IN PARTNERSHIP WITH PLYMOUTH UNIVERSITY

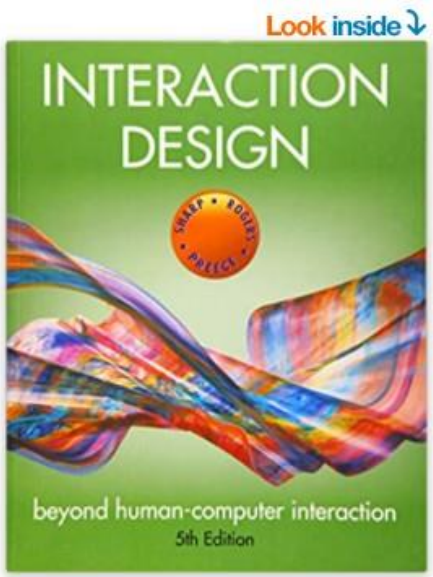
PUSL3122 HCI, Computer graphics and visualisation

About the PUSL3021 module ..

- HCI
- Computer graphics
- Visualisation

COURSE TEXT? COVERS ≈ 50% OF COURSE

Computing & Internet › Programming › Interface Design



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Interaction Design: Beyond Human–Computer Interaction Paperback – 10 May 2019

by Helen Sharp (Author), Jennifer Preece (Author), Yvonne Rogers (Author)

★★★★½ 78 ratings

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A new edition of the #1 text in the human computer interaction field!

Hugely popular with students and professionals alike, the Fifth Edition of *Interaction Design* is an ideal resource for learning the interdisciplinary skills needed for interaction design, human-computer interaction, information design, web design, and ubiquitous computing. New to the fifth edition: a chapter on data at scale, which covers developments in the emerging fields of 'human data interaction' and data

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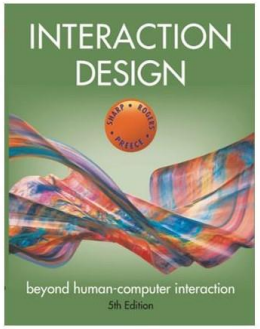
ISBN-10	ISBN-13	Edition	Publisher	Publication date	Language

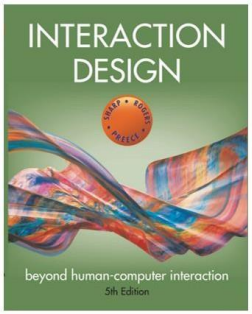
TOPICS COVERED THIS LECTURE (LECTURE 1)

- Interaction design, User experience, User experience goals, design principles
- IxD activities: **Discovering** requirements, **Designing** alternatives, **Prototyping and Evaluating**
- This part of the module is taken from the main text book for the module, the latest release from 2019. This lecture focuses on chapters 1 and 2.



Chapter 1

WHAT IS INTERACTION DESIGN?



Chapter 2

THE PROCESS OF INTERACTION DESIGN

WHAT IS INTERACTION DESIGN?

- Interaction Design (IxD) defines the **structure** and **behaviour** of interactive systems. Interaction designers strive to create **meaningful relationships** between **people** and the **products** and **services** that they use, from computers to mobile devices to appliances and beyond. Our practices are evolving with the world.

The Interaction Design Association @ ixda.com

- It is the “design of spaces for **human communication** and **interaction**.”

Winograd, T. (1997). The Design of Interaction. In Beyond Calculation: The Next Fifty Years of Computers, Denning, P.J. & Metcalfe, R.M. (Eds.) Copernicus, New York, pp. 149-161.

- It is designing “**interactive products** to support the way **people** communicate and interact in their **everyday** and **working** lives.”

Sharp, H., Roger, Y., & Preece, J. (2019). Interaction design: beyond human-computer interaction

THE GOOD, THE BAD …

- How **many** of the interactive devices that you use are **easy**, **effortless** and **enjoyable**?

- On the **positive** side we have
  - Smartphones
  - iPads
  - Satellite navigation systems
  - The ribbon in MS products
    - Note it started out over there
- On the **negative** side we have
  - SharePoint
  - In-house software systems
  - Self checkouts in shops where understanding where the scales are located is like a game of hide and seek

BAD DESIGNS

- Lift controls and labels **vary a lot**, so it is **easy to push the wrong button** by mistake.

https://uxdesign.cc/analyzing-elevator-controls-using-nielsen-normans-usability-heuristics-53e385fa8003

- People would not make the same mistake for the controls in the last example. Why not?
- Another good example of bad design is drakes circus lifts – have you ever got out at the wrong one?

WHY IS THIS VENDING MACHINE SO BAD?

