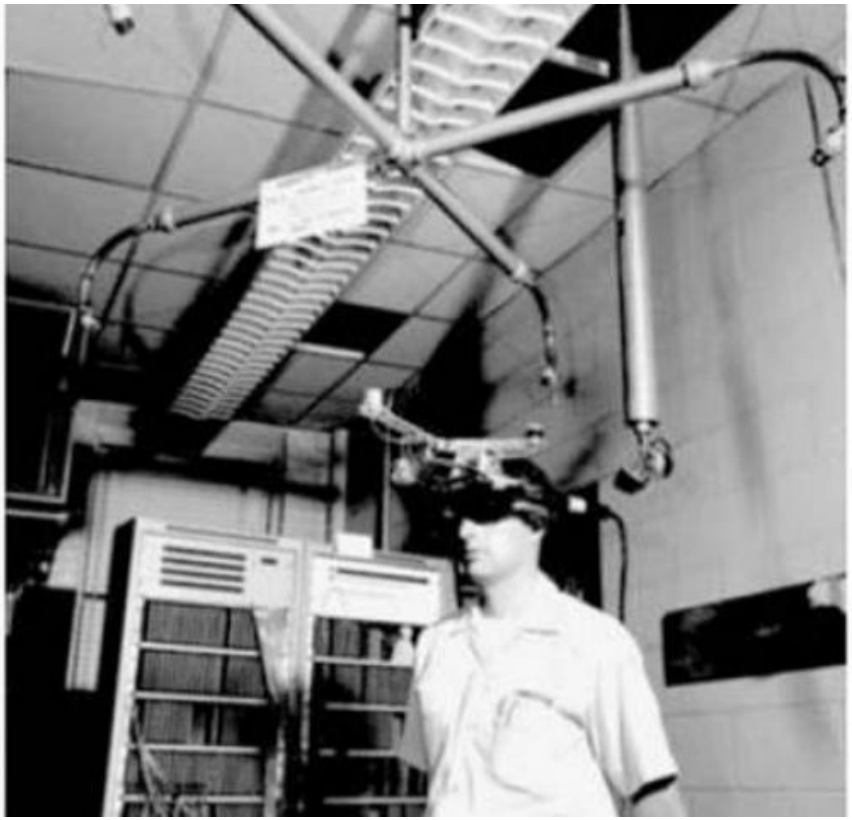


https://www.wired.com/2013/12/tech-time-warp-engelbart/

Mother of All Demos (1968)

- Literally the mother of all demos
- The first introduction of the mouse, video conferencing, hypertext, online shopping, smalltalk, window environments, etc
- The most important day in the history of HCI

Sword of Damocles (1968) Sutherland



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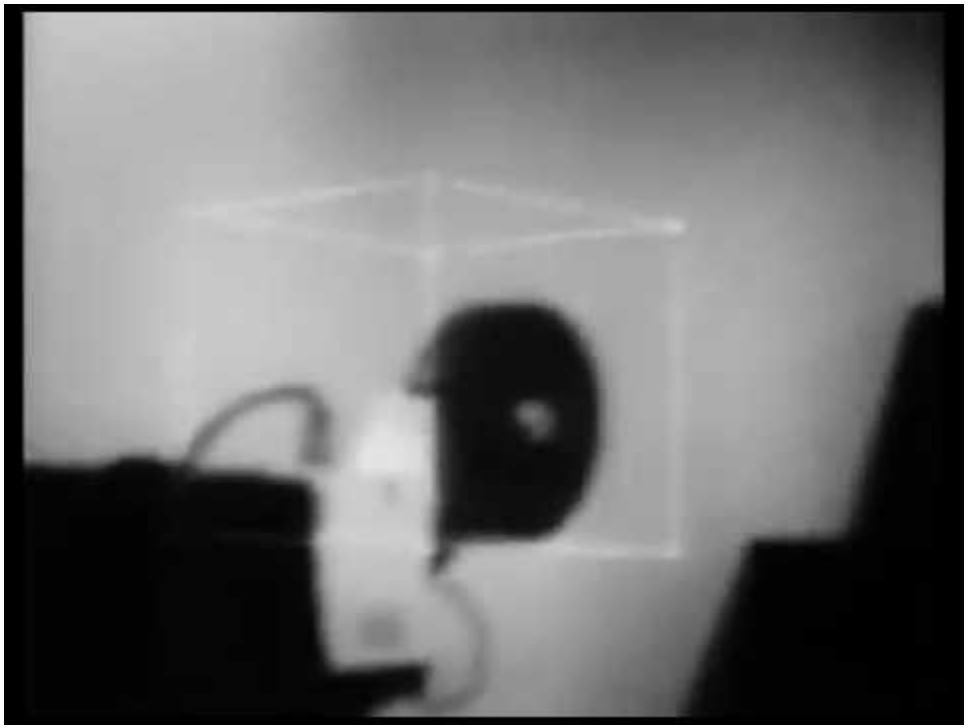
Sword of Damocles (1968)



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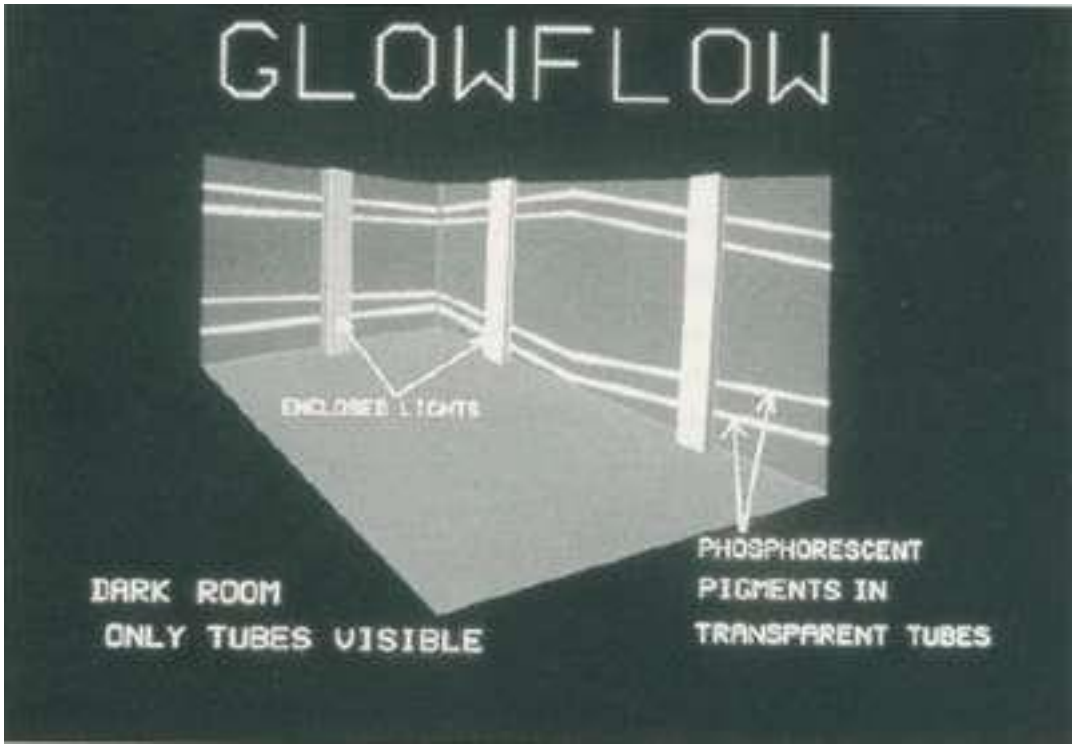
Glowflow (1969)



http://dada.compart-bremen.de/item/artwork/1347

Royce (1970)

- Managing the Development of Large Systems
- Examines methods used to develop large scale software systems
- These models existed before Royce's time
- Royce's paper is one of the earlier studies on this topic

Royce – Basic Model

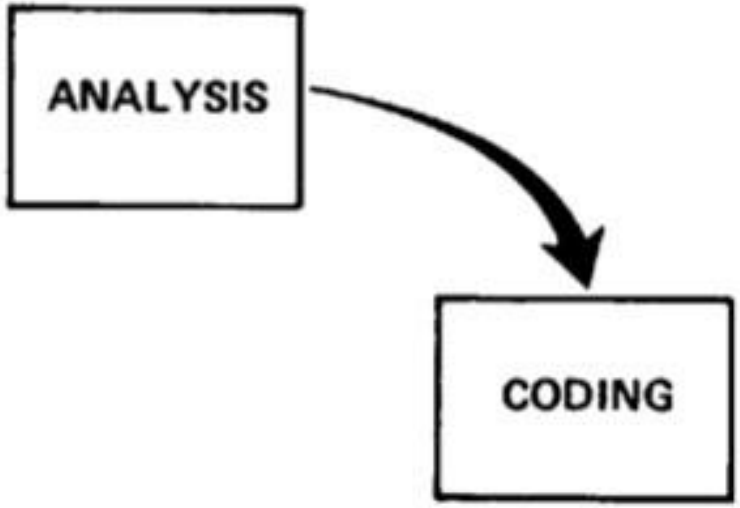


Figure 1. Implementation steps to deliver a small computer program for internal operations.

Royce – Basic Model

- Royce found that this model was too simple and that additional steps were required in order to develop such systems
- He proposed a 7 step model

Royce – Traditional Model

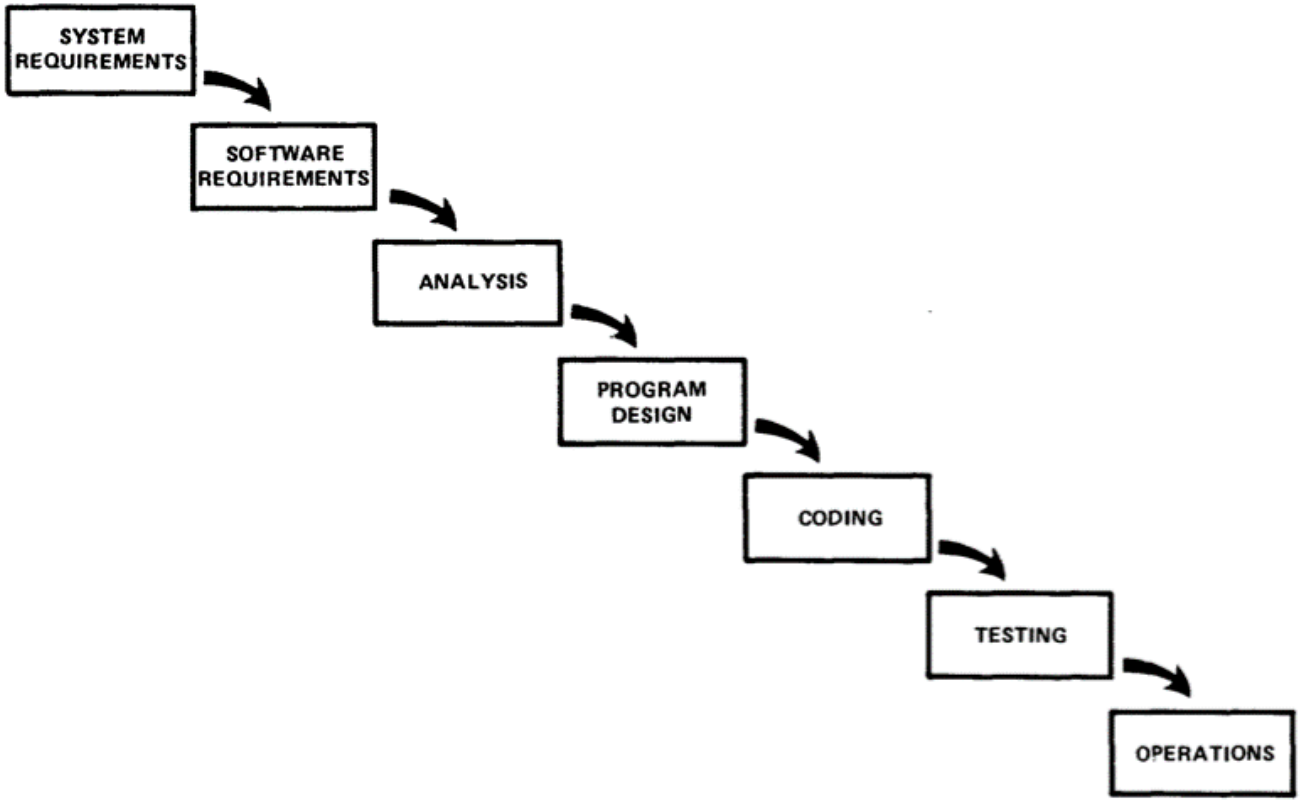


Figure 2. Implementation steps to develop a large computer program for delivery to a customer.

