



# User Interfaces

**EECS 3461 – Sections A & B**  
**Fall 2021**

Resource Pack: Interaction IV  
Barriers and Access

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# Dependencies

This resource pack assumes that you are already familiar with:

- R-Humans-III (and all previous)
- R-Design-VIII (and all previous)
- R-Interaction-III (and all previous)
- R-Technosocial-I, R-Knowledge-I

# Inquiry

Break down this resource pack into smaller pieces

1. What is a “curb-cut effect”?
2. What is meant by ‘accessible’ and ‘accessibility’?
3. How does accessibility relate to disability?
4. What is Universal Design and what are its principles?

**1.** What is a “curb-cut effect”?

## Examples of Curb Cuts



The Curb Cut Effect: How Making Public Spaces Accessible to People With Disabilities Helps Everyone  
Disability Science Review, Emily Morson, Dec 2016

## Curb Cuts

- first installed starting after World War II (veterans)
- originally designed to make public streets accessible to wheelchair users
- the main curb cut movement started in the 1960's, Berkeley activism (Rolling quads)
- curb cuts are used by many:
  - Parents pushing strollers
  - People lugging heavy loads
  - Travelers wheeling luggage
  - Runners and skateboarders

The Curb Cut Effect: How Making Public Spaces Accessible to People With Disabilities Helps Everyone  
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# the Curb Cut Effect

## the curb cut effect:

- when accessibility features come to be used and appreciated by a larger group than the people they were designed for
- refers to a more general phenomenon of ‘mainstream use’
- when the features become sufficiently ubiquitous and widely used, it starts to becomes “normal”

## Examples of Curb Cut Effects

- close captioning
- elevator door time-out
- land-lines and dial tones
- Oxo good grips

**2.** What is meant by 'accessible' and 'accessibility'?

## Review: Relational Concepts

- recall Gibson's concept of an affordance
  - Affordances are all "action possibilities" latent in the environment, objectively measurable and independent of the individual's ability to recognize them
- recall how we contrasted:
  - affordance as a *relational concept*
    - e.g., Gibson's characterization
  - affordance as property
    - e.g., the misused version, which was the result of practitioners mistaken interpretations of Norman's book)
  - action possibilities exist *in relation to an individual*, not as a possibility that is independent of the individual
- thus, the concept of an affordance is a *relational*

# Accessible

- “this {building|app|program|piece of equipment} is/is not accessible”
  - the accessibility or inaccessibility of something is *relational*
- *accessible* refers to the property of something as ‘being able to be used by a person’
- accessible applies in a wide variety of situations:
  - information and communication technologies (ICT)
  - the build environment
  - civic processes (e.g., voting, government services)
  - medicine
  - education

# Accessibility and Usability

- *accessibility* and *usability* are interrelated concepts
  - usability tends to assume ‘specific users’, often based on the normate (which we will discuss further)

**2.** What is meant by 'accessible' and 'accessibility'?

## Review: Product 'Scripts'

- recall what we discussed earlier about product 'scripts'
  - Madeleine Akrich (1992) developed the concept of the "script" as a metaphor for the "instruction manual" that is "inscribed" in an artifact
    - Any artifact contains a "message" (the script) from the *producer/designer* to the *user* describing the product's intended use and meaning
    - the product script might be legible to some people, but not others, depends on social factors
  - 'Mainstream' design can be understood as a process that results in a particular framework of action (Akrich, 1992)
  - to what extent can this the 'framework of action' be performed by a person?

## Direct and Indirect Access

- if a person is able to perform the ‘framework of action’ inscribed in a design artefact, this is often called *direct access*
- if a person is not able to perform the ‘framework of action’ inscribed in a design artefact through the use of **additional technology**, this is often called *indirect access*
- this **additional technology** is very often called assistive technology

## Example: html content

- html content deployed on the web
  - this is a mainstream design technique
- the inscribed framework of action is to open and engage with the content using a web-based client
  - the mainstream version of this is to engage visually and to perform motor input actions
  - this is *direct access*
- some users employ additional technologies to circumvent barriers to using a mainstream web browser
  - screen reader software
  - input interface software (eye tracking, switch-based input)
  - this is *indirect access*

## Illustration

- Screen Reader Demo for Digital Accessibility
  - <https://www.youtube.com/watch?v=dEbl5jvLKGQ>
- Assistive Technology During a Pandemic: Empowering people with disabilities
  - <https://www.youtube.com/watch?v=TD6nQeNbmL8>

