Critique of

Glass Case Vending Machines

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Photo from [Vending Machines Unlimited]

Introduction

This critique uses Donald Norman's 7 action steps (48) to evaluate the usability of the standard glass-case vending machine. Throughout the action model, it becomes clear that the affordance of the glass window is key to the usability of the system, providing visual feedback and placing a good deal of knowledge in the world and visually accessible to the user.

Seven Action Steps

1 Goal

How easily can the user determine function of device and form an appropriate goal?

Upon encountering the glass-case vending machine, the user sees many products arranged in rows and labeled with prices. This allows the user to form the mental model of store shelves. The products are located above a large opening with a push door – this gives the impression that products are somehow attainable. The user can easily determine the machine is intended to dispense these products and to form the goal of purchasing a product.

The glass window affords opportunistic goals as well as planned goals. In fact, the vending companies rely on the fact that users walking by with no planned goal of purchasing an item will be enticed to do so once they see the display.

User's Goal: to purchase an item from the machine. At some point, the user may also form the additional goal of receiving change back.

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2 Intention to Act

How easily can the user tell what actions are possible?

The mental model of the store shelves leads to the additional mental model of a purchase transaction. Additionally, a lock on the display case is clearly visible and suggests the products are not free for the taking.

2 slots are visible on the control panel – one with a picture of a dollar bill over it. Slots afford the act of insertion. The shape of the slots and the image of the dollar bill are in line with user's mental model of a purchase transaction.

The user can also see a key pad and a digital display, both of which have semantic constraints in this context. There is only one use for the key pad: to enter information. There is only one use for the digital display: to read information.

There are 2 openings with push covers that afford reaching in and receiving something – one underneath the products and one beneath the control panel.

There is also a round button next to the coin slot – it is not labeled so determining its function requires some Knowledge in the Head (KIH) or trial and error. An improvement to the system would be to label this as the change return button and place that Knowledge in the World (KIW).

The user can easily see the allowable actions: inserting money, pressing various buttons, reading a display and reaching into the machine to receive items from it.

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3 Sequence of Actions

How easily can the user determine mapping from intention to physical movement and determine the correct sequence of actions?

The user can rely on the mental model of a purchase transaction to figure out that the item must be selected and paid for before being received. But what is the correct order of the selection task and pay task? In a typical store transaction, the user makes a product selection first and then pays for it. However, users that are experienced with simple pay-and-dispense vending systems where no selection task is required (bubble gum machines, parking ticket machines, etc) are likely to enter their money first. In a properly designed vending machine, the order of these 2 tasks doesn't matter.

User determines the sequence of:

- **Select item, pay, obtain item (optional: collect change) OR**
- **Pay, select item, obtain item (optional: collect change)**

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4 Execute Actions

How easily can the user perform the action? What mistakes can be made and how can they be prevented?

a. Insertion of money

The size and shapes of the slots are physical constraints that assist the user with properly executing this task.

Possible error: User inserts the money improperly (i.e., inserts the paper money face down)

Error Prevention: Most of the newer vending machines accepts money inserted in any orientation (except folded)

b. Selection of product

The keypad affords easy entry of item number.

Possible errors:

- User enters the price of item instead of the item number (data driven error)
- User selects an item that is out of stock
- User enters the item number of the wrong product

Error prevention:

- The item numbers on most vending machines are designed to minimize selection errors. Single-digit numbers, repeat-digit numbers and prices are not used in the item numbers and letters are used in the item number to eliminate confusion.
- Glass window provides immediate information as to whether an item is in stock and also removes the language barrier that would be introduced if there were simply a non-glass case with product names listed

There doesn't seem to be a way to recover if user accidentally enters the valid item number of the wrong product. An improvement would be to somehow highlight the product that was selected and prompt the user to confirm the selection by hitting an Enter key.

c. Obtain Item

The door on the product receiving bin affords pushing to access product.

Possible errors: Product is stuck and user attempts the sometimes fatal task of tipping the machine to dislodge the product.

Error prevention: Newer machines are equipped with infrared sensing technology to detect whether a product has dropped. If the product didn't drop, the machine will either re-vend or refund user's money.

d. Obtain Change

The door on the change receiving bin affords pushing to access change.

User can easily execute intended actions with minimal errors.

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5 Perceive State of World

How easily can the user tell what state the system is in?

The digital display shows the amount of money as its being entered and also shows the item code as its being entered. This is immediate and continuous feedback to the user as to the state of the system.

The system immediately reacts to product selection either by dispensing a product or, if money has not yet been entered, displaying the amount of money that needs to be entered on the digital display screen.

The glass window allows the user to immediately tell whether the product has been dispensed to the receiving bin and auditory feedback lets the user know whether change has been dispensed.

User can easily determine the state of the system.

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6 Interpret the Perception

How easily can the user interpret the perception?

All of the feedback signals – digital display, visual and auditory signs of product and money being dispensed – are easily interpretable. Nothing about the signals is ambiguous.

User can easily interpret their perception.

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7 Evaluation of Interpretation

How easily can one tell if system is in desired state?

Again the visibility into the system that the glass window affords easily allows the user to see if correct product has been dispensed. If there was no motion on the part of the machine to dispense the product, that is visible as well and the user can look for other clues as to why nothing happened – typically the digital display will have additional information. If the machine attempted to dispense the product but the product got stuck, that is also clearly visible.

User can easily determine whether the system is in the desired state.

Conclusion

It's my conclusion that the modern glass-case vending machine is a user-friendly design that incorporates a number of design constraints to enhance usability and prevent Gulf of Execution and Gulf of Evaluation errors.

There is a strong reliance on Knowledge in the World with almost all of the vending machine's actions being highly visible and information about the system state and allowable actions being easily retrieved from the environment. Mental models, natural mappings and constraints are exploited and no learning or memory is required for operation. This is important for a device that is 'walk up and use' and where the target audience is extremely diverse and most likely hungry or thirsty.

In 2009, new touch screen vending machines are being introduced to replace the traditional glass front machines. These machines will allow users to find out how many calories are in the various snacks and play games to win products from the machine. Also in 2009, Coca-Cola won a design award for their new vending machine that integrates a 46-inch LCD touch screen into the front that combines Flash technology, motion graphics, high-definition video and Bluetooth capabilities for mobile downloads. It "incorporates sight, sound and motion video to take the vending experience from transaction to true interaction," said Anthony Phillips, global marketing manager, The Coca-Cola Company.

It's entirely possible these new vending machines will be leading us into the paradox of technology – where the addition of extra features and functionality do not serve to improve the usability but only serve to increase cognitive friction for the user.

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