Simplicity or Complexity?
Design Review of a Rice Cooker Interface

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Abstract

This paper researches simplicity and complexity in design, primarily focusing on Korean rice cooker brand Cuckoo's design approach in general.

It thoroughly examines why Cuckoo's interface is designed the way it is, its context of use, the constraints of the device, the trade offs in the design decisions and how they relate to cultural preferences and if cognitive biases play a role.

Based on the findings on Cuckoo's design, the paper then expands the scope to discuss simplicity and complexity in design: what complexity is, whether complexity is good or bad, how our biological processing systems handle complexity, the relation between complicated and confusing, why simplicity is praised and if that notion may be challenged, and finally, concluding the paper with additional suggested improvements, if any.

Cuckoo: The most popular Korean-style pressure rice cooker brand

Cuckoo Electronics is a South Korean company founded in 1978, manufacturing small home appliances. Their most notable product is Korean-style pressure rice cookers. They are currently the top selling rice cooker brand in South Korea, and after their headquarters moved to USA, they became the largest global distributor of rice cookers in the States as well (cuckooworld.com).

Fig. 1 Cuckoo Rice Cooker / CRP-FA0610F

The model in review is CRP-FA0610F. English translation of the user manual for CRP-FA0610F is a total of 23 pages. It includes 37 safety caution notes with sub items, 22 safeguards, 6 additional safeguards, short cord instructions, and various warning notes throughout the manual.

The Interface under Review:

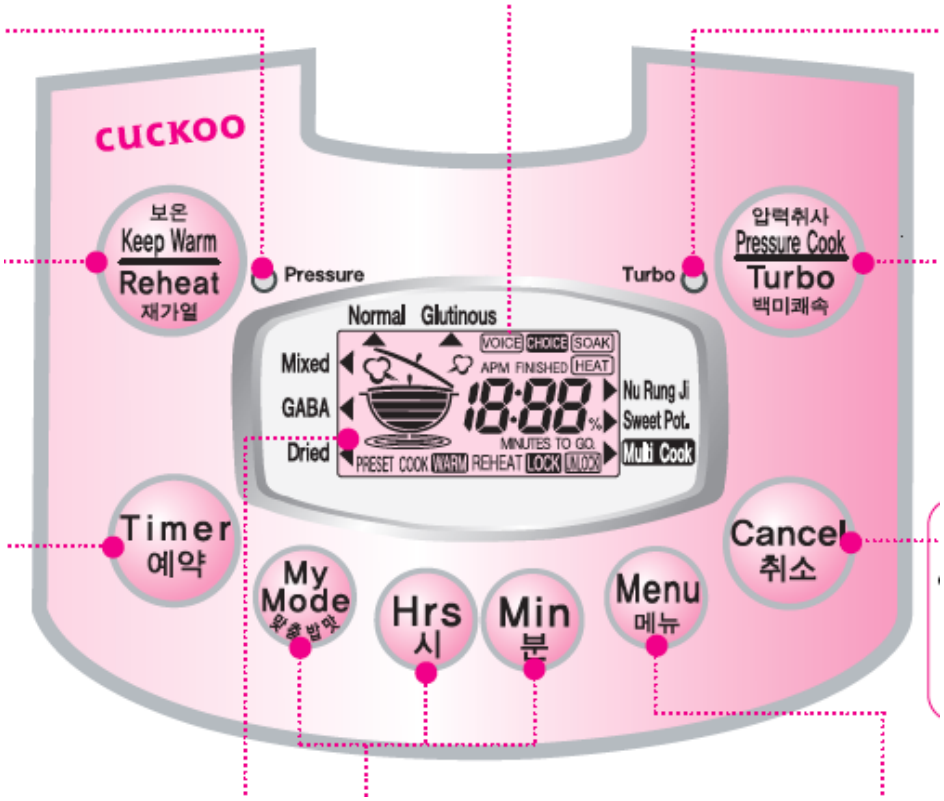


Fig. 2 Cuckoo Rice Cooker (Model: CRP-FA0610F) Main Interface Screen

Looking at the main interface, there are 8 digital buttons that surround the rectangular screen in the middle.

