Finale T2, 2020

COMP3511/9511 Human Computer Interaction

Never Stand Still

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Overview

- Putting it together
- Exam
- Peer Review for Assignment 2
- Course and Teaching Survey
  - On-line via Moodle / MyUNSW
  - MyExperience

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Before HCI

- If you were building a software application 5 weeks ago, what would you have done compared with what you now know?

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What have we learned?

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Design Principles

- Visibility
- Feedback
- Constraints
- Mappings

- Affordance

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Constraints - physical

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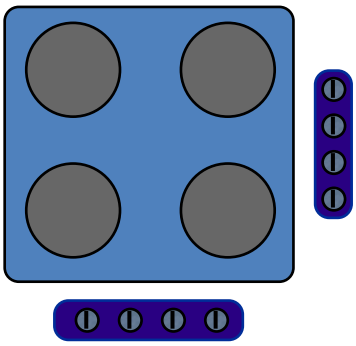
Mappings

Stove



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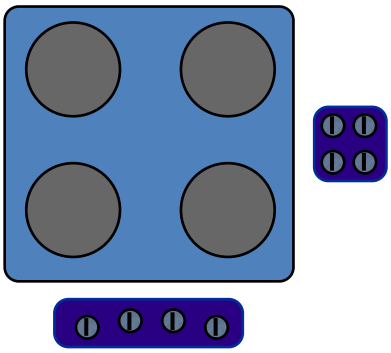
Mappings

Stove



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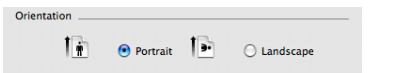

For '6': Press 1
For '7': Press 2
For '8': Press 3
etc.

https://www.nngroup.com/articles/natural-mappings/

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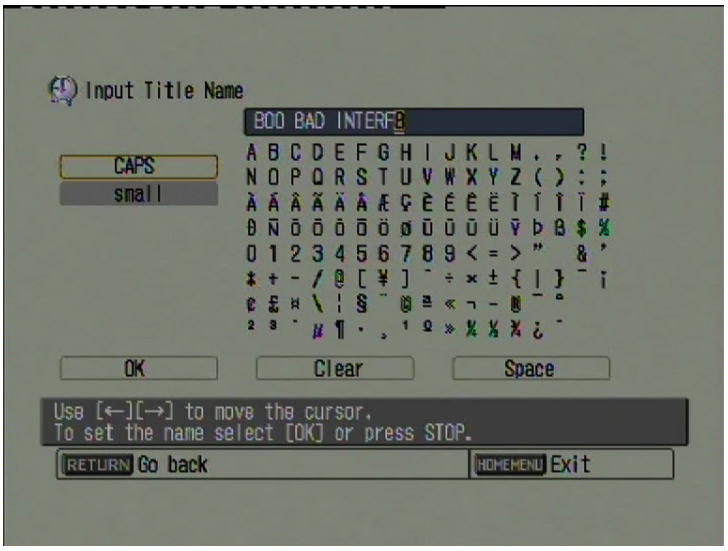

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Usability principles

- Similar to design principles, except more prescriptive
- Used mainly as the basis for evaluating systems
- Provide a framework for heuristic evaluation

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Usability principles (Nielsen 2001)

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Help and documentation

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Usability principles (Nielsen 2001)

- Help users recognize, diagnose and recover from errors
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design

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Usability and User Experience Goals

- User experience goals – focus on emotive aspects eg. fun, satisfying, entertaining vs. annoying, frustrating, etc…
- Usability Goals – Effective, Efficient, Safe, Utility (correct functions available), Learnability, Memorability.

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The Journey

- Introduce engineering students to user centred design
- Appreciate the needs of the user
- Incorporate those needs into the design
- Realise that the process is *iterative*

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The Journey…..

- Conceptual Design, Working With People, Design Diary and Creativity
- Heuristics / Design Principles/ Usability and User experience goals
- Design Process
  - Includes brainstorming, scenarios/personas, requirements, data gathering (including interviews), paper prototypes, user testing, electronic prototypes, iteration….
- Universal Accessibility
- Ethics (including online quiz)

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The Journey…..

- Humans, Memory and Problem Solving
- Cognitive load theory
- Heuristics and Cognitive Load
- Visual Design and the Graphical User Interface
- Evaluation
- Scientific Methodology
- Basic Statistics
- Expert/Novice

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The Journey…..

- Electronic Prototyping
- Internationalisation
- Input and Output Devices
  - includes: screen technologies, Virtual Reality, Augmented Reality, Wearable devices, Intelligent devices, using gamification.
- Quantification - performance measurement methods to evaluate usability.
- Data Visualisation
- Collaborative and Social computing

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Approach

- Process
  – User centred design process
- Speak the language of usability
  – Not just your opinion
- Iterative

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Our Process

- Many techniques presented to give you a broad understanding of the types of processes
- Through assignment and lab exercises you have had first-hand experience using such techniques
- You have a sense of what might work and when

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What is HCI

- Designing computer systems that support people so they can carry out their activities productively and safely…
- Neither the study of humans, nor the study of technology, but the bridging between the two...
- Whereabouts on the bridge are you now?

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Goals of HCI

- Understand factors influencing use of technology
- Psychological, ergonomic, organisational, social
- Utilise tools and techniques to help designers create suitable systems
- Ultimately produce highly usable, efficient, effective, and safe systems

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What is usability

- A usable application is one that allows its users to focus on their tasks, not on the application…
- A usable interface becomes transparent to the user

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What was covered in the course

- And how does it all tie together….

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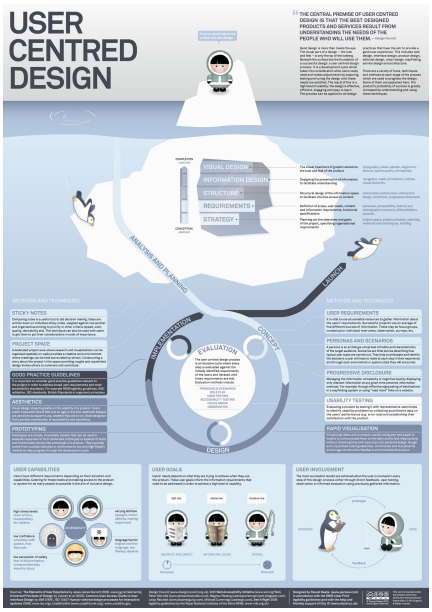

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Requirements gathering

- Functional = 'functions' of the software (e.g. ability for user to log in)
- Non-functional = 'qualities' of the software (e.g. accessibility)
- PDS – 30 words, summary of your project
- Trilogy between Information Design/ Interaction Design/Visual design
- Diagramming options: ERD, UML, Use Case – each one depends on your preference. ERD shows relationships, UML better for data flow/storage/architecture, Use Case between for client understanding of scope/project

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Interviews

- Interviews have a structure – know it! (introduction, warm up, main body, closure)
- Need consistency, avoid leading questions and jargon, make sure participant is comfortable
- Consider structured/unstructured questions, open/closed questions
- Be careful about your bias as an interviewer
- Think about data gathering and refine after pilot interview – your questions will always be refined!

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Ethics

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Paper Prototyping

- Paper still has a valuable role in the UCD Process
- Pros: Everyone can draw, quick, easy, finds logic flow problems easily, can modify/update/throw away very easily
- Cons: Not specific/realistic, perhaps unprofessional (though that's questionable), can't measure timing constraints and some aspects of accessibility
- Can produce using templates and printed/drawn hybrid:https://www.youtube.com/watch?v=FS00UIo12Xk

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Electronic Prototyping

- Both paper and electronic have different levels of fidelity, sit at different points in the design process
- Pros: Specific, realistic, video/animation capable
- Cons: Expensive, time consuming, prone to errors
- Iteration is key -> don't fall in love with first design
- Options for design:
  - Basic (photoshop/keynote)
  - Freeform (Photoshop, or equivalent)
  - Accurate (Prototyper)

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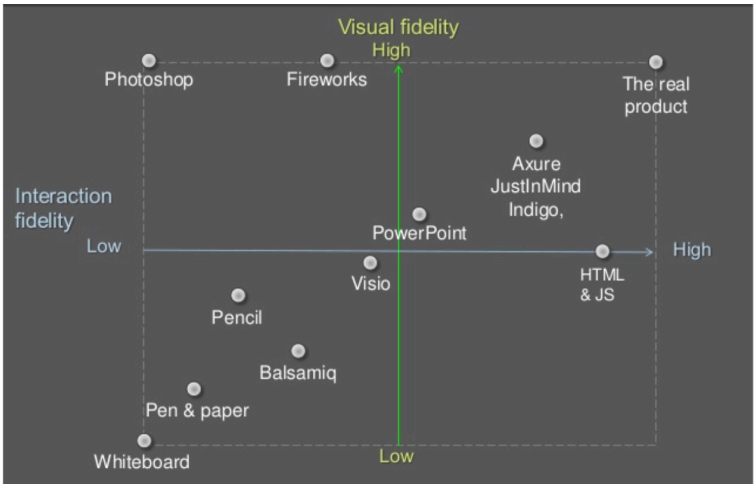
Electronic Prototyping tools



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Visual Design

- Visual Design:
  - Relationship of layout to workflow
  - Aesthetics of layout
  - Colour considerations
- Context of visual design:
  - Need to have requirements sorted
  - Need to know who your users are and their needs
  - Need to understand context of use, as well as likely platforms eg. phones, desktops, etc.
  - Not too early in the Design Lifecycle

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Visual Design….

- Users want:
  - An orderly, clean clutter free appearance
  - An obvious indication of what is being shown and what should be done with it
  - Expected information located where it should be
  - A clear indication of what relates to what, indicating options, headings, data and so forth
  - Plain, simple English (terminology)
  - A simple way of finding out what is in the system and how to get it out
  - A clear indication of when an action can make a permanent change in the data or system

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Human memory

- Memory is limited - the more that the information is processed (not just input) the more likely it will be remembered
  - data -> information -> knowledge -> wisdom

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Implications for HCI

- The more meaningful the names and icons are, the more likely they will be remembered
- Recognition is easier than recall
- Completing tasks involves combining information in the head with knowledge of the world
- GUIs can reduce the amount of knowledge required about the interface, you can recognise the “command”

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Cognitive load theory

- Huge long-term memory is used to store vast amounts of information over long periods of time
- Limited working memory (WM) used to process current information, not for long term storage
- Surface vs Deep learning
- Takes time, iteration, review

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Cognitive load theory

- Schemas allow us to bypass the limitations of WM by chunking large amounts of information together into a single unit
- Automation also helps to reduce the burden on WM by allowing us to process information with minimal use of our limited WM capacity
- Schema acquisition and automation are the two most important components of learning
- Acquiring schemas is important for your own studies!

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Cognitive load theory effects

- split attention
- redundancy effect
- modality effect
- transient information effect
- expertise reversal effect
- worked example effect
- animation effect

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Cognitive Load Theory Effects

- Split attention effect - do not make users have to mentally integrate information because it is physically split. Physically integrate related information.
  - Eg: Don't make your users have to remember a product code from one page that needs to be entered onto another page
  - Integrated training packages that do not split users attention between the screen and the manual, should be used. Eg. Computer Based Training

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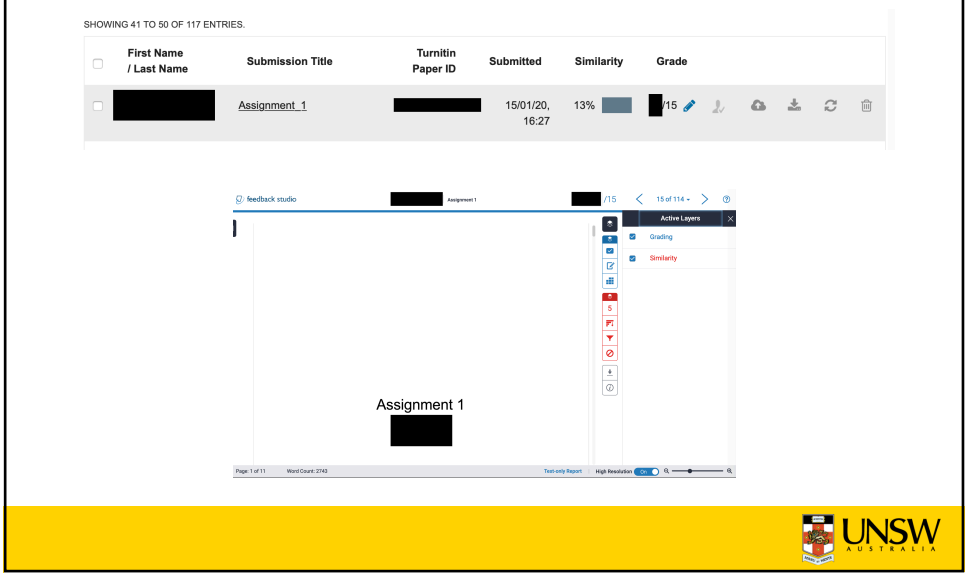

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Cognitive Load Theory Effects

- Redundancy effect - if information is not essential to learning or understanding, it is better to omit that information. Extra information is not neutral - it uses up our limited processing capacity.
  - Eg: eliminate redundant links on websites
  - Screens should be designed to only contain essential information. Redundant text and graphics should be eliminated. Eg. 'google' site versus 'yahoo' site

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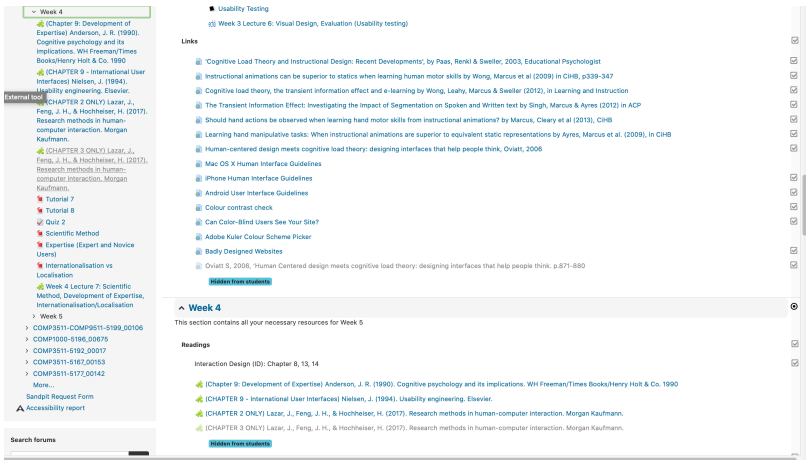

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Cognitive Load Theory Effects

- Modality effect - We have separate audio and visual memory processors. We can effectively expand our WM by presenting some information in an audio format and some visually.
  - The two sources of information needs to be related.
  - Timing is important.
  - Audio component needs to be relatively simple and short.
  - Eg: Simple errors messages could be in an audio format. Can 'look' at screen and 'listen' to what needs to be corrected.

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Cognitive Load Theory Effects

- Transient Information effect – Information that is transitory places a load on working memory as it needs to be recalled, and should thus be used sparingly. This includes both auditory and animated materials.
- Can reduce effects using:
  - Segmentation, pauses
  - Making audio/animations not too long or complex
  - Using written instead of audio content
  - User control, signalling for animations
  - Animations best for human movement related content

- **Wong, A., Leahy, W., Marcus, N., & Sweller, J.** (2012). Cognitive load theory, the transient information effect and e-learning. ***Learning and Instruction,*** *22(6),* 449-457.
- **Singh, A., Marcus, N. & Ayres, P. (2017)**. Strategies to reduce the negative effects of spoken explanatory text on integrated tasks. ***Instructional Science,*** *45(2)*, 239–261. DOI 10.1007/s11251-016-9400-2

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Knowledge and mental models

- Mental models enable users to generate descriptions and explanations about systems - can make predictions about how it will work (mental models = schemas)

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Memory

- Human memory capability helps explain a range of reasons why systems fail, how people can rapidly adopt or learn new systems
- We can use the understanding of human memory capability to inform our design process

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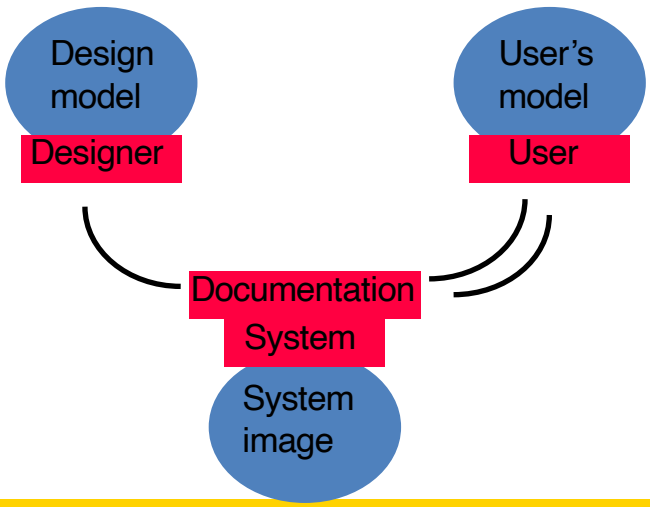
matching the models



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Problem Solving

- If we understand how people solve problems and why they sometimes struggle, we can design software and interfaces that are easier for people to learn to use.
- The PROBLEM of learning to use the new system/interface need not be overwhelming for the users.
  - Eg: To solve the 9 dot problem, you need to make the correct assumptions about what is possible. Your perspective is affected by your prior experience and expectations.

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Perception

- We need to understand users CONTEXT as it will have a great impact on what they perceive and how they make sense of the information we present to them.
- Gestalt principles

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Accesibility/ Internationalisation/ Experts vs. Novices

- Need to design for the particular group of users.
- Different groups of users have different needs and goals.
  - Disabilities
  - Different cultures, languages
  - Various skill levels

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Input /Output Technology

- To select an appropriate input and output method we should consider:
  - Target users; Task; Environment; User experience goals
- Can enhance users' input by using gamification, which involves using game thinking in design.
- New forms of displays:
  - Multi touch displays (Smart boards, Home appliances, and Interactive Tables)
  - Volumetric displays
  - Foldable displays
- New technologies that can create new forms of interaction without using a normal display:
  - Virtual Reality (VR) / Augmented Reality (AR)
  - Motion sensing devices
  - Brain-computer interfaces

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Quantification : performance measurement models in usability evaluation

When:

- Where it is difficult to carry out testing by using real users.
- For comparative evaluation of different systems.

How:

- **Key Action Model** looks at how users interact with the interface using keyboard and what shortcut keys are used in the software.
- **Keystroke Level Model** predicts the time to accomplish a task using computer software in order to compare different methods of doing the same task.
- **Fitts' Law** predicts the time required to move to a target area. It can help us to understand the issues of layout, size and distance.

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Interacting with data at scale

- Data Analytics (DA) and Data Visualisation (DV) deal with large volumes of data (big data)
- Used DA to inform the design choices and DV to inform the user
- Data at scale (**quantitative and qualitative data)** consists of social media messages, sentiment and facial recognition data, documents, sensor, sound and sonic data, and video surveillance data.
- Analyzing data from **different sources** is powerful because it provides **different perspectives on people's behavior**.
- Different ways to collect data: **scraping, monitoring oneself and others, crowdsourcing, and sentiment and social network analysis**.
- Data **visualization** provides tools and techniques for **representing, understanding, and exploring data**.

