COMSATS University Islamabad

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**SUBJECT HCI**

***ASSIGNMENT NO. 1***

**Question: Give examples for the various types of constraints:**

**Physical, semantic, logical, cultural.**

**Sample areas: interface design, kitchen appliances, security devices, vending machines.**

There are four primary types of constraints in HCI:

* **Physical Constraints:** Restrictions on a system resulting from its physical characteristics.
* **Semantic Constraints:** rules based on the meaning or function of an element
* **Logical Constraints**: These rules assure correct actions based on logical reasoning.
* **Cultural Constraints** Design choices influenced by societal norms and conventions

Each type is used to improve interfaces and systems to make them more user friendly. The sections show how they are used in interface design, in kitchen appliances, security devices and vending machines, with explanations and examples.

1. **Physical Constraints: (Defining User Actions Through Structure)** 
   * ❑ **Explanation:**

Physical constraints are limits built into an object or its properties that control interactions, prevent misuse, and minimize errors.

* + ❑ **Examples**

**Interface design**: touchscreens require finger or stylus input so cannot be used with nonconductive objects like gloves

**Kitchen Appliances:** A microwave works only with a closed door, so you do not get exposed to radiation,

**Security devices:** Biometric scanners make skin-to-skin contact to ensure only authorized people are permitted access to secure areas.

**Vending Machines:** Coin slot accepts only certain coin sizes, preventing wrong or fraudulent transactions

1. **Semantic Constraints: (Guiding Users Through Meaning)** 
   * ❑ **Explanation:**
   * Semantic constraints rely on an object's inherent meaning or purpose to determine what the user should do. They make interfaces more intuitive by building on existing knowledge and analogies to the real world.
   * ❑ **Examples**
   * **Interface Design** A file deletion icon is usually a trash can ("landfill") because people trash physical junk.
   * **Kitchen Appliances:** If you turn the knob on the stove one way it raises the heat and the other way it lowers the heat, so it makes sense.
   * **Security devices** A swipe card system forces users to insert or swipe the card in a particular orientation, reinforcing proper use through implied meaning.
   * **Vending Machines** If something is sold out, you disable selection so that people can't try to do something that is impossible.Impact on HCI:

* By leveraging semantic constraints, designers reduce the learning curve, enhance user confidence, and create seamless interactions without requiring extensive instructions.

1. **Logical Constraints: (Enforcing Correct Sequences Through Logic)**

* **❑ Explanation:**

Logical constraints rely on cause-and-effect relationships to direct users through a prescribed sequence of actions. Logical constraints prevent nonsensical operations and improve system reliability.

* ❑ **Examples**
* **Interface design:** The “Submit” button is disabled until all required form fields are filled, so that data cannot be entered incompletely.
* **Kitchen Appliances** A blender will not operate unless the lid is properly locked.
* **Security devices**: A system requires users to enter a valid password before proceeding to further authentication steps to block unauthorized access.
* **Vending machines:** The vending machine only gives you the product after you put in the correct amount of money, so transaction logic is enforced.

1. **Cultural Constraints: (Design with Societal Norms)** 
   * ❑ **Explanation:**
   * Cultural constraints are built into the way society functions and what users expect, and this affects the way people interpret symbols, colours and design patterns through cultural context.
   * ❑ **Examples**
   * **Interface Design:** Red is used a lot for error messages because of its cultural association with warnings or danger.
   * **Kitchen Appliances** Turning a knob clockwise increases heat. This convention is based on a standard that is common in many cultures.
   * **Security devices**: Most systems use the four-digit PIN format because it has become globally accepted as a standard for authentication.
   * **Vending machines:** Number-letter sequences like A1, B2 for selecting items are well understood and provide a consistent user experience.