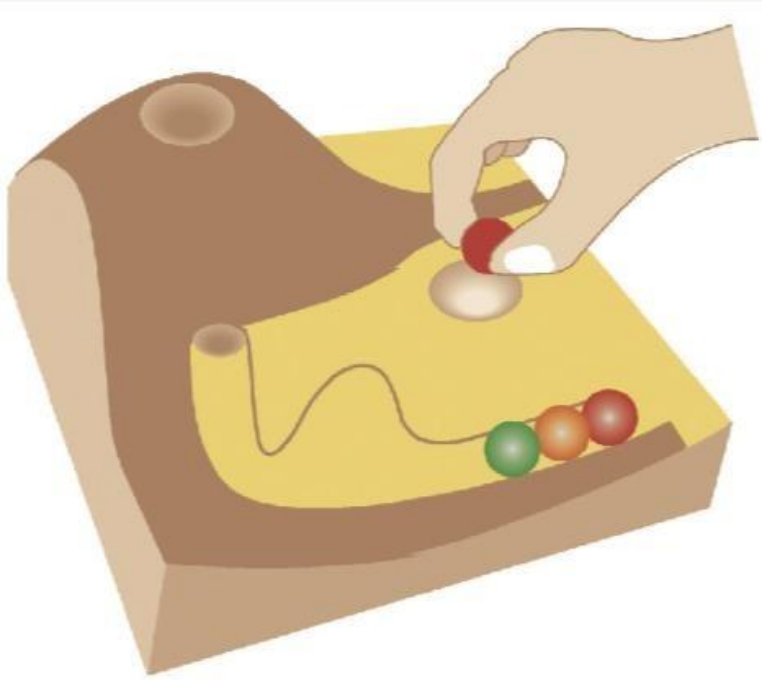
www.baddesigns.com (accessed 18/11/20)

- Need to push button **first** to **activate reader**
- Normally **insert money first** before making **selection**
- Contravenes **well known** convention

GOOD DESIGN

- This is a classic: like ‘hello world’ is to programming
- Marble answering machine (Bishop, 1992)
- Based on how everyday objects behave
- Easy, intuitive, and a pleasure to use
- Only requires one-step actions to perform core tasks

Durrell Bishop's answerphone: vimeo.com/19930744



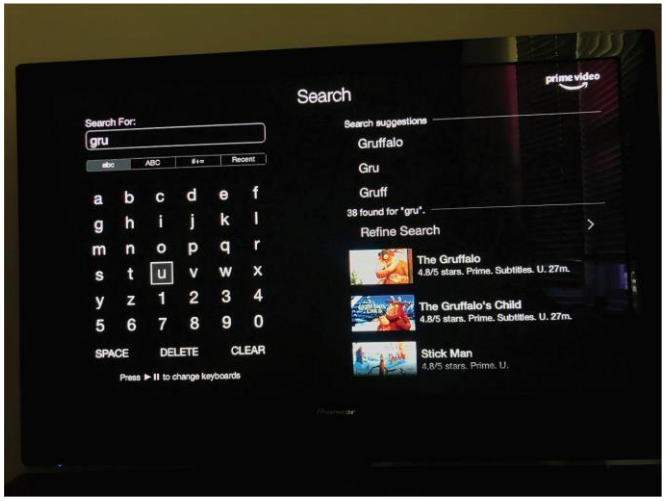
GOOD DESIGN – THE TIVO REMOTE

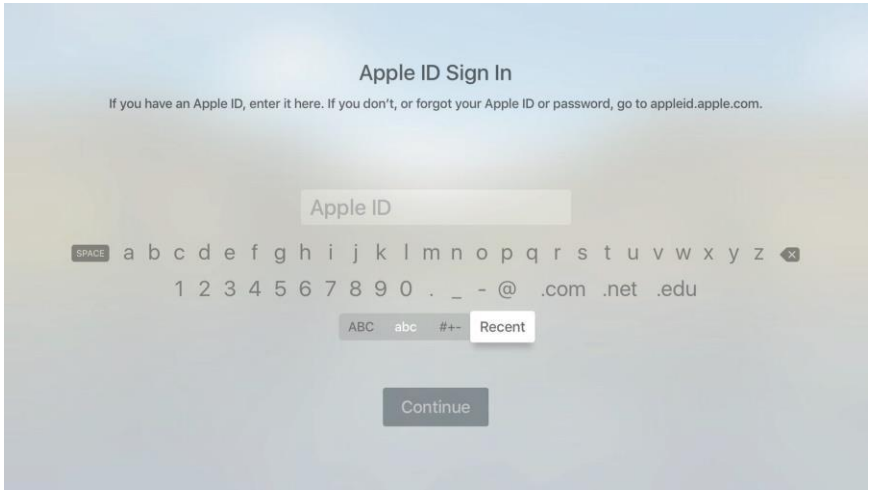
- Why was the TiVo remote so successful compared to standard remote controls?
  - **Peanut shaped** to fit in hand
  - Logical layout and **colour-coded**, distinctive buttons, **Easy-to-locate** buttons
- What did TiVo do differently?
  - They took **time** and **effort** to follow a user-centred design process. They **involved** potential **users throughout** the design progress getting feedback
  - Avoided “buttonitis”- where teams overwhelm users with a button for everything
  - They received **design awards** for the design.

Click here for the story of a peanut

DILEMMA

- **Which is the best** way to interact with a smart TV? **Why**?
  - **Pecking** using a grid keyboard via a remote control
  - **Swiping** across two alphanumeric rows using a touchpad on a remote control
  - **Voice** control using remote or smart speaker