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Social Interaction

- Any exchange between two or more individuals is considered as social interaction
- Elements of social interaction:
  - Context
  - Status/role
  - Norms
  - Verbal/non-verbal communication
  - Social perception
  - Personal characteristics
  - Cultural issues

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Social Computing

- Social computing refers to any computing technology that supports social interactions, connecting people together, facilitating collaborations & potentially predict social outcomes.
- Time-space taxonomy:
  - Same time, same place (video-games, classroom tech.)
  - Different time, same place (displays)
  - Same time, different place (audio/video-call, text-chat)
  - Different time, different place (Email, social media)

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Collaborative Computing

- Collaborative computing provides an environment in which people can collaborate on a common task without time/space constraints.
- Time-space taxonomy
  - Same time, same place (Presentation, shared screen)
  - Different time, same place (Email, video messaging)
  - Same time, different place (Audio/video conf., Electronic shared documents)
  - Different time, different place (Email, shared calendar)

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Social and Collaborative computing

Take-home:

To come up with an efficient and effective social and collaborative technology, adopt the social rules that work well in face-to-face interactions

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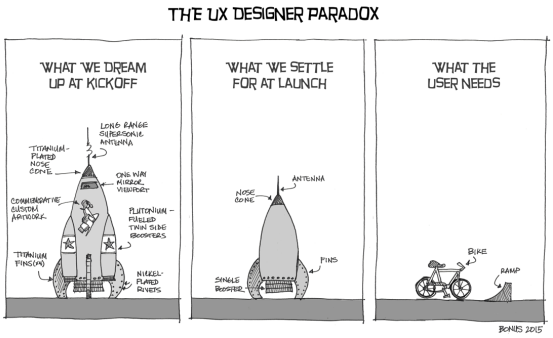
If you've learned one thing…

- As a developer, you are not your user
- It is necessary to take the users' perspective in everything you do…



https://uxmag.com/content/comic-the-ux-designer-paradox

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Thanks everyone for a full (very hectic!) and engaging term, the online learning presents its own challenges and you have all worked so well with some wonderful prototypes to show – best of luck with your presentations and the exam.

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Sample Exam or other Questions

- Please hit us in the Q&A with your questions about any of the content we have covered in the last five weeks.

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Data Visualisation Interacting with Data at Scale

Dr. Wafa Johal

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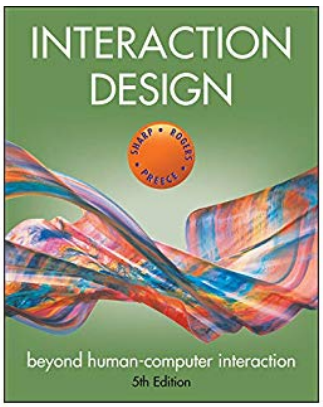
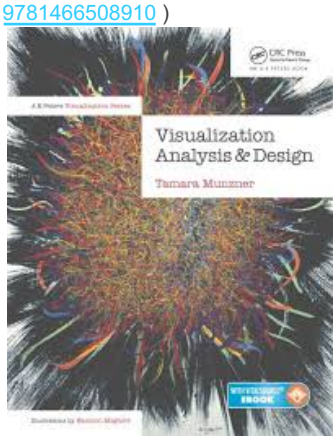
Reading

Interaction Design - Chapter 10



Visualization Analysis and Design (free online book https://proquest.safaribooksonline.com/9781466508910)



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Why Data Visualization?

You have seen - how to analyze quantitative and qualitative data in UX setting; test on relatively low number of individuals

Data Analytics and **Data Visualization** focus on large sample, less qualitative information

2

Why Data Visualization?

Logging of data from software and devices that are connected to the cloud

=> enormous amount of data collected and stored

How these large amount of data can be **used to inform the design?**

Could these data also **inform the user**:

- on their own use?
- on their behavior / norm?
- on the traffic?

3

Why Data Visualization?

Dashboards are present in more and more software, to **inform** us and enable us to **take decisions**.

Garmin Connect

Inform designers about cultural trends.

Example: pick an icon for 'Hot Beverage'

Google Trends

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Objectives of this lecture

Why Data Visualization?

- Inform the Design (i.e. trends analysis)
- Inform the User (i.e. dashboards)

How to Collect Relevant Data?

How to Visualize Big Data?

Principles and tools for DataViz

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Source of Data – Interaction Logs

Collection of data during the interaction with the software.

For instance:

- Click stream: sequence of clicks (can inform on the goal of the user)
- GPS data (where is my app used, if at the beach, I should consider using colors that are suitable for high lighting conditions)
- Time of logging in (is my app used at night, propose a night mode?)
- Viewing information (what does the users spend time on? How to make them spend more time on other features?)

6

Source of Data – Web Scrapping

Extracting data from websites through an automated process implemented using a bot (web crawler)

Example:

Contact Scraping - Get information about your users : build a database with extra information found about your user from the web – avoid asking directly to the users for personal data

Spam Act 2003 – forbid address harvesting software

Product Review scraping– check prices of similar products on the web –online price change monitoring and price comparison

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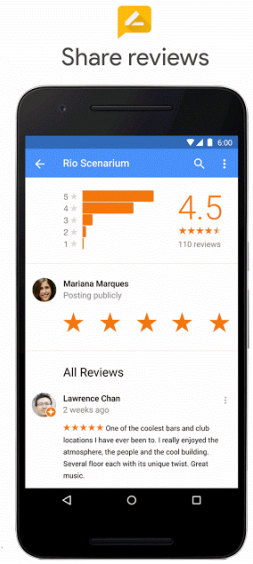
Source of Data – Crowdsourcing

"type of **participative online activity** in which an individual, an institution, a nonprofit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the **voluntary undertaking of a task**."

[E. Estellés-Arolas et al.]

Example: google map with restaurant information



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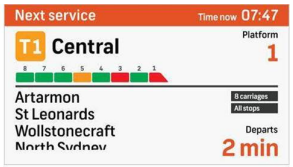
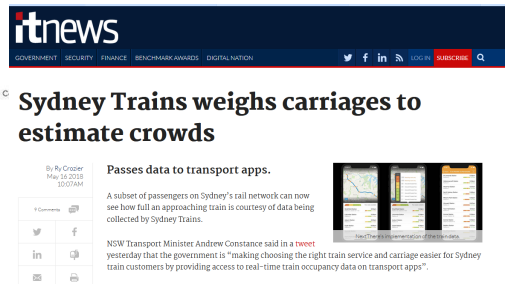
Example of data gathered by surveillance





https://medium.com/@NextThere/tracking-live-train-loads-in-sydney-c410ac313748

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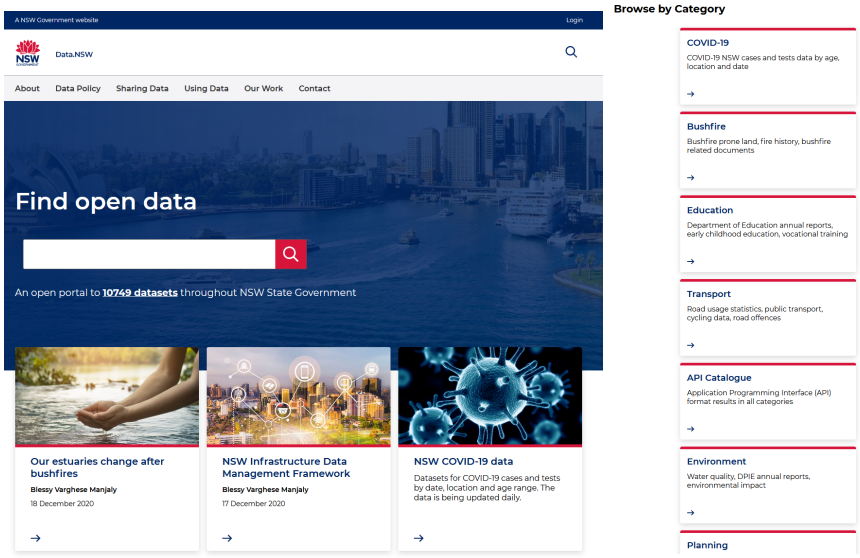
Open Data Available in NSW



https://data.nsw.gov.au/

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Source of Data – Sentiment Analysis

Process of **identifying the subjective information** in text and classifying each piece of data as ***positive***, ***negative***, **or** ***neutral***. Often referred to as ***opinion mining***, it provides insights on how customers feel about products or services.

Explicit

Implicit

- textual review analysis

Loves the German bakeries in Sydney. Together with my imported honey it feels like home	Positive
@VivaLaLauren Mine is broken too! I miss my sidekick	Negative
Finished fixing my twitter...I had to unfollow and follow everyone again	Negative
@DinahLady I too, liked the movie! I want to buy the DVD when it comes out	Positive
@frugaldougal So sad to hear about @OscarTheCat	Negative
@Mofette brilliant! May the fourth be with you #starwarsday #starwars	Positive
Good morning thespians a bright and sunny day in UK, Spring at last	Positive
@DowneyisDOWNEY Me neither! My laptop's new, has dvd burning/ripping software but I just can't copy the files somehow!	Negative

- facial expression

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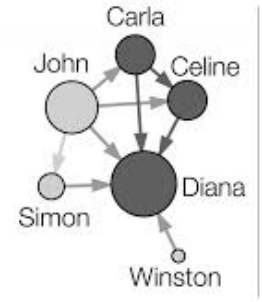
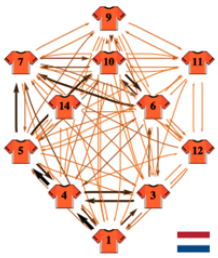
Source of Data – Social Networks Analysis

Study of **social structure of people related to each** other through common relations of interests

Reveal **clusters**, **groups** of people, give insights on their behaviour

Identify a community, make recommendations





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Source of Data is not unique

Combine multiple sources to build a domain knowledge, or a user profile

Interaction Logs	Log the places you clicked (what options did you investigate?)
Crowd-sourcing	Collect Reviews, opening hours ...
Web Scrapping	Determine price range of restaurants ($, $$, $$$)
Sentiment Analysis	Analyse content of your review (atmosphere, staff ...)
Social Network Analysis	Recommand similar restaurants to your friends, or highlight them

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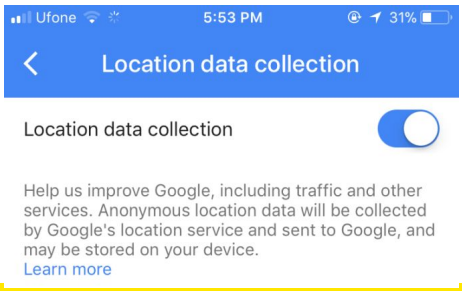
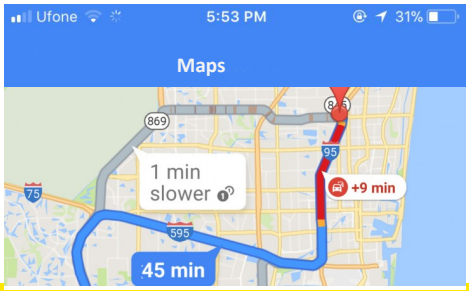
Ethics and Data Privacy

EU *General Data Protection Regulation* (*GDPR*)
The GDPR and the Australian Privacy Act 1988 share many common requirements, including to:

- implement a privacy by design approach to compliance
- be able to demonstrate compliance with privacy principles and obligations
- adopt transparent information handling practices

Inform and collect user's agreement to use their data





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Data Visualization

Definition:

arrange data abstraction on an image in a way that the visual properties of the image plot reflect the abstract properties of the data, i.e. the relationship between data

Goals:

- get the user to understand the data in order to **inform their decision**
- get insights to **inform the design choices**

Human in the loop

Different from machine learning in which the goal is to have an AI to learn how to take decisions for the user

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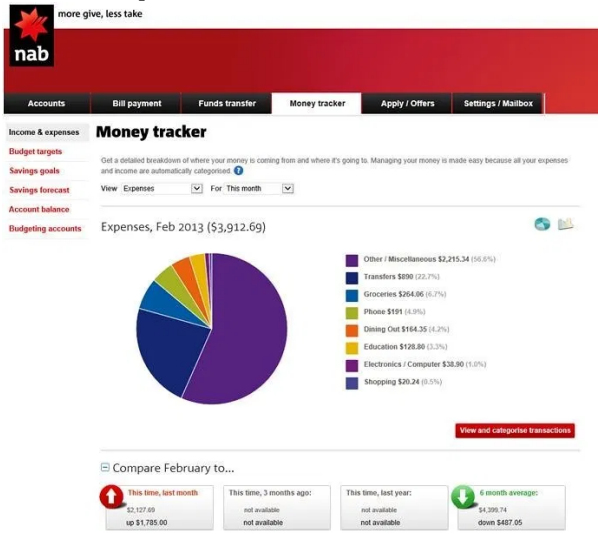
Data Visualisation

- What?
  the content that is to be shown
- Why?
  the intention, the message behind the data visualisation
- How?
  the choices made to map the data to visual

Example



1) What data?
Match visual element to the data

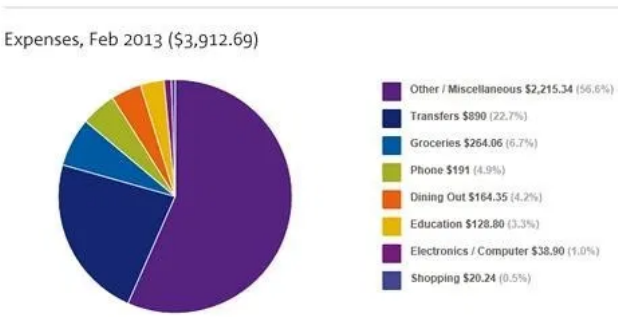
- items, positions, tables
- static or temporal
- categorical, ordered, quantitative, sequential

Example

2) Why
- Consume (discover, present, enjoy)
- Produce (record, annotate)
- Search
- Determine trends
- Find outliers
- Discover features
- Show distribution
- Show spatial attributes

18

Example



2) How?
Encode > Manipulate > Facet > Reduce

Encoding: arrange the data (axis?, order?)

Map categorical data & ordered data with:
Color
Size
Shape

19

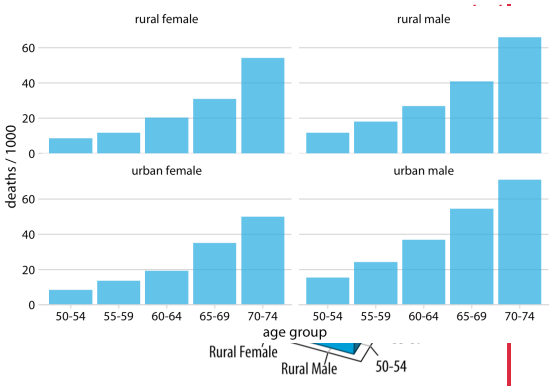
2D or 3D

3D graphs present advantages but final rendering is done on a 2D screen.

Potential issues:

- distortion
- occlusion of information

One alternative is a Latice of 2D projections



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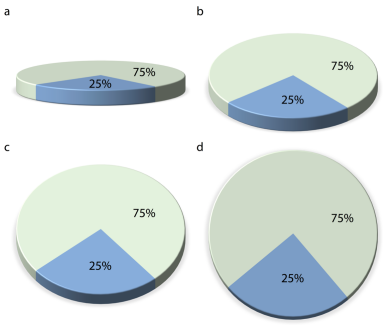
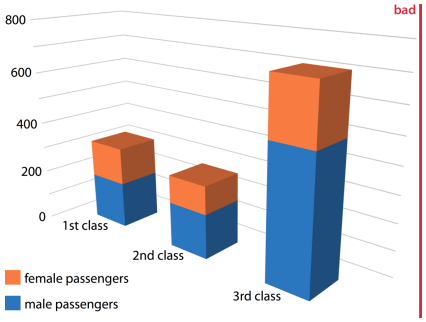
Don't go 3d





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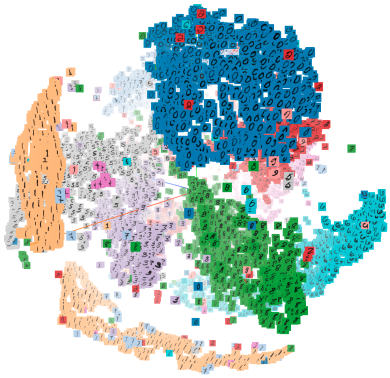
8D? High dimensional data



Example of MINST Dataset for Optical Character Recognition (OCR)

https://projector.tensorflow.org/

Alternatives:

1) use statistical methods for aggregation (distances, PCA, mean)

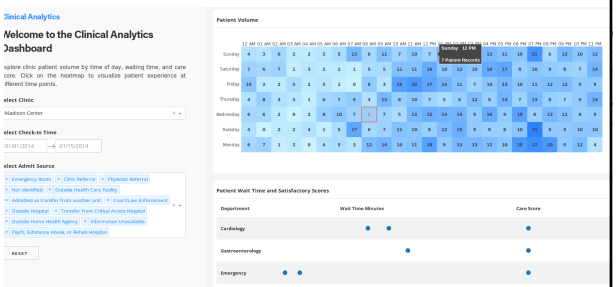
2) create interactive plots

Interactive Plots - Dashboards

Interactivity allows to:

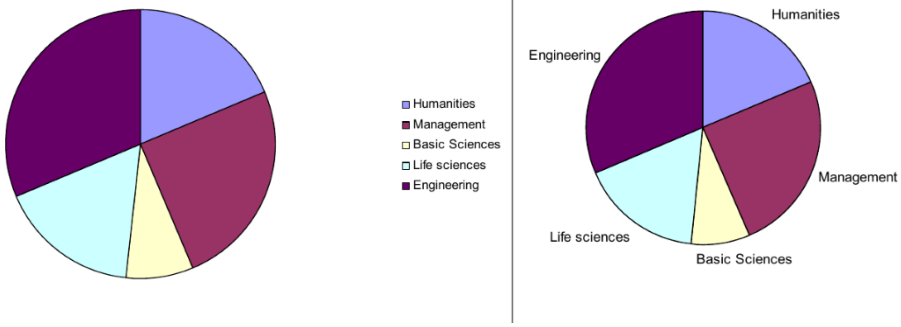
- Explore the data
- Deal with complexity
- Change over time
- Select
- Navigate (zoom, pan, constrained)

https://dash-gallery.plotly.host/dash-clinical-analytics/

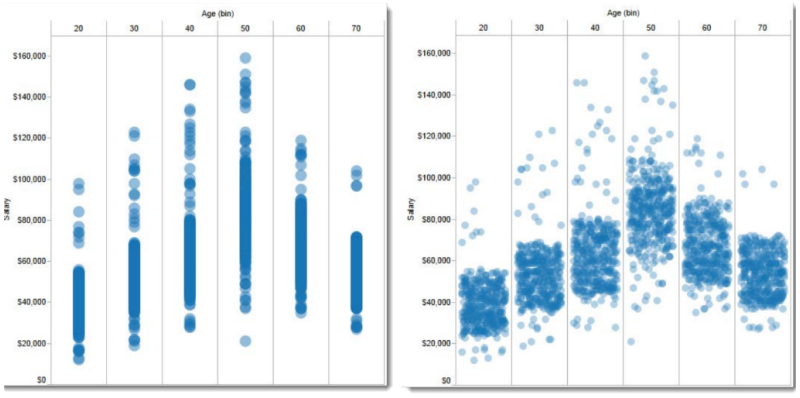


https://covid19.who.int/

Split Attention Effect



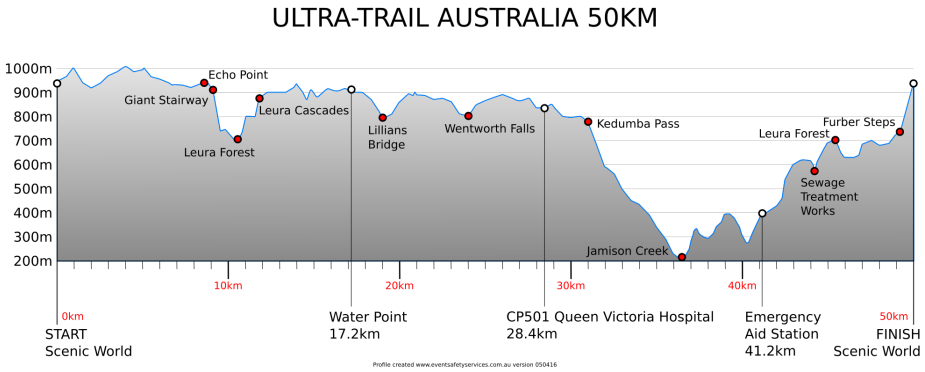
Jitter



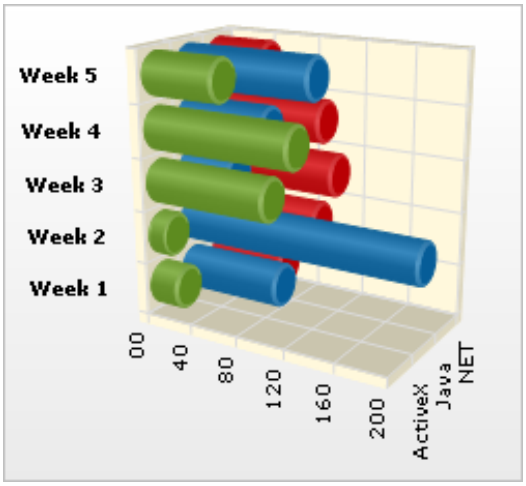
Add Noise to make individual points more visible

Geometrical Distortion

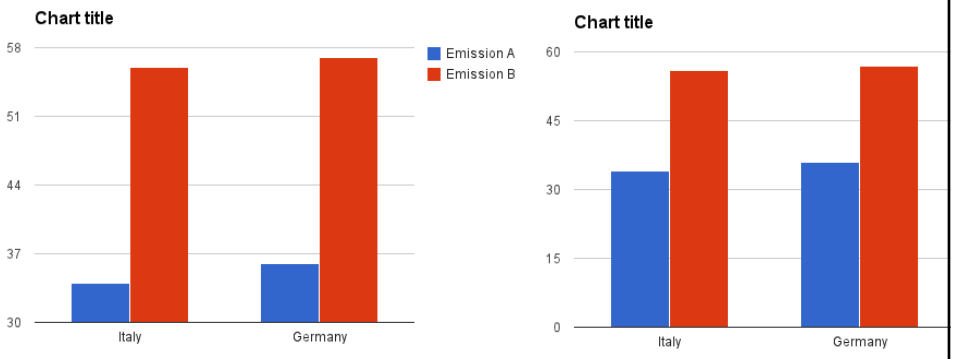
Sometimes necessary when scales are not compatible



What is wrong with this chart?

