

## Lecture 3 Interaction Frameworks

Frameworks for understanding interaction  
Coping with complexity

Heim, Chapters 2.1-2.2



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## Frameworks for Understanding Interaction

- Execution/Evaluation Action Cycle
- Interaction Framework

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## Frameworks for Understanding Interaction

- A framework is basically a structure that provides a context for conceptualizing something
- We can use these frameworks to:
  - Structure the design process
  - Help us to identify problematic areas within the design
  - Help us to conceptualize the problem space as a whole

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## Execution/Evaluation Action Cycle (EEC)

- Donald Norman (1990) *The Design of Everyday Things*
- The structure of an action has four basic parts:
  - **Goals:** We begin with some idea of what we want to happen; this is our goal.
  - **Execution:** We must then execute an action in the world.
  - **World:** To execute an action, we must manipulate objects in the world.
  - **Evaluation:** Finally, we must validate our action and compare the results with our goal.

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## Execution/Evaluation Action Cycle (EEC)



## Execution/Evaluation Action Cycle (EEC)

- Goals do not specify particular actions
- Goals and intentions do not have a one-to-one, relationship
- “Delete text” goal
  - Intention that involves the Edit menu
  - Intention that involves the Delete key
- Each intention involves a sequence of actions

**Goal > Intention > Actions > Execution**

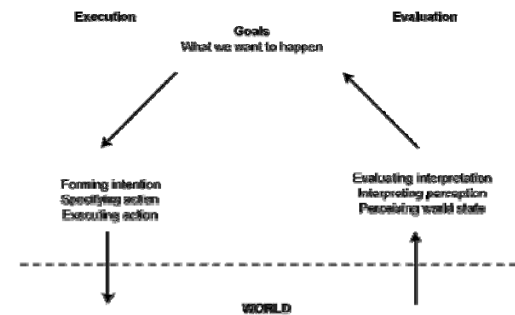
## Execution/Evaluation Action Cycle (EEC)

- Evaluate Results
  - Perceive new state
  - Interpret what we perceive
  - Evaluate new state with goal

**Perceive > Interpret > Evaluate**

## Execution/Evaluation Action Cycle (EEC)

- Seven Stages of Action



## Execution/Evaluation Action Cycle (EEC)

- The seven stages form a cycle
- The cycle can be initiated at any point
  - Some goals are data-driven - initiated when an environmental event is perceived
  - Others are goal-driven - initiated when the person conceives of a new goal

## Gulf of Execution

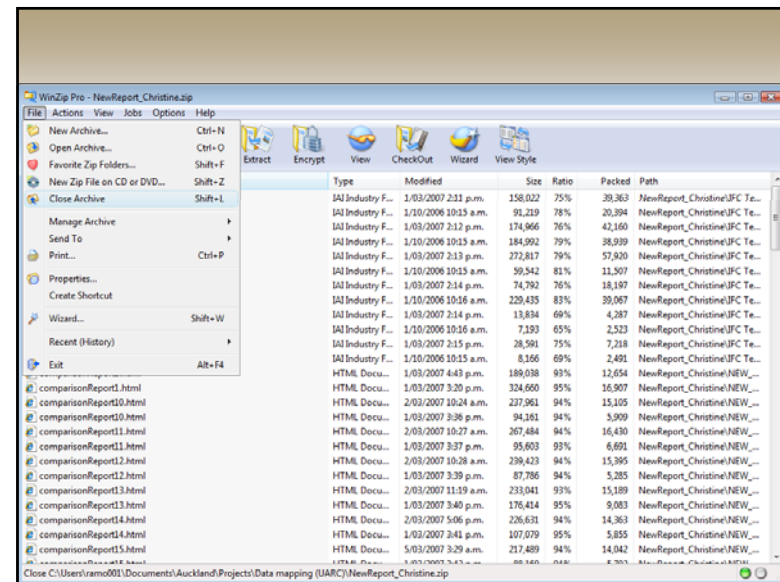
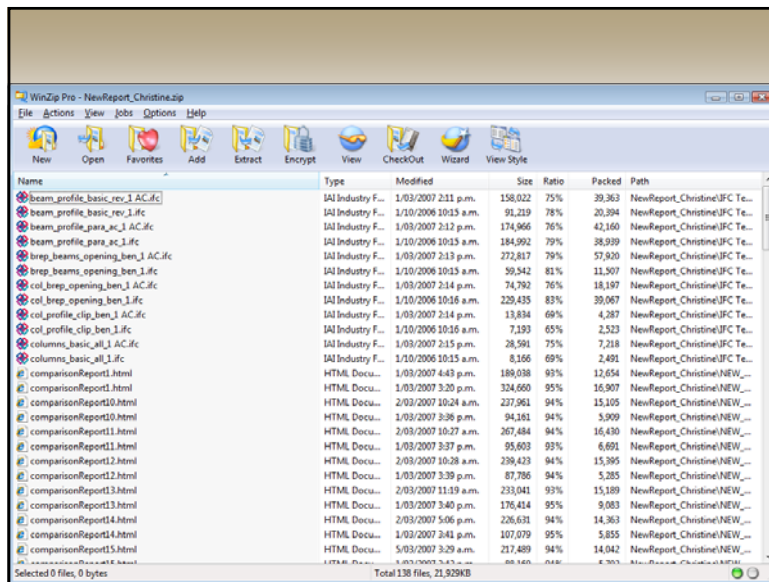
- Does the interface allow us to carry out the actions required by the intention?