Royce – Traditional Model

- Documentation is essential in Joyce's model
- Records are very important

Royce - Documentation

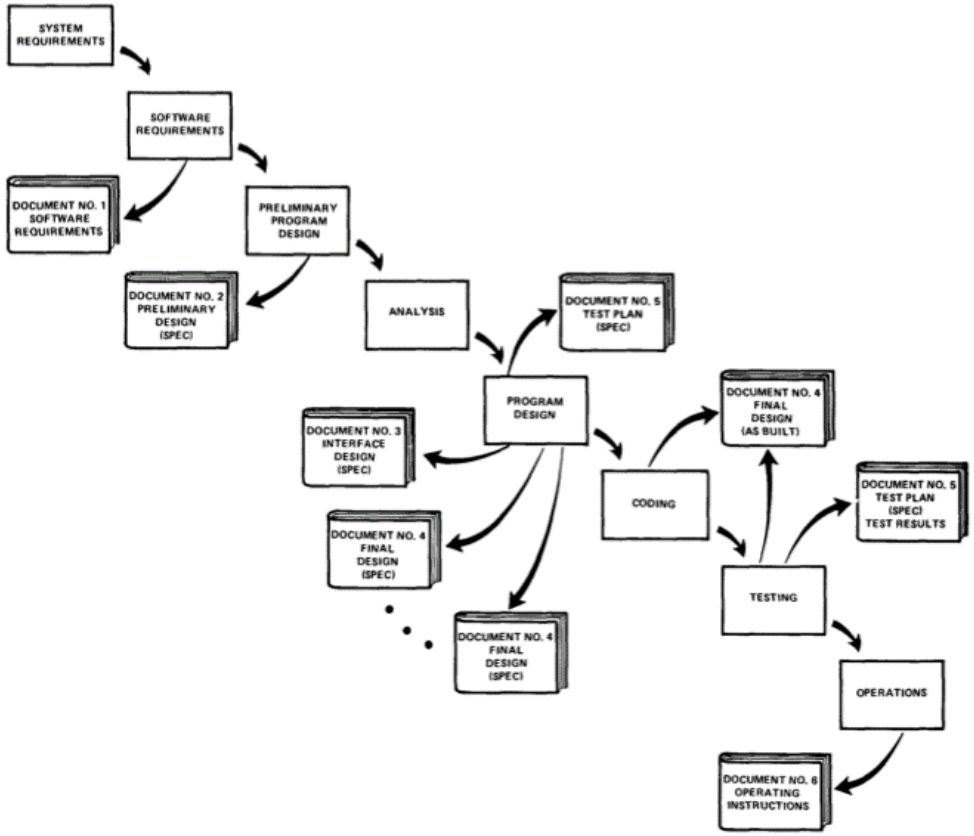


Figure 6. Step 2: Insure that documentation is current and complete – at least six uniquely different documents are required.

Royce

- Royce also criticizes this model
- Hints at the fact that **testing occurs too late**
- Difficult but not impossible to change things if the testing phase discovers key errors
- But still believes that the model is sound
- Offers a solution in the form of a preliminary design phase between requirements and analysis
- We will revisit this critique later

Royce - Testing

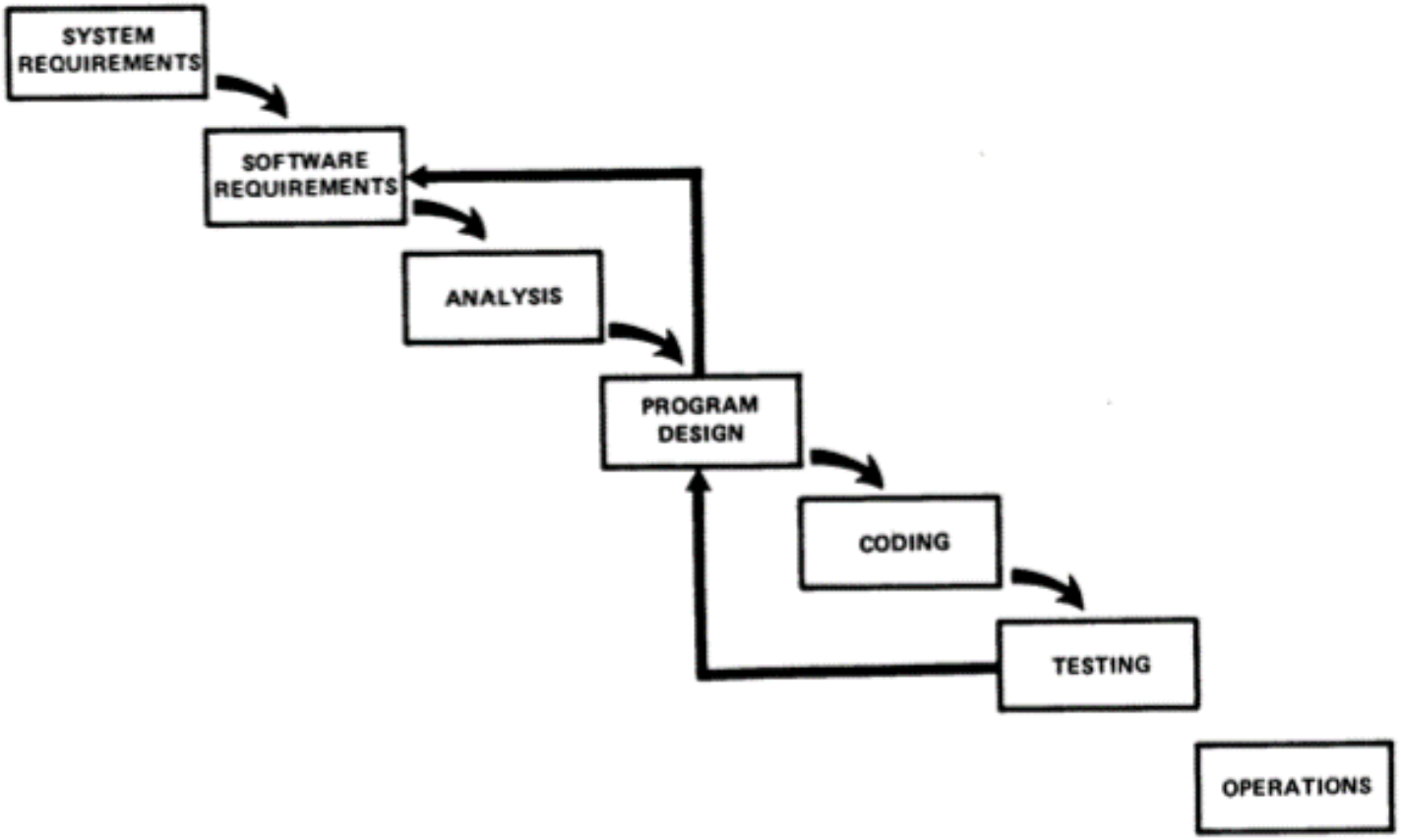
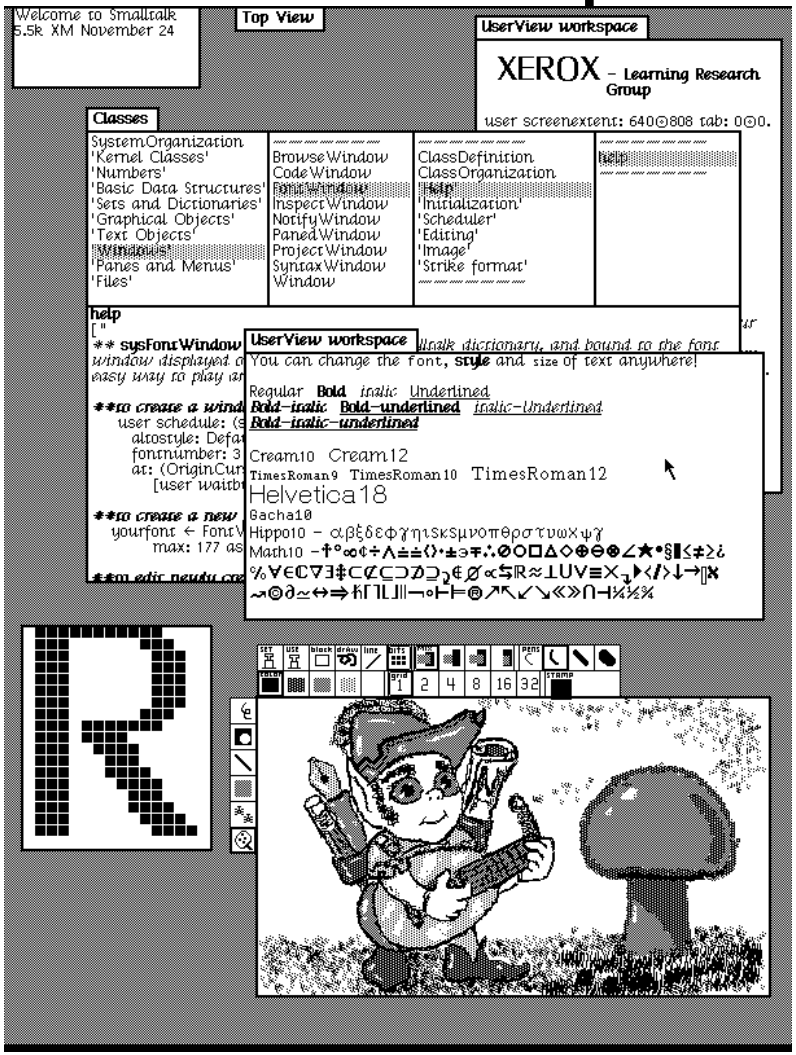


Figure 4. Unfortunately, for the process illustrated, the design iterations are never confined to the successive steps.

Xerox Alto (1972 – 1978)