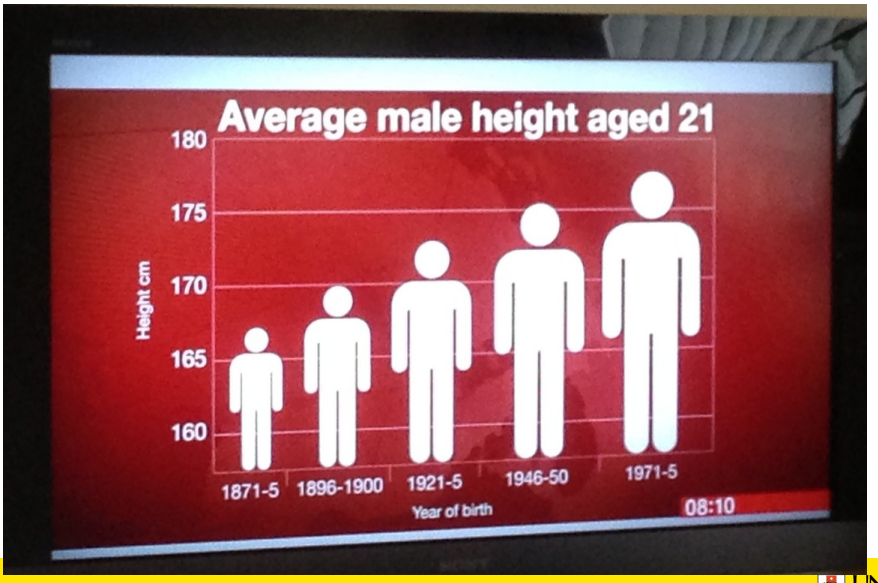


What is wrong with this chart?



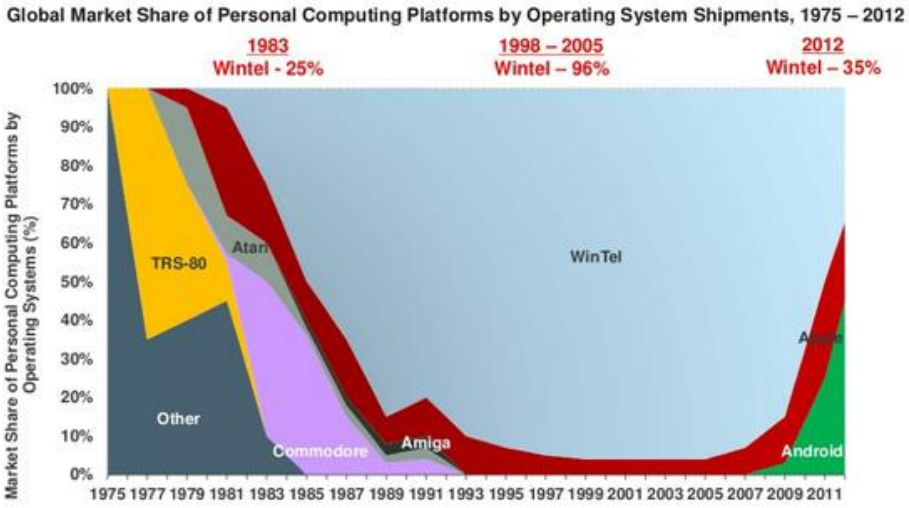
28

What is wrong with this chart?



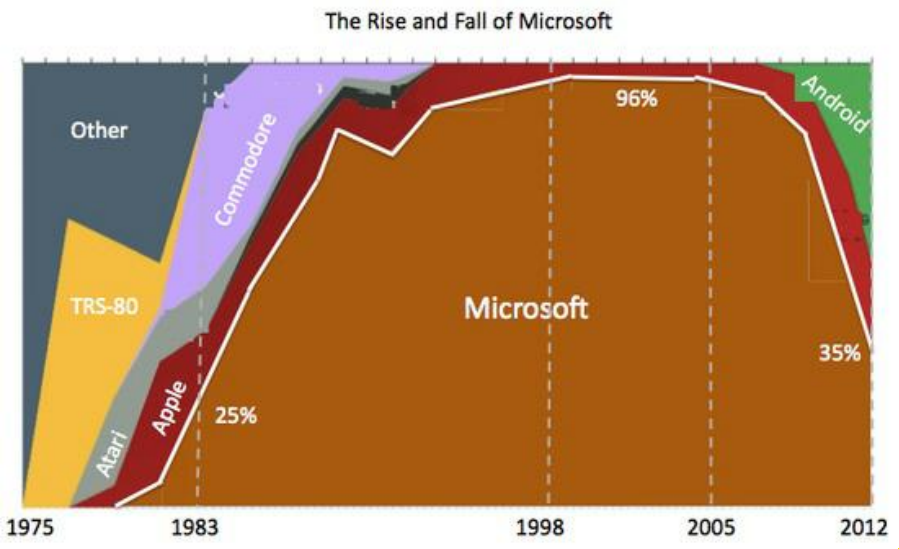
29

Highlight what is important to tell a story



30

Highlight what is important to tell a story



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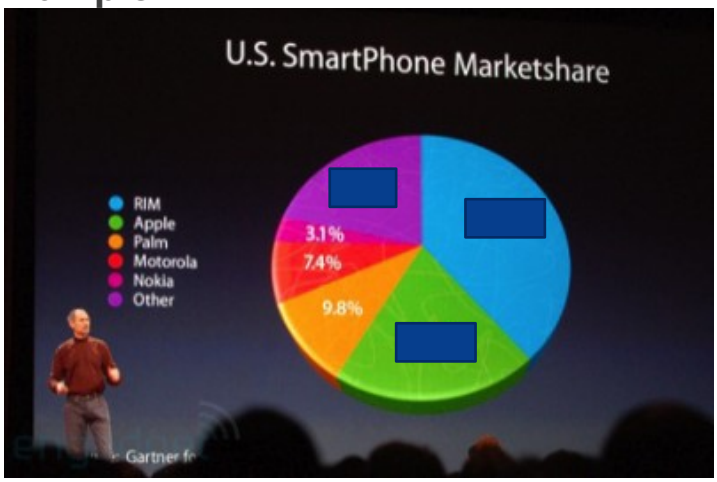
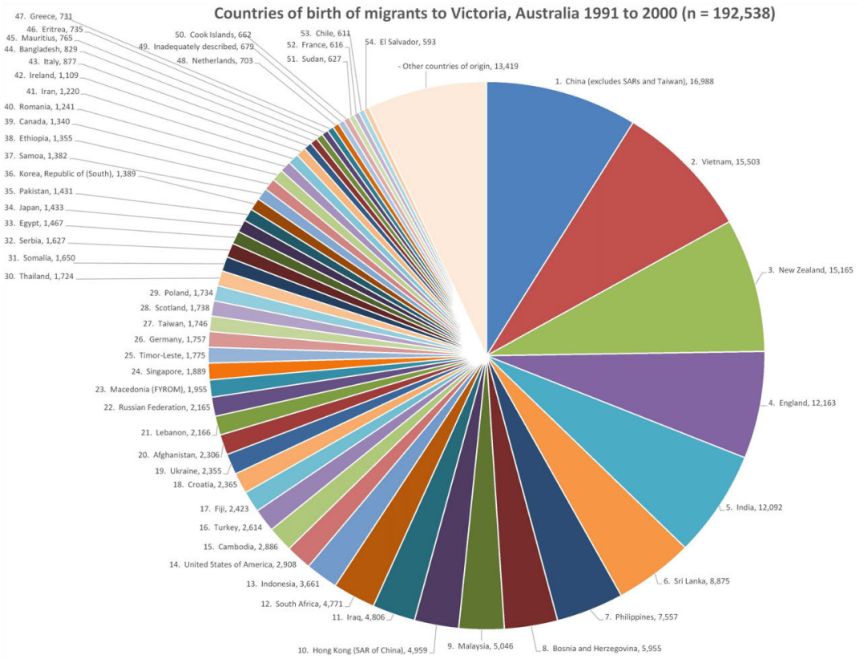
Another Example



presented by Steve Jobs at Engadget 2008
http://www.engadget.com/2008/01/15/live-from-macworld-2008-steve-jobs-keynote/

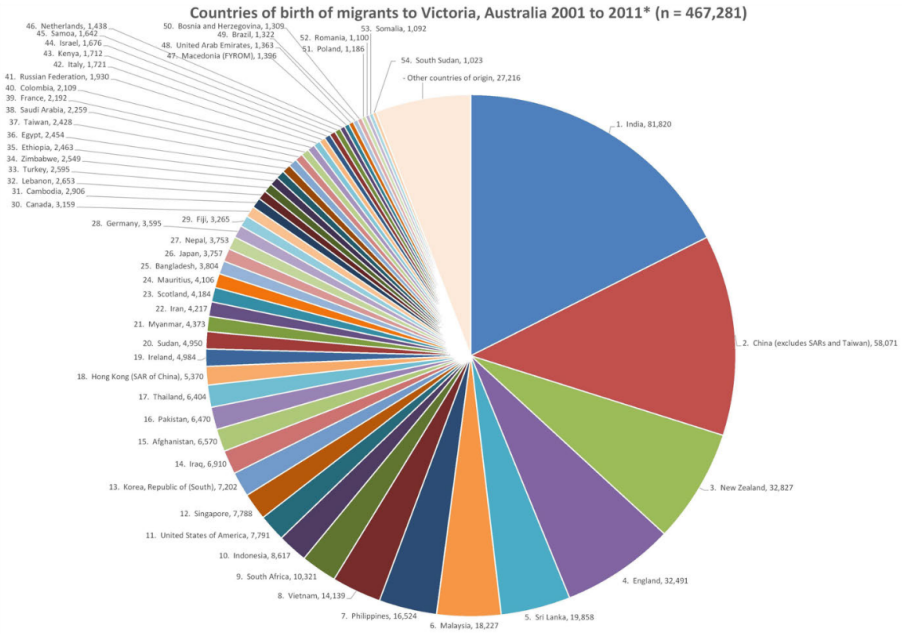
32



Source: Australian Bureau of Statistics

Figure 3: Countries of Birth Pie Chart for Migrants to Victoria, 1991-2000

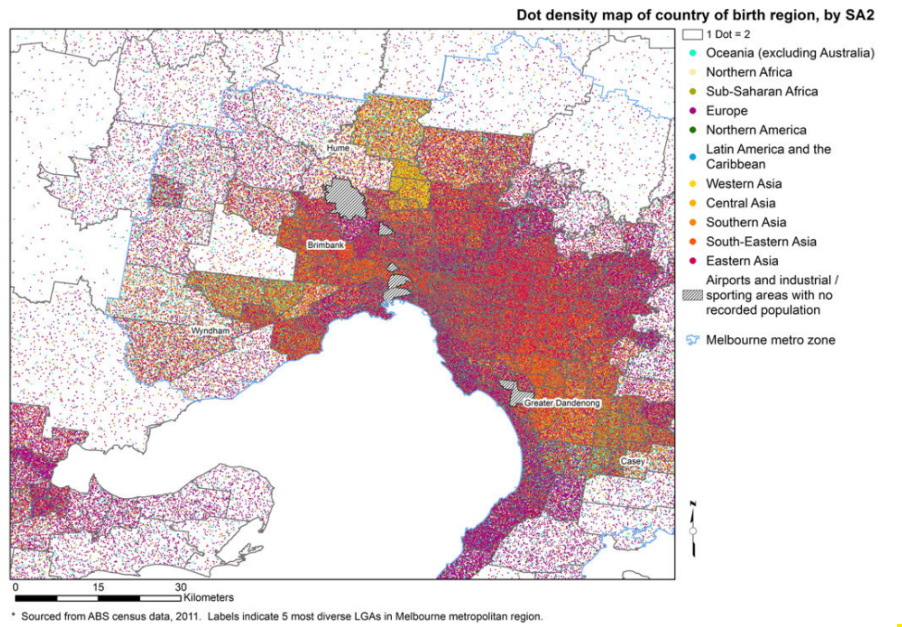
33



*2011 data only available up to 9 August
Source: Australian Bureau of Statistics

Figure 4: Countries of Birth Pie Chart for Migrants to Victoria, 2001-2011

34



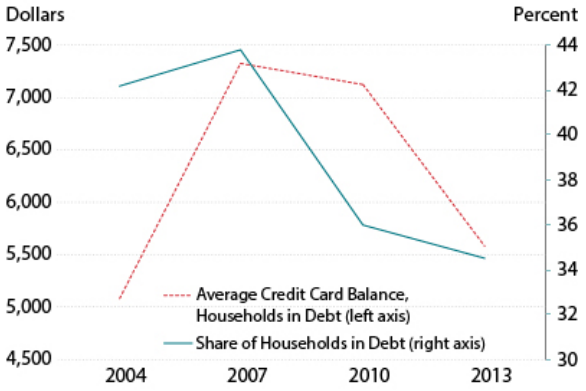
* Sourced from ABS census data, 2011. Labels indicate 5 most diverse LGAs in Melbourne metropolitan region.

Figure 5: Dot Density Map of Countries of Birth for Melbourne by SA2, 2011 – Major Regions

35

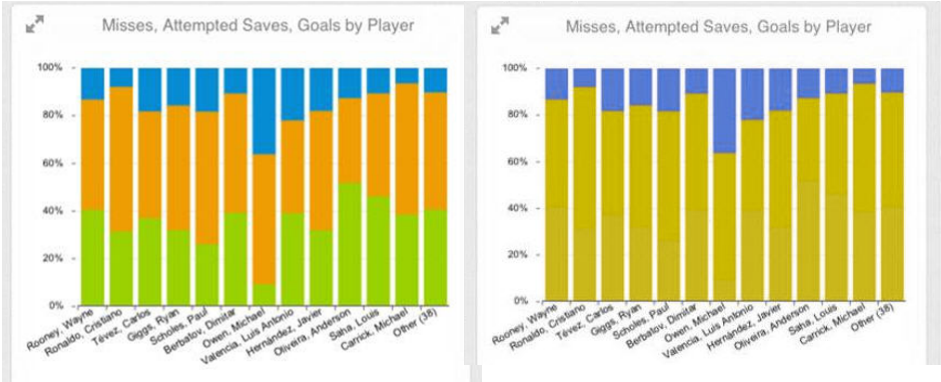
What is wrong with this chart?

Figure 1
Share of Households with a Positive Credit Card Balance



SOURCE: Survey of Consumer Finances.

Again mind your colors



Remove any visual clutter

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Summary

- Data Analytics and Data Visualisation deal with large volumes of data (big data)
- Used 1) to inform the design choices and 2) to inform the user
- Data at scale (**quantitative and qualitative data)** consists of social media messages, sentiment and facial recognition data, documents, sensor, sound and sonic data, and video surveillance data.
- Analyzing data from **different sources** is powerful because it provides **different perspectives on people's behavior**.
- Different ways to collect data: **scraping, monitoring oneself and others, crowdsourcing, and sentiment and social network analysis**.
- Data **visualization** provides tools and techniques for **representing, understanding, and exploring data**.

40

1

Input, Output and Interaction

Never Stand Still

Different input and output devices and new technologies

Human Computer Interaction - COMP3511/9511

By Ali Darejeh

Ali.darejeh@unsw.edu.au

Adapted from slides by Dr Daniel Woo & Dr Cat Kutay

2

AIM

- Discuss different input and output devices that can be used into the systems we design.
- Talk about design considerations based on the selected input and output devices.

3

Content

- Computer displays
  - History of computer displays
  - Touch screen technologies and devices
  - Volumetric Displays
- New technologies that can create new forms of interaction
  - Virtual Reality
  - Augmented Reality
  - Motion sensing input devices
  - Brain-computer interfaces
- Wearable devices
  - Projector phones
  - Foldable phones
  - Smart watches
- Smart devices
- Robotics
- Selecting an appropriate input and output method
- Special input methods to help users
- Ways to increase users' input and engagement using game techniques

4

What are the Input and output hardware?

- Monitors
- Flat touch screens
- Bluetooth/Wireless
- Audio input and output
- Still and Video camera
- Physical switches and buttons
- Input and output by cable
- Geo location sensor
- Finger print reader
- Game pads
- Motion sensing devices
- Virtual reality glasses
- Gesture recognition and eye tracking devices
- Sensors (Gyroscope, Accelerometer)
- Keyboard
- Mouse
- Touch pad
- Scanners
- Printers 2D / 3D
- Digital pens

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History of computer displays

Source: https://www.pcworld.idg.com.au/slideshow/366677/brief-history-computer-displays/

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Teletype Monitor

The teletypes provided a continuous printed output of a computer session.

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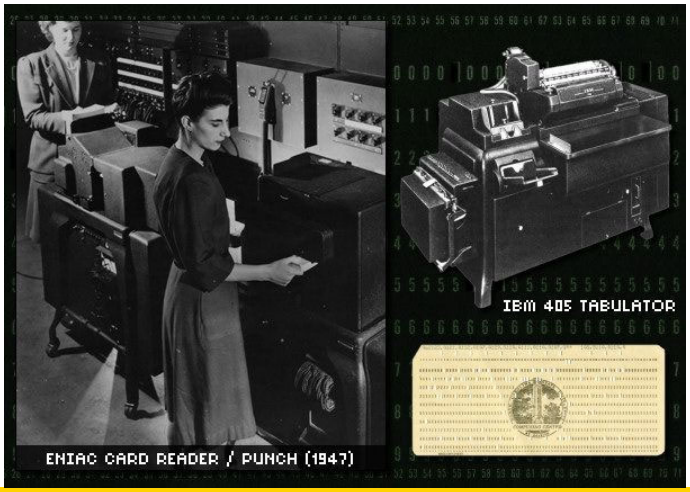
Punch Cards In, Punch Cards Out

The ENIAC, used punched cards as both input and output.



