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The Psychology of Human Computer Interaction

Introduction

To design a product that gives a positive user experience, an understanding of psychology is mandatory. The gulf of execution and evaluation describes the steps people take either consciously or subconciously to reach a goal. Then they evaluate if their actions got them to their desired destination hence the gulf of evaluation. It's important to also place a set of constraints on a product to be used as intended. The constraints discussed in this paper are physical, cultural, semantic, and logical. There is also discussion about constraints that force desired behavior and the utilization of sound as a signifier. With each of these, there is also a given example.

The Gulf of Execution and Why it's important

The gulf of execution, in essence, means people are trying to figure out how something works. The goal behind the gulf of execution is it serves as the bridge to how people are to achieve a particular purpose. For example, if you had a website with a slider and wanted to go down, the slider bridges the gulf by inviting/suggesting you scroll down. When the gulf of execution works, people feel satisfaction and enjoyability. However, when the gulf of execution returns unexpected results or a failure, people feel frustration and inadequacy.

Positive Example

In Figure 1 there are multiple examples that bridge the gulf of execution. Firstly the mouse arrow moves around the menu, inviting clicking, and when you slide over specific actions, a button lights up, inviting clicking. And what is achieved by clicking is clearly stated.

Figure 1: Call of Duty 4 Main Menu [1]

Negative Example

Below in figure 2 is a overclocking tool called MSI afterburner which is used to help people gain better performance out of their computer. The only problem is nothing works as expected. Most of the controls and sliders do not work unless you activate specific options in the program that it does not inform you of. There is no intuitive way to increase the clock speed, it's just a circle, and it's simple to damage your system from a massive gulf of execution and ambiguous controls. Most options do not behave as expected.

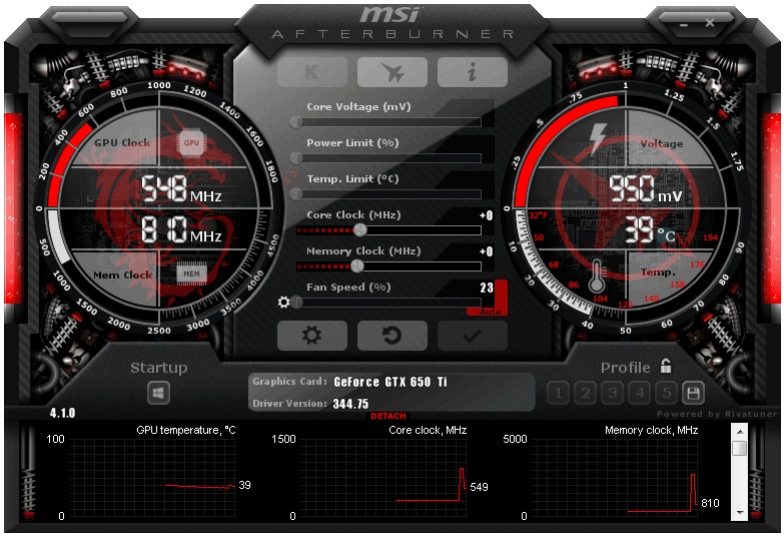


Figure 2: MSI Afterburner Main Menu [2]

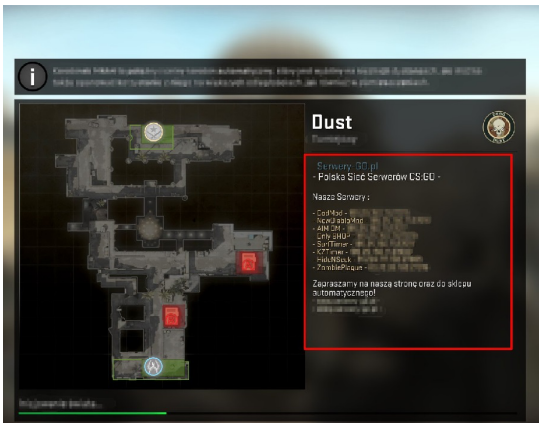
Gulf of Evaluation and Why it's Important

The gulf of evaluation is when a user tries to figure out what happened when something failed. The goal is to have a small gulf of evaluation, so things work with ease and without multiple failures to get the desired result. When something goes wrong, you must notify the user of what went wrong and why. Ambiguous or non-existent notifiers leave people clueless and increase the gulf.