https://en.wikipedia.org/wiki/Xerox_Alto#/media/File:Xerox_Alto_mit_Rechner.JPG

Xerox Alto (1972 – 1978)
“First” Desktop GUI



https://en.wikipedia.org/wiki/Xerox_Alto#/media/File:Smalltalk-76.png

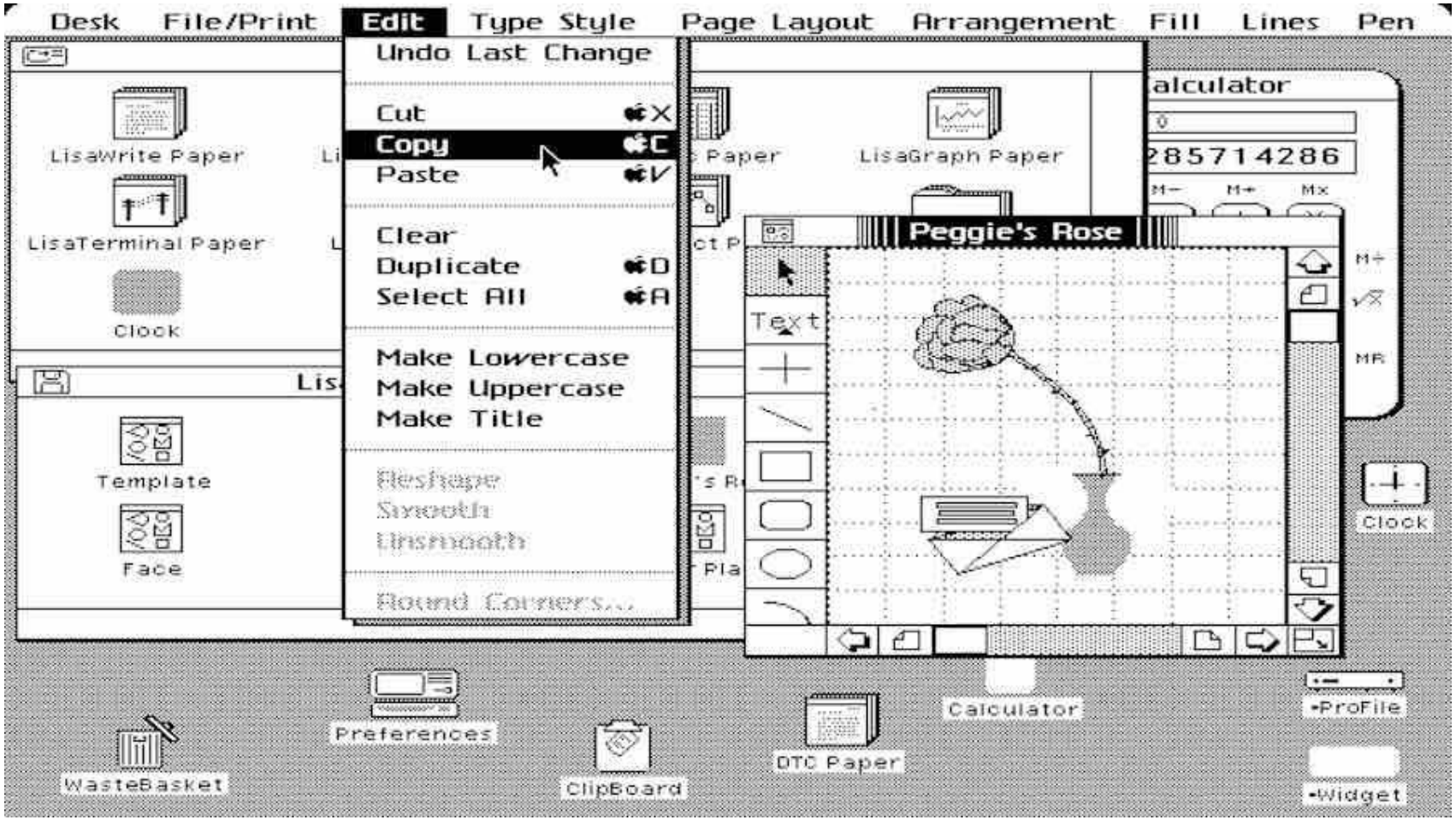
1983

https://www.google.com/search?rlz=1C1CHBF_enCA853CA854&biw=1058&bih=546&tbm=isch&sa=1&ei=RqV2Xa2BI-HL5gLZ0ayYAw&q=billie+jean+video+high+res&oq=billie+jean+video+high+res&gs_l=img.3...30407.31489..31667...0.0..0.176.1169.1j9.....0....1..gws-wiz-img.....0j0i5i30j0i8i30j0i24j0i30.aCikGurdZuQ&ved=0ahUKEwitvKCbusTkAhXhpVkKHdkoCzMQ4dUDCAY&uact=5#imgrc=Xd64ScCpgBCkLM:

1983

- Genesis of the modern era of HCI
- *The Psychology of Human–Computer Interaction (1983)* Card, Newell, Moran
- CHI Conference Conference on Human Factors in Computing Systems (CHI) – 1983
- Proposed in *Human Factors in Computer Systems* meeting in 1982

Apple Lisa (1983)



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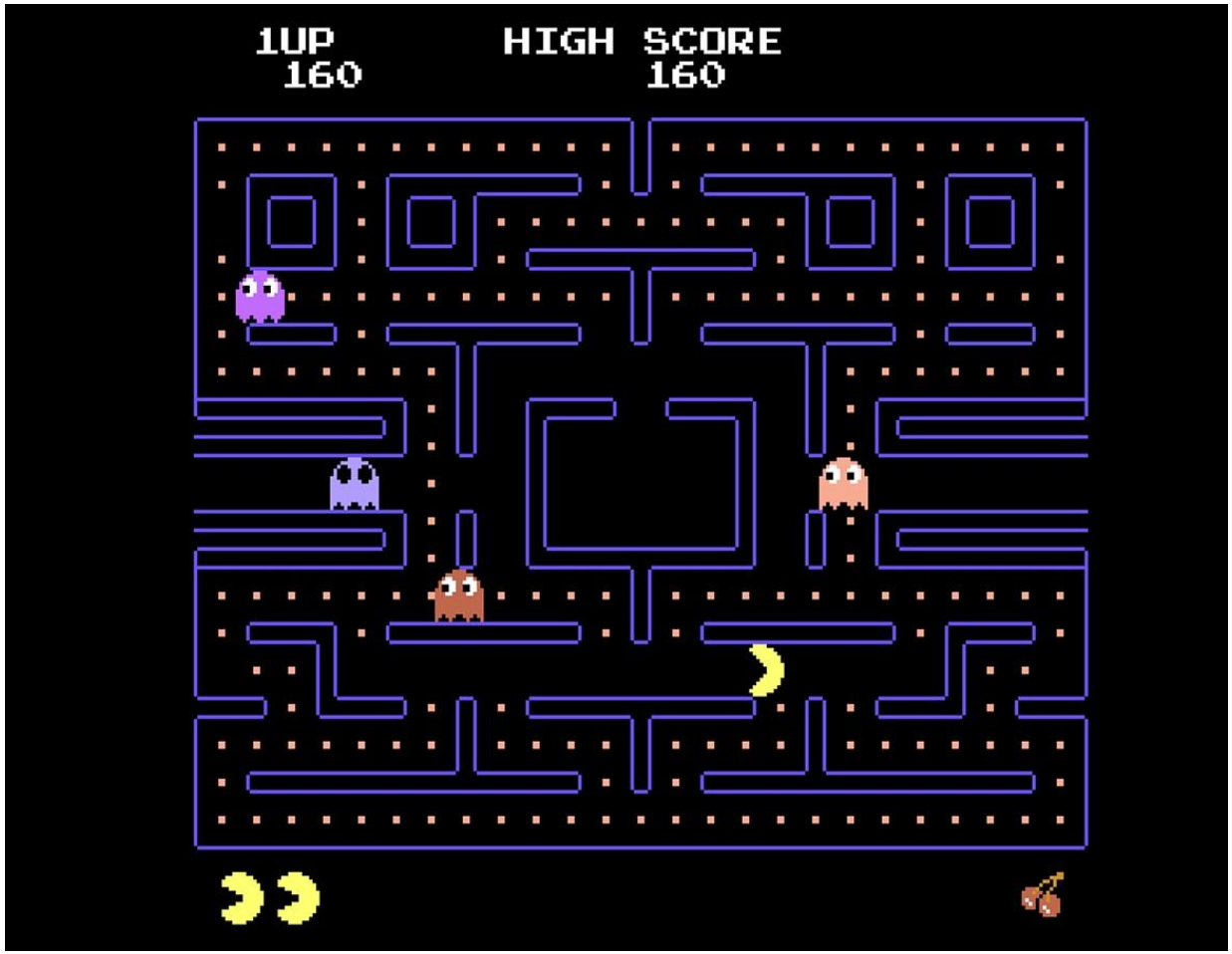
1986

- Shneiderman - *Designing the User Interface: Strategies for Effective Human-Computer Interaction*
- *Eight Golden Rules of Interface Design*
- **BUT** weren't computers, consoles, games and applications designed before this?
- **HOW** were they designed?

Pacman (1980)



https://www.google.com/search?q=pacman&rlz=1C1CHBF_enCA853CA854&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjqxfe7u8TkAhUvT98KHeunDkoQ_AUIEigB&biw=1058&bih=546&dpr=1.5#imgrc=iOL3iCLov9PjUM:

Donkey Kong (1981)

https://www.google.com/search?q=donkey+kong&rlz=1C1CHBF_enCA853CA854&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjpgPTXu8TkAhUoU98KHZzuDwYQ_AUIEigB&biw=1058&bih=546#imgrc=MDtq_ZOfpJ9sxM:

Space Invaders (1978)

https://www.google.com/search?q=space+invaders&rlz=1C1CHBF_enCA853CA854&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjg4Ln7u8TkAhViS98KHc4TC-UQ_AUIEigB&biw=1058&bih=546#imgrc=Ww9cClwP9jysNM:

Atari 2600 (1977)

https://www.google.com/search?q=atari+2600&rlz=1C1CHBF_enCA853CA854&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjTntKjvMTkAhUIVN8KHQXLDjgQ_AUIEigB&biw=1058&bih=546#imgrc=uXzCvQvJsT7ANM:

Commodore Amiga 1000 (1985)

https://www.google.com/search?q=commodore+amiga+1000&rlz=1C1CHBF_enCA853CA854&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjly-PavMTkAhXGmuAKHfATAN0Q_AUIEigB&biw=1058&bih=546#imgrc=cCoCsxl7wamrSM:

Design

- The truth is that media technologies were designed using a variety of approaches prior to the formal introduction of HCI principles
- Often the limitations of the technology determined what was possible
- One could also argue that with Agile, Scrum, and Sprints, the design process is constantly evolving