WHAT TO DESIGN

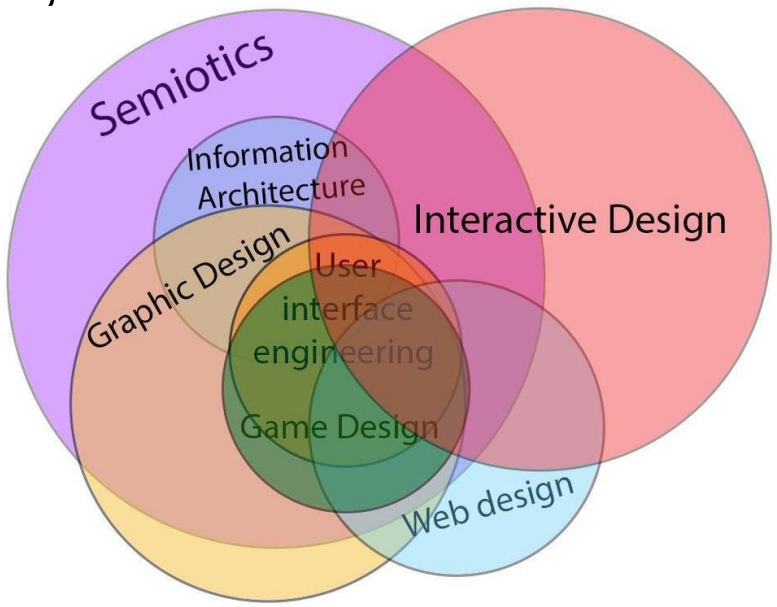
- Need to **take into account**:
  - **Who** the users are
  - **What** activities are being carried out
  - **Where** interaction is taking place
- Need to **optimize the interactions** users have with a product:
  - So that they match the users' activities and needs

Goals of interaction design

- Develop **usable** products
  - Usability means easy to learn, effective to use, and provides an enjoyable experience
- **Involve users** in the design process

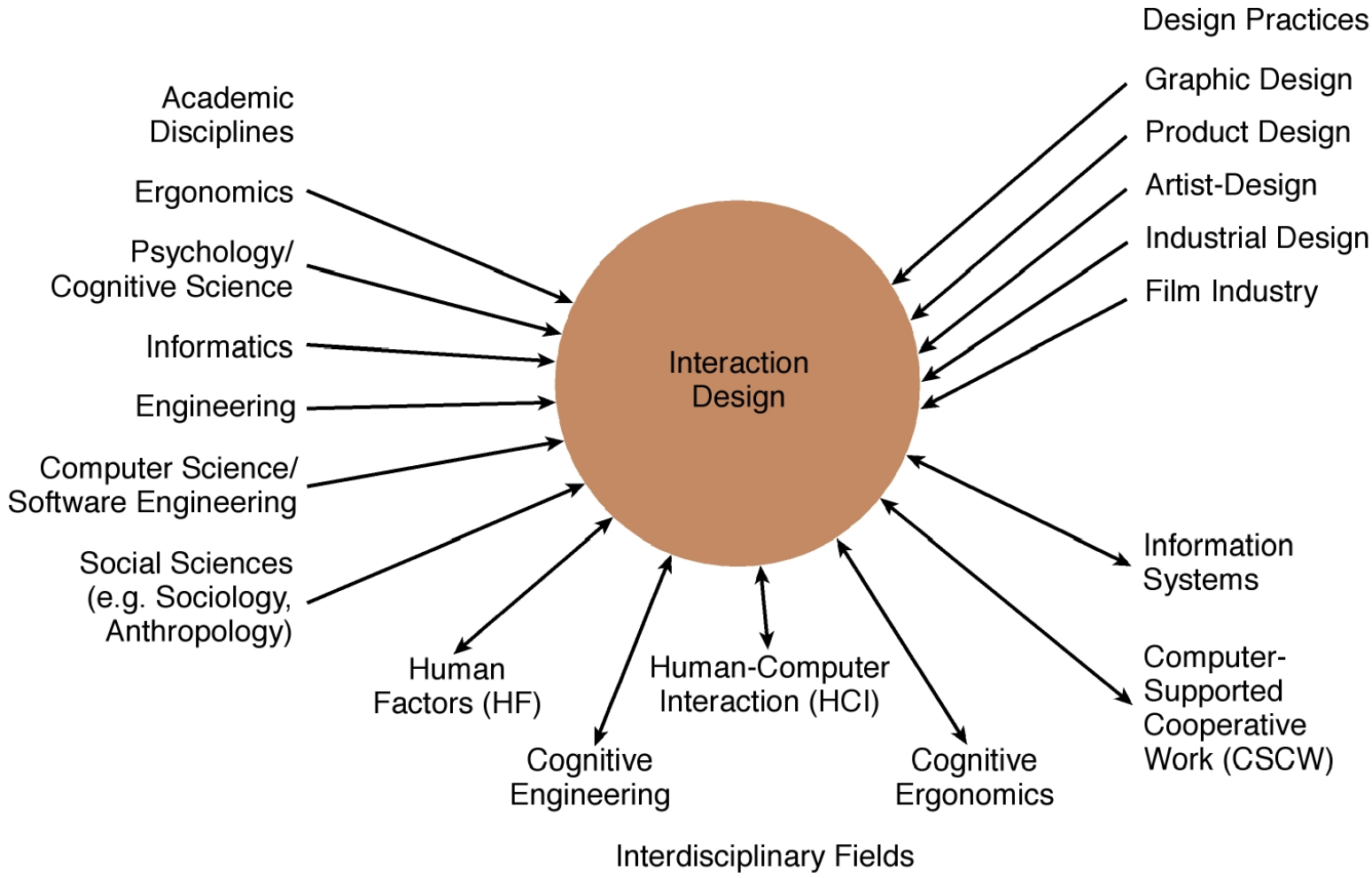
WHICH KIND OF DESIGN?