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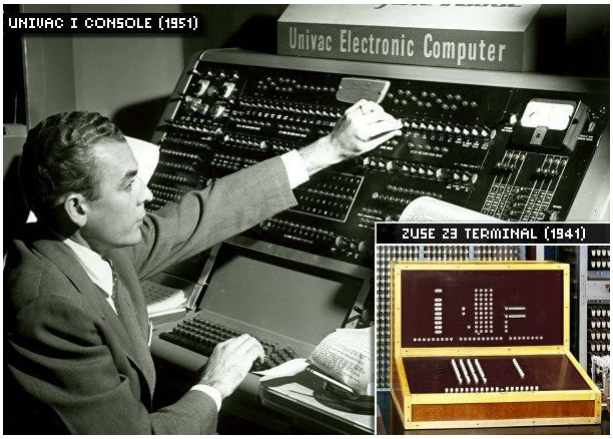
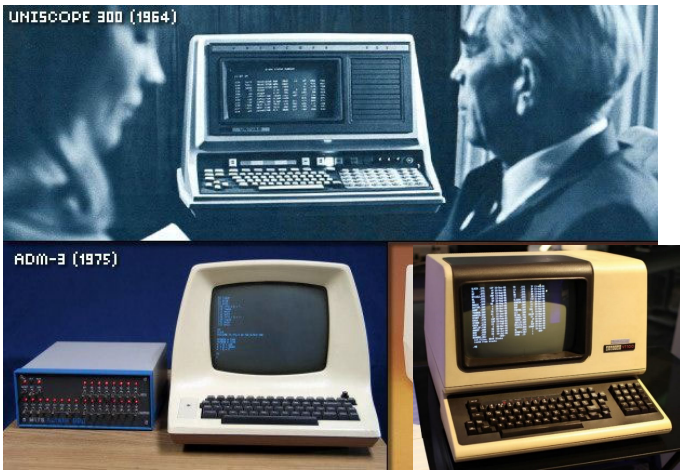
8

Blinking Indicator Lights



9

Black and white text based Cathode Ray Tube screens



10

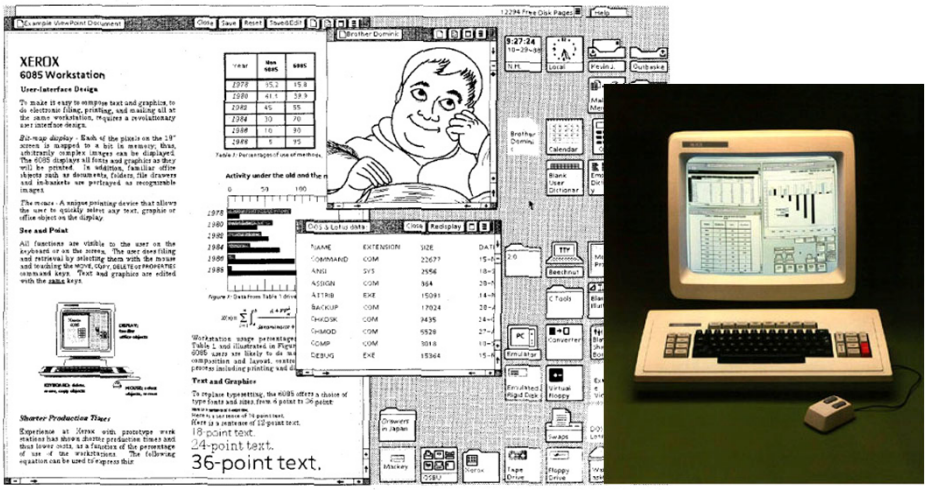
Monitors that support graphics

Attached video displays with a video terminal that could support graphics.

11

Who designed the first graphical operating system?

Xerox Star -1981

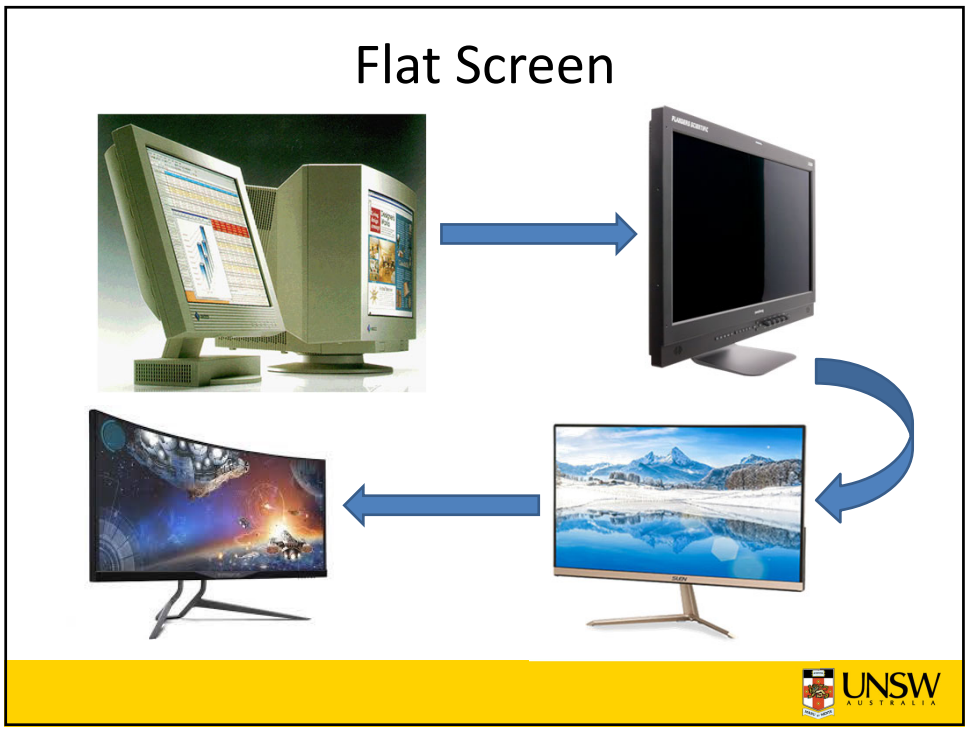


http://www.digibarn.com/friends/curbow/star/retrospect/

12


IT WAS INEVITABLE
$1795
OSBORNE
COMPUTER CORPORATION
NEWSFILTER.ORG
NEW FOR '84
Priced From 4999.00
256K 1-Disk
Commercial Lease Available for Only $175 Per Month
(Plus Applicable Use/Sales Tax)
The guy on the left doesn't stand a chance.
$1795. It's inevitable.
OSBORNE
COMPUTER CORPORATION
We run even faster since
we've lost a few pounds.
IBM announces the new 5100 Portable Computer
10 Megabyte Hard Disk
$3,495
COMPUTER COMPONENTS

13


Flat Screen
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Touch screen technology

- **Resistive:** It can be touched by stylus pen and gloved finger.
- **Optical:** finger disrupts light ray of the camera.
- **Wave:** works by sound waves.
- **Capacitance:** it can detect anything that is conductive.

Source: https://www.engineersgarage.com/articles/touchscreen-technology-working

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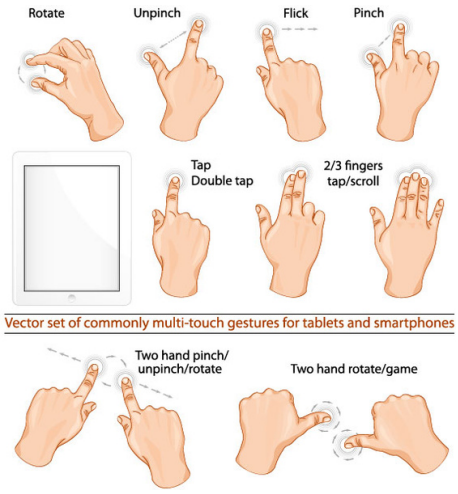
Multi-touch devices



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Foldable and flexible displays

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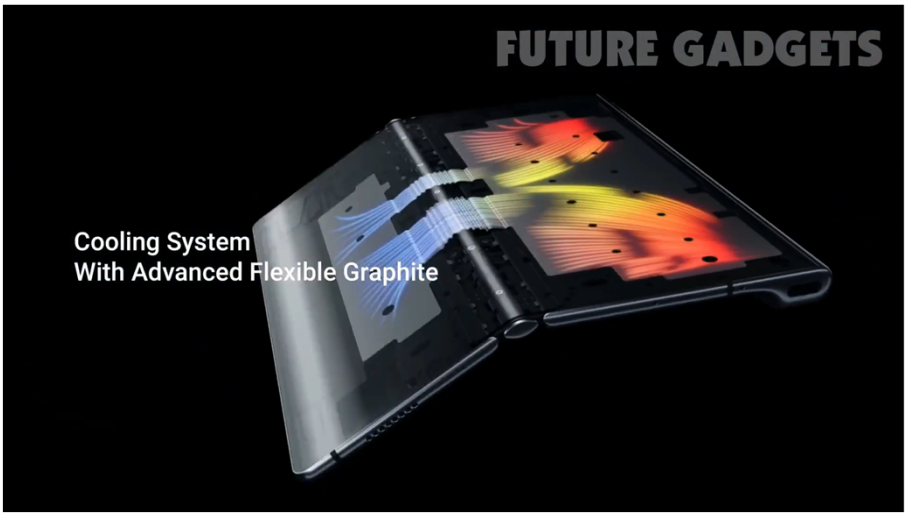
Foldable phones



Source: https://www.youtube.com/watch?v=iMcAja1qEFM

18

Touch screen technology usages

- Monitors
- Tablets
- Mobile phones
- Cameras
- Game consoles such as: Nintendo 3DS, Nintendo switch
- ATM Machines
- Payment terminals
- Self-serve kiosks (airports, shops and restaurants)
- Interactive Video projectors
- Interactive displays
- Smart boards
- Interactive Tables

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Self-serve kiosks

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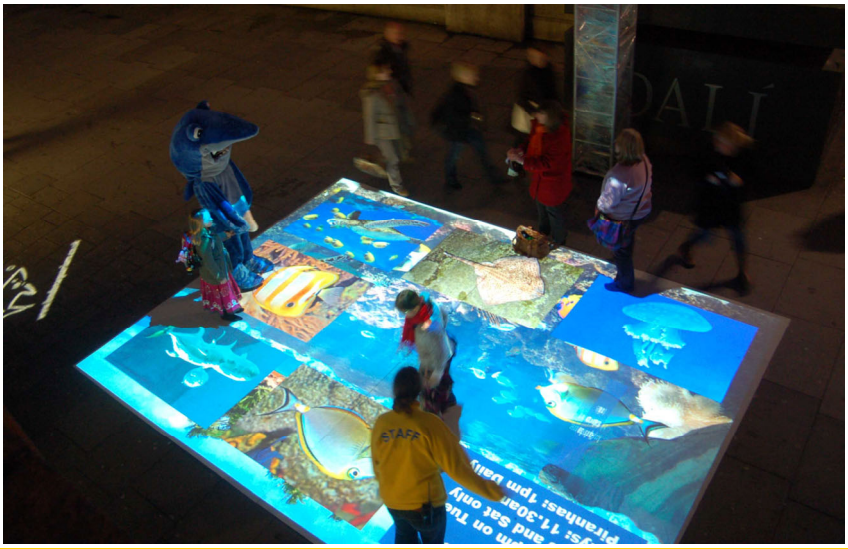
Interactive Video projectors



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Smart boards

22

Interactive displays

http://www.youtube.com/watch?feature=player_detailpage&v=vb5g19Nn4Cc#t=17

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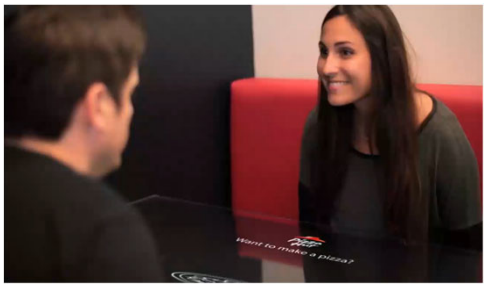
Tables with Interactive displays

Interactive Restaurant Technology



Source:
https://www.youtube.com/watch?v=oImHUVOylfw
https://www.youtube.com/watch?v=gvWxqAcsDBM
https://www.youtube.com/watch?v=xvT0MCugb58

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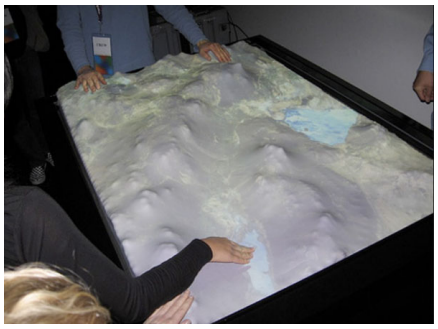
3D Map Table

3D Map Table creates a three-dimensional physical map. Some pins powered by a single motor push up a silicone screen to simulate the height, while vacuum sucks down the rest of the unpinned skin. Then an overhead projector displays a geographical map on the table skin.

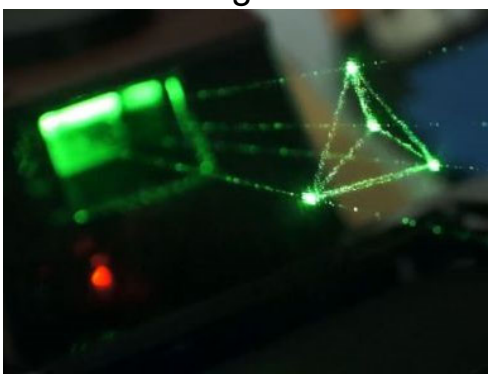


Source: http://www.spatialrobots.com/2007/04/3d-topographic-map-table/

25

Volumetric Displays

A volumetric display is a type of display that forms a visual representation of an object in 2 or 3 dimensions without having a screen.



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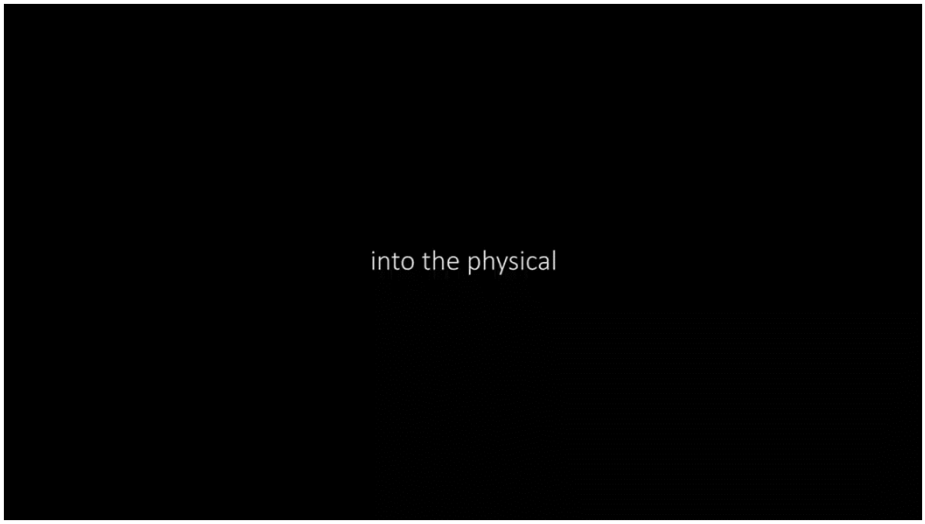
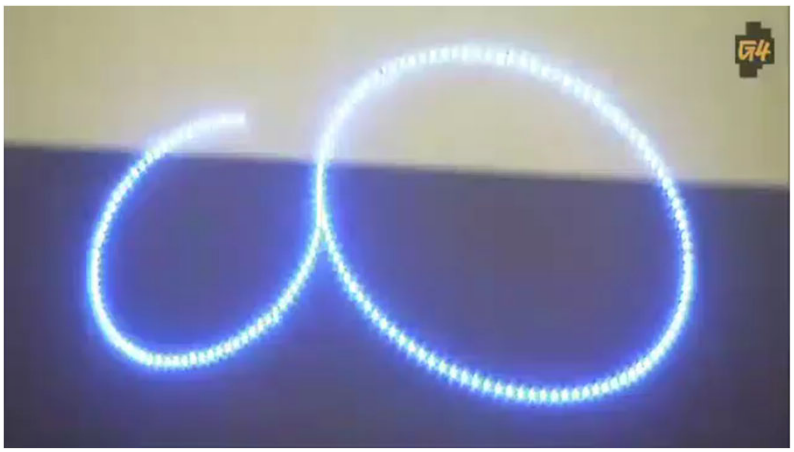
Volumetric Displays



Source: https://www.youtube.com/watch?v=cWXLsbsrA9U

27

Laser light



Source: https://www.youtube.com/watch?v=KfVS-npfVuY&t=115s

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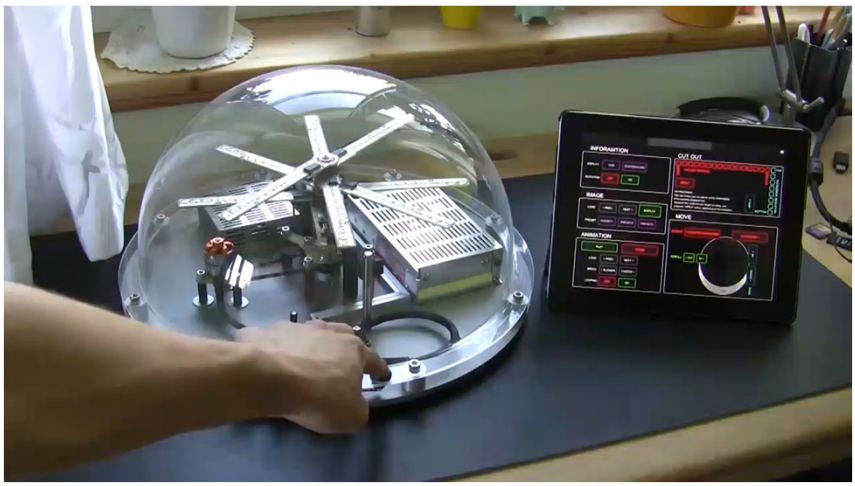
Physical and mechanical movements



Source: https://www.youtube.com/watch?v=I7vqha_N5s8&t=182s

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Transparent display

Source: https://www.youtube.com/watch?v=SYQUCpLIc8U&t=64s

30

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New technologies that can create new forms of interaction

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Virtual worlds

Virtual Reality

Augmented Reality

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What is Virtual Reality?

- Instead of viewing a screen, users are able to interact with a 3D world.
- VR has different usages like simulations or games.

Source:
https://www.marxentlabs.com/what-is-virtual-reality-definition-and-examples/
https://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html

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Virtual Reality in education

Source: https://www.youtube.com/watch?v=x189dNYYhDg

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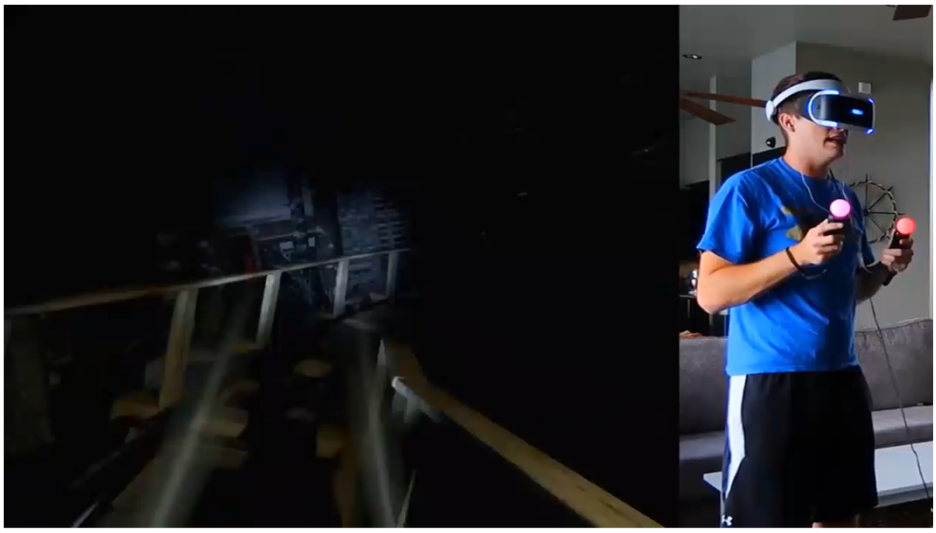
Virtual Reality in education

Source: https://www.youtube.com/watch?v=m_44MehaXxU&t=2s
https://engagevr.io/

36

Virtual Reality in games



Source: https://www.youtube.com/watch?v=MrNNOImQ2oo&t=794s

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Virtual Reality and input devices

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What is Augmented Reality?