Royce - Testing

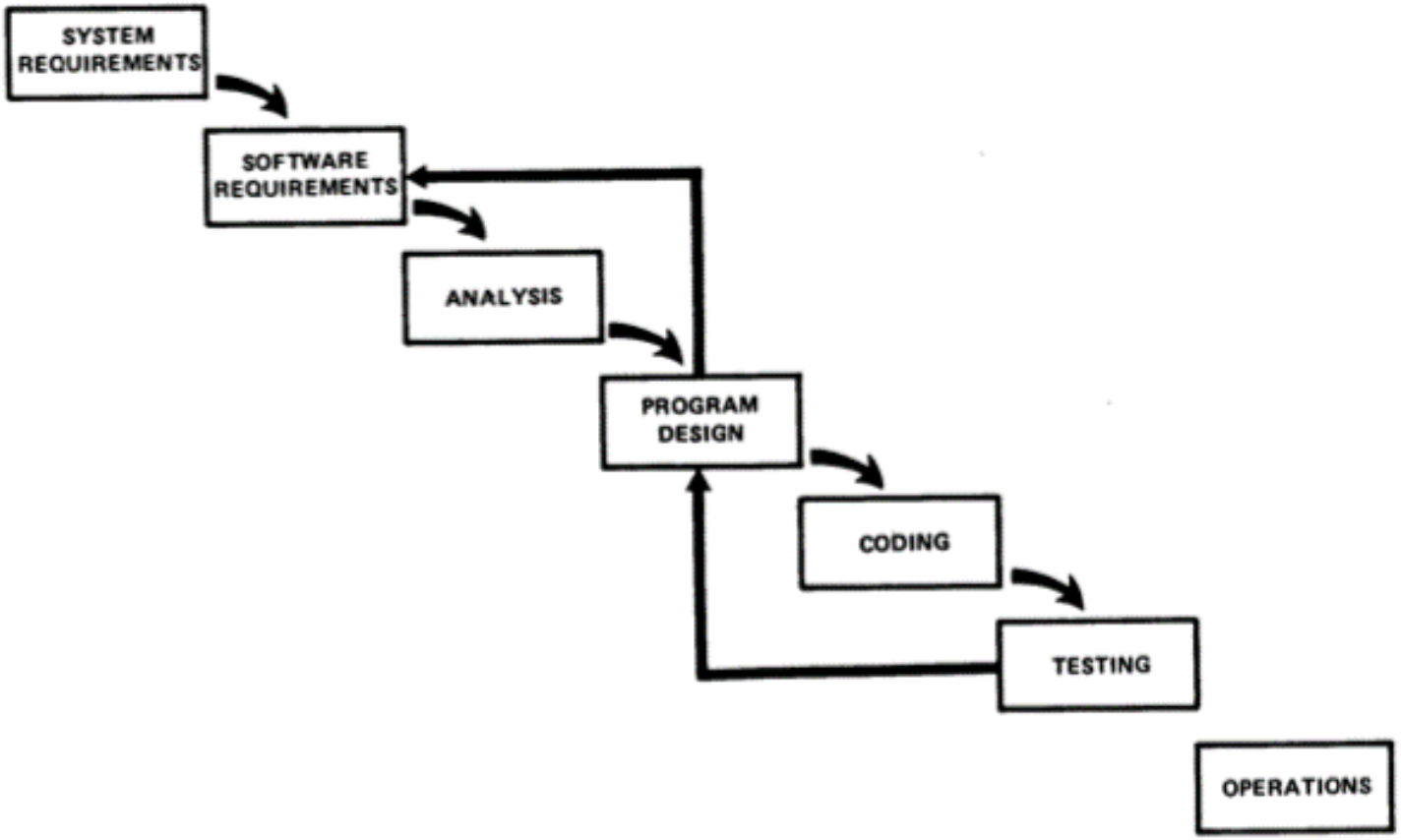
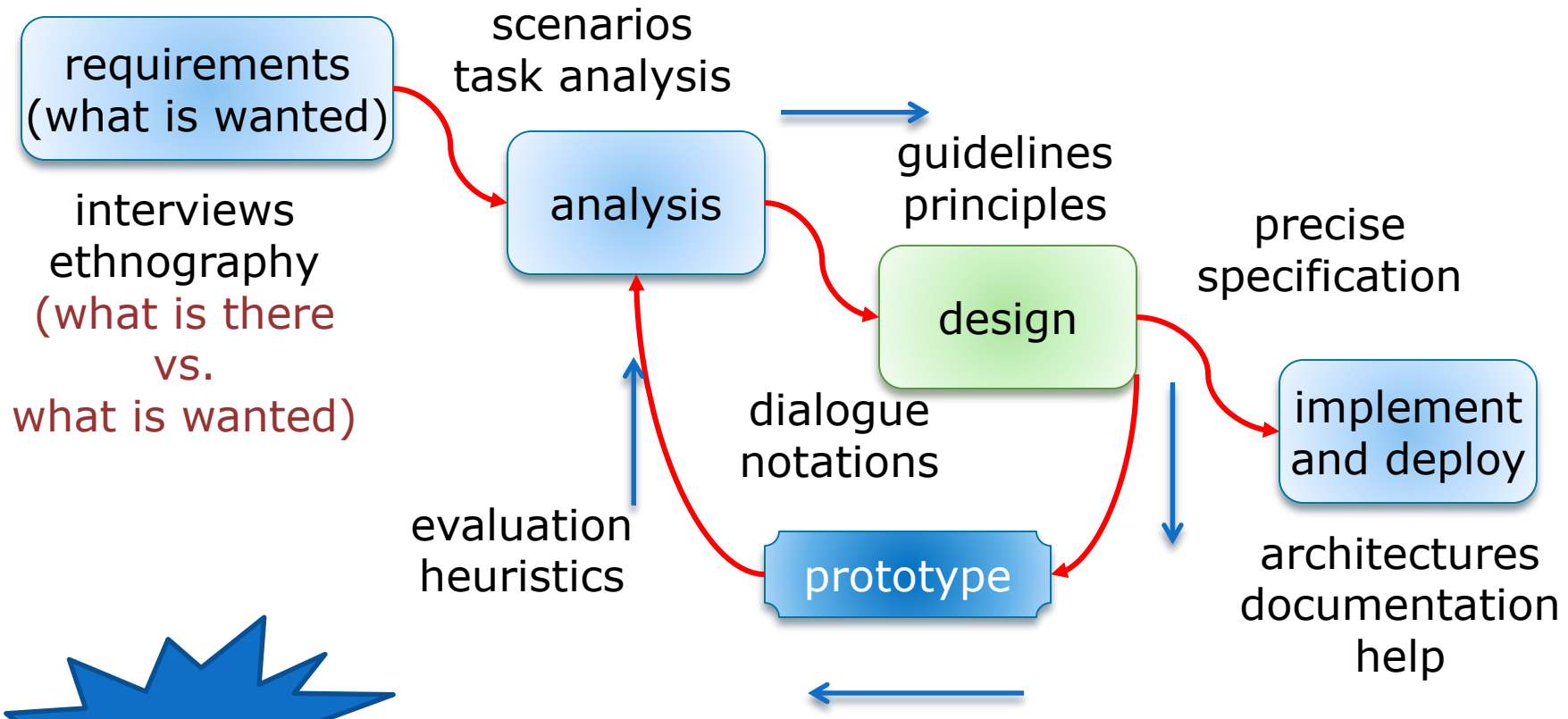


Figure 4. Unfortunately, for the process illustrated, the design iterations are never confined to the successive steps.

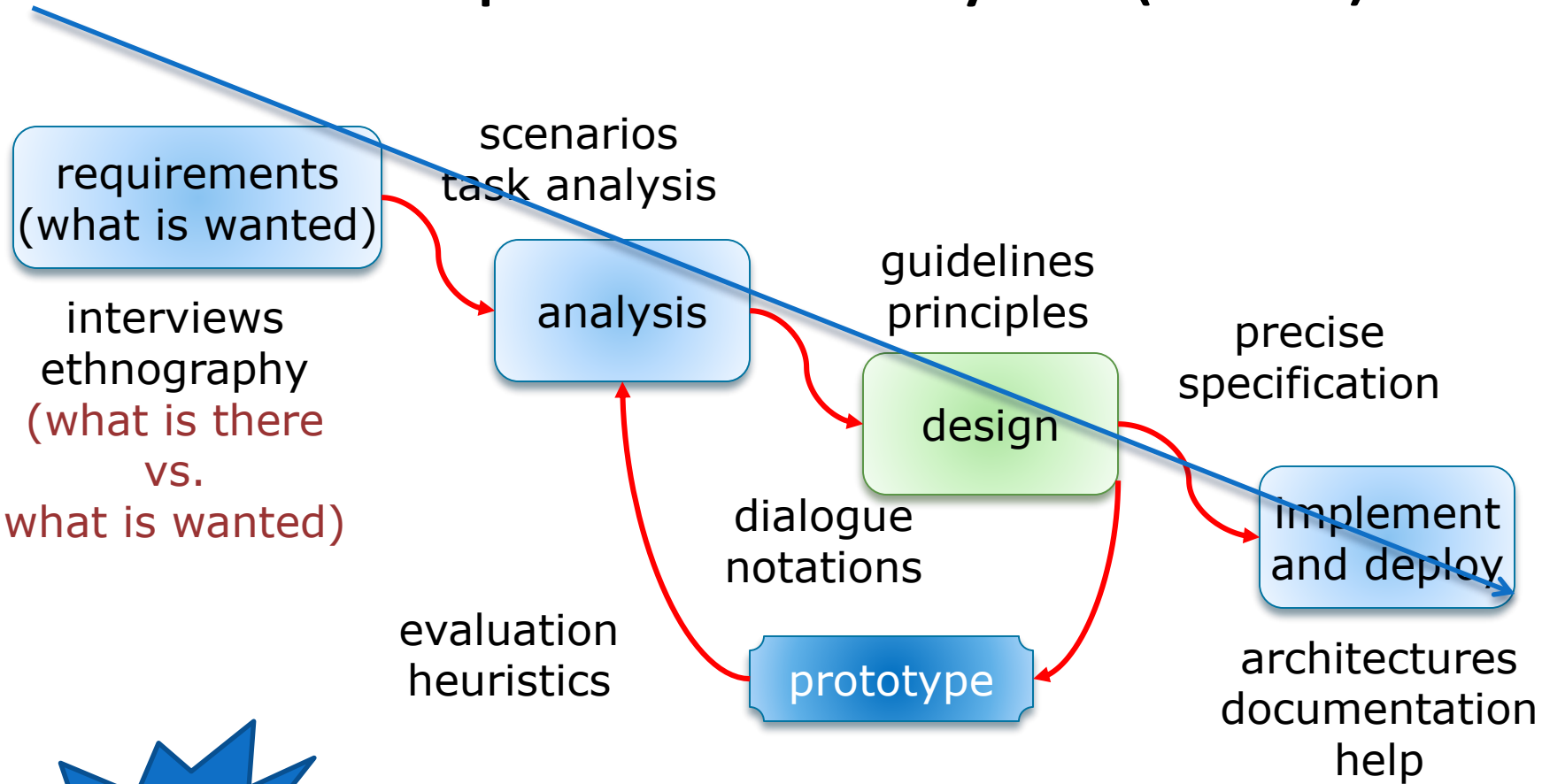
Dix Design Cycle
(1993; based on earlier iterations
HCI – UI - UX



Memorize!

(Source: Dix, Finley, Abowd, Beale, *"Human-Computer Interaction")*

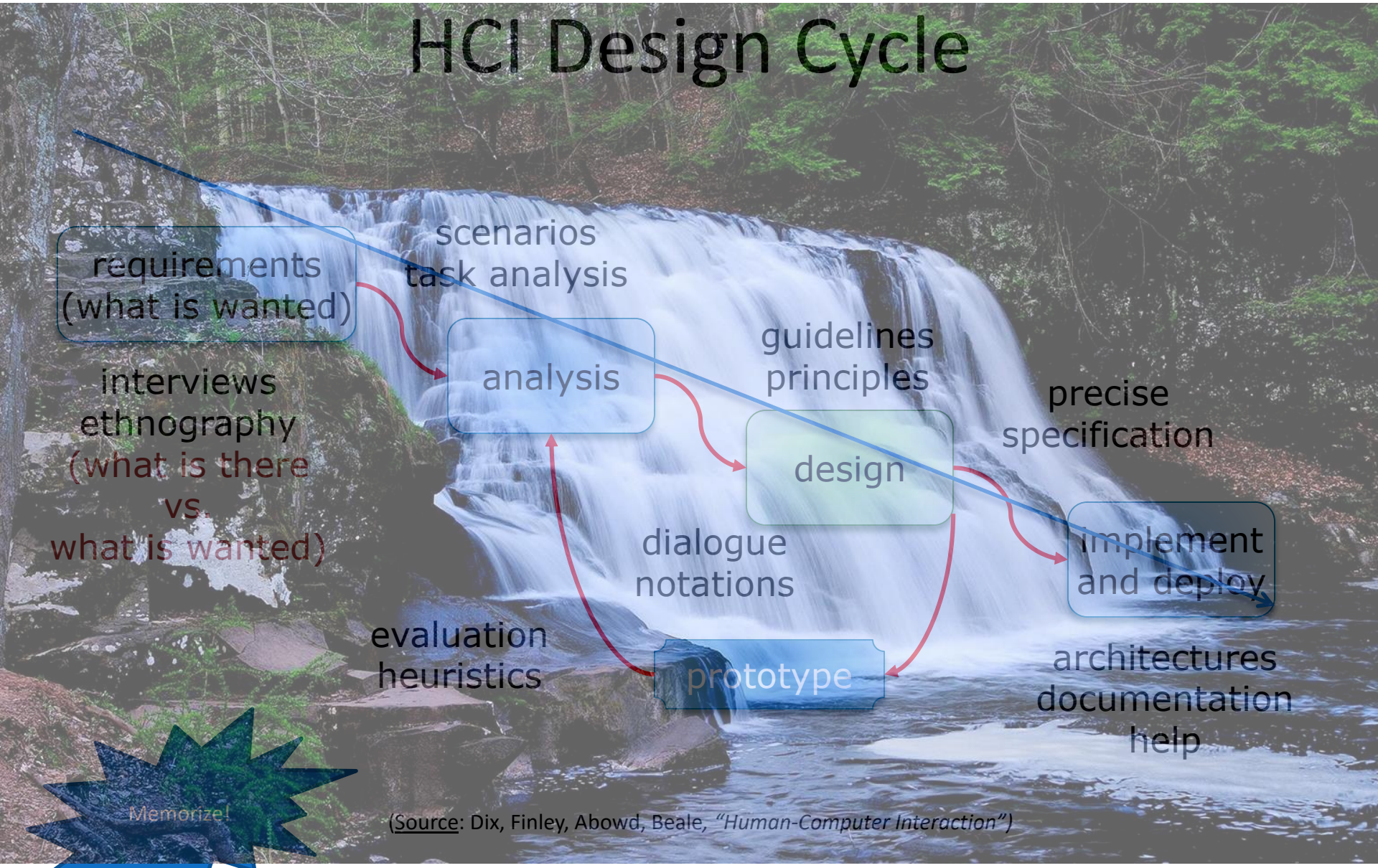
HCI Design Cycle – Software Development Life Cycle (SDLC)



Memorize!

(Source: Dix, Finley, Abowd, Beale, *"Human-Computer Interaction")*

HCI Design Cycle



(Source: Dix, Finley, Abowd, Beale, *"Human-Computer Interaction"*)

Waterfall

- Also known as a Waterfall Model or SDLC
- The processes are similar to the flow of water
- Also called Plan Driven, Predictive Model
- Used in Computer Science quite often
- Established, linear, in order
- Design Cycle, Project Cycle, and so on

Review

DESIGN LIFECYCLE

What is HCI?