### **3. How does accessibility relate to disability?**

## Characterizing Disability, II

- “The meaning of disability, like the meaning of illness, is presumed to be self-evident; we all know it when we see it. But the meanings of illness and disability are not nearly so fixed or monolithic; multiple understandings of disability exist.” [Kafer, 2013]

# Multiple Understandings of Disability

- the different ‘understandings’ of disability are typically referred to as *models*
- Here are some of the prominent models
  - charity model
  - medical model
  - social model
  - biopsychosocial model
  - political/relational model

# The Medical Model of Disability

This model holds that:

- Disability is a deficiency or abnormality
- Disability is perceived as negative; being disabled is a negative attribute
- Disability is a feature of a person's health condition
  - an individual's experience of disability arises from that feature
  - medical care is required, want to cure
  - failing a cure, then correct to the greatest extent possible
  - in general, there is a “problem” with the individual that must be “corrected” [WHO, 2002]

# The Charity Model of Disability

An offshoot of the medical model

- disability is something in the body that can and should be cured.
- creates a view of disabled people's lives as tragic and pitiable
- connected to the 'supercrip' narrative;
  - someone who overcomes their disability in ways that are often seen by the public as inspiring.

## Example: supercrip narrative



# The ‘supercrip’ narrative

The ‘supercrip’ narrative;

- someone who overcomes their disability in ways that are often seen by the public as inspiring.
- a stereotype narrative displaying the plot of someone who has “to fight against his/her impairment” in order to overcome it and achieve unlikely “success.”
- a type of ‘inspiration porn’
- is a form of ableism
  - holds a negative ethos of disability
  - glorifies any achievement, no matter how insignificant; feeds low expectations
  - portrays people with disabilities as “one-dimensional saints who only exist to warm the hearts and open the minds of able-bodied people”

# The Social Model

The Social Model holds:

- Disability is not a deficiency or abnormality; it is a difference
- Disability is perceived as neutral; being disabled is a neutral attribute
- It is not the individual who has the disability; the disability is created by society.
- The social model of disability holds disability to be a socially-created condition rather than an attribute of an individual [Hughes and Paterson, 1997, p. 328].
- The implication is that the issues of disability do not have their locus on the individual but instead in society.

“... In our view, it is society which disables physically impaired people. Disability is something imposed on top of our impairments by the way we are unnecessarily isolated and excluded from full participation in society. Disabled people are therefore an oppressed group in society..."

(Oliver, 1996, 22)

## Characterizing Disability, Medical Model

...Disability activists and advocates have been trying to frame disability and surrounding issues using a social model of disability since at least the 1980s in an effort to distance discourse from the (still) predominant medical model...

[1] <http://www.gimpgirl.com/2011/11/24/social-vs-medical-model-evolved/>

# The Biopsychosocial Model

- The biopsychosocial model originates from the WHO, and the International Classification of Functioning, Disability and Health (ICF)
  - the ICF is a classification of the health components of functioning
  - created 1980, revised in 2001
  - also a child and youth version (ICF-CY) which captures aspects of functioning that relate to development
- The ICF **does not** use the term *functional impairment*, but rather just the term *functioning* (as a noun)

# The Biopsychosocial Model

- A person's *functioning* is seen neutrally and encompass all of that individual's body functions, activities and involvement in life situations.
- A person's *functioning* can be viewed from three levels:
  - body or body part (biological),
  - the whole person (individual), and
  - the whole person in a social context (social)
- Decrements in functioning are (similarly) viewed from three levels:
  - a decrement in functioning at the body or body part level (biological) is termed an *impairment*
  - a decrement in functioning at the person level is an *activity limitation*
  - a decrement in functioning at the societal level is a *participation restriction*

[Hamraie, 2012]

## Emergence of the Normate, I

- starting in the 19<sup>th</sup> century, the possibility was created to quantify the “average man”
  - the rise of anthropometry (the scientific study of the measurements and proportions of the human body)
  - the rise of scientific measurement
  - shifting epistemological stances
  - e.g., Quetelet, first application of statistics to social science
  - from this, statistical means arose
    - average height, weight, strength, suicide rates, etc, etc
- BUT... the concept of a ‘statistical mean’ came to be conflated with the concept of a ‘norm’

[Hamraie, 2012]

## Emergence of the Normate, II

- In the early 20th century, the US military began to use anthropometrics for the ergonomic design of cockpits and weapons (Wickens and Hollands 2000)
- Eventually anthropometric data and ergonomics entered industrial design and civilian product design as evidence about potential users.
- This collection of evidence came to form the **normate template**

