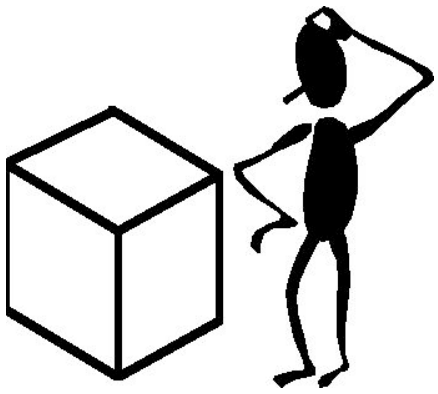
Blackboxing Technology—Cybernetics

Context

A black box is a system in which the internal structure is unobservable or "invisible". Black boxes are central to cybernetics, or the control and modeling of systems through input, process, output and feedback mechanisms. Fundamental to a black box is its inputs and outputs. Input is the combination of all possible influences to which the box is subjected. Output is the reaction of the box to these influences in terms of observable values. In cybernetics, the goal is to model systems through the use of black boxes. Some people, such as Professor Bruno Latour, say that science and technology are like black boxes. When machines run efficiently, or when scientific facts are settled, we need only deal with inputs and outputs, while the internal processes have been made invisible. Should the internal workings of scientific and technological products be kept invisible? Should most people be ignorant of the internal structure of black boxes?

Problem

Design and construct a "black box" that transforms inputs to outputs without revealing internal processes.



Design Constraints

- The box must be designed so that the internal processes transform the outputs (inputs must be different than outputs).
- The box must have at least four different outputs.
- Three of four inputs must be different than the outputs.
- Inputs and outputs must be observable (visible or audible).
- The internal processes must be enclosed so they are not observable.
- The box must not exceed a volume of 8 cubic feet.
- There is a $5.00 limit on the cost of <u>new</u> materials, and you must account for all money spent.

Design Considerations

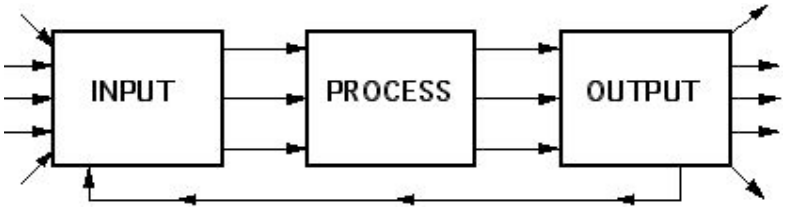
- Pay close attention to the relations between inputs and outputs.
- Consider a wide range of possible inputs and outputs.
- Consider outputs that differ significantly from inputs.
- Think of the black box as a magic box.
- Consider how the internal processes can be hidden from observers.

Construction Sequence

- Brainstorm ideas for the black box appearance.
- Sketch two or three designs and choose appropriate forms, materials and patterns.
- May use 2D computer aided design (CAD) or 3D modeling techniques to lay out mechanisms and parts.
- Locate recycled materials or new materials.
- Assemble materials for the internal processes.
- Assemble and finish the black box case.
- Final assembly and tests.

Management Issues

- End of Day 1: Approval of black box ideas.
- End of Day 2: Black box design on paper completed and approved.
- End of Day 3: Begin construction of black boxes.
- End of Day 6: Black boxes completed
- End of Day 7: Trials with black boxes.



Related Studies

- Cybernetics
- Sciences
- Mathematics
- Social Studies
- Sociology
- Psychology
- Engineering

Honest Self (Group) Evaluation

1. We stayed within the design constraints and deadlines _____ out of 5 marks

2. Our black box is unique in its design _____ out of 5 marks

3. Our black box has at least four different outputs and at least three inputs are different than the outputs _____ out of 5 marks

4. Most of the materials used are recycled _____ out of 5 marks

5. Our use of materials was creative, economic and efficient _____ out of 5 marks

6. Our black box successfully transforms inputs to outputs without revealing internal processes. _____ out of 5 marks

7. The demonstration of our black box was creative and entertaining _____ out of 5 marks

Total _____ out of 35

Assessment

Group's Self Assessment _____ Total/ 35

Design Principles

Features and Form _____ out of 10

Originality _____ out of 10

Economics and Ecology _____ out of 10

Craft and Quality _____ out of 10

Working parts _____ out of 15

Deadlines, Safety and Participation _____ out of 10

Total

_____ out of 100