Pressure Cook/Turbo button: The first thing to look for is a start button. Start or On label doesn't exist. Instead, there is another button named Pressure Cook/Turbo that is used to start cooking. The user knows that it a pressure cooker so there's no point in naming the full feature of the device in order to activate it, unless the device affords types of cooking and there are buttons reserved for these added features, however there's not. Following the same logic, a microwave's start button could be called "Microwave" or a TV's on/off button "Display/Don't display" that inevitably would add redundancy.

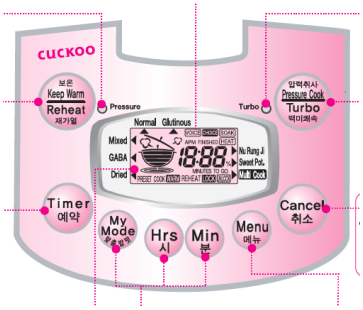
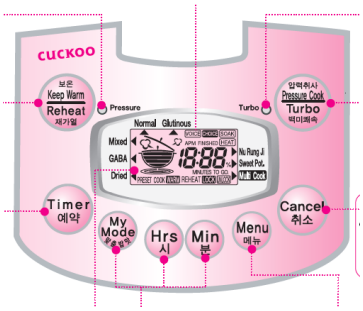


Fig. 2 interface screen has been added to design review pages (6-12) as well in order to avoid scrolling up and down to associate the image with related content.

Cancel button: Placed below start button. Since canceling is not one of the most desired steps while cooking food, there was no need to make it one of the bigger buttons placed right near the menu button either. As a side note, canceling is different than what we have in today's microwave devices where it acts stop button acts as a pause button and enables the user to resume. In addition, it takes around 7 minutes for the system to stabilize the inner pressure and unlock the lid, which is likely to ruin the experience if the food is undercooked.

Menu button: Menu button is used not only for selecting a combination of several different types of rice to cook but also functions as a center to control the strength and weakness of warming process. The user may come across some of the design constraints of the interface in this section: The menu can only be selected with all the functions canceled.

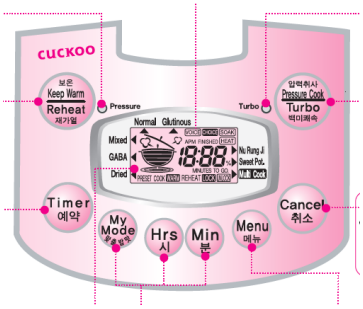


Since I experimented with the system in many ways, I became familiar with the interface. Personally, the menu button was the most frustrating section of the evaluation. I was unable to complete some tasks such as readjusting the strength of warming process. According to the manual, the system activates the warming process through L/H mode; L should be selected "when much water runs-off from top cover when opening", and H should be selected "when the rice near the jar becomes too softened". The system allows the user to set the value in 7 seconds. After 7 seconds, the system enters the set value for the temperature automatically. However, none of the buttons helped in giving the control to the user to set L and H buttons. Neither the manual nor the online videos were of any help. The problem is that, as a user, I still have no idea if I was doing something wrong or if the rice cooker that I was experimenting on was malfunctioning. As a result, I was completely lost while trying to decrease the temperature during the warming process.

This is where I noticed another design constraint of the device. During the warming process, I realized that I was unable to readjust the temperature. In order to do that, the user has to click Cancel button and terminate the operation first, then press Reheat button for 5 seconds, and then is allowed to reset the warming temperature. It is another function that is not intuitive.

Hour/Minute buttons:

There are separate buttons to adjust hour and minute settings in a system where there is only one button to select the type of rice out of 9 selections or adjust the warming temperature.



My Mode button:

User can select the degree of "softness", "glutinosity" and "tastiness" to meet their specific taste. , I was using scorched rice at one point during my experiment with the rice types, and selected Nu Rung Ji on the screen -Nu Rung Ji is a Korean dish where scorched rice is used-, however I was unable to set My Mode.

A quick search on the internet indicated that My Mode button could only be activated with 4 rice types out of 7, excluding Nu Rung Ji option as well. There was no indication that Nu Rung Ji was not customizable. It showed that the system has predetermined settings and the user is unable to be aware of them unless experiments with them.