## The Normate

- the **normate** is the position of identity held by those unmarked by stigmatized identifiers of disability
- *it is the imagined "everyday" person whose self-determination, independence, rational thinking ability, and physical sturdiness makes our society philosophically possible*

Rosemarie Garland Thomson, Extraordinary Bodies, 1997, Columbia University Press

[Kafer, 2013]

## Political/relational model

- rejects the idea that disability as a purely medical “problem” of the body/mind
- foregrounds issues around non-normative bodies and the normate template
- this model seeks to make legible how social and architectural barriers can alienate non-normative bodies
- holds that disability is a political site that is ever-changing and always in relation to other people, environments, and attitudes

## How does accessibility relate to disability?

- oftentimes, accessibility and assistive technology are described in terms of disability
  - “Accessibility refers to the design of products, devices, services, or environments so as to be usable by people with disabilities.”
  - “Assistive technology is technology used by individuals with disabilities”
- this is problematic
  - the experience of and the attribution of disability is contested; multiple understandings of disability exist
- raises the question: can accessibility be characterized without making use of the concept of disability?

**4.** What is Universal Design and what are its principles?

[Hamraie, 2012]

## Universal Design, the Lead up

- a new research strategy arose to challenge the normative template
- it began as a regime to make excluded bodies apparent to designers and also to shift the way design research was conducted
- Selwyn Goldsmith, a British architect published *Designing for the Disabled* (1963) “as a model for incorporating anthropometric data about people with disabilities into design as a corrective to existing data sets”
- later, Ronald L. Mace, an American architect, coined the term Universal Design in the 1970’s, a term that has now become very well-established

[Hamraie, 2012]

## Universal Design (UD)

- UD was first used to describe the socially inclusive design practices that were starting to emerge in the 1970's
  - these design practices privileged users in the design process rather than making them secondary to aesthetic or formal considerations
- UD challenged the conventional approach of *designing for the average user*
- UD poses the challenge to designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life [1]

[1] [http://www.ncsu.edu/ncsu/design/cud/about\\_us/usronmace.htm](http://www.ncsu.edu/ncsu/design/cud/about_us/usronmace.htm)

## UD: Built Environment vs IT

- The principles of UD can be applied to
  - built environment
  - products and services
  - technology/ICT
- We will first discuss each UD principles as it applies to the built environment

# Universal Design (UD) Principles

- Source for following images and test
  - NC State University 7 Principles of Design Poster
  - <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/>
  - Zheng (2020), Learn to Create Accessible Websites with the Principles of Universal Design, Interaction Design Foundation
    - <https://www.interaction-design.org/literature/article/learn-to-create-accessible-websites-with-the-principles-of-universal-design>
- [1] [http://www.ncsu.edu/ncsu/design/cud/about\\_us/usronmace.htm](http://www.ncsu.edu/ncsu/design/cud/about_us/usronmace.htm)
- [2] <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/>

# Principles of UD

## **Principle 1: Equitable Use**

The design is useful and marketable to people with diverse abilities.

### **Guidelines:**

- 1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.
- 1b. Avoid segregating or stigmatizing any users.
- 1c. Provisions for privacy, security, and safety should be equally available to all users.
- 1d. Make the design appealing to all users.



**1**

## Equitable Use

The design is useful and marketable to people with diverse abilities.



# Principles of UD

## **Principle 2: Flexibility in Use**

The design accommodates a wide range of individual preferences and abilities.