- Number of **other terms** used emphasizing what is being designed, for example:
  - User interface design, software design, user-centred design, product design, web design, experience design (UX)
- Interaction design is **the umbrella term** covering all of these aspects:
  - Fundamental to all disciplines, fields, and approaches concerned with **researching** and **designing** computer-based systems **for people**



https://en.wikipedia.org/wiki/Interactive_design#/media/File:Interactive_design_in_relation_to_other_fields_of_study.jpg

INTERACTION DESIGN - GENUINELY TRANSDISCIPLINARY



RELATIONSHIP BETWEEN IXD, HCI, AND OTHER FIELDS

- **Academic disciplines** contributing to IxD:
  - Psychology
  - Social Sciences
  - **Computing Sciences**
  - Engineering
  - Ergonomics
  - **Informatics**
- **Design practices** contributing to IxD:
  - Graphic design
  - Product design
  - Artist-design
  - Industrial design
  - Film industry

RELATIONSHIP BETWEEN IXD, HCI AND OTHER FIELDS

- Interdisciplinary fields that '**do**' interaction design:
  - **HCI**
  - Ubiquitous Computing
  - **Human Factors**
  - Cognitive Engineering
  - Cognitive Ergonomics
  - Computer Supported Co-operative Work
  - **Information Systems**

WORKING IN MULTIDISCIPLINARY TEAMS

- **Many** people from **different** backgrounds involved
- **Different perspectives** and ways of seeing and talking about things
- Advantages = **More** ideas and designs generated
- Disadvantages = **Difficult** to communicate and progress forward the designs being create
- So, it's all about striking the **balance**; although there is a very **wide** variety of **practice** in business
  - Based on the **Ux maturity** level of the business and its management

INTERACTION DESIGN IN BUSINESS

- Large number of ID consultancies.

- Examples of well known ones include:
  - **Nielsen Norman Group**: “help companies enter the age of the consumer, designing human-centred products and services”
  - **Cooper**: “From research and product to goal-related design”
  - **IDEO**: “creates products, services and environments for companies pioneering new ways to provide value to their customers”

THE USER EXPERIENCE

- **How a product behaves** and **is used** by people in the **real** world:
  - **The way people feel about it** and their **pleasure** and **satisfaction** when using it, looking at it, holding it, and opening or closing it.
  - "Every product that is used by someone has a user experience: newspapers, ketchup bottles, reclining armchairs", cardigans.

    Garrett, J. J. (2010) The Elements of User Experience: User-Centered Design for the Web and Beyond (2nd edn). New Riders Press.

  - "All aspects of the end-user's interaction with the company, its services, and its products

    Nielsen, J., and Norman, D. (2014) The Definition of User Experience, www.nngroup.com/articles/definition-user-experience/ (accessed 18/11/2020).

- Cannot **design a user experience** - only can design **for** a user experience

DEFINING USER EXPERIENCE

- How users **perceive** a product, such as whether a smartwatch is seen as **sleek** or **chunky**, and their **emotional reaction** to it, such as whether people have a positive experience when using it.

Hornbæk, K., and Hertzum, M. (2017) Technology Acceptance and User Experience: A Review of the Experiential Component in HCI. Transactions on Human-Computer Interaction, 24, 5, Article 33, 30 pages.

- Hassenzahl's (2010) model of the user experience
  - **Pragmatic**: how simple, practical, and obvious it is for the user to achieve their goals
  - **Hedonic**: how evocative and stimulating the interaction is to users

Hassenzahl, M. (2010) Experience Design: Technology for All the Right Reasons. Morgan & Claypool.

WHY WAS THE IPOD USER EXPERIENCE SUCH A SUCCESS?

- **Quality user experience** from the **start**
- Simple, elegant, distinct brand, **pleasurable**, must have fashion item, catchy names, cool ...

Figure 1.6 The iPod Nano Touch

Source: ©Press Association, reproduced with permission.

CORE CHARACTERISTICS OF INTERACTION DESIGN

- Users should be **involved throughout** the development of the project
- Specific usability and user experience **goals** need to be **identified**, clearly **documented**, and **agreed** to at the beginning of the project
- **Iteration** is needed through the core activities

WHY ?

- Help designers:
  - **Understand how** to design interactive products that **fit** with what people **want**, **need**, and **may desire**
  - Appreciate that **one size does not fit all** (for example, teenagers are very different to silver surfers)
  - **Identify** any **incorrect assumptions** they may have about particular user groups. (for example, not all old people want or need big fonts)
  - Be aware of both people's **sensitivities** and their **capabilities**

ACCESSIBILITY AND INCLUSIVENESS

- **Accessibility:** the extent to which an interactive product is accessible by as many people as possible
  - **Focus** is on people with **disabilities**
  - **Inclusiveness**: making products and services that **accommodate** the **widest** possible **number** of people
  - For example, smartphones **designed for all** and made available to everyone **regardless** of their disability, education, age, or income
- **Inclusivity** is much better than **accessibility**; disabled people don’t want to be different
- Watch this video; it captures my point really well

DISABILITIES

- Whether someone is disabled, it **changes** over time with age, or recovery from an accident
  - *probably the most frustrating thing*
- The **severity** and **impact** of an **impairment** can vary over the course of a day or in different environmental conditions
- Disabilities can result because technologies are designed to necessitate a certain type of interaction that is **impossible** for someone with an **impairment**

UNDERSTANDING DISABILITY

- Disabilities can be classified as:
  - **Sensory** impairment (such as loss of vision or hearing)
  - **Physical** impairment (having loss of functions to one or more parts of the body after a stroke or spinal cord injury)
  - **Cognitive** (including learning impairment or loss of memory/cognitive function due to old age)
- Each type **can be further defined** in terms of **capability**:
  - For example, someone might have only peripheral vision, be color blind, or have no light perception
- Impairment can be categorized:
  - **Permanent** (for instance, long-term wheelchair user)
  - **Temporary** (that is, after an accident or illness)
  - **Situational** (for example, a noisy environment means that a person can’t hear)