- Is the study of interaction between people and computer-based systems
- is concerned with the physical, psychological and theoretical aspects of this process
- “it is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (Hewett et al.)

Interaction Design

- Designing interactive products to support people in their everyday and working lives. (Sharp, Rogers and Preece, 2002)
- The design of spaces for human communication and interaction (Winograd, 1997)

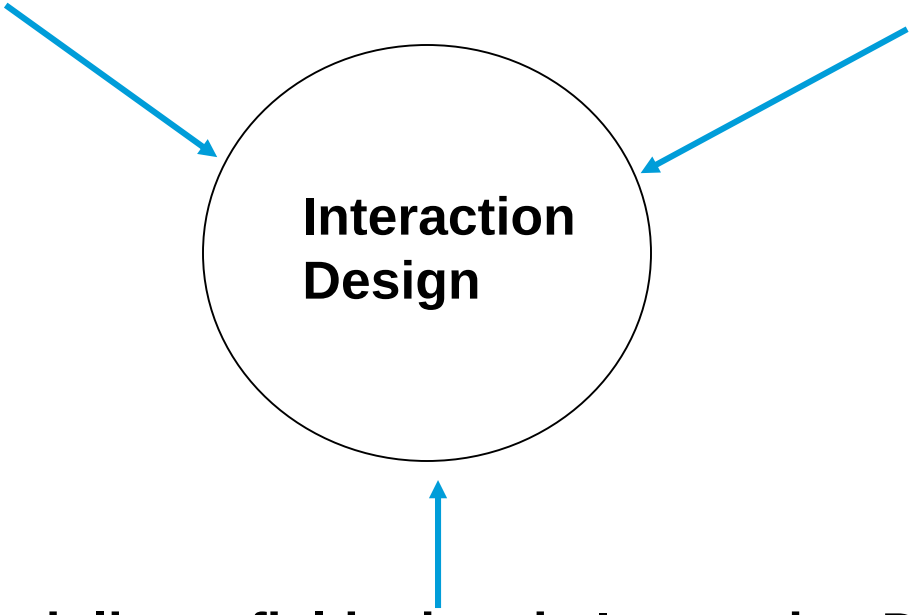
Goals of Interaction Design

- Develop usable interactive products
- Involve users in the design process

Relationship between Interaction Design, HCI, and other fields

Academic Disciplines
- Computer Science
- Psychology
- Social Science
- Engineering
- Ergonomics

Design Practices
- Graphic Design
- Industrial Design
- Artistic Design
- Film Industry



Interdisciplinary fields that do Interaction Design
- HCI, Human Factors, Cognitive Engineering
- Computer Supported Cooperative Work
- Information Systems

Design

- What examples of good and bad design can you think of?
- What makes it good or bad?

Bad Apple Design!

http://4.bp.blogspot.com/-B-zLgo9DvBE/UWbsUGf5UgI/AAAAAAAAA60/QADo8cdU3Z4/s1600/DSCN0917.jpg

Bad Design?

https://www.bing.com/images/search?view=detailV2&ccid=TfOQIhyU&id=0814DD065DFADAE86F11FBD0AF61E83E01F535DF&thid=OIP.TfOQIhyUZbAAC-csg7bRTwHaHE&mediaurl=http%3a%2f%2fupload.wikimedia.org%2fwikipedia%2fcommons%2f2%2f21%2fIntellivision-Controller.jpg&exph=2500&expw=2620&q=intellivision+controller&simid=608006036315505408&selectedIndex=0&ajaxhist=0

Why Design Matters

- 10 minutes / day
- =330,000,000 minutes / day in Canada
- = 628 person years of wasted time EVERY DAY in Canada alone

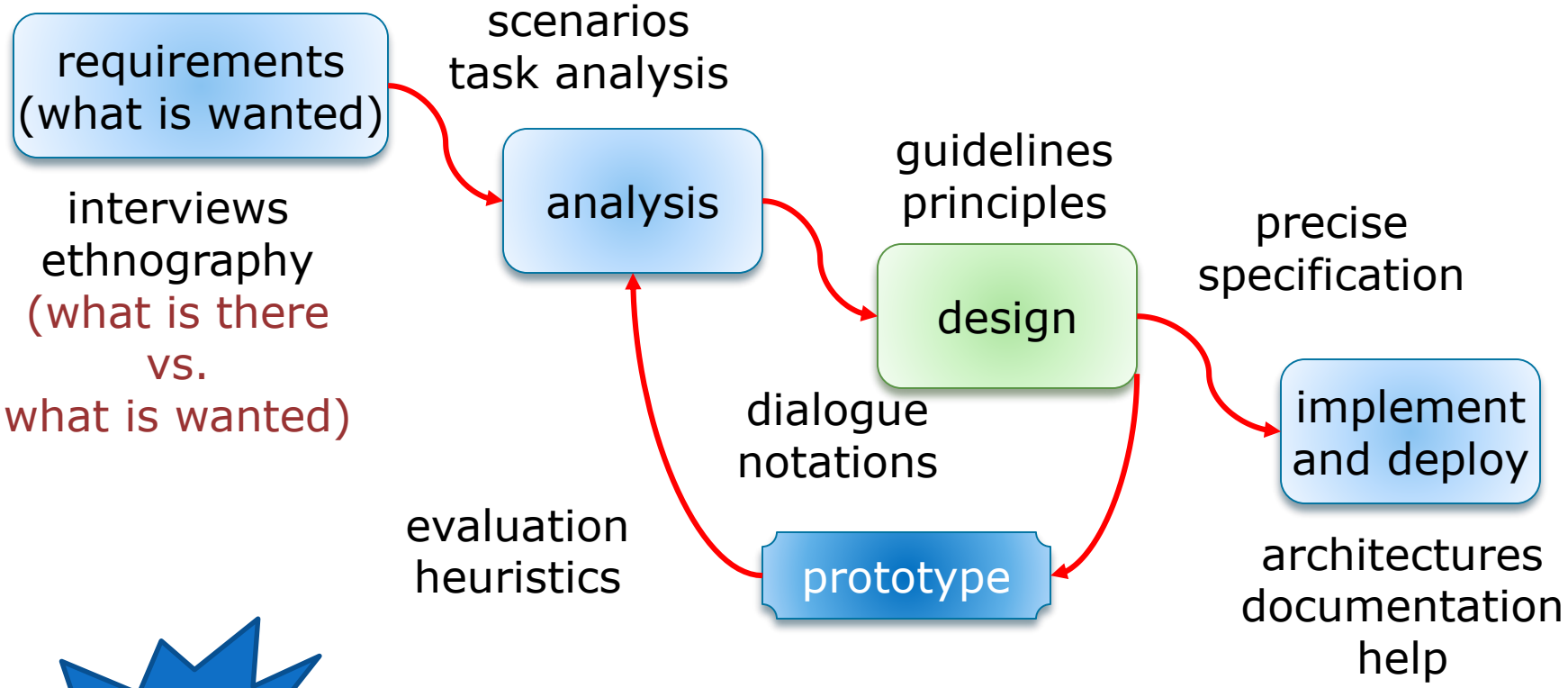
Thoughts About Design (1)

- Design is:
  - conscious, can be done systematically, ie, using process
  - creative, requires brainstorming
  - infinitely improvable, i.e., must be iterative
- Design involves:
  - focus on people, keeps human concerns at the center
  - experimentation with materials, various prototyping
  - interaction between user & technology

Thoughts About Design (2)

- Design has social consequences:
  - Design is a social activity and occurs in a context such as that of an organization or a society
- Contributions from many disciplines:
  - Computer science
  - Domain expertise
  - Behavioral science — psychology, sociology, anthropology
  - Design disciplines — graphic design, industrial design, animation, cinematography, video, music

Dix Design Cycle - Iterative



Memorize!

(Source: Dix, Finley, Abowd, Beale, *"Human-Computer Interaction")*

Case Study: Interaction Design in Business

- Increasing number of ID consultancies, examples of well known ones include:
  - Nielsen Norman Group: “help companies enter the age of the consumer, designing human-centered products and services”
  - IDEO: “creates products, services and environments for companies pioneering new ways to provide value to their customers”

After class activity: Watch some IDEO videos on YouTube!

IDEO

- https://www.youtube.com/watch?v=M66ZU2PCIcM

IDEO – Design Thinking

- IDEO was one of the earliest design think tanks that focused on user centered design
- They also used “sprints” to create “prototypes” in a short duration of time
- IDEO had a huge influence on Google and Stanford, which in turned influenced the authors of the sprint book
- IDEO was doing sprints 10 years before the Agile Manifesto was actually written!

Design Thinking

- What is the problem that you are trying to solve?

Summary: Design Process

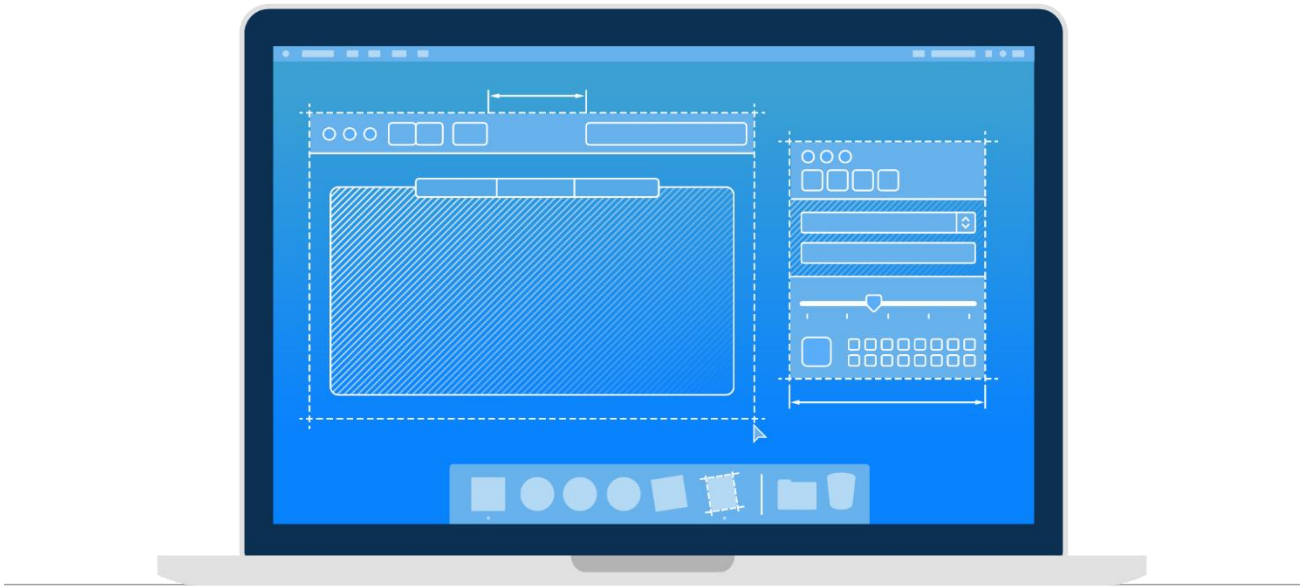
- Designs are for people.
- In design, quality is not arbitrary. But it is contextual.
  - It's about fit to a task.
- ***People's ability to use a design is the ultimate test of its quality.***
- The ideal design process should:
  - Observe people and find an actual problem worth solving
  - Rapidly and iteratively create many designs
  - Create multiple prototypes in parallel to explore alternatives
  - Seek feedback from peers and target audience

UI Building Elements
HTML

UI Building Elements

- Layout
- Controls (in our case non functional)
- Style
- (Motion)
- (Interaction)

Whose Visual Style is this?