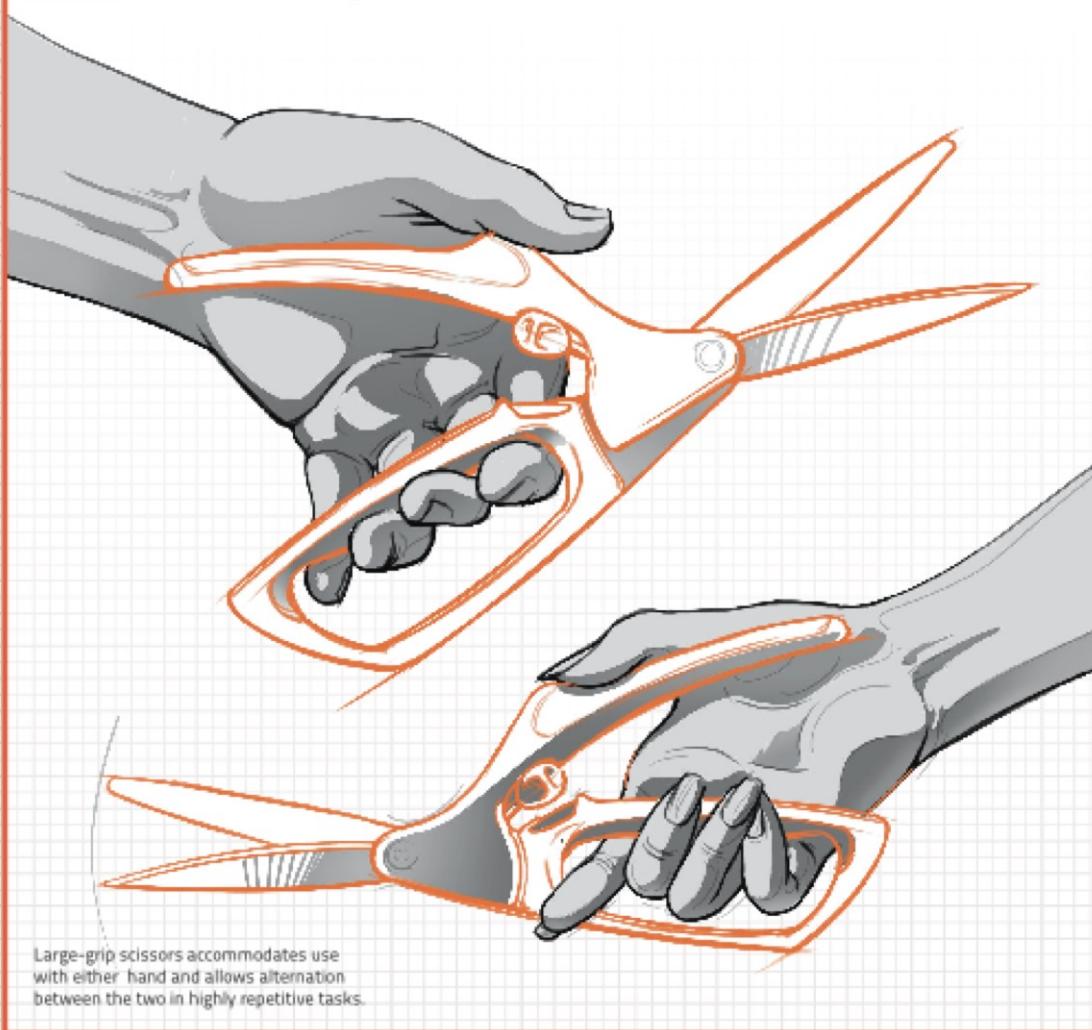
### **Guidelines:**

- 2a. Provide choice in methods of use.
- 2b. Accommodate right- or left-handed access and use.
- 2c. Facilitate the user's accuracy and precision.
- 2d. Provide adaptability to the user's pace.