With AR, users are able to interact with virtual contents in the real world, and are able to distinguish between them.

Benefits:
- Solving the issues with the use of mouse.
- Feeling the material we are touching.
- Seeing information everywhere.
- Seeing an object in its future location.

Source:
http://www.techtimes.com/articles/5078/20140406/augmented-reality-vs-virtual-reality-what-are-the-differences-and-similarities.htm
http://www.augment.com/blog/virtual-reality-vs-augmented-reality/

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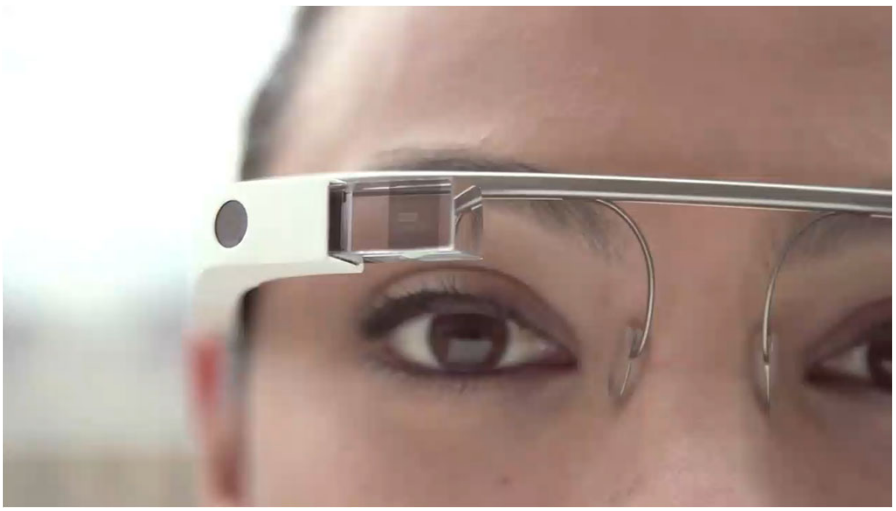
Augmented Reality as a replacement for smart phones



Source: https://www.youtube.com/watch?v=4EvNxWhskf8

40

Augmented Reality in your daily life

Source: https://www.youtube.com/watch?v=aYdB2xBNFek&t=14s

41

Augmented Reality as a replacement for your computer

Source: https://www.youtube.com/watch?v=ihKUoZxNClA

42

Augmented Reality for facilitating training and jobs

Source: https://www.youtube.com/watch?v=MbgL5XPFXAQ

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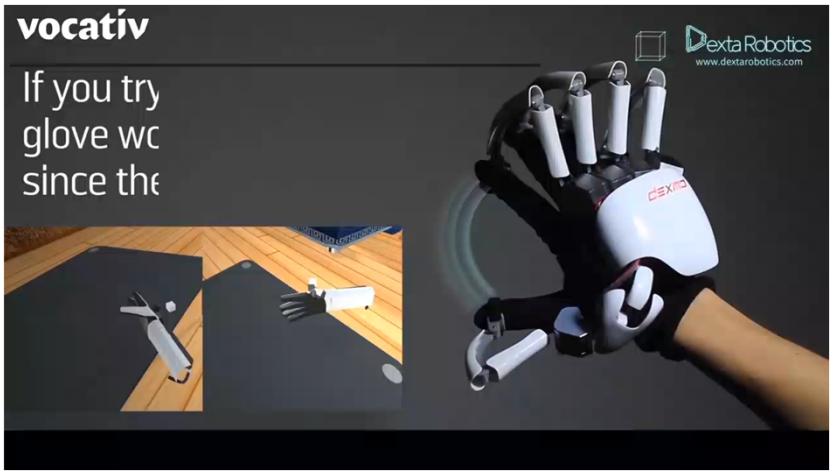
Haptic feedback gloves

These gloves let users to have a better interaction with objects in AR.



Source: https://www.youtube.com/watch?v=-3h2-D-0MYc

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Special User interface design principles for augmented and virtual reality

Discoverability: Giving users enough freedom to discover what all they can do with the platform.

Source: https://medium.com/web-ar/interaction-design-principles-for-augmented-reality-903a597ef4be

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Special design principles for Augmented Reality

Scalability: how well gestural interactions work on objects with different sizes.

Source: https://medium.com/web-ar/interaction-design-principles-for-augmented-reality-903a597ef4be

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Differences and similarities between AR and VR

Both virtual reality and augmented reality are similar in the goal of engaging users in a virtual world. With AR, users continue to be in touch with the real world while interacting with virtual objects around them.

But with VR, user is isolated from the real world while covered in a world which is completely fabricated.

Source:
http://www.techtimes.com/articles/5078/20140406/augmented-reality-vs-virtual-reality-what-are-the-differences-and-similarities.htm

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Motion sensing input devices

Source: https://www.youtube.com/watch?v=p2qlHoxPioM

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Usage of Motion sensing input devices

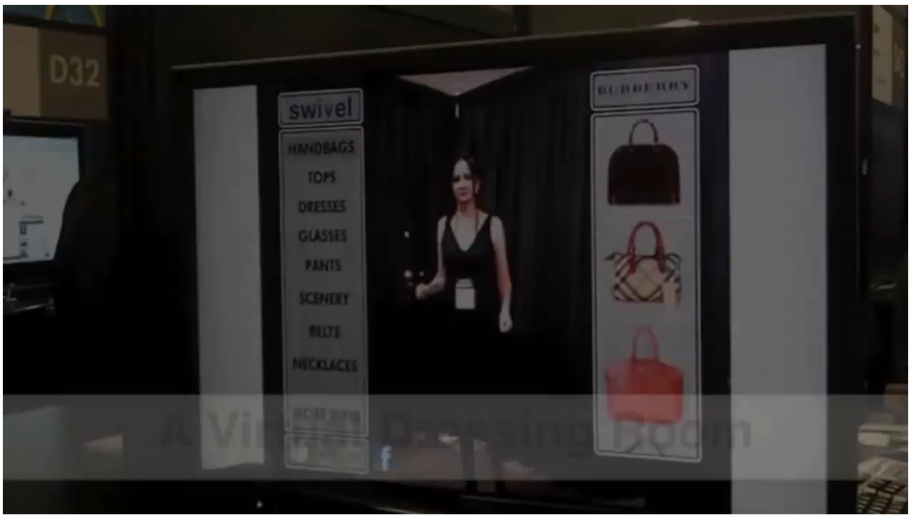
These devices can be used for:

- High quality 3D scans
- Video games
- Translate sign language
- Select information without being at the screen
- Convert any surface to a touch screen display
- Control Robots with body movement
- Virtual clothing fitting

Source: http://www.hongkiat.com/blog/innovative-uses-kinect/

49

Motion sensing input devices in fitting rooms



Source: https://www.youtube.com/watch?v=cb1ZKRdY2Fc

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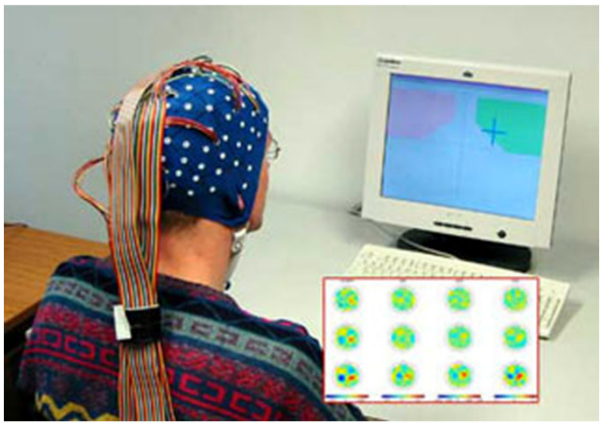
Brain-computer interfaces



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Brain-computer interfaces

Source: https://www.youtube.com/watch?v=7t84IGE5TXA

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Wearable devices

A prediction from 1981

- ✓ Smart watches
- ✓ Projector phones
- ✓ Foldable phones

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Smart watches that are replacement for mobile phones

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Skin Input

It is an input technology that uses bio-acoustic sensing to localize finger taps on the skin. When augmented with a projector, the device can provide a direct graphical user interface on the body.

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Smart devices

- Smart Speakers
- Smart home appliances
- Medical assistant
- Smart cars

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Smart speakers

Amazon Alexa

Apple HomePod

Google home

JBL Link View

57

Smart home appliances

58

Medical assistant

Source: https://www.youtube.com/watch?v=QjJ_GffiNEE

59

Smart Cars

Source: https://www.youtube.com/watch?v=aKed5FHzDTw

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Interface design considerations for smart devices

- Considering Users knowledge
- Simplify it as match as possible
- Considering screen size
- Avoid distracting users
- Adapt interface based on the device purpose.

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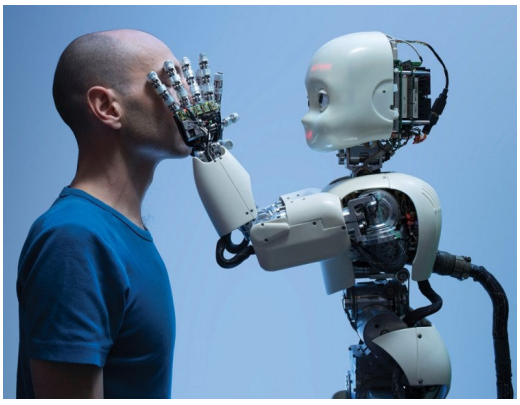
Robotics

- Robots usages:
  - Medical surgery
  - War
  - Space
  - Manufacturing
  - Helping human
- Robots can:
  - Recognize Images
  - Have speech interaction
  - Walk
  - Build / destroy
  - Mimic human behavior



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Robots that mimic human face gestures

Source: https://www.youtube.com/watch?v=W0_DPi0PmF0

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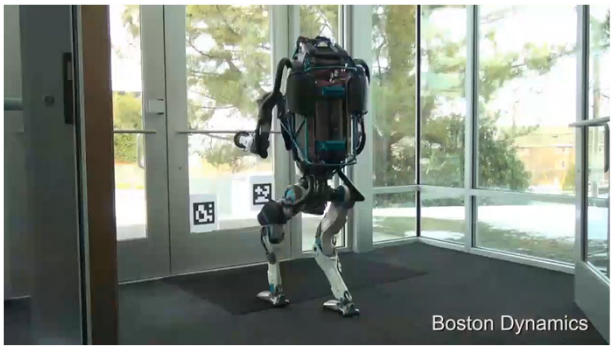
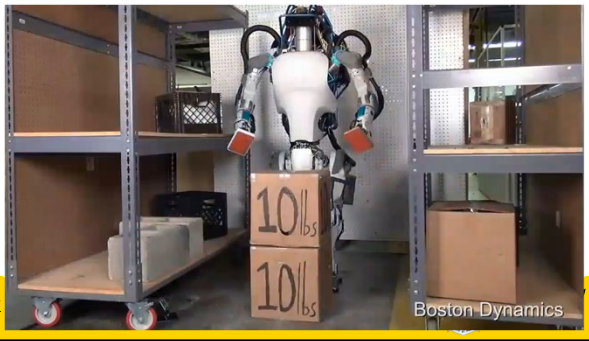
Walking robots with a good stability and balance





Source: https://www.youtube.com/watch?v=rVlhMGQgDkY

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Selecting an appropriate input and output method

In order to select an appropriate input and output method we should answer four questions:

1. What input method is appropriate for the target user? Considering their needs and limitations.
2. Is the selected input method appropriate for the task?
3. Is the selected input method appropriate for the environment?
4. What are the User experience goals?

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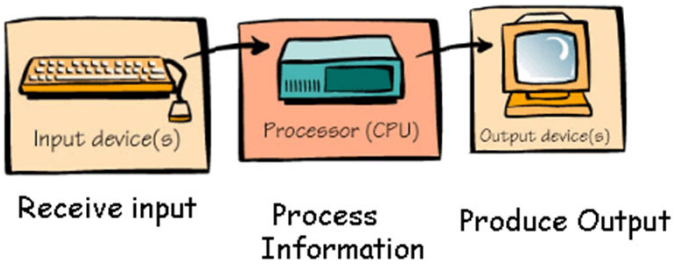
Special input methods to help users

It is about how we transfer users input to outputs that are useable for the users and how well we support natural input.



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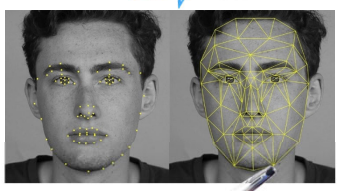
Some of the inputs are transformable

- Speech recognition
- Face recognition
- Eye tracking
- Handwriting to text
- Text to speech
- Brain signal to commands



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Ubiquitous computing and structuring its output

- Ubiquitous computing is about connecting electronic devices to communicate information. Devices that use ubiquitous computing have constant availability and are completely connected.
- Since in ubiquitous computing data comes from different sources the main concern is **how to filter the information for different usages?**

Source: https://www.techopedia.com/definition/22702/ubiquitous-computing
http://www.ubiq.com/hypertext/weiser/UbiHome.html

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Aggregating information by using dashboard

Dashboard helps users to get an overview of important information by showing a summary of the output of different information sources.

In dashboards, considering mapping principle is very important for arrangement of buttons around the screen.

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How can we increase users' input and engagement?

- Game inspired design
- Serious game
- Gamification

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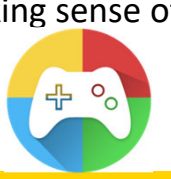
Game based designs

- **Game inspired design:** is a user interface that has games' artwork style.
- **Serious game:** is similar to normal games but they are developed with the purpose of training a concept to a specific group of users.
- **Gamification:** is about use of video game mechanics in non-game contexts to encourage and engage users in the context by making sense of playfulness and fun.



Source: Darejeh, A., & Salim, S. S. (2016). Gamification Solutions to Enhance Software User Engagement—A Systematic Review. *International Journal of Human-Computer Interaction*, *32*(8), 613-642.

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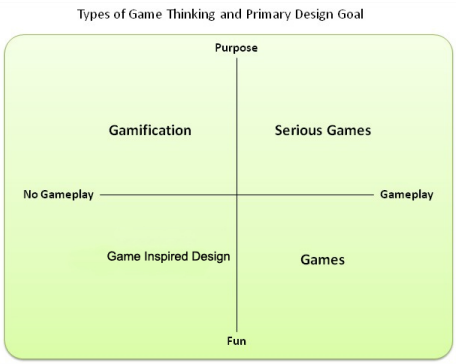
Difference between these techniques

Game Thinking, Broken down by design goal.

	Game Thinking	Game Elements	Game Play	Just for Fun
Game Inspired Design	●			
Gamification	●	●		
Serious Game / Simulation	●	●	●	
Game	●	●	●	●



Marczewski, 2013

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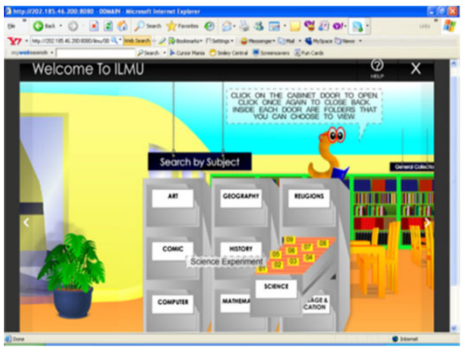
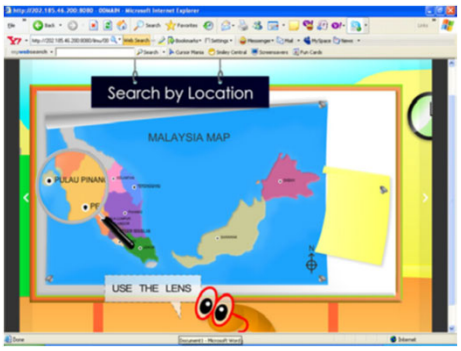
A sample of Game inspired design





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A sample of serious game in learning

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Different areas of using serious games

- Teaching Games
- Simulators
- Meaningful Games
- Purposeful Games

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Different areas of using gamification

- Human resource
- Health care and sport
- e-Learning
- Data collection
- Online community
- Software popularity

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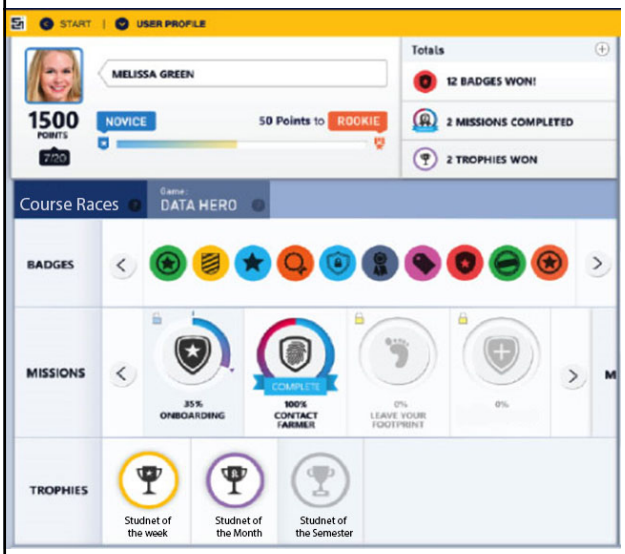

A sample of Gamification in learning

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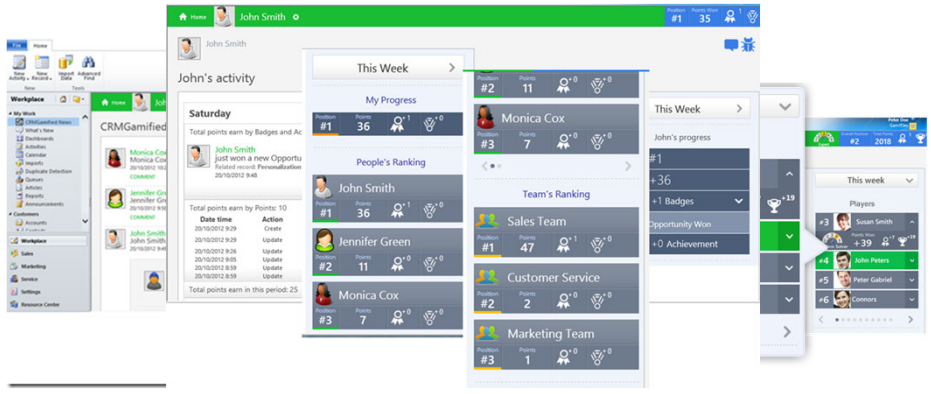
A sample of Gamification in a CRM systems



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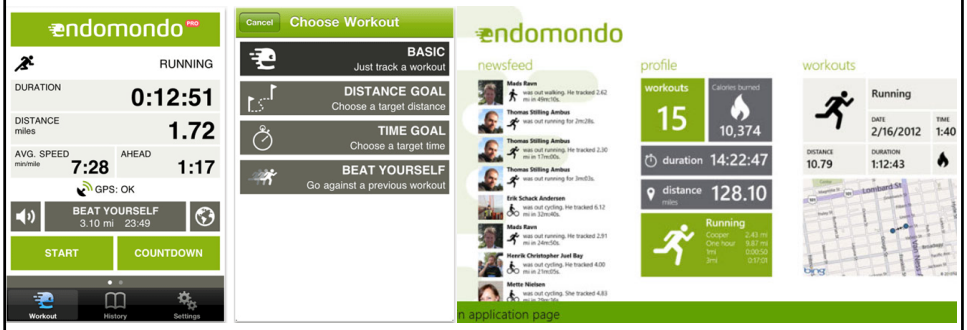
A sample of Gamification in sport