**Goal** = save a file

**Intention** = use the file menu

**Action** = click the save option

- Is there a save option in the file menu?



## Gulf of Evaluation

- Given a particular interface design, how easily can you:
  - Determine the function of the device?
  - Determine what actions are possible?
  - Determine mapping from intention to physical movement?
  - Perform the action?
  - Determine whether the system is in the desired state?
  - Determine the mapping from system state to interpretation?
  - Determine what state the system is in?

(Norman, 1990)

## Coping with Complexity

- Mental Models
- Mapping
- Semantic and Articulatory Distance
- Affordances

## Mental Models

- A mental model is a cognitive representation of something that defines a logical and believable estimation as to how a thing is constructed or how it functions
  - Transparent objects expose their functions
    - Bicycles
  - Opaque objects hide their functions
    - Computers

## Mental Models

- **Mental models are:**
  - **Unscientific**—They are often based on guesswork and approximations.
  - **Partial**—They do not necessarily describe whole systems, just the aspects that are relevant to the persons who formulate them.
  - **Unstable**—They are not concrete formulations, but evolve and adapt to the context.
  - **Inconsistent**—They do not necessarily form a cohesive whole; some parts may be incompatible with other parts of the same model.
  - **Personal**—They are specific to each individual and are not universal concepts that can be applied generically.

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Designs that align with a user's mental model will be easier for him or her to use

## Nielsen: Mental models (www.useit.com)

- The word "Google" is usually the top query at other search engines, and words like "Yahoo" and "Bing" score high on Google.
  - Why do people search for a website if they already know its name?
  - Many users have never formed an accurate model of how the "type-in boxes" on their screen function. When they type stuff into a box, they sometimes get where they want to go.
- Netflix is a mail-order service for renting movies on DVD. However, Netflix works differently than typical e-commerce sites:
  - When users added a film to their Netflix "queue," they used a mental model of an e-commerce shopping cart to predict what would happen: nothing. Adding stuff to the cart doesn't cause you to receive that item in the mail. You first have to proceed through checkout and confirm that you want it.
  - In reality, however, Netflix will immediately mail you the DVD that's on top of the queue. Later, when you mail it back, they'll send you the next movie in your queue, without you having to go to the site and do anything. That's why they have the "queue" feature instead of a standard shopping cart.

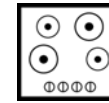
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## Mapping

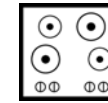
- The concept of mapping describes how we make connections between things

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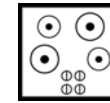
Proper mapping can increase the usability of an interface



Arbitrary mapping



Arbitrary mapping improved



Natural mapping

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Use natural mapping whenever possible

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## Semantic and Articulatory Distance

- **Semantic Distance**
  - The distance between what people want to do and the meaning of an interface element.
- **Articulatory Distance**
  - The distance between the physical appearance of an interface element and what it actually means.

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## Affordances

- The **affordances** of some interfaces can be intuitively understood: a steering wheel affords turning, and a door bell affords pushing.
- These connections allow us to make predictions about the results of our actions and help us to create usable mental models.



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## Affordances

- **Affordance Confusion** - when certain aspects of an object do not work in a way in which we assume they should

A screenshot of a web browser window titled "Login". It contains two input fields: "User Name:" and "Password:". Below the "Password:" field is a "Submit" button. The form is designed to look like a standard login interface.

- Norman considers an affordance to be a relationship between an object and a user, not a property of an object

## Affordances

- What may be an affordance to one person may not be to another
- The perception of affordance fosters usability
- The affordances a user may need must be present
- Affordances must not contradict the user's expectations

## Summary

- Choose the interaction style which best suits needs of intended user
- Focus on reducing Gulf of Evaluation
- Focus on reducing Gulf of Execution