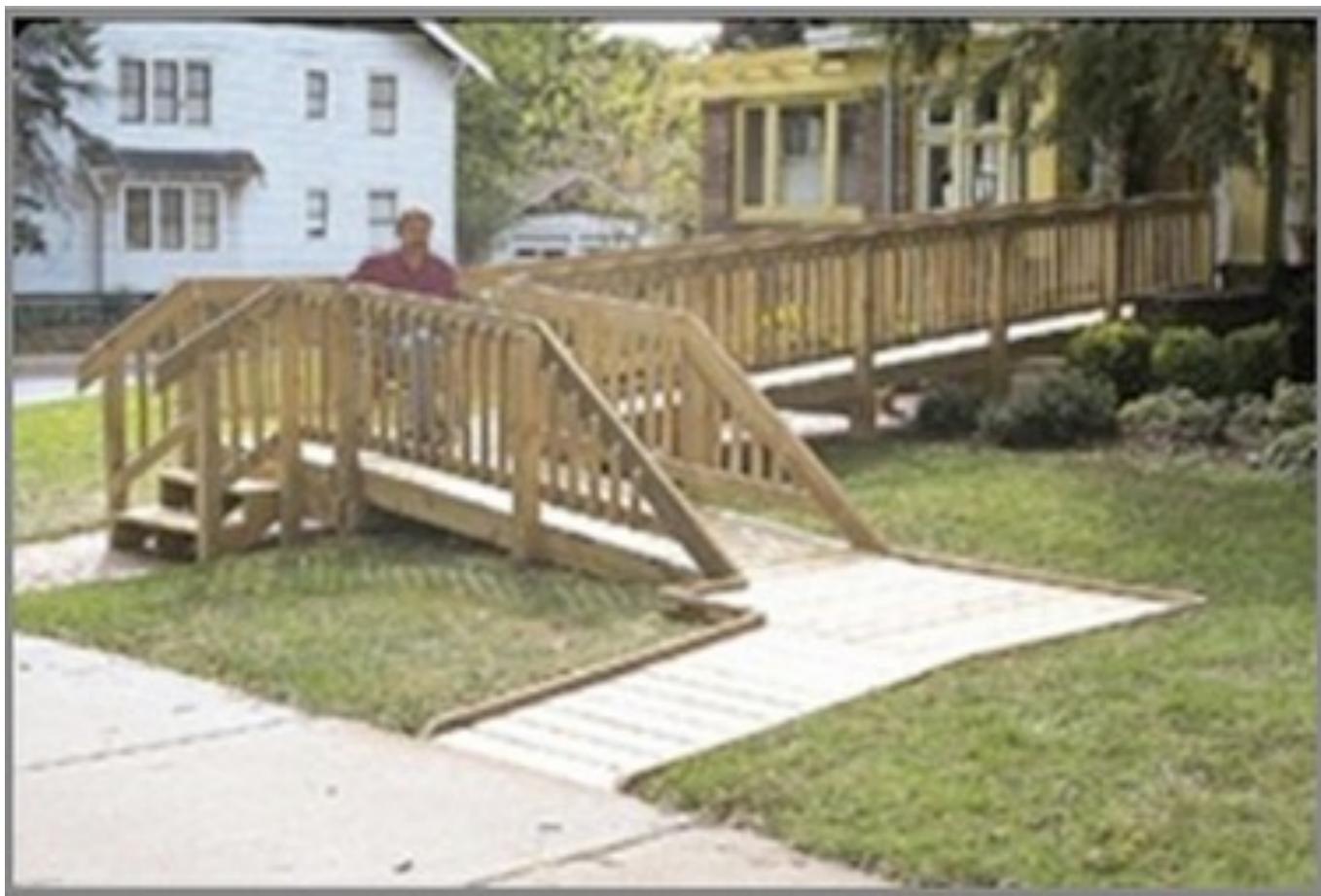
## 2

## Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.



Large-grip scissors accommodates use with either hand and allows alternation between the two in highly repetitive tasks.









# Principles of UD

## **Principle 3: Simple and Intuitive Use**

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

### **Guidelines:**

- 3a. Eliminate unnecessary complexity.
- 3b. Be consistent with user expectations and intuition.
- 3c. Accommodate a wide range of literacy and language skills.
- 3d. Arrange information consistent with its importance.
- 3e. Provide effective prompting and feedback during and after task completion.

# Principles of UD

3

## Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or education level.

Public emergency stations utilize recognized emergency colors and a simple design to quickly convey function to passers-by.