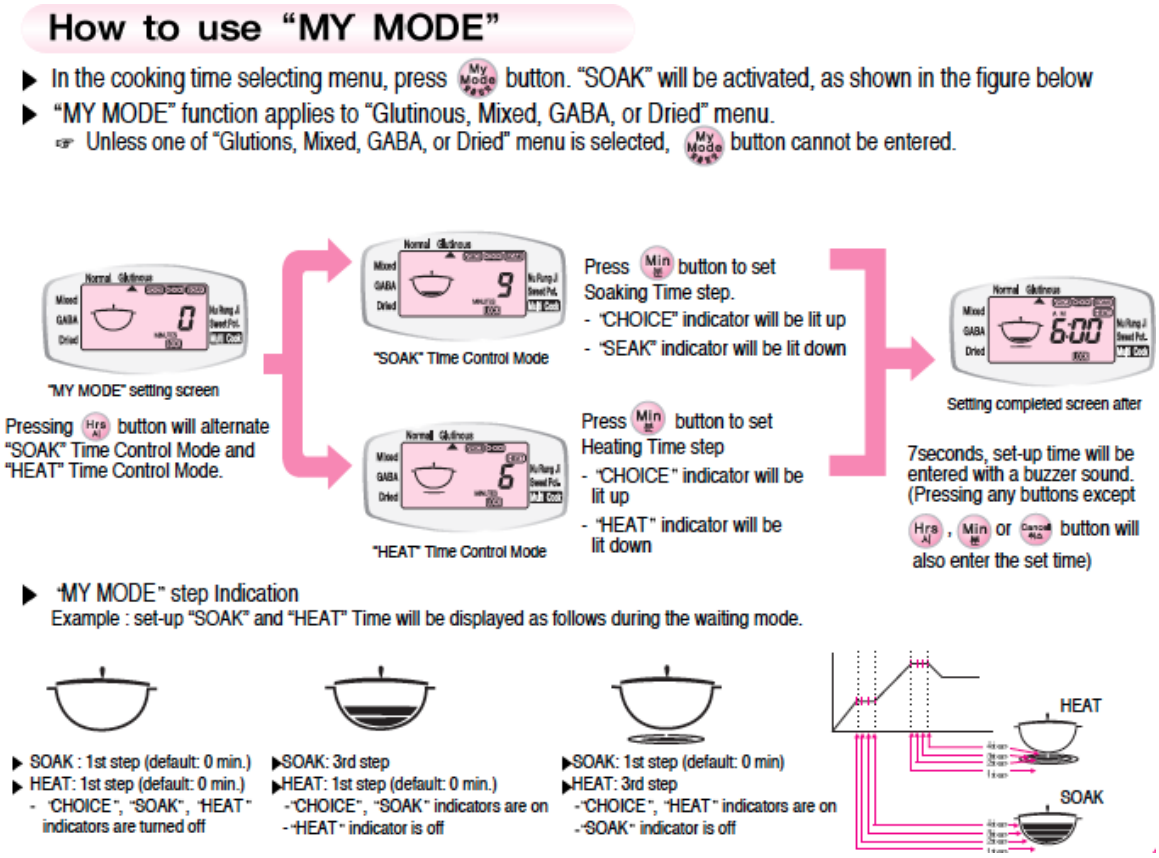


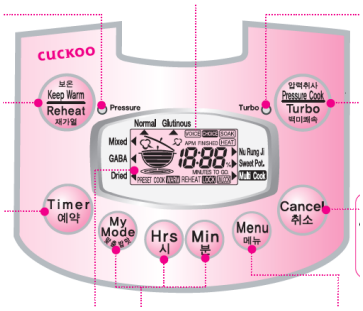
Fig. 3 Information on how to program "My Mode" in the rice cooker, taken from the manual.

Timer button:

Using Timer button is fairly easy. Having separate buttons for hours and minutes help the user to see everything clearly. If the current time is set correctly, all the user has to do is to put the rice inside the cooker, click Timer, click on Hrs button to adjust the hour and Min to adjust the minute of the timer, and finally click Timer button again. One may be confused whether the selected time is the time the device starts to cook, or the time the rice is ready to be served. This is actually the time the rice is ready to be consumed. For example, if 7:30 pm is selected for dried rice, the device starts cooking at 6:47 pm.

Keep Warm/Reheat button:

