Affordances

• A key element of effective interaction design, particularly with the direct manipulation interaction style, is visibility — user interface elements must be seen before they can be used.

• With the noun-verb sequence for direct manipulation, visibility also includes the actions that can be performed on this element — the more intuitive, the better.

• Don Norman’s concept of an affordance is a “message” that an object conveys about its “possible uses, actions, and functions.”

A Lego Motorcycle

• Affordances are essentially constraints imposed by an object — physical, semantic, cultural, and logical.

• An ideal example of affordances can be found in Don Norman’s Lego motorcycle experiment.

• Without any instructions or even seeing the completed motorcycle, Norman found that many adults are able to reproduce it accurately; the combination of different types of constraints work together to “compel” a particular assembly of the Lego pieces.
Physical Constraints

• Real-world objects provide natural constraints based on their shape and size — keys won’t fit when inserted the wrong way, doors without handles can’t be pulled

• Ideally, the nature of the physical constraint is visible before it is even tried — e.g., we know that a square peg won’t fit into a round hole by just looking

• While user interface elements can’t have “real” physical constraints, we can use the ideal of a visible physical constraint (shape, size) to communicate how they can be used, or how they fit somewhere

Semantic Constraints

• Our experience in the real world, plus the context of a particular situation, allows us to attach meanings to certain elements

• These meanings form semantic constraints — limitations that we impose on objects because their meanings dictate a particular choice

• For example, while a Lego person figure may be positioned facing forward or backward on the Lego motorcycle, we tend to place that figure facing forward, since that is the “meaningful” choice
Cultural Constraints

• Conventions or expectations on behavior form another category of constraints, labeled as “cultural” because, in many ways, that is what “culture” is: a communal set of conventions or expectations

• If asked to place the Lego motorcycle on a Lego street, Americans will most likely place it on the right side of that street; other nationalities may place it on the left

• Note how this constraint is driven by “what we’re used to,” which may vary — thus, internationalization is a crucial element in interaction design these days

Logical Constraints

• The final type of constraint is driven by reasoning — given a situation, a particular choice may “make the most sense” to us

• Given a set of Lego pieces and a request to build something out of it, we might conclude that we are expected to use all of the given pieces

• Logical constraints may also come into play through elimination: given a set of choices for how to handle a situation, physical/semantic/cultural constraints might eliminate all but one, leaving that as the “logical” choice
Natural Mappings

- *Natural mappings* are a special type of logical constraint — a design has a natural mapping when it holds all of the necessary information to make correct inferences about some aspect of a system.

- This issue frequently comes up with device controls such as switches and knobs: is it possible to arrange switches and/or knobs such that users will not need explicit labels to tell what they control?

- Common layout, physical resemblance to the device, or other properties allow a design to “just make sense”

Case Studies: Doors and Switches

- Norman applies the affordance and mapping concepts to two everyday objects: doors and switches.

- The overriding rule of thumb: “If a design depends upon labels, it may be faulty”
  
  ◦ Proper use of affordances can produce doors that do not need a “Push” or “Pull” sign

  ◦ Natural mapping of switches on a panel to the lights that they control obviates the need for labels

- And yet…many systems *still* require labels