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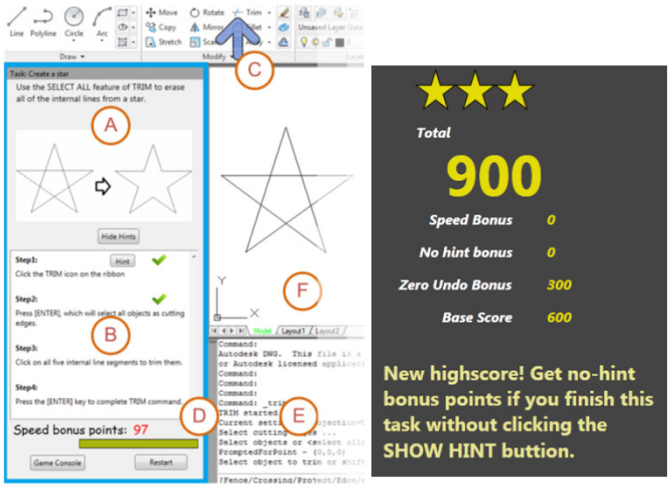
Gamification in AutoCAD



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Microsoft Ribbon hero

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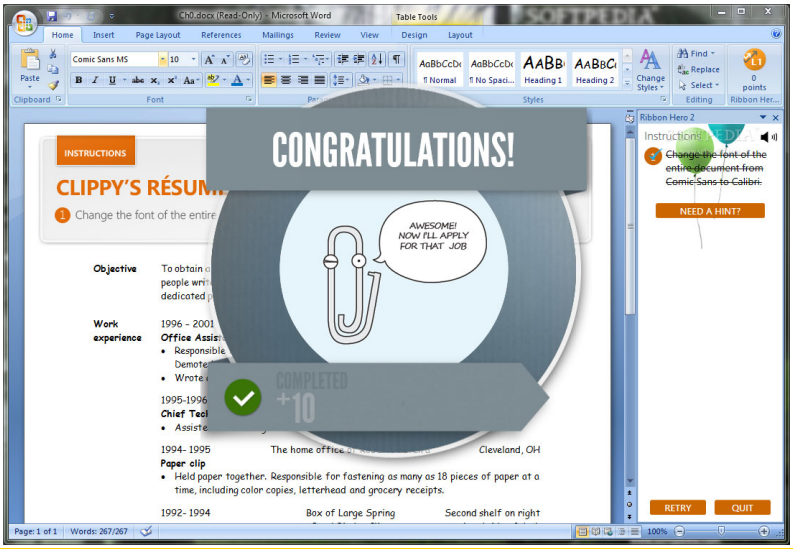
Microsoft Ribbon hero



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A sample of gamification in survey system

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Augmented reality and Gamification

Source: https://www.youtube.com/watch?v=ziHCvpikLh8&t=93s

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Summary

In this lecture we talked about:

- Usage of touch screen technologies in different devices such as Self-serve kiosks, Interactive displays, Smart boards, Home appliances, and Interactive Tables.
- New forms of displays including volumetric displays, and foldable displays.
- New technologies that can create new forms of interaction without using a normal display and controller including: Virtual Reality, Augmented Reality, Motion sensing input devices, Brain-computer interfaces.
- Wearable devices such as Projector phones, Foldable phones, Smart watches that can replace classic smart phones.
- Intelligent devices such as Personal assistants, Medical assistant and Smart cars.
- Robotics, its usages and types.
- Factors that should be considered to select an appropriate input and output method.
- Transforming different inputs to useful output.
- Ubiquitous computing and using dashboard to present its output in a meaningful manner.
- Using gamification to increase users' input and engagement.

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References

Preece, Jennifer, Helen Sharp, and Yvonne Rogers. Interaction design: beyond human-computer interaction. John Wiley & Sons, 2019.

Sharp, et. al., *Predictive Models*, Section 15.4, Beyond Human Computer Interaction, 2011

Raskin, J., *Quantification* Ch 4, The Humane Interface, 2000 (PG Reader)

John, B. E., Why Goms?, Interactions, 1995

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1

Quantification

Never Stand Still

Performance measurement methods

Human Computer Interaction - COMP3511/9511

By Ali Darejeh

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Adapted from slides by Dr Daniel Woo, Dr Cat Kutay and Dr Nadine Marcus

2

When performance measurement models are used in user interface design?

- When it is difficult to carry out testing by using real user.
- In analytical approach to user interface design.
- To develop predictive models of performance.
- For comparative evaluation of different systems.
- To solve problems such as the best placement and size of the objects.

3

What are the assumption about the imaginary users in Measuring Performance Models?

- Users have appropriate cognitive skill.
- They are expert users.

4

Models used in measuring performance

- Descriptive: Key-action model
- Predictive: Keystroke-level model (KLM)
- Predictive: Fitt's law

What are these models developed based on?

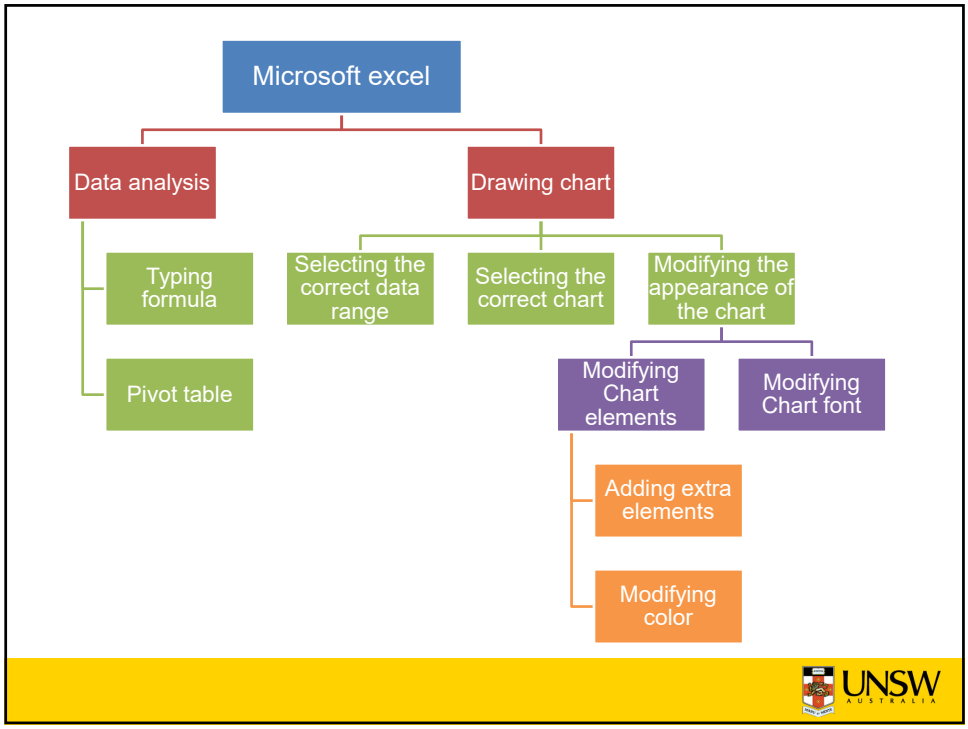
A. Hierarchical task analysis (HTA)
B. GOMS

5

What is Hierarchical task analysis (HTA)?

HTA method breaks down the task into sub components.

6



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What is GOMS?

GOMS provides a method to measure performance and compare different interface designs.

It breaks down tasks into:

1. a set of Goals
2. a set of Operators
3. a set of Methods for achieving the goals
4. a set of Selections rules

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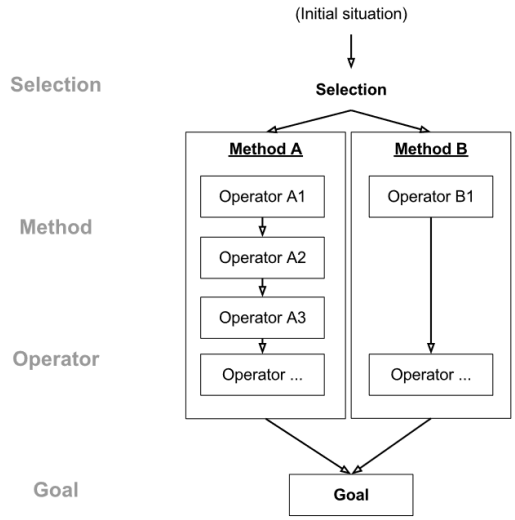
What is GOMS?



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Goals

Goal is what the user wish to achieve.

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Methods

Method is the sequence of steps required to reach the goal.
E.g.

Method for accomplishing goal of deleting a word using menu option:

Step 1. Recall that word to be deleted has to be highlighted
Step 2. Recall that command is "cut"
Step 3. Recall that command "cut" is in edit menu
Step 4. Accomplish goal of selecting and executing the "cut" command
Step 5. Return with goal accomplished

Method for accomplishing goal of deleting a word using delete key:

Step 1. Recall where to position cursor in relation to word to be deleted
Step 2. Recall which key is delete key
Step 3. Press "delete" key to delete each letter
Step 4. Return with goal accomplished

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Operators

Cognitive actions and processes that must be performed in order to satisfy the goal.

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Selection Rules

Rules for determining which method to choose when there is an alternative.

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Goal: delete a word in a sentence

Method for accomplishing goal of deleting a word using menu option:

Step 1. Recall that word to be deleted has to be highlighted
Step 2. Recall that command is "cut"
Step 3. Recall that command "cut" is in edit menu
Step 4. Accomplish goal of selecting and executing the "cut" command
Step 5. Return with goal accomplished

Method for accomplishing goal of deleting a word using delete key:

Step 1. Recall where to position cursor in relation to word to be deleted
Step 2. Recall which key is delete key
Step 3. Press "delete" key to delete each letter
Step 4. Return with goal accomplished

Operators to use in above methods:

Click mouse
Drag cursor over text
Select menu
Move cursor to command
Press keyboard key

Selection Rules to decide which method to use:

1: Delete text using mouse and selecting from menu if large amount of text is to be deleted
2: Delete text using delete key if small number of letters is to be deleted

Preece 2002

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Other forms

- There are other forms of GOMS that have been developed
- Natural GOMS Language NGOMSL
  - Based on Cognitive Psychology theories
- Cognitive Perceptual Motor GOMS CPM-GOMS
  - Represents dependencies of operators like a PERT chart

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Models used in measuring performance

- Descriptive: Key-action model
- Predictive: Keystroke-level model (KLM)
- Predictive: Fitt's law

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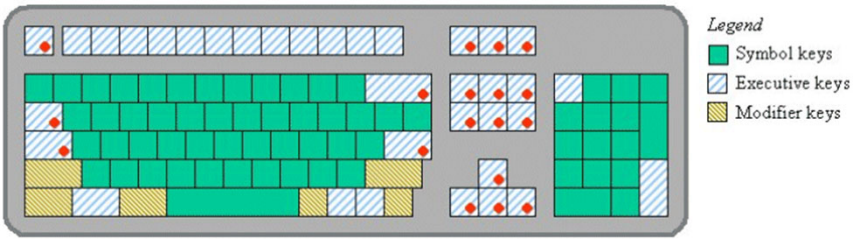
Key Action Model

- Key Action Model is a descriptive model.
- This model looks at how users interact with the interface using keyboard and what shortcut keys are used in the software.



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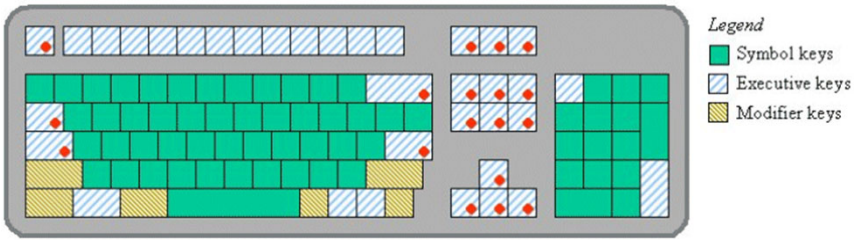
Keyboard buttons in Key action model

Based on Key Action Model, Keyboard buttons can be categorised into: Symbol keys, Executive keys and Modifier keys



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Keystroke Level Model

KLM is developed as a practical design tool to **predict the time to accomplish a task** using computer software.

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Advantages of KLM

- The KLM is designed to be a quick and easy to use system design tool.
- No deep knowledge of psychology is required to use it.
- Task times can be predicted without:
  - building a prototype.
  - testing on users, which can save time and money.

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How to use Keystroke Level Model?

- Defining a task.
- Selecting a method for performing the task.
- Knowing the command language of the system.
- Knowing skill parameters of the users.
- Knowing response time of the system.
- Calculating the execution time which is the sum of the times spent on executing different operators.

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Execution time

	Sec.	Description
K	0.2	Keying. The time to tap a key. Shift key is separate.
P	1.1	Pointing. Point to a position on screen. Moving the mouse
H	0.4	Homing the hand(s) between keyboard and pointing device.
M	1.35	Mentally preparing. Preparation time for the next step
B	0.1	Mouse button press or release.
R		Responding (computer). Waiting for the computer to respond.

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Example

Two different ways to delete a file for an average skilled user.

Method A: drag the file into the trash bin	Method B: use the keyboard key "Delete"
1.initiate the deletion (M) 2.find the file icon (M) 3.point to file icon (P) 4.press and hold mouse button (B) 5.drag file icon to trash bin icon (P) 6.release mouse button (B) 7.point to original window (P)	1.initiate the deletion (M) 2.find the file icon (M) 3.point to file icon (P) 4.press mouse button (B) 5.release mouse button (B) 6.move hand to keyboard (H) 7.press Delete key (K) 8.move hand back to mouse (H)
Total time	Total time
3P + 2B + 2M = 3*1.1 sec + 2*.1 sec+ 2*1.35 sec = 6.2 sec	P + 2B + 2H + K + 2M = 1.1 sec + 2*.1 sec + 2*.4 sec + .2 sec + 2*1.35 sec = 5 sec

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KLM for mobile tasks

- **Distraction:** A multiplicative operator that adds time to other operators.
- **Pinch:** A 2+ finger gesture commonly used to zoom out
- **Zoom:** A 2+ finger gesture commonly used to zoom in
- **Initial Act:** The action or actions necessary to prepare the system for use (e.g. unlocking device, tapping an icon, entering a password).
- **Tap:** Tapping some area of the screen to effect a change or initiate an action.
- **Swipe:** A 1+ finger or fingers are placed on the screen and subsequently moved in a single direction for a specified amount of time.
- **Tilt:** full rotation of the entire device.
- **Rotate:** A 2+ fingers are placed on the screen and then rotated d degrees about a central axis.
- **Drag**: A 1+ finger gesture in which fingers are placed on the screen and then moved to another location.

Rice, A.D.; Lartigue, J. W. (2014).

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Fitts Law (predictive)

Fitts Law **predicts the time required to move to a target area**.

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Fitts' Law

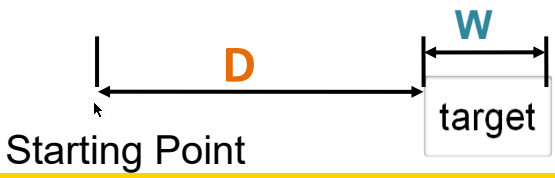
To predict the time, we use Shannon formulation.

MT = A + B * $\log_2$(D/W + 1)

D = distance between start and target

W = size of target

A is the intercept and B is the slope. They are constants that are determined empirically by regression analysis. For example, Raskin uses A=50, B=150.



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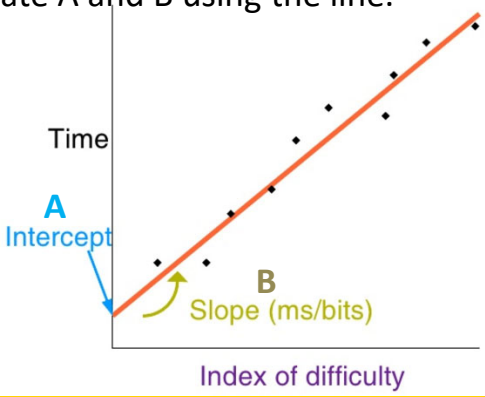
How to calculate A and B?

1. Use **$\log_2$(D/W + 1)** to calculate different duration based on different location of the target.
2. Add the results on a chart to draw a line.
3. Calculate A and B using the line.



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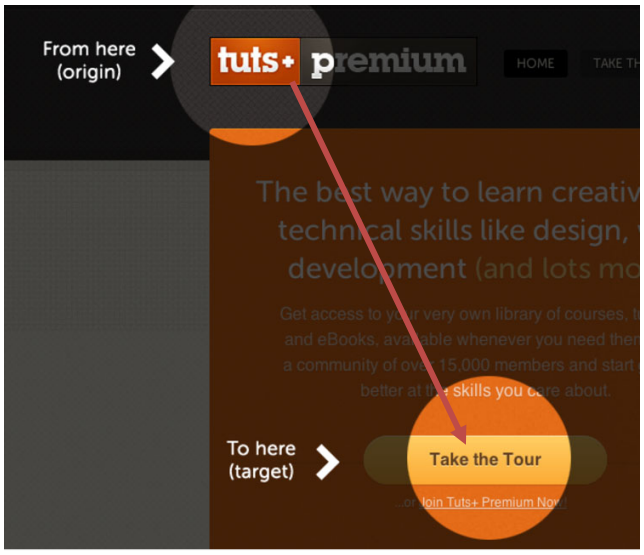

MT = A + B * $\log_2$(D/W + 1)

MT = 50 + 150 * $\log_2$(Distance from "tuts" to "Take the tour" button / button size + 1)

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Hints to decrease mouse move duration

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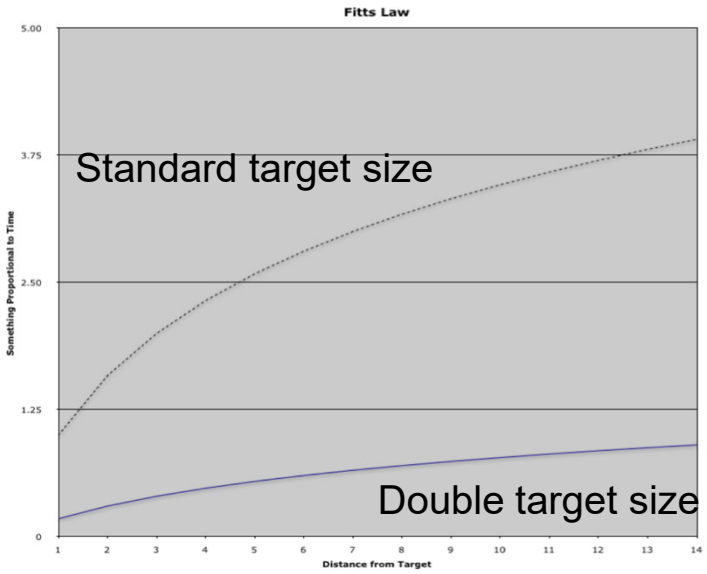
What is the effect of size on timing?



