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**How We Fuel Up:
An In Depth Analysis of the
Affordances and Constraints of
the Self Service Gas Pump**

Overview

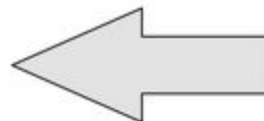
In this project, our team is going to analyze the affordances and constraints of a certain piece of technology. We will discuss the features of a self-service gasoline pump, and describe how the features act as affordances and how they act as constraints for the user. In analyzing the features, we will be able to understand how different features of a product can have an effect on the interaction between the product and the user. Understanding what certain features allow and guide users to do, as well as constrain them from doing, is key for developing products that are user friendly.

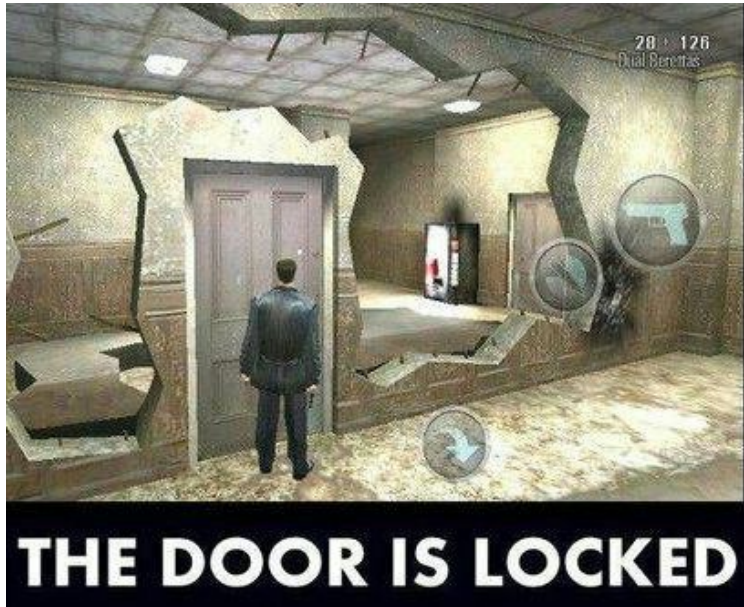
Approach

The concept of affordances was coined by psychologist James J. Gibson: "...the term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used." Well crafted designs have many affordances that help the user understand the purpose of the design.



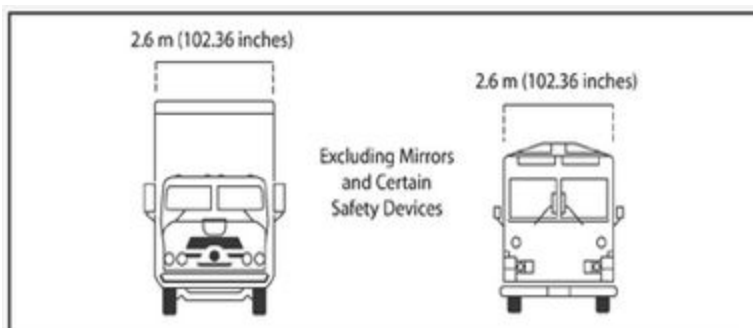
The handle of a mug acts as an affordance as it guides the user to grab the handle in order to use the mug.



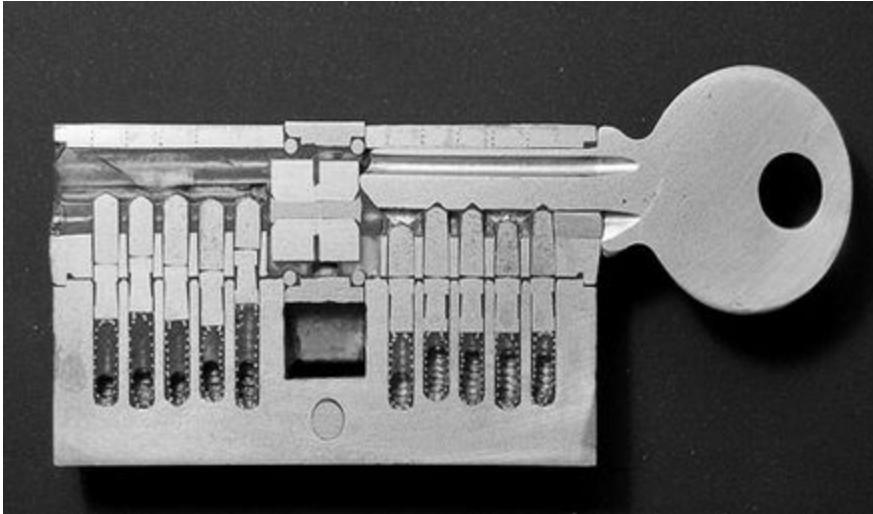


Affordances are used heavily in videogames to guide the user through the plot of the game. In many cases the affordances are obvious. The reason why affordances in games are usually somewhat obvious is to prevent confusion for the player while maintaining entertainment value.