BEING COOL ABOUT DISABILITY

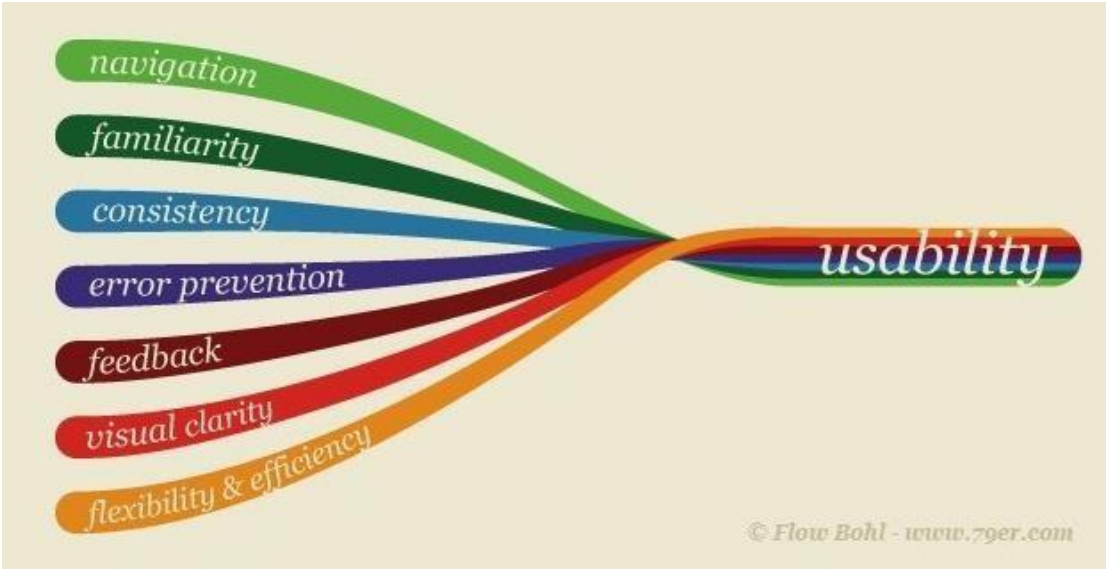
- Prosthetics can be designed to **move beyond being functional** (and often ugly) to being desirable and fashionable

- People now refer to "**wearing their wheels**," rather than "**using a wheelchair**"

Fashionable (prosthetic) leg covers

Skins for cochlea implants

USABILITY GOALS



http://www.79er.com/blog/articles/Usability-best-practice-for-UX-design.php

- **Effective** to use
- **Efficient** to use
- **Safe** to use
- Have good utility (**it works**)
- Easy to **learn**
- Easy to **remember** how to use

USABILITY AND USER EXPERIENCE GOALS

- Selecting terms to convey a person's **feelings**, **emotions**, and so forth **can help designers understand** the multifaceted nature of the user experience
- How do **usability** goals differ from **user experience** goals?
- Are there **trade-offs** between the two kinds of goals?
  - For example, can a **product** be **both fun** and **safe**?
- How **easy** do you think it is it to measure usability versus user experience goals?

USER EXPERIENCE GOALS

Desirable aspects

Undesirable aspects

DESIGN PRINCIPLES

- **Generalizable abstractions** for thinking about different aspects of design
- The **do’s** and **don'ts** of interaction design
- What to **provide** and what **not to provide** at the interface
- Derived from a mix of
  - **theory-based knowledge**
  - **experience** and
  - **common-sense**

VISIBILITY - POOR INTERFACE

- This is a **control panel** for a lift. How does it work?
- **Push** a button for the floor you want? **Nothing** happens. **Push** any other button? Still **nothing**.
- **What** do you **need** to do? It is **not visible** as to what to do!

www.baddesigns.com

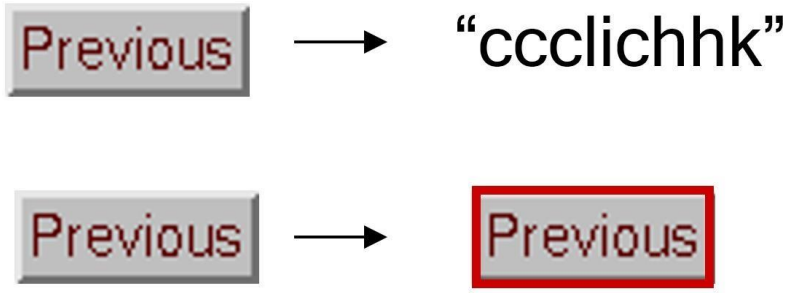
YOU COULD ….