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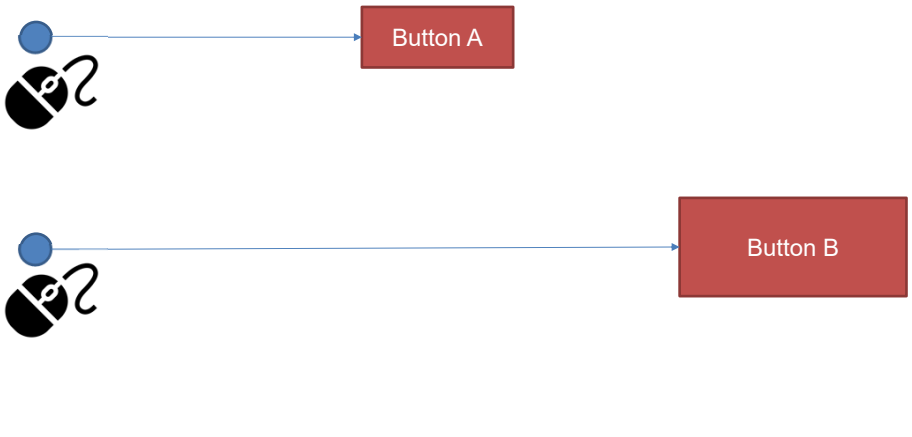
Which button is faster to click on?



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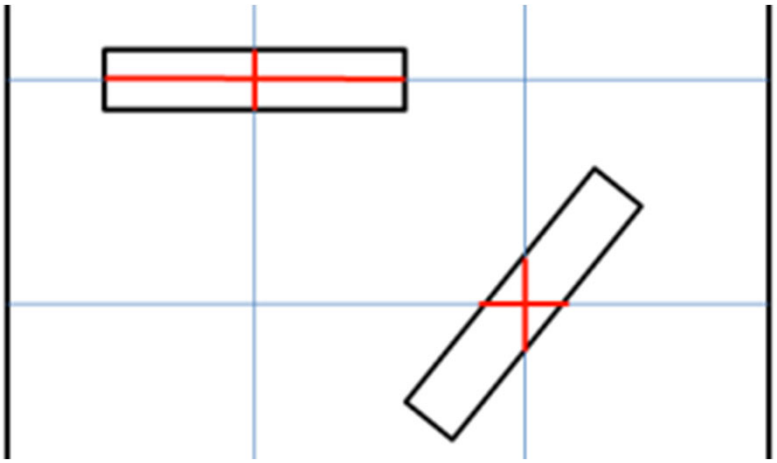
The effect of direction on timing



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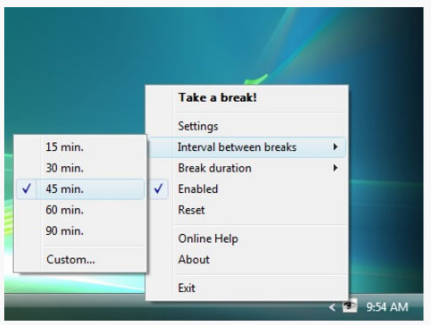
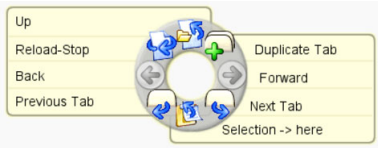
Using right clicks and pop-up menus





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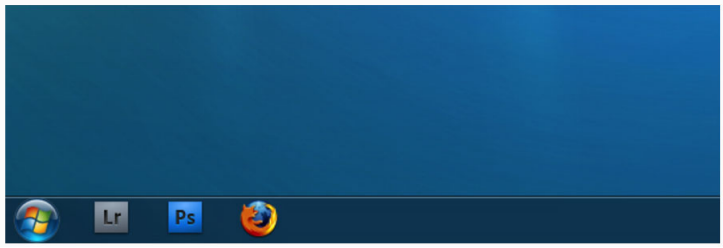
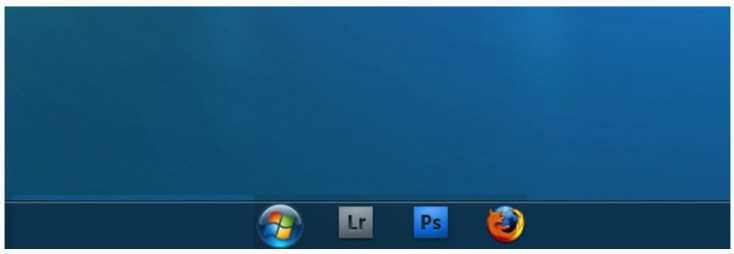
Limit the objects area

A



B



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Summary

- **Key Action Model** looks at how users interact with the interface using keyboard.
- **Keystroke Level Model** predicts the time to accomplish a task using a computer software.
- **Fitts' Law** predicts the time required to move to a target area.

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References

Preece, Jennifer, Helen Sharp, and Yvonne Rogers. Interaction design: beyond human-computer interaction. John Wiley & Sons, 2019.

Sharp, et. al., *Predictive Models*, Section 15.4, Beyond Human Computer Interaction, 2011

Raskin, J., *Quantification* Ch 4, The Humane Interface, 2000 (PG Reader)

John, B. E., Why Goms?, Interactions, 1995

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Social & Collaborative Computing

Never Stand Still

Human Computer Interaction

COMP3511/9511 – T2, 2020

Dr Gelareh Mohammadi

Aims

- Social interaction
- Social computing
- Collaborative computing
- Crowd computing

Social Interaction

Humans are social creatures by nature

Social Interaction

As social beings, we are sensitive and responsive to social cues.

What do you think about this picture? What is the context? What is the relationship? What is happening?

Image from: Vinciarelli et. al, “Social signal processing: Survey of an emerging domain”, 2009.

Social Interaction

What is social interaction?

What are the elements of social interaction?

How do people communicate with one another or non-humans?

How to study social interactions?

Social Interaction

"Social interaction is the process by which we act and react to those around us. In a nutshell, social interaction includes those acts, people perform toward each other and the responses they give in return."

by Kimberly Moffitt

Elements of Social Interaction

- Social context
- Social roles/status
- Social norms
- Social communication
- Social perception
- Personal characteristics
- Cultural issues

Social Interaction: Context

Social context refers to the immediate physical and social setting in which people live or in which something happens or develops [1] and will affect our social interaction.

- Family
- Friends
- Education
- Work
- …

[1] Bazire M, Brézillon P (2005) Understanding context before using it. In: Context, pp 29–40

Social Interaction: Status/Roles

Social status is the relative rank that an individual holds, with attendant rights, duties, and lifestyle, in a social hierarchy based upon honour or prestige.

Ascribed status	Achieved status
• Age • Sex • Race • Family relationship • …	• Education • Occupation • Marital status • Accomplishments • …

Social Interaction: Status/Roles

Roles are the behaviours expected of people in a certain status. Regardless of our individual differences, if we are in a certain status, we are all expected to behave in a way appropriate to that status. Roles thus help make social interaction smooth and possible. [1]

- Child & Parent
- Students & teachers
- Shopper & cashier
- …

[1] Barkan, S. "Sociology: Understanding and changing the social world", Book

Social Interaction: Norms

Social norms are informal understandings that govern the behaviour of members of a society. [1]

- Shaking hands
- Eye contact with the person you are talking to
- Avoid racist comments
- If there is a queue, go at the back of the line
- …

[1] Marshall, G. "*Oxford Dictionary of Sociology*"

Social Interaction: Communication

Communication is the act of conveying meaning from one entity or group to another through the use of mutually understood signs and semantic rules. [1]

[1] Huawei Technologies Co., Ltd. (2016) Network Communication Fundamentals. In: Huawei Technologies Co., Ltd. (eds) HCNA Networking Study Guide. Springer, Singapore

Communication Types

Verbal: conveys the message or information through using language and it can be in different forms:

- Text
- Voice
- Audio visual
- …

Communication Types

Non-verbal: conveys the message or information through non-linguistic representations like:

- Facial expression
- Body gestures
- Postures
- Eye-gaze
- Vocalization
- Clothing
- …

Social Interaction: Perception

Forming impression about others dispositions and intentions.

- Emotions
- Personality
- Mood
- Belief
- Behavior
- …

Social Interaction: Personal Characteristics

Our personal and social characteristics:

- Personality
- Mood
- Emotions
- Belief
- Behavior
- …

Social Interaction: Cultural issues

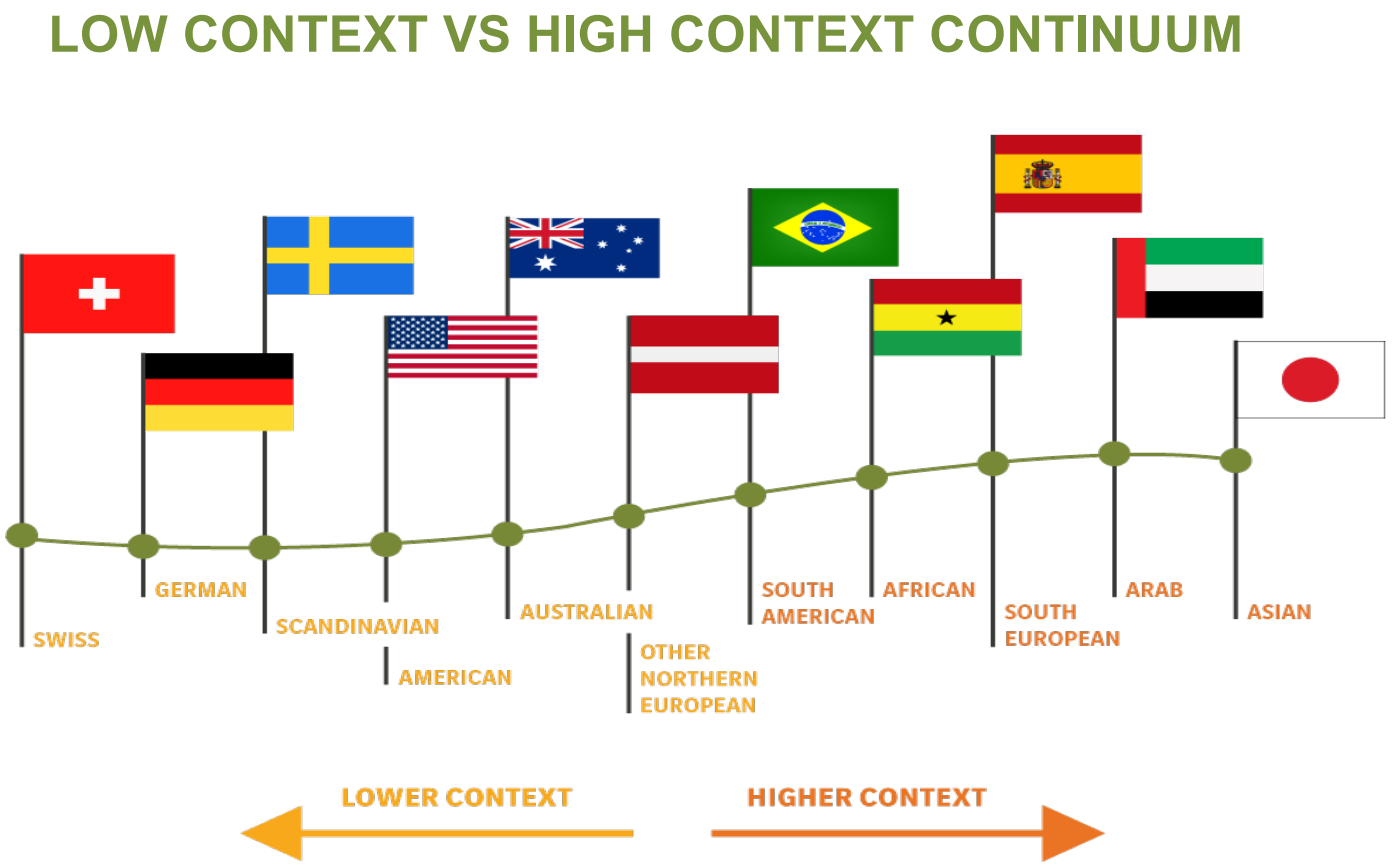
- People speak with different languages
- Not all norms are universal
- People use different signs/signals in different cultures

Culture Types

For example there are two types of cultures:

- High-context: relies heavily on nonverbal communication and deep cultural knowledge to convey meaning.
- low-context: depends largely on words themselves.

Culture Types



From: https://online.pointpark.edu/business/cultural-differences-in-nonverbal-communication/

Studying Social Interaction

- Why study social interaction?
- What's the purpose?
- How it relates to HCI?

Studying Social Interaction

"The study of social interaction involves the careful assessment of the practices of everyday communicating between people in various real-life situations."

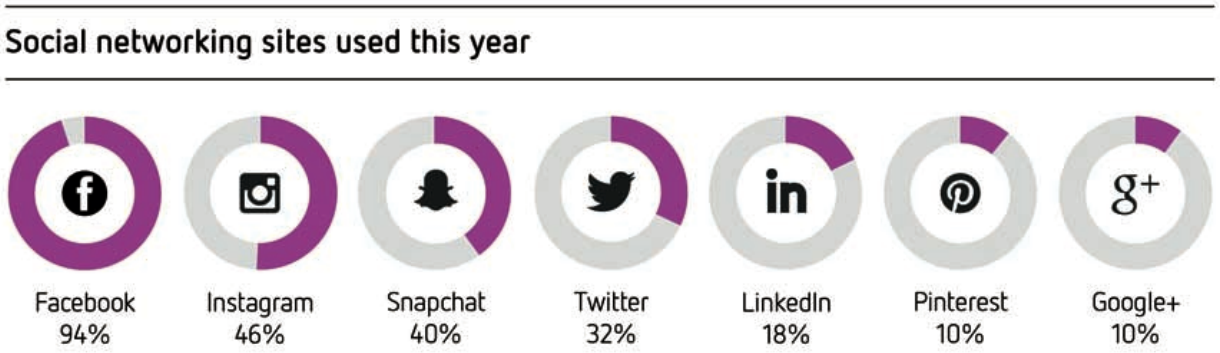
From "Social Interaction" by Valerie Manusov

Studying Social Interaction

Because social interactions are not limited to only face-to-face interactions anymore. Technology has introduced different mediums to connect people together. To design effective and efficient systems we need to study and apply the rules of natural social interactions.

Social Media (2018 Yellow Social Media Report)

- 79% of Australians use social media
- 59% access social media every day / most days
- 57% first thing in the morning



- 63% check in to social media while watching TV
- 85% use to catch up with family / friends, 46% to share photographs or videos & 34% for news and current events

[1]: https://www.sensis.com.au/about/our-reports/sensis-social-media-report

Social Media: Emergence

- Pervasive computing devices
- Widespread internet access
- Portable computing devices
- Greater need for remote communication and collaboration

Social Computing

Social computing revolves around the ways that computing can be used to support social interactions, connecting people together, facilitating collaborations & potentially predict social outcomes.

Social Computing

A multi-disciplinary field:

- Computing
- Social psychology
- Communication science

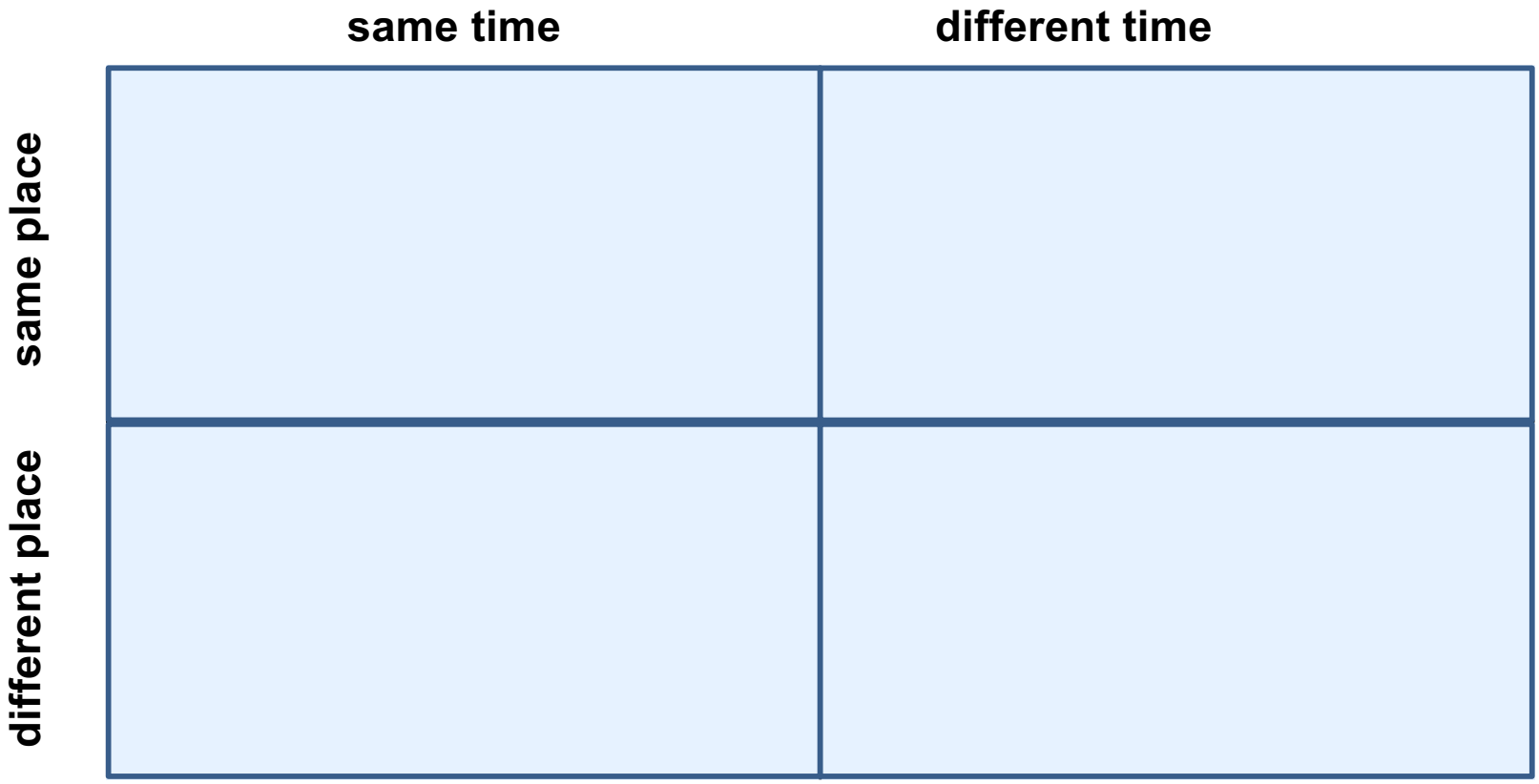
Social Computing Questions

How to develop technologies/systems that

- work in harmony with social norms?
- comprehend social context?
- recognize social roles/status?
- understand social communication?
- predict potential outcome(s)?