# Principles of UD

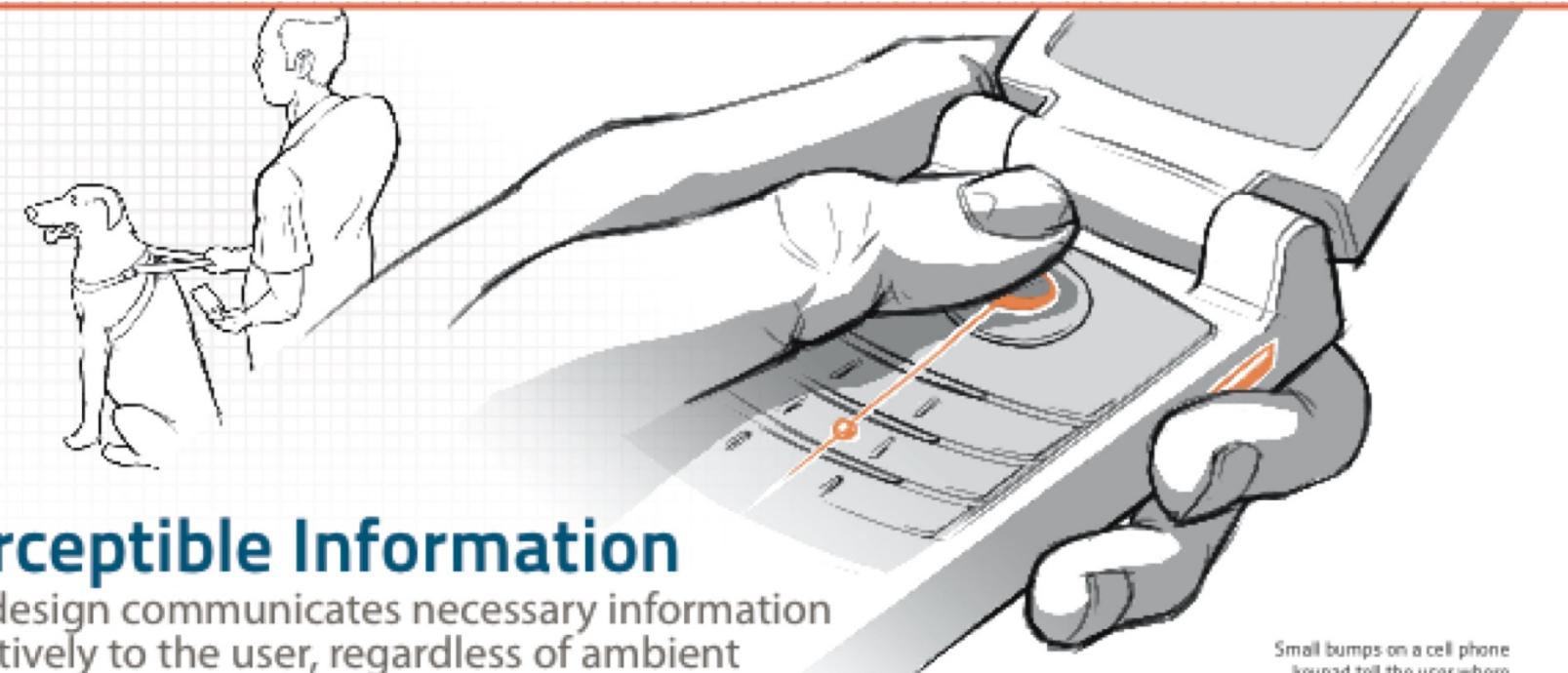
## Principle 4: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

### Guidelines:

- 4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- 4b. Provide adequate contrast between essential information and its surroundings.
- 4c. Maximize "legibility" of essential information.
- 4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- 4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