Positive Example

Take, for example, the following loading screen in figure 3. The bar's constant progression and information update below signifies that your desire to load something is processing. It's giving regular updates towards its progress and that no errors have occurred. It gives constant information regarding if the user's execution has worked successfully.

Figure 3: CSGO Loading Menu [3]



Negative Example:

When a loading screen possesses no indication or sign of progression, it's confusing for the user. Did my action work? Why is it taking so long? They are unsure if their desired goal has failed or is in the process of being reached. Take, for Example, figure 4. There is no bar to indicate progress. There is only a spinning icon that signifies no progression. It just spins until you suddenly achieve your goal or fail to achieve it. Spinning icons are ambiguous and increase the gulf of execution by not signaling if the user's desired goal was achieved or failed.

Figure 4: GTA V Loading Menu [4]

The seven stages of actions: seven fundamental design principles

Anytime you are doing something, you are coming up with a plan to achieve the goal. Whether this is subconscious or conscious. Both the bridge of execution and the bridge of evaluation has three subparts adding to seven parts once you include the goal. Bridge of execution has three steps; plan, specify and perform. The plan is the action, specify is an action sequence, and preform is the actual doing of the action. You must first have your goal before you can begin the bridge of execution. Second, you follow the three steps of evaluation; Perceive, interpret, compare. Perceive refers to the state of the world; interpretation is the perception; comparison is the outcome with the goal. Why is this useful for interface or product design? Because to create a unique and intuitive design, you must have a deep understanding of people. You must understand the actions taken by people to reach a specific goal to make the design complement their desire. A lack of knowledge leads to inadequate designs and frustrated users.

Chapter 3

Physical Restraint

Physical restraint is something that stops someone's possible behavior. For example, puzzle pieces can only connect with specific parts to prevent people from incorrectly assembling the puzzle. In other words, it stops people from manipulating the object in particular ways. Physical constraints should be intuitive, so someone who's never interacted with the product understands its constraints. It also limits the total number of actions that are not correct, leaving more room for proper interactions.

Example

Take, for example, the Mac OS seen in figure 5. It's designed to prevent users from potentially damaging the system by installing harmful software or anything of the matter. It physically restrains the user from putting the system in an unstable state. Many OS's have this feature, but mac takes it to another level by not allowing users to install unverified apps.

Figure 5: Mac OS unidentified developer warning [5]

Cultural Constraints

Culture constraints are the allowable actions of a given culture in a specific social environment. For example, if you were at a court hearing, you'd be expected to stay silent and speak when it is permitted. Also, if you were at a funeral, you wouldn't start blaring trap music from your phone. In terms of items/products, cultural constraints are a standard societally accepted way of designing something. For example, almost all cars have headlights driving in the night, airbags for safety, and seats inside them. Most of these are required by law for car manufacturers, making it a cultural constraint.

Example

Take, for example, Google. Google will not allow you to obtain illegal content such as untraceable firearms or different illicit drugs. They hide material that would be harmful to people or that is socially accepted as bad. Google also can enable safe search to almost entirely filter out explicit content that may be harmful to younger children. For example, you probably don't want your four-year-old blaring Cardi B in the bathroom.

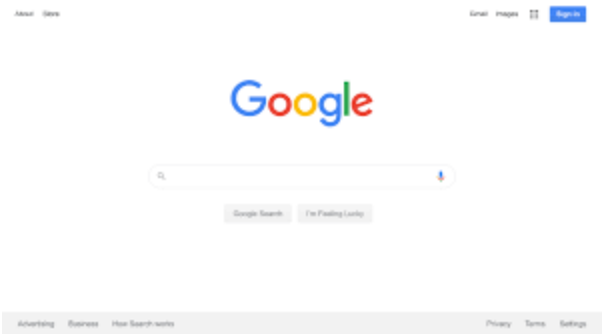


Figure 6: Google Search Engine [6]

Semantic Constraints

Semantic constraints depend upon the situation to determine what is allowable and what's not. Imagine a go-kart. A person tends to drive in the forward direction, so the seat is facing forward as well as the steering wheel. Sitting forward is the only meaningful location for a go-kart driver. Semantic constraints are also constantly adapting and changing depending on technology. A semantic constraint 30 years ago may not be one anymore.