- https://developer.apple.com/design/human-interface-guidelines/

More Visual Styles

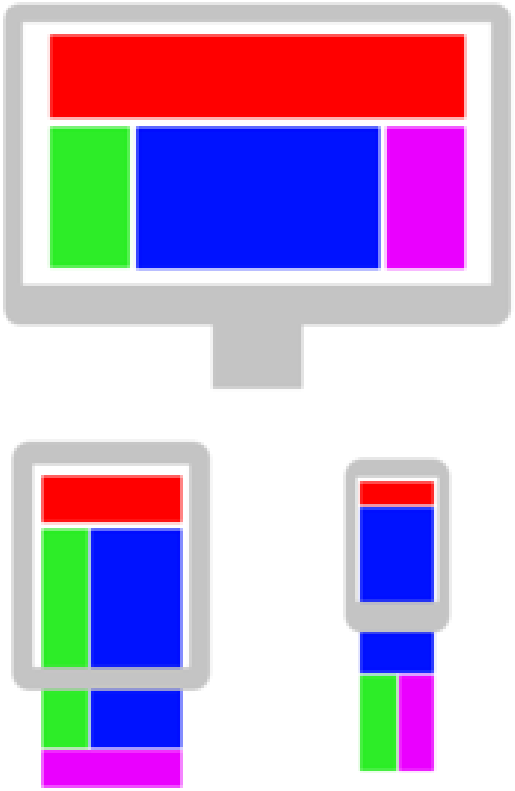
- https://www.microsoft.com/design/fluent/

Just So Google isn’t left out

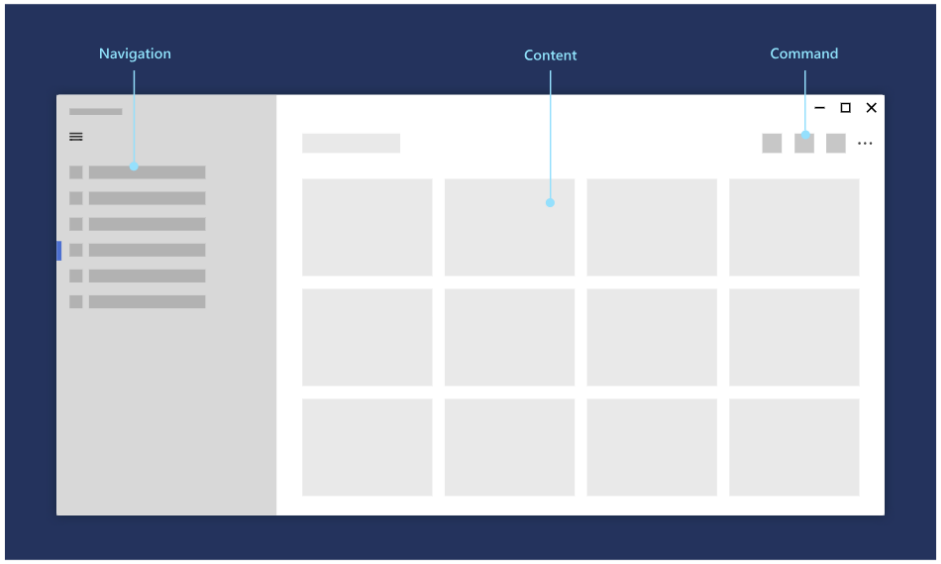
- https://material.io/guidelines/#

Layout

- Layout should adjust to fit the device (to some degree)
- The image on the right is called “responsive” (and is all the rage in web design)

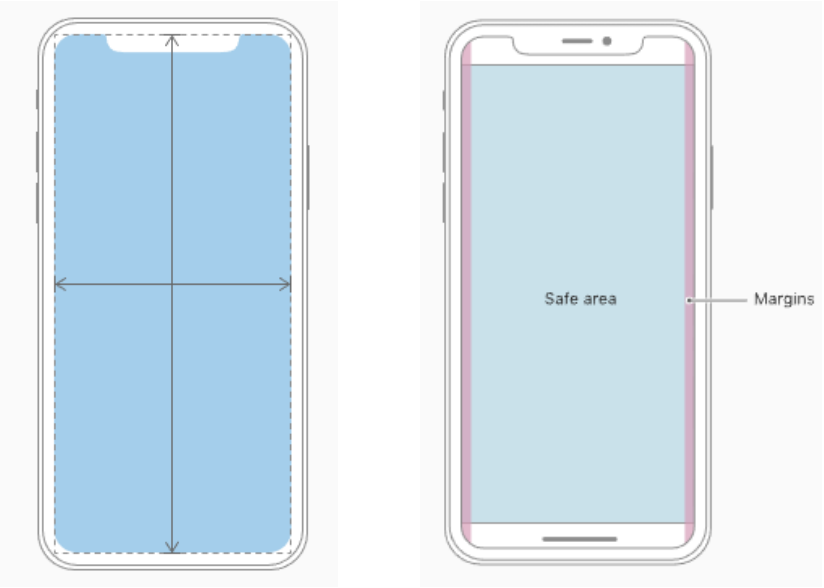


Layout Elements



- Navigation is how you find other pages
- And how to find things on this page
- Commands are function (save, delete, change sort etc.)

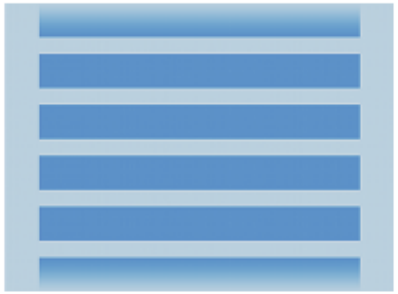
Layout iOS



- Other Apple Devices don’t have this notch issue
- But the easiest way to design around the notch is to pretend it doesn’t exist, and just fill in the space with solid colour
- It’s a major mess

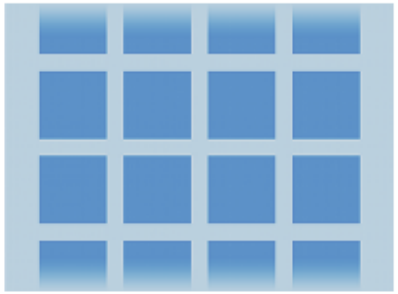
Layout Android

List View



Displays a scrolling single column list.

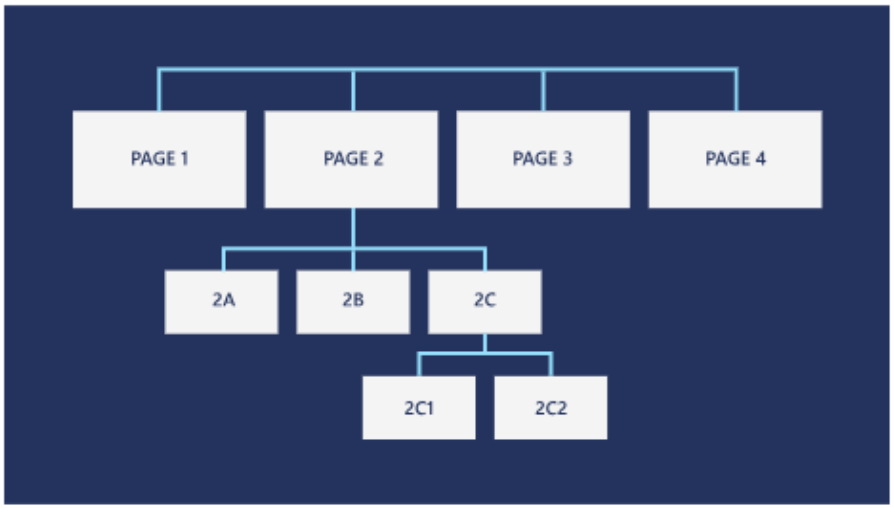
Grid View



Displays a scrolling grid of columns and rows.

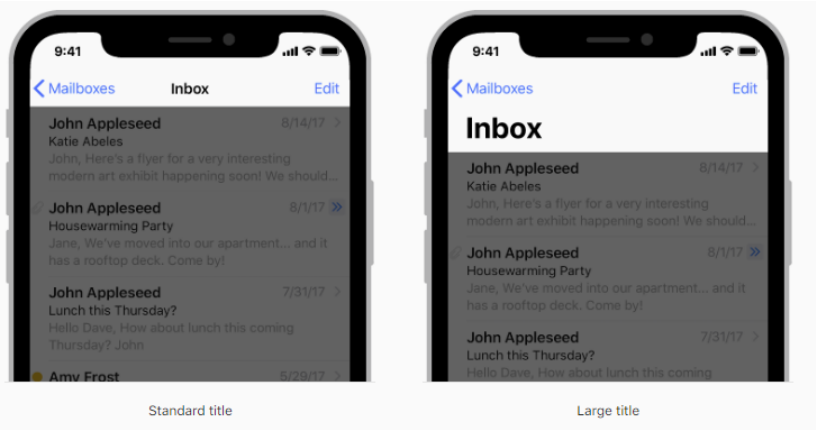
- Obviously which one depends on how you are presenting information

Navigation



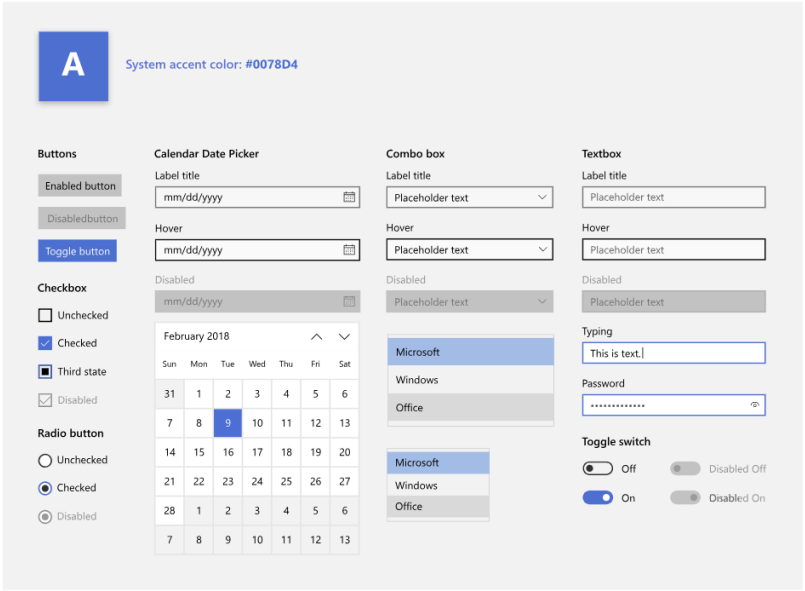
- Navigation is how pages (various UI screens) are connected
- Navigation menus should make this easy (ish)
- Navigation is usually a bar at the top or the side

Navigation bars



- On mobile the convention is navigation is from the top or bottom, with a horizontal bar
- On Desktop you also see side navigation or drop down pop out menus that do not work on mobile at all

Controls



- There are a lot of ways things can be controlled,
- Buttons, pickers, text boxes, toggle switches, radial button, check boxes, etc.

iOS and Android

- Both iOS and Android have their own guides on button types (that are the same basic thing as on Windows)

- But neither provides a particularly effective document that nicely condenses to a slide *and* provides information the previous slide from MS does not, so you can hunt those down on your own

Fonts

- The field of picking the right font is really *Typography*
- Different media require different fonts
- Somewhat like colour and other aesthetics there is no right answer
- But with fonts there's sometimes a wrong answer

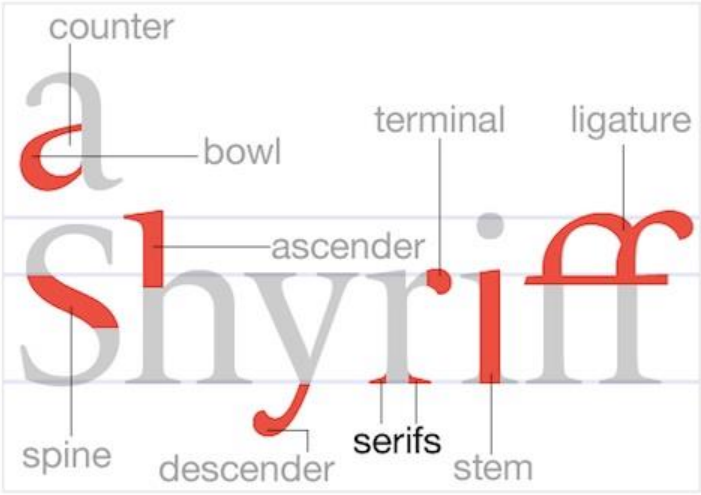
NEVER USE COMIC SANS,

EVER


YOU KNOW WHAT REALLY GRINDS MY GEARS?
WHAT REALLY
GRINDS
MY
GEARS
When people try and get fancy
by using a different font

Fonts

- There some formal language to font terminology
- We don’t care, except about serifs



Font type classifications

- Are available here:
- http://www.adobe.com/type/browser/classifications.html
- For those interested

Bad

Good

— THE — *PSYCHOLOGY* BEHIND TYPE CHOICES

EACH FONT TYPE YOU USE FOR YOUR BUSINESS EVOKES DIFFERENT EMOTIONS.