# Principles of UD

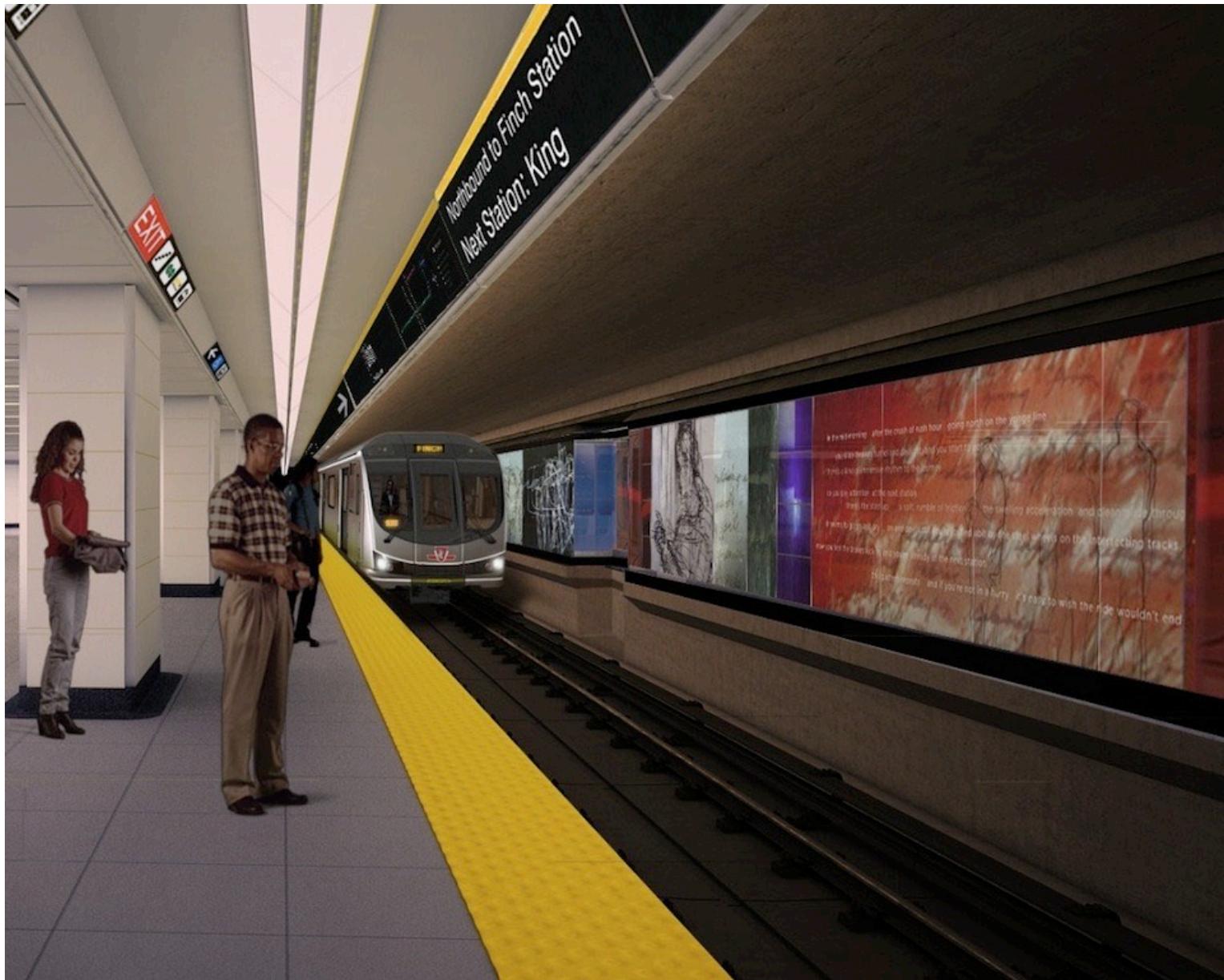


4

## Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Small bumps on a cell phone keypad tell the user where important keys are without requiring the user to look at the keys.







# Principles of UD

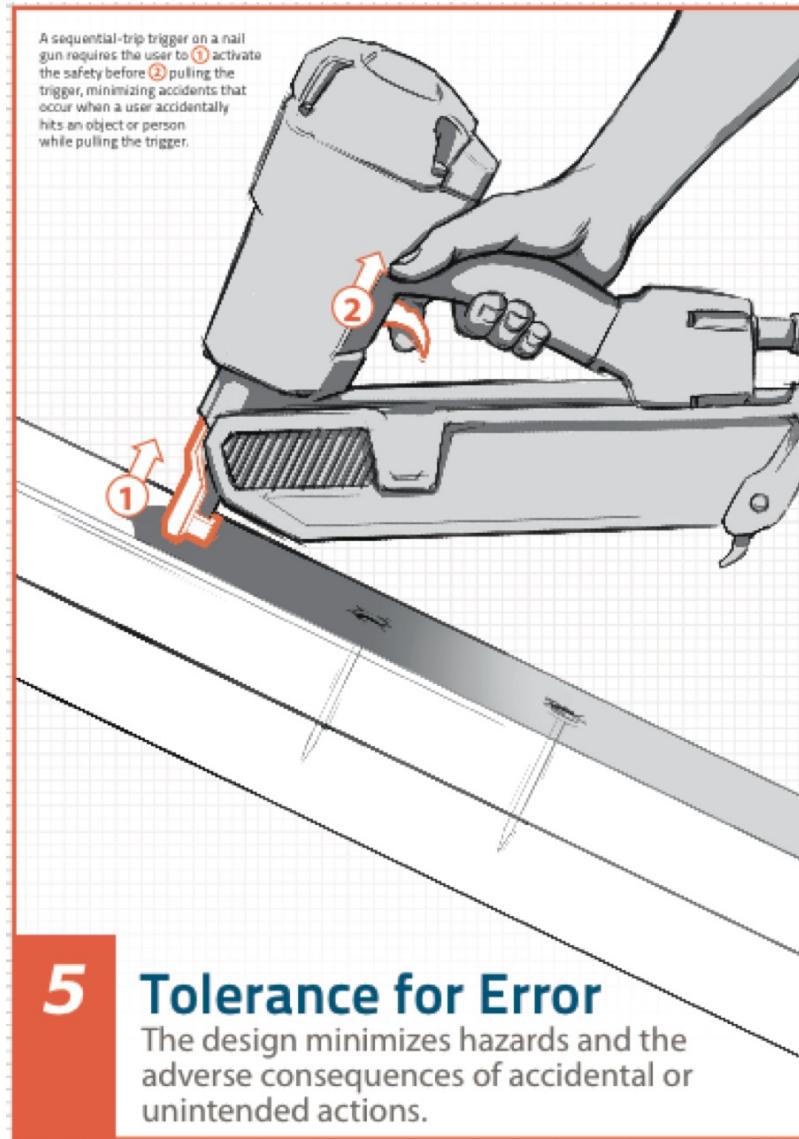
## **Principle 5: Tolerance for Error**

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

### **Guidelines:**

- 5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- 5b. Provide warnings of hazards and errors.
- 5c. Provide fail safe features.
- 5d. Discourage unconscious action in tasks that require vigilance.