Lidwell, Holden, and Butler describe constraints in *Universal Principles of Design*, as “a method of limiting the actions that can be performed on a system” (p. 60). Constraints are necessary in design because if a user interacts with a product the wrong way, it can lead to unintended results. To prevent unintended consequences, constraints are used in nearly any design.



An example of a design constraint is the legal width of a vehicle. Trucks are subject to maintain a certain degree of width, constraining them from going beyond a certain length.



A lock and key is another example of how a constraint is necessary for a product to perform its function. Without the constraint that disallows a single key to open any lock, the purpose of having a lock would be futile.

Case Study

Step	Affordance	Constraint
1. Pulling up to the pump	1a) Dual sided to accommodate various models	1b) Cement Pillars
2. Payment: Inserting Credit/Debit Card into the reader	2a) Easy to use Payment interface & Keypad	2b) Card only; cash payments at register inside
3. Selecting grade of gas	3a) Large "Press" buttons	3b) Multi-Colored background
4. Inserting Nozzle into tank	4a) Stretchy hose	4b) Safety warning
5. Pulling on lever of handle to begin flow of gas	5a) Grates in handle allow hands free pumping	5b) Dial shows the running total of gallons pumped and overall cost

6. Returning the handle to its cradle	6a) The cradle contours to the shape of the handle so it fits in place perfectly	6b) The weight of the handle
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Affordance



1a)

The pump itself is an affordance because of the dual accessibility. Since the self service station is on both sides; it can accommodate all types of cars. Though the majority of vehicles in the United States are made with their gas tanks on the drivers side, many vehicles have their gas tanks positioned on the opposite side of the vehicle, so the option to pull up to either side is an intuitive feature that allows the user to pump gas easier and more efficiently.



2a)

There are many affordances to be observed at the payment section of the pump. The first affordance that sticks out the most (literally) is the credit/debit card swiper. The design of the swiper is made to fit the standard size of payment cards, and an indent on the rims of the swiper make inserting the card easier to do with the thumb and index finger. Furthermore, the small icon on the left of the swiper tells the user which way the card should face when inserting. The second affordance is the keypad. The keypad is designed similar to a calculator or other typing devices, having buttons that are finger size, which makes the user realize that this is where to type information. The same goes for the buttons on the small screen. Since the arrows on the screen point to the buttons on the sides of the screen, it tells the user that those white boxes are pushable buttons.



3a)

The three options of gas and the bright yellow buttons are affordances that tell the user which button coincides with which type of gasoline. The word “press” is obviously a strong indication of the desired action, but the big yellow buttons also jut out at an acute angle to increase visibility to the user with the intent of becoming parallel to the service station when force is applied.



4a)

The design of the nozzle of the pump is an affordance that tells the user that the pump needs to be inserted into the gas tank of the car. The nozzle also is designed with a piece of rubber to prevent the user from inserting the nozzle too far into the gas tank. The long rubber hose that connects the pump is also an affordance that tells the user how close he or she should park next to the pump, and constrains the user from parking too far away.



5a)

The design of the gas pump is an affordance that tells the user how to use the pump. It's handle and gun-like trigger make it obvious that the lever needs to be squeezed in order for gas to pump through the nozzle and into the car. Also the ridges on the inside of the handle allow the user to lock the lever in place which allows for hands free pumping.



6a)

This design helps guide the user easily put back the pump after use. The shape of the holder contours to the handle of the pump, and the hook on the holder keeps the pump in place. The user puts the pump back on the holder, and inserts the nozzle into the hole.

Constraints



1b)

The First constraint in the gas pumping process are the cement pillars that extend outward past the pump. In my opinion, they are there as a protective barrier from bad/dangerous drivers. Though the extension of the hose helps accommodate in the

parking process, the cement barriers ultimately define how close a car can park next to the gas pump.



2b)

The second constraint is the black and white placard next to the keypad that lets customers know that the pump is unable to process cash transactions, and before they can pump, they need to go inside to pay at the register.



3b)

The multi-colored background acts as a constraint, because it helps differentiate the various grades of gas. This variation, though subtle acts as a warning to the user,



6b)

The weight of the pump itself serves as a constraint. In a rough estimate, I'd say the handle weighs ~5lbs. As such, the handle is slightly uncomfortable to just hold in your hand with no purpose or intent; it makes you want to quickly put it in your gas tank or quickly return it to its holster in the self-service pump.

Conclusion

We figured out various kinds of affordances and constraints of self-service gasoline pumps after doing plenty of research. Several features act as affordances are very successful. For instances, the grates in handle allow hands free pumping and it is obviously easy to use payment interface and key pad. Moreover, there're also some constraints showed above. For examples, if multi-colored background is available in the future will be perfect. All in all, self-service gasoline pump is a well-designed product. Based on our research, it has lots of affordances and constraints. All the unique features show that the product was designed with a focus on the user experience. Through doing this project, we are much more familiar with the concepts of affordance and constraint in design. We figured out

why each thing was designed in a unique way. This project extremely sets up a basic foundation for us to help us further study in the future.

References

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