Example

Look at the following screenshot from COD Cold War. People see through their eyes and aim guns with their hands at things they see with their eyes. So having the gun placed in front of the player is the only meaningful position. Any other position does not make much sense. You generally don't blind fire by shooting behind you nor to the right of you. Your eyes face the same direction as your barrel as it's the only meaningful position.

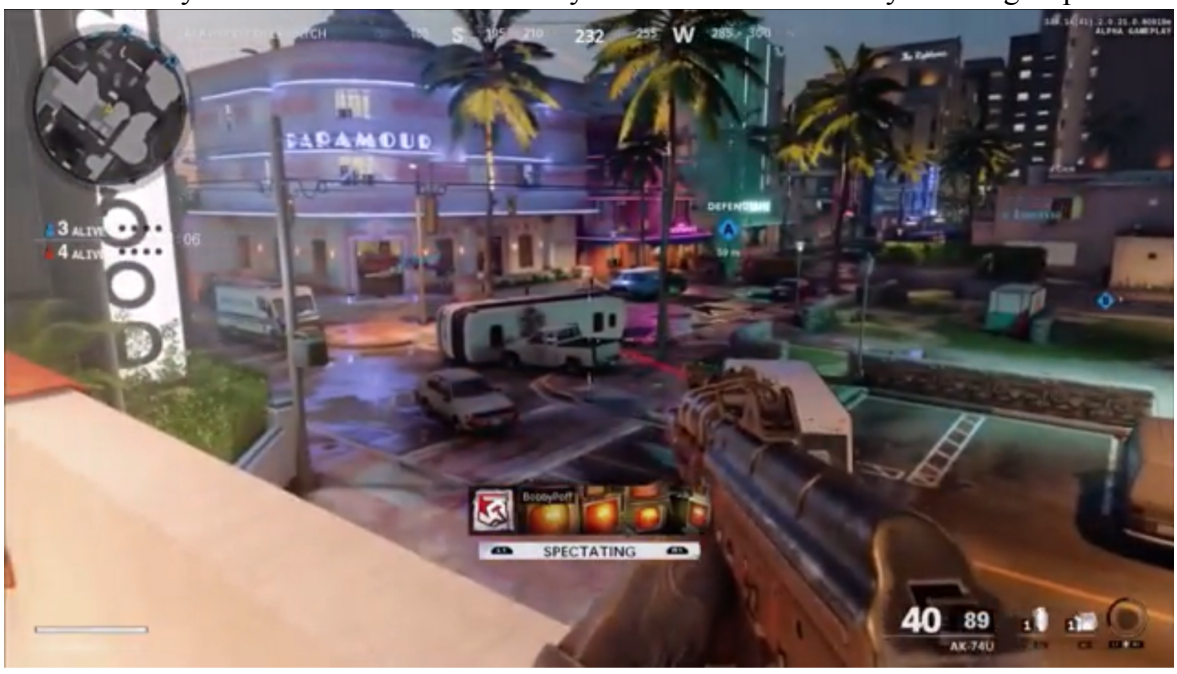


Figure 7: Call of Duty Cold War Multiplayer [7]

Logical Constraint

The best way to describe a logical constraint is to imagine taking an engine apart. You organize all your parts and put them back together in the same way you took them apart. But you are left with four other pieces that you didn't initially start with. It's logically viable that you missed a step or forgot to insert these parts into the engine. Based on the extra parts, you know there was an error somewhere along the assembly process.

Example

Take, for example, Google's Interface layout in Figure 8. There is an arrow facing to the left that, when clicked, takes you back to a page. It's logical based on the left arrow taking you backward that the right arrow should take you forward. Therefore it's a logical constraint as there are two options; if one partakes in option A then the next option must partake in option B

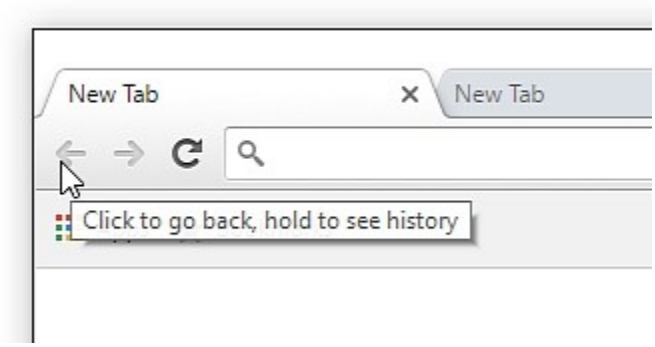


Figure 8: Google back and forward button [8]