# Principles of UD









# Principles of UD

## **Principle 6: Low Physical Effort**

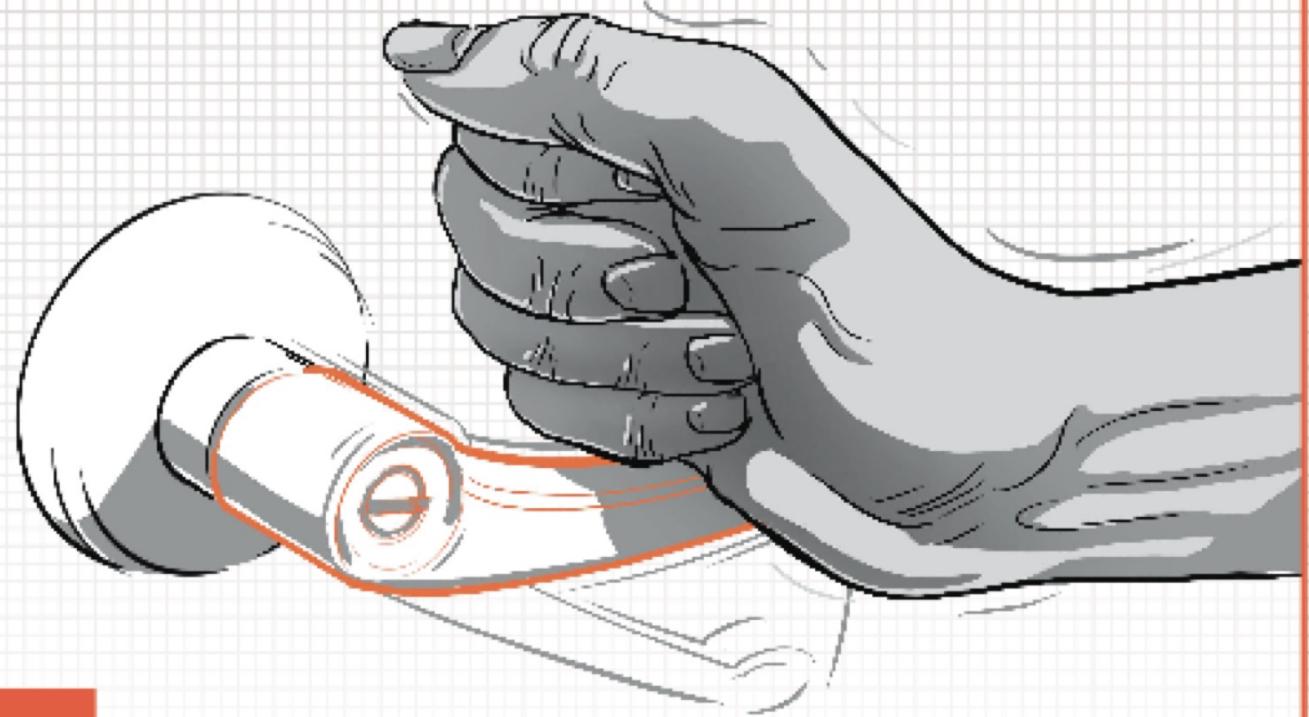
The design can be used efficiently and comfortably and with a minimum of fatigue.

### **Guidelines:**

- 6a. Allow user to maintain a neutral body position.
- 6b. Use reasonable operating forces.
- 6c. Minimize repetitive actions.
- 6d. Minimize sustained physical effort.

# Principles of UD

Door lever does not require grip strength to operate, and can even be operated by a closed fist or elbow.



**6**

## Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.



# Principles of UD

## **Principle 7: Size and Space for Approach and Use**

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

### **Guidelines:**

7a. Provide a clear line of sight to important elements for any seated or standing user.

7b. Make reach to all components comfortable for any seated or standing user.

7c. Accommodate variations in hand and grip size.

7d. Provide adequate space for the use of assistive devices or personal assistance.

# Principles of UD



## Size and Space for Approach and Use

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