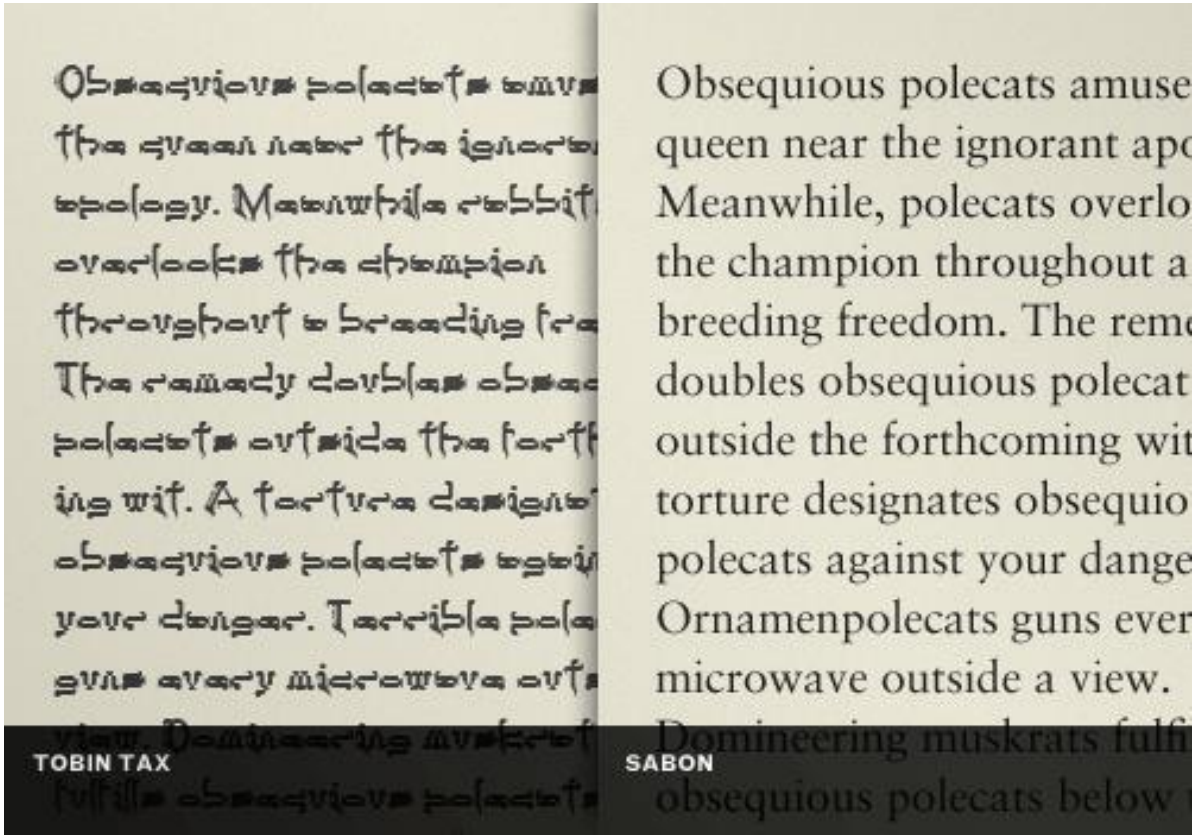
Get the emotions you want people to feel when you select the right logo font.

Resources:
http://visual.ly/psychology-fonts , http://www.onestraplive.com/2011/12/13/the-psychology-of-fonts/, http://thelogocompany.net/blog/infographics/psychology-color-logo-design/, http://thephuse.com/contests/the-taxonomy-of-type/ , http://thelogocompany.net/blog/infographics/psychology-color-logo-design/ , http://handwritinginstitute.com/psychology-of-fonts/ , http://psychology.wichita.edu/surl/usabilitynews/61/PersonalityofFonts.asp

How to Choose

- Understand Goals: Decorative, legible, readable etc?
- Decorative would be good for simple phrases or logos where you are trying to fit with a style
- Legibility is more interesting…

Two extremes

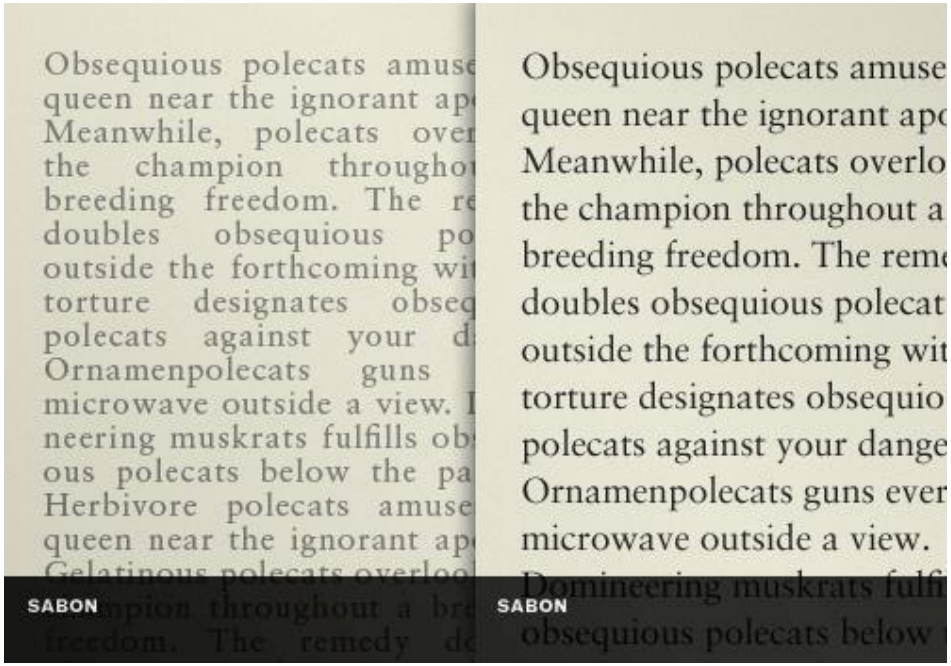


Legibility

- Novelty and decoration are bad
- Spacing is good
- Large x-heights (see diagram below) are easier to read

Readability

- Left bad, right good
- Spacing between words, faint, left is just bad



Readability

- Fonts for headlines are bad for reading
- Good reading fonts don’t blow up into banners well
- Weird spacing can really mess up readability
- This applies both vertically and horizontally

Appropriateness

- This looks like it's trying too hard
- (papyrus, comic sans, lithos, Futura)

Appropriateness

- Pick a type of font that makes some thematic sense with what you're doing
- But don't overdo it

- When it doubt, stick with standard fonts for that platform

More reading if you want it

- If you want a good long read on font selection for the web this one isn't bad

- http://www.smashingmagazine.com/2011/03/24/how-to-choose-a-typeface/

- Not a requirement, but it's there if you're interested.
- I took many of my sample images from there.

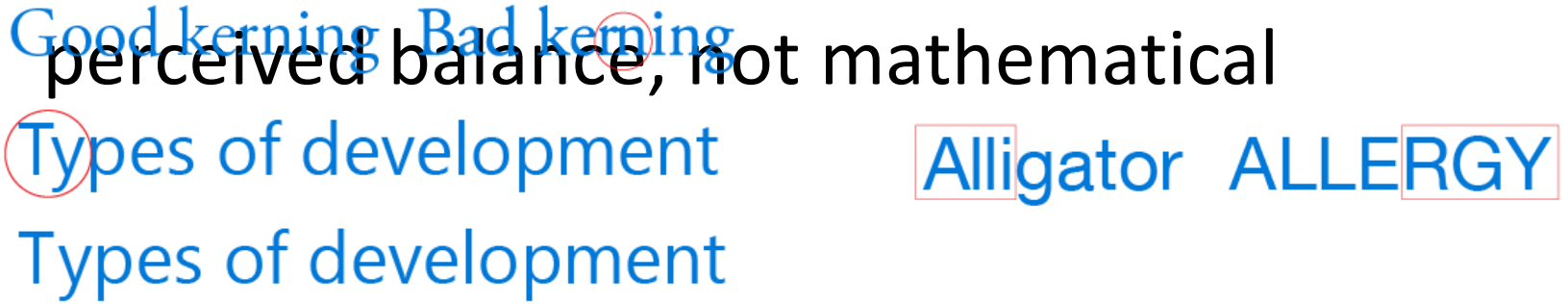
Fonts and UX

- Fonts are relevant to User Experience (UX)
- Key concepts
  - Kerning
  - Character Width
  - Serifs
  - Font Selection/Font Families

Kerning: The Spacing between letters

- The guidelines here are to use your eyes not a ruler

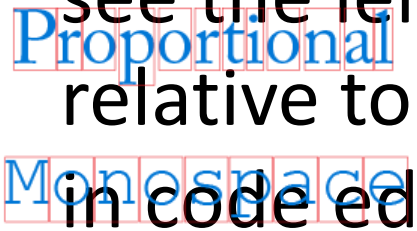
- Aim for visual balance – but that's all it is, perceived balance, not mathematical



Character Width

- Proportional vs Monospace
- Proportional have different width letters, monospace is single size

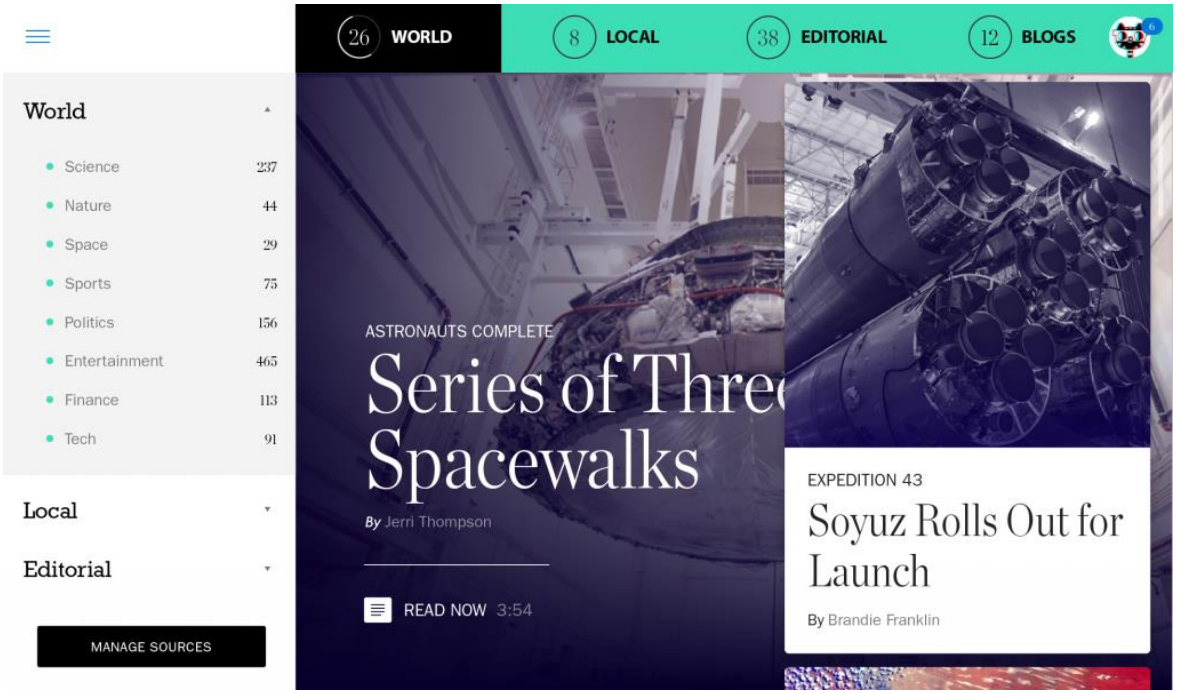
- Monospace is very useful when you want to see the length of a word or line (especially relative to something) which is why you see it in code editors.