- Make the card **reader more obvious**
- Provide an **auditory message** that says what to do (which language?)
- Provide a **big label** next to the card reader that flashes when someone enters
- Make relevant parts visible
- Make what has to be done obvious

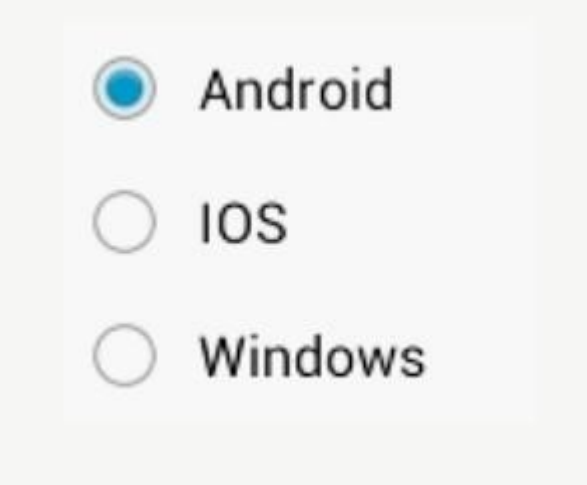
www.baddesigns.com

FEEDBACK

- It is crucial that you **send information back** to the user about **what has been done**
  - *every time I would suggest*
- Includes sound, highlighting, animation, and combinations of these
  - For example, when screen button is **clicked**, it provides **sound** or red **highlight** feedback:



CONSTRAINTS



- **Restricting** the **possible actions** that can be performed helps prevent user from selecting incorrect options
  - For example, using groups of radio buttons
- Physical objects can be designed to constrain things.
  - For example, there being only one way you can insert a key into a lock

LOGICAL OR AMBIGUOUS DESIGN?

www.baddesigns.com

- Old style mouse and keyboard connectors.
  - Where do you plug the **mouse**?
  - Where do you plug the **keyboard**, in the top or bottom connector?
  - Do the color-coded icons help?
- Its not like that **anymore**? Or is it?

HOW TO DESIGN THEM MORE LOGICALLY

FROM this ..

www.baddesigns.com

To this …

www.baddesigns.com

(A) provides direct adjacent mapping between icon and connector

(B) provides color coding that associates the connectors with the labels

www.baddesigns.com

CONSISTENCY

- Design interfaces to have **similar operations** and use **similar elements** for **similar tasks**.
  - For example, always use Ctrl key plus first initial of the command for an operation: Ctrl + c, Ctrl + s , Ctrl + o
- The main benefit is that **consistent** interfaces are **easier** to **learn** and **use**
- What happens if there is more than one command starting with the same letter? For example, save, spelling, select, style. Consistency **breaks** down ☹
  - You have to find other initials or combinations of keys, thereby **breaking the consistency** rule. For example, Ctrl + s, Ctrl + Sp, Ctrl + shift + l
  - **Increases learning burden** on user, making them more prone to **errors**

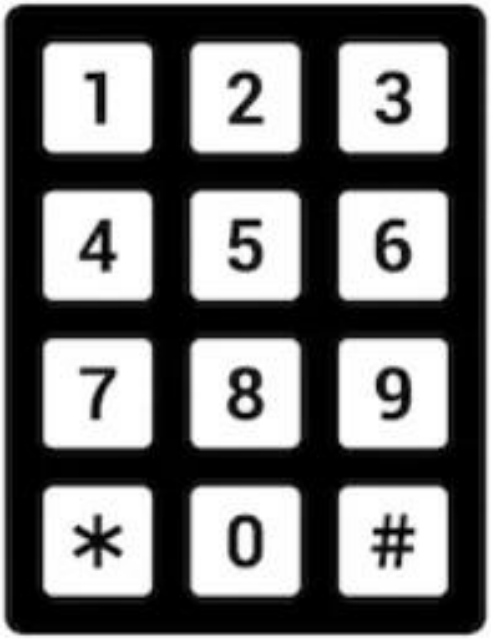
INTERNAL AND EXTERNAL CONSISTENCY

- **Internal** consistency refers to designing operations to behave the same **within an application**
    - Difficult to achieve with complex interfaces
- **External** consistency refers to designing operations, interfaces, and so on to be the same **across applications** and devices
    - Very rarely the case, based on different designer's preference

KEYPAD NUMBERS LAYOUT

- A case of **external inconsistency**

(a) phones, remote controls



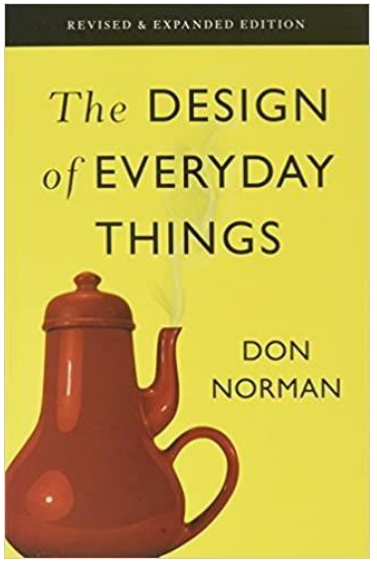
(b) calculators, computer keypads

AFFORDANCES: TO GIVE A CLUE

- Affordance refers to an **attribute of an object** that allows people to **know how to use it**.
  - For example, a **mouse button** invites **pushing**, a **door handle** affords **pulling**
- Norman used the term to discuss the design of everyday objects

Norman, D. (1988) *The Design of Everyday Things*. Basic Books, New York.

- Has since been **popularized** in interact**ion design** to discuss how to design interface objects
  - For example, **scrollbars** to enable moving up and down; **icons** to click on



WHAT DOES "AFFORDANCE" HAVE TO OFFER INTERACTION DESIGN?