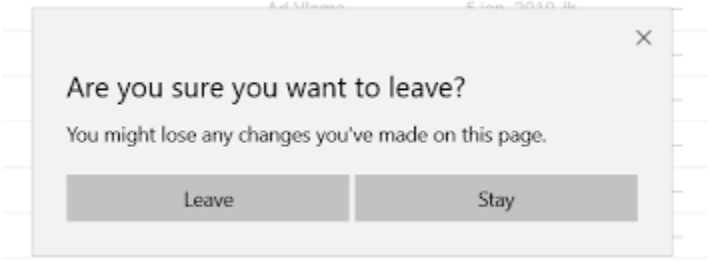
Constraints that force the desired behavior

Some constraints force a user to take a specific step to act. For example, to drive a mower to cut the grass, you must be in a seated position, or else the mower will turn off. This is a forced constraint that prevents accidents or potentially harmful behavior. Interlocks force a specific sequence of actions to be performed within a particular order. Take, for example, microwaves; when the door is opened, the microwave turns off. This interlock prevents potential harm to a person. Another example is lockouts, which is deliberate blockage of a person from doing something. For example, when someone is welding, there are curtains placed up to prevent people from accidentally walking in or getting blinded from the flash.

Example

Figure 9 is an example of a lockin. It prevents the user from prematurely closing the application without deliberately choosing whether to leave or stay on the webpage. Such a lockin prevents the user from accidentally losing data from a misclick.

Figure 9: Microsoft Edge Leave Notification [9]



Using Sound as Signifiers

Sometimes information cannot be communicated through visible means. This is when sound becomes a potent tool. Sound can inform us if something is working correctly, requires repair, or is being misused. For example, when you don't shut the car door all the way, the excessive roaring down the road indicates the door is not fully closed.

Even though sound can be a tool, it can also just as quickly become an annoyance. Most sounds that act as signifiers are unnatural and obnoxious sounds that irritate users over time. Sounds should be subtle and convey useful information, not distract the user.

Example

Take, for example, Modern Warfare 2's hitmarker system. When you successfully hit an enemy player, a small x is placed to indicate contact, as well as a gentle but unique sound effect. It sounds like a rubber hammer hitting something. The sound is not invasive but incredibly informative. It was such an iconic sound signifier that almost every single First-person shooter incorporated a similar sound to indicate contact.

Figure 10: MW2 Hitmarker System [10]

Conclusion

Designing a good product interaction requires an understanding of human psychology. A lack of knowledge often leads to frustrating designs and unhappy users.

Most human behaviors occur subconsciously. We often have a goal: turn on the television, AC, or oven, and we automatically know how to achieve our desired result with little effort. But understanding the mental process to achieve this goal is critical to designing an intuitive product. The steps required to reach our goal is called the gulf of execution; each step bridges the gulf, hence the name. However, what if things do not go as expected? We intuitively debug and attempt to solve the problem or figure out what went wrong. This is called the gulf of evaluation.

It's also important to have constraints on a product to prevent the user from misused or product damage. One of the most apparent constraints is a physical constraint, stopping someone from committing a particular action. Some of the less obvious design constraints are both cultural and semantic. Culture refers to things deemed socially appropriate for a given culture, and semantic is a constraint dependent on a given scenario. Lastly, a logical constraint gives an obvious logical explanation to an issue, such as having leftover parts from something you put back together. The excessive parts signal an error occurred.

Sometimes constraints are forced for safety or societal reasons. Take, for example, cars; you cannot exit the parked position without having your foot mashed on the brake. This constraint helps reduce accidents and potential injuries that may occur from the vehicle accidentally slipping into reverse.

A sound is also a vital tool when creating a pleasant user experience. Sound can inform the user that something is wrong without any visual indication, such as an error beep to signal an error or a simple beep to signal success. However, using sound as a signifier is a very tricky thing to do. Most of the time, sound can end up causing more frustration than help, but a well-designed sound signifier can communicate more information than any visual queue.

I have learned a tremendous amount of information about the psychology of designing a pleasant user experience. Psychology plays a more significant role in product design than I had previously imagined.

Citation

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