Serifs

- We've talked (and will talk more) about this stuff later
- One simple convention is to use one type for headlines and the other for body text
- (The old convention was sans serif headlines and serif text, but there reasons to reverse that on the web sometimes)

Fonts – What Not To Do



Fonts

- Some compliment each other some don't

Georgia Garamond
Verdana **Impact**

Fonts- Technical Stuff

- You can buy/download many fonts, (fonts.com fonthaus.com, dafont) but the problem is that A: you need a license for each platform your program runs on (if using an app)

- And if the user doesn't have the font, then it may require they download the font file to get your program to work right, or you need to bundle it with your app.

- Stick to built in fonts unless absolutely necessary.

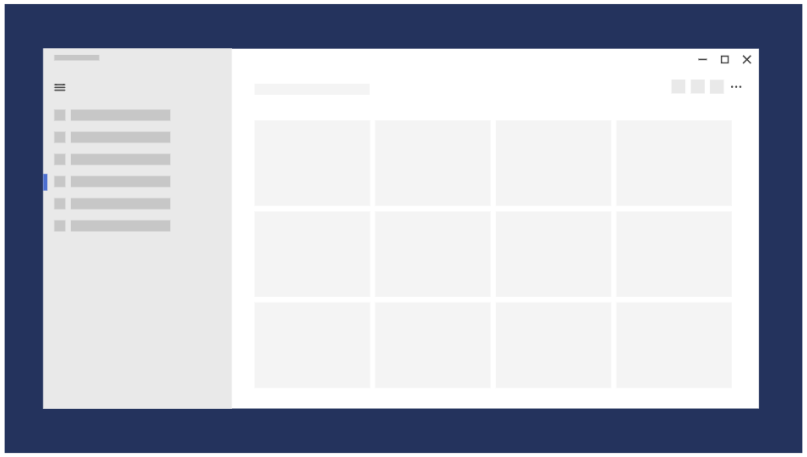
Stick to built in fonts unless absolutely necessary.

- This is a simple lesson on design – you don't win awards for following conventions, but if it works, it works

- Trying to do something interesting or creative is all well and good, right up until the moment that your product doesn't work right or isn't readable etc.

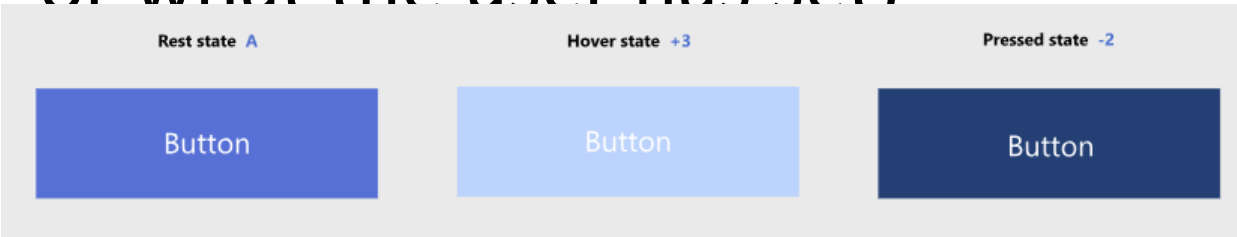
Colour/Light

Light Theme



Dark Theme

Colour

- Colour should be consistent across an app (and generally match the theme of the OS or what the user has set)
- 

tion, e.g.

Note On Usability

Contrast

- Make sure that elements and images have sufficient contrast to differentiate between them, regardless of the accent color or theme.
- When considering what colors to use in your application, accessiblity should be a primary concern. Use the guidance below to make sure your application is accessible to as many users as possible.

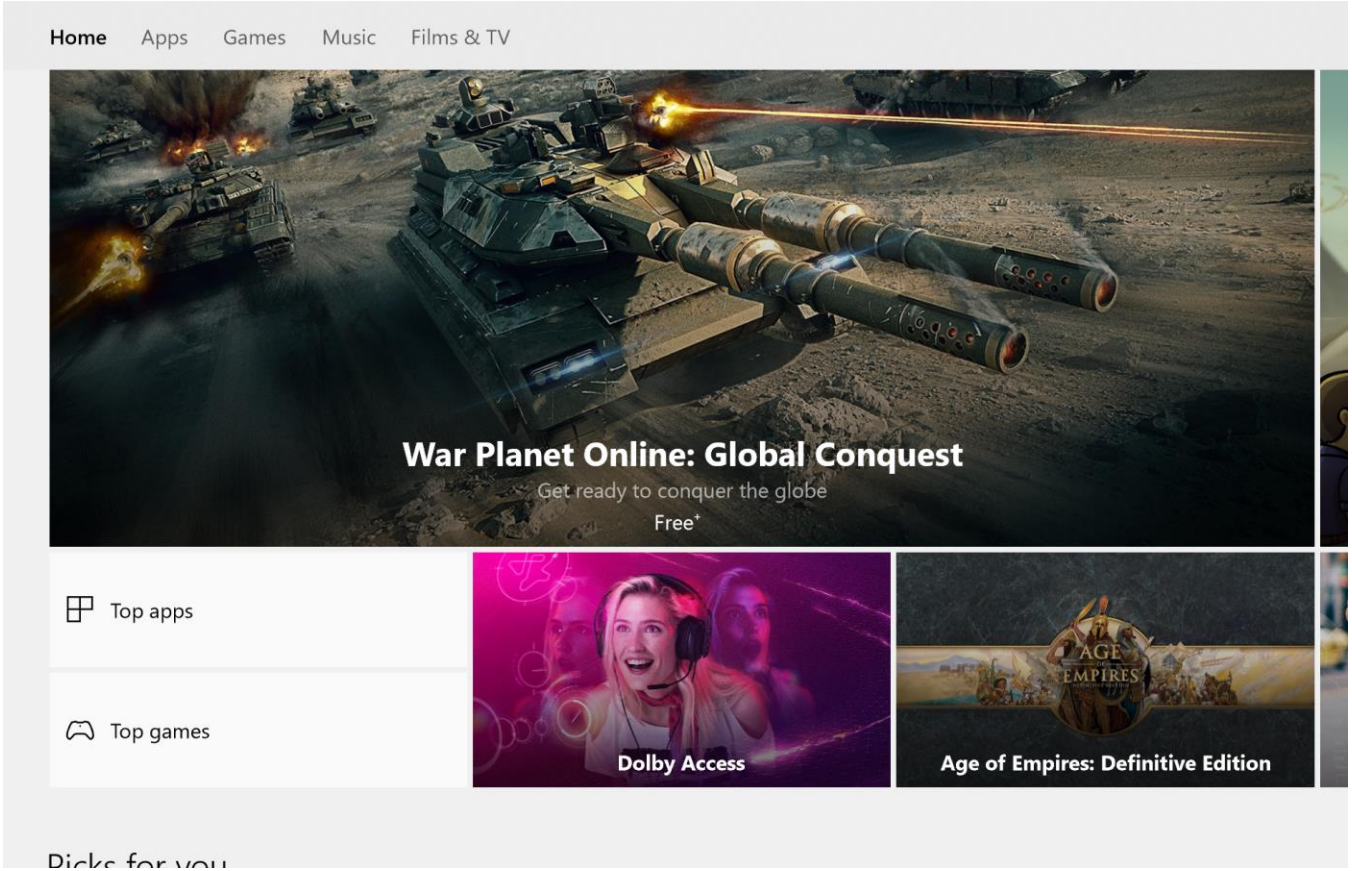
Lighting

- Be aware that variation in ambient lighting can affect the useability of your app. For example, a page with a black background might unreadable outside due to screen glare, while a page with a white background might be painful to look at in a dark room.

Colorblindness

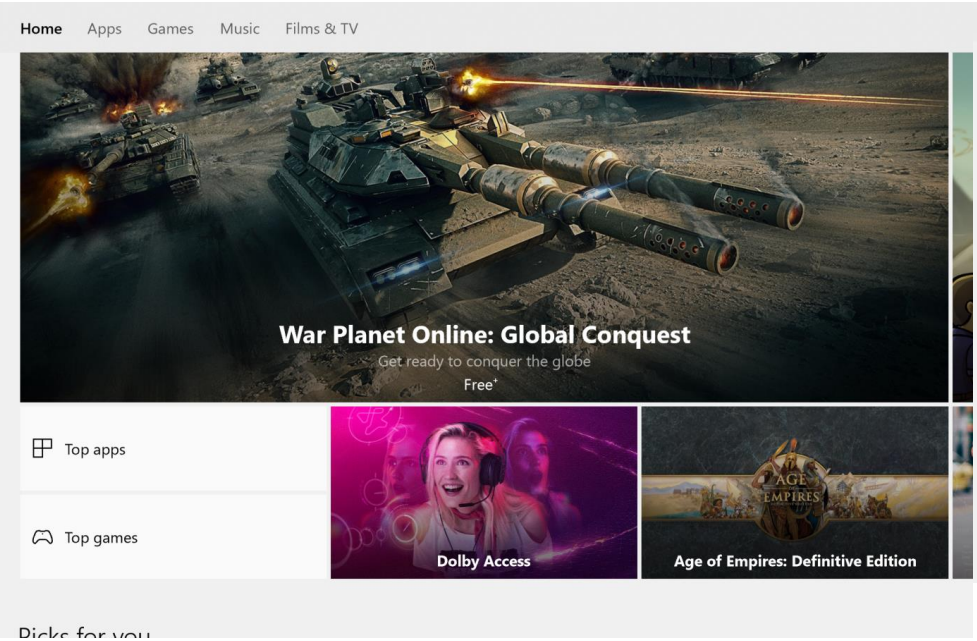
- Be aware of how colorblindness could affect the useability of your application. For example, a user with red-green colorblindness will have difficulty distinguishing red and green elements from each other. About **8 percent of men** and **0.5 percent of women**are red-green colorblind, so avoid using these color combinations as the sole differentiator between application elements.

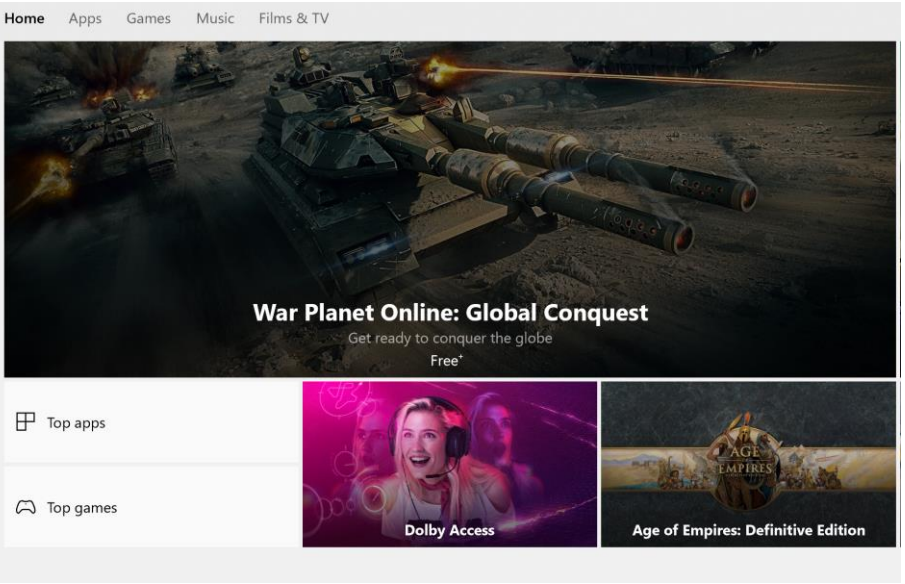
Buttons and “Fluent” Design



Windows Store uses light as Signals

The darkened “War Planet Online” is the ‘on mouse over’
(it changes to that when you move the mouse over it)





Motion and Interaction

- Motion is animations, basically how does a drag and drop look, or how does a system evolve as you reshape it etc.
- That is a bit out of scope for this course (because you generally need to use a native tool for each platform, and that is a pain)

- Interaction is something we'll take a stab at later in the course (e.g. to reuse my oft discussed example: How do you enter a password with a game controller?)

Assignment on a Native Application

- In 2020 this is A2
- The goal is to explore the concepts here with easy to use tools
- With responsive web design the world is moving away from native apps except where absolutely necessary, and onto web applications, so that's where we are taking the course for the future.