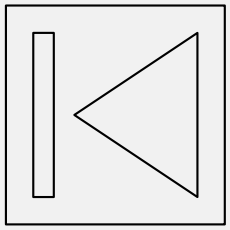
- **Interfaces** are **virtual** and **do not have affordances** like physical objects
- Norman argues that it does not make sense to talk about interfaces in terms of 'real' affordances
- Instead, **interfaces** are better conceptualized as '**perceived**' affordances:
  - **Learned conventions** of arbitrary mappings between **action** and **effect** at the interface
    - **Some** mappings are better than others

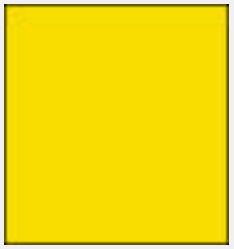
ACTIVITY

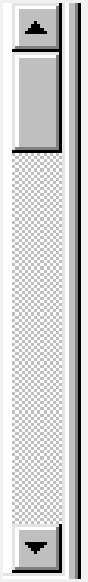
or

Virtual affordances

- How do these screen **objects afford**?
- What if you were a **novice** user? Would you know what to do with them?



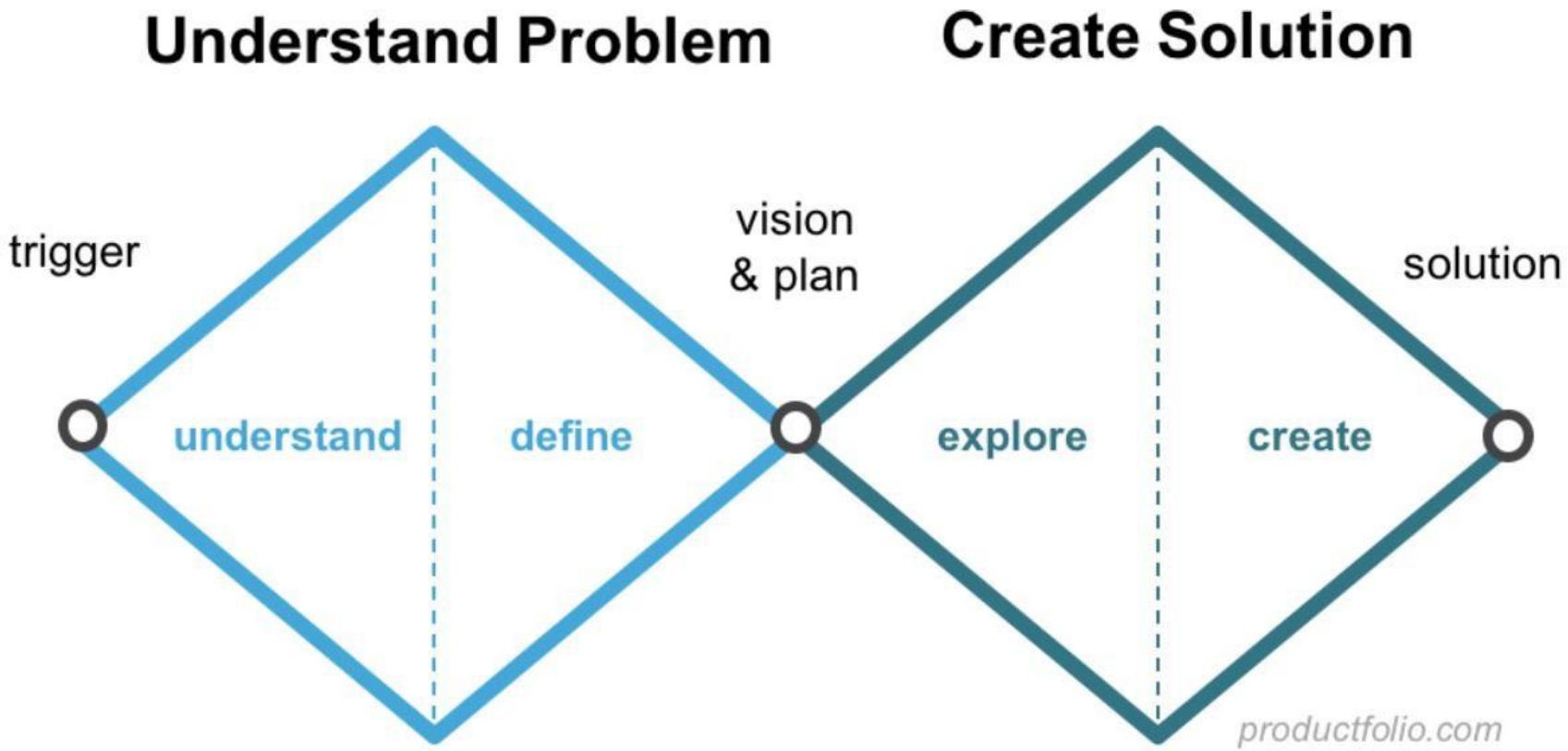




FOLLOW THE PROCESS … WELL ONE OF THEM …

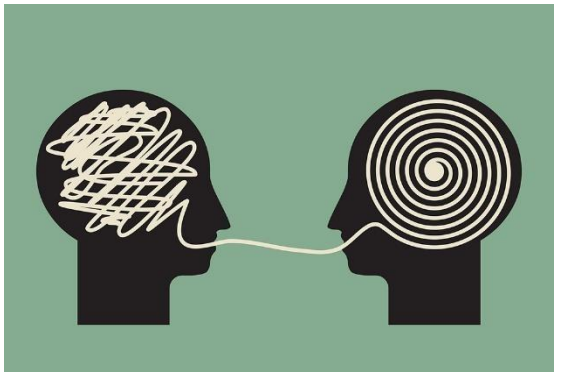
- It is a **process** focused on
  - **discovering requirements**
  - **designing** to fulfil requirements
  - producing **prototypes** and
  - **evaluating** them
- Focused on **users** and **their goals**
  - Involves **trade-offs** to balance conflicting requirements
- **Generating alternatives**
  - choosing between them is key
- **Four** approaches: user-centred design, activity-centered design, systems design, and genius design