Social Computing

Social interactions in time and space



From Scott Klemmer lecture notes

Examples: Same time, same place

[1] Kinect Xbox 360

[2] Microsoft surface

[3] Clickers

[1] https://thenextweb.com/microsoft/2011/07/08/microsoft-surface-sdk-2-0-due-july-12/
[2] https://www.giantbomb.com/kinect-adventures/3030-31704/images/
[3] http://teachingcenter.wustl.edu/2016/05/integrating-active-learning-with-clickers-tips-from-a-faculty-workshop/

Examples: Different time, same place

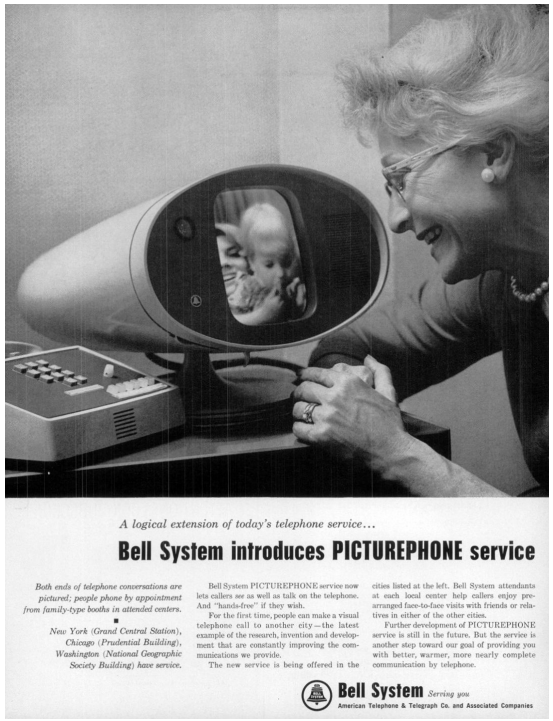
[1] Stock market displays

[2] Airport display *(Mark Mulville/Buffalo News)*

[1] https://www.istockphoto.com/au/videos/stock-market?sort=mostpopular&offlinecontent=include&phrase=stock%20market

[2] https://buffalonews.com/2015/12/23/todays-day-travel-reunite/

Example: Same time, different place



[1] first video call, 1964

[2] HP Halo

[3] WhatsApp

[4] Viber

[5] WeChat

[1] https://www.pinterest.com.au/pin/514536326153669830/

[2] http://www.hp.com/hpinfo/newsroom/press_kits/2008/halo/products.html

Example: Different time, different place

[1] Social Media app

[2] Email Platforms

Social networks: Facebook, Twitter, Google+, …
Blogging networks: Tumblr, Medium, …
Image networks: Instagram, Flicker, Pinterest, Snapchat, ...
Video networks: YouTube, Vimeo, …
Audio/music networks: Soundcloud,…
Professional Networks: Linkedin, …
Social forums: Quora, Reddit, …

[1] https://videohive.net/item/social-media-links/20067721
[2] https://fastsms.co.uk/blog/fastsms-email-to-sms-brochure.html

Social Computing: Ongoing Challenges

1. Understanding context (e.g. shared calendar)
2. Understanding roles/status (e.g. Facebook friends)
3. Following norms (e.g. doctor/patient relationship)

Social Computing: Ongoing Challenges

4. Making communication (e.g. Alexa)
5. Reading social cues (e.g. emotion & recommender systems)
6. Understanding cultural differences

Example: Some Solutions

- Emoticon (social cues)
- Natural Language Processing (communication)
- Hashtags (social context)
- Online/offline status (social norms)

Example: Some Solutions

- Automatic emotion recognition (social cues)
- Automatic sentiment analysis (social cues)
- Automatic mood recognition (social cues)
- Automatic personality recognition (social cues)

Collaborative Computing

Collaborative computing is a subgroup of social computing and it "focuses on group rather than individual problem solving and decision-making tasks necessary to accomplish business and scientific objectives. It provides an environment in which people can share information without the constraints of space and time. [1] "

[1] Sharma, K. J., "Collaborative computing", 1995

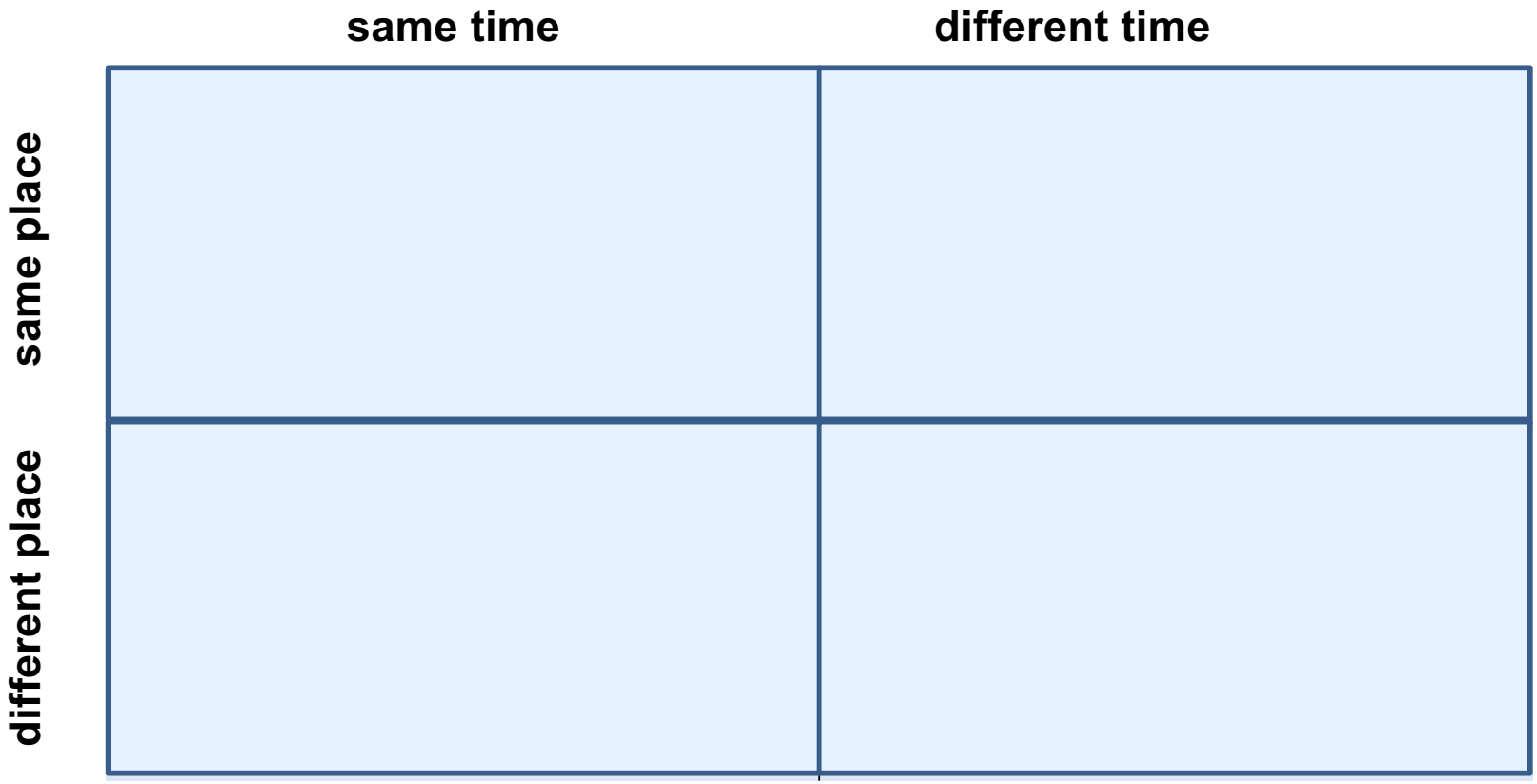
Collaborative Computing Questions

In collaborative computing the questions are how to develop a systems or technologies that:

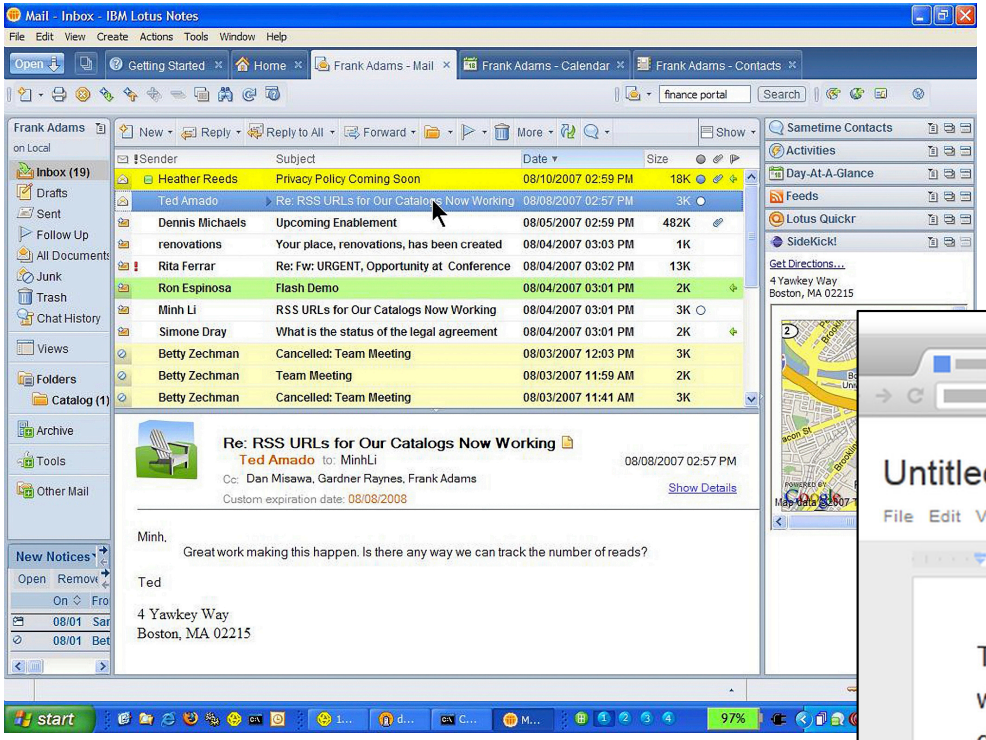
- facilitate groupwork?
- Increase efficiency and productivity?
- Support informed decision making?

Collaborative Computing

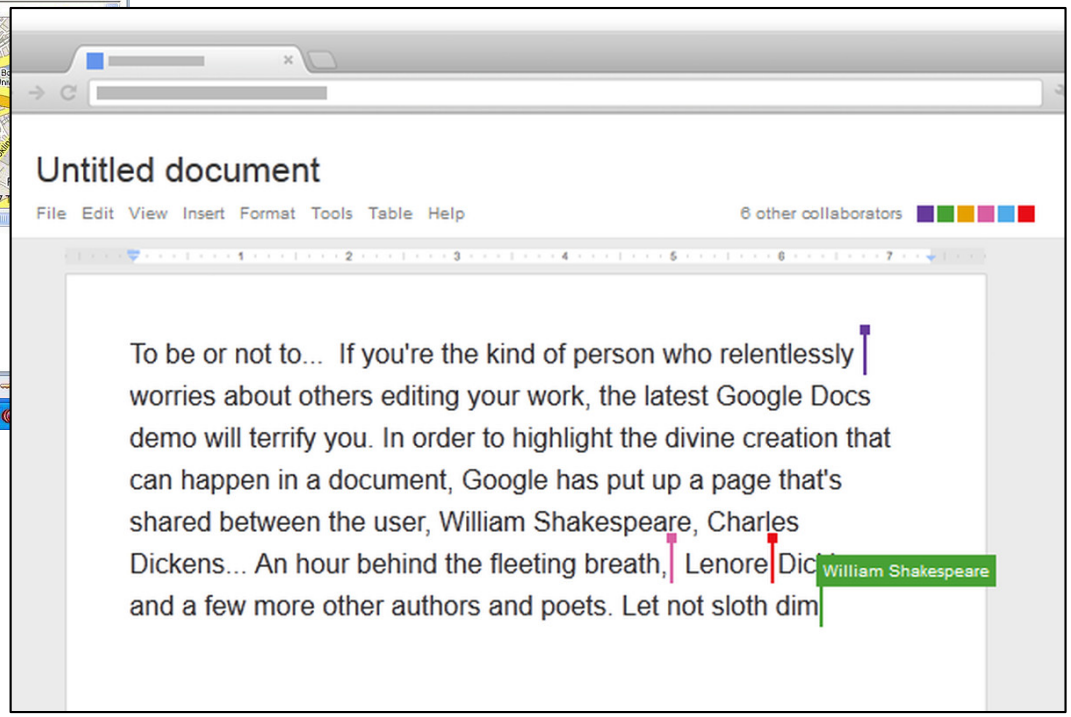
Collaborative computing across time and space



Collaborative Computing: Examples



[1] IBM Domino

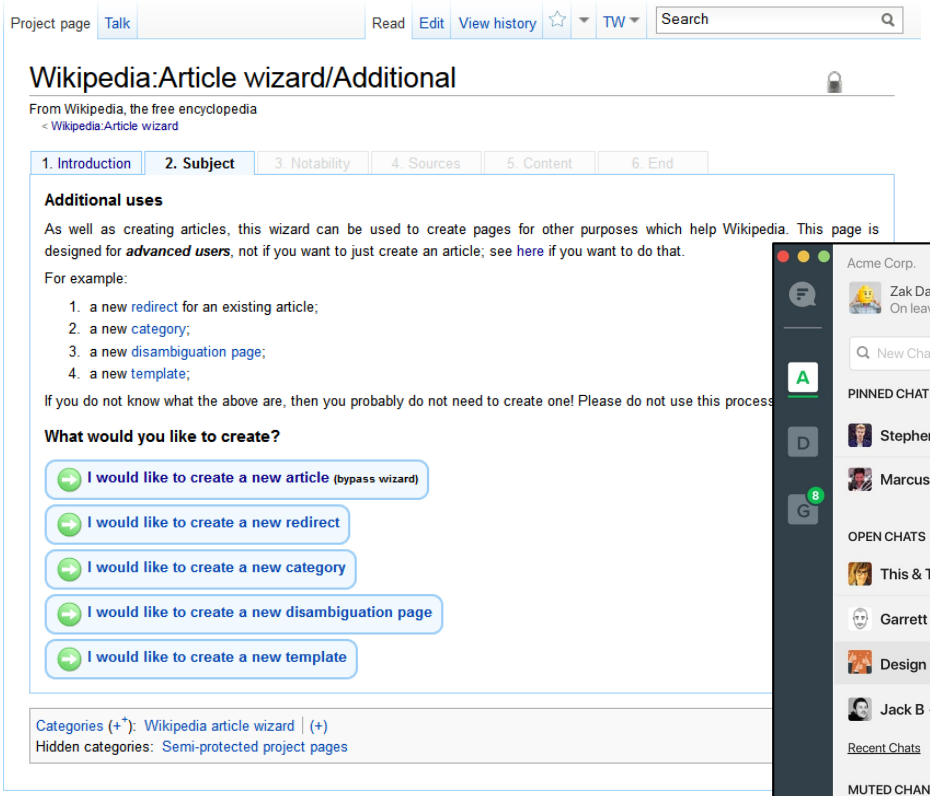


[2] Google Docs

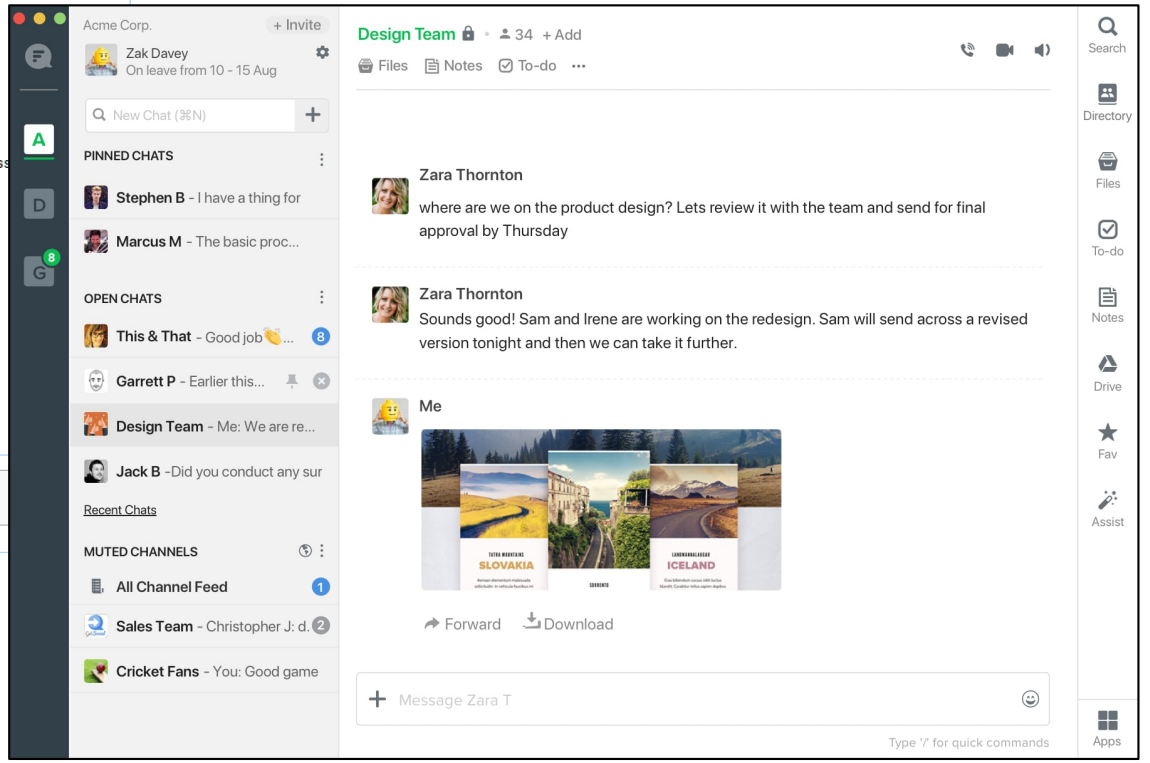
[1] http://www.falsepositives.com/index.php/2007/08/17/lotus-notes-and-domino-8-now-shipping/

[2] https://www.theverge.com/2012/7/11/3152468/google-docs-demo-masters-edition-author-collaboration

Collaborative Computing: Examples



[1] Wikipedia



[2] Flock

[1] https://en.wikipedia.org/wiki/Wizard_(software)
[2] https://flock.com/indexe/?utm_expid=.K6ynX0_cQ1u4kPZKHUiMkA.2&utm_referrer=https%3A%2F%2Fwww.google.com.au%2F

Collaborative Computing

- Benefits:
  - Flexible working (time/place)
  - Leverage of distributed talents
  - Increasing productivity
- Challenges:
  - Building trust
  - Quality
  - Coordination mechanisms
  - Social translucence (awareness)

Social & Collaborative Computing

So, what's next?

Crowdsourcing

"is a form of distributed work where tasks that are hard for computers to do, are handled by large numbers of humans distributed across the internet."

Example: the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call.[1] "

[1] Mack, S, 'Faces in the Crowd: Interview Series Part I', 2006.

Crowdsourcing

- History
  - Wisdom of crowd (by James Surowiecki, 1907)
  - You need a large number of independent estimates for the wisdom of crowd to be effective
  - The term “Crowdsourcing” comes from Jeff Howe, 2006
  - Aggregation of independent estimate can be really effective for prediction

Crowd Computing

"Understand the ways in which systems of human intelligence across the globe and social networks can work together as efficiently as a giant machine. These systems result in new behaviors, and will prove useful as intermediaries between human intelligence and technological forms used by humans. [1]."

[1] T. Ali, M. Gheith and E. S. Nasr, "Socially intelligent computing — A survey of an emerging field for empowering crowd," *Informatics and Systems*, 2014.

Crowd Computing

"Crowd computing empowers computer systems by utilizing humans' perception, and their ability to solve non-algorithmic problems. In this approach, a group of humans are asked to contributively solve a problem that cannot be solved easily by individuals, or perfectly by computers."

Why crowd computing?

computers are very fast and accurate, but they can not understand the world around them as good as humans. On the other hand, humans understand the world, but they can not process as fast and accurate as computers.

Challenges:

- Cost
- Participants with different levels of expertise
- Erroneous decisions
- Speed
- Integration of collected knowledge

Crowd Computing Example

- Creation: e.g. Wikipedia or open-source soft-wares
- Standby human resources: e.g. “Rent a Coder”
- Collective intelligence: e.g. Amazon Mechanical Turk, CrowdFlower, oDesk, CAPTCHA
- R&D: e.g. InnoCentive

Suitable Problems for Crowd Computing

- It should be divisible into several independent sub-problems.
- Non-solvable by machines, but could be solved by a regular human
- Solving the main problem using a small group of expert people should be costly.
- There should be a feasible method to integrate the sub-solutions.

Social & Collaborative Computing

Major goals:

- Develop better social software to facilitate interaction and communication among groups of people as well as between people and computers/machines
- Computerize aspects of human society
- Forecast the effects of technologies on social and cultural behavior.

Social & Collaborative Computing

Major application areas:

- Computer-supported online communities
- Intelligent entities in interactive entertainment
- Business & public sector applications
- Forecasting systems

Take-home

To come up with an efficient social technology, you have to adopt the social rules that work well in face-to-face interactions and keep things as flexible as possible (not too much structure).

Question?