THE DOUBLE DIAMOND OF DESIGN



https://productfolio.com/double-diamond/

UNDERSTANDING THE PROBLEM SPACE

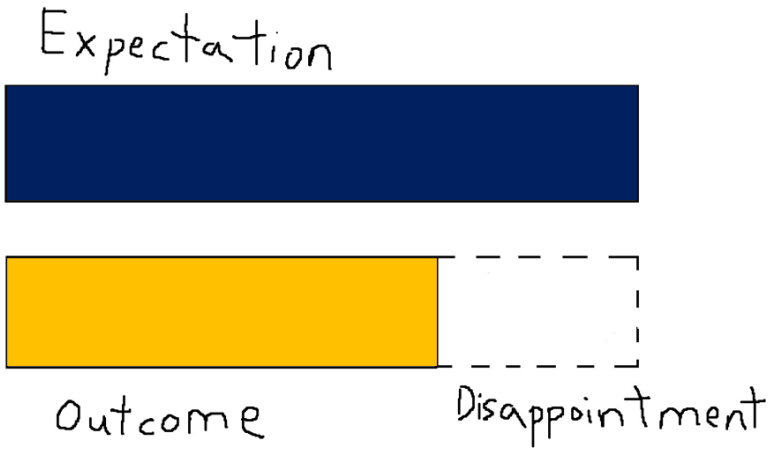


http://marli.us/clear-language-goals/

- **Explore**
  - What is the **current user experience**?
  - **Why** is a change needed?
    - **How** will this change **improve** the situation?

- Articulating the problem space
  - **Team** effort
  - **Explore different perspectives**
  - **Avoid** incorrect assumptions and unsupported claims

IMPORTANCE OF INVOLVING USERS



http://phil-makingchange.blogspot.com/2014/10/7-ways-to-manage-expectations-during.html

- **Expectation** management
  - **Realistic** expectations
  - No surprises, no disappointments
  - **Timely** training
  - Communication, but **no hype**
- **Ownership**
  - Make the users **active** stakeholders (bit like having an insurance policy)
  - More likely to **forgive** or **accept** problems (that relationship is very important)
  - Can make a **big difference** in acceptance and success of product

DEGREES OF USER INVOLVEMENT

- **Member** of the design team
  - **Full** time: constant input, but lose touch with users
  - **Part** time: patchy input, and very stressful
  - **Short** term: inconsistent across project life
  - **Long** term: consistent, but lose touch with users
- Face-to-face **group** or **individual** activities
- **Online contributions** from thousands of users
  - Online Feedback Exchange (OFE) systems
  - Crowdsourcing design ideas
  - Citizen science
- User involvement after product release

COVID lockdown restrictions have *finally* changed my opinion on this (but face-to-face still best)

WHAT IS A USER-CENTERED APPROACH?

- User-centered approach is based on:
  - **Early** focus on users and tasks: directly studying cognitive, behavioral, anthropomorphic (having human characteristics), and attitudinal characteristics
  - **Empirical** measurement: users' reactions and performance to scenarios, manuals, simulations, and prototypes are observed, recorded, and analysed
  - **Iterative design**: when problems are found in user testing, fix them and carry out more tests

FOUR BASIC ACTIVITIES OF INTERACTION DESIGN MORE ON THESE NEXT WEEK

- **Discovering** requirements
- Designing **alternatives**
- **Prototyping** alternative designs
- **Evaluating** product and its user experience throughout

Comparison elicits a greater depth of feedback

KEY POINTS

- Interaction design is concerned with **designing interactive products** to **support** how people **communicate** and interact in their everyday and working lives
- It is concerned with how to create **quality user experiences** for services, devices, and interactive products
- It is **multidisciplinary**, involving many inputs from wide-reaching disciplines and fields
- **Optimizing** the interaction between users and interactive products requires consideration of a number of interdependent factors, including context of use, types of activity, UX goals, accessibility, cultural differences, and user groups.
- Design **principles**, such as feedback and simplicity, are useful **heuristics** for informing, analyzing, and evaluating aspects of an interactive product.

THESE ARE THE LIFEBLOOD OF IXD

- Four basic activities in interaction design process
  - **Discovering** requirements
  - **Designing** alternatives
  - **Prototyping**
  - **Evaluating**
- User-centered design rests on three principles
  - **Early** focus on users and tasks
  - Empirical measurement using quantifiable and measurable usability criteria
  - **Iterative** design

Thank you

Scribble here (in white box)

Spot the difference …

(answer in chat) Dingbats

→ GUN GUN GUN	NIAT NUOM	PANTHER
CLOCKWORK	↑	NORTH STORY EAST SOUTH
SENSE SENSE SENSE SENSE SENSE → SENSE	S S S S	F A L L I N G
CEPINTION	OCTOBER 31	BROTHERS
1760 YARDS	→ A B O AB	FAMOU

ANSWERS . . .

- ROW 1 = Top Gun – Brokeback mountain – The Pink Panther
- ROW 2 = Clockwork Orange --- Up ---West Side Story
- ROW 3 = The 6th Sense --- Super 8 --- Falling Down
- ROW 4 = Inception --- Halloween --- The Blues Brothers
- ROW 5 = The Green Mile --- ☺ First Blood ☺ --- Almost Famous

Spot the difference …

(answer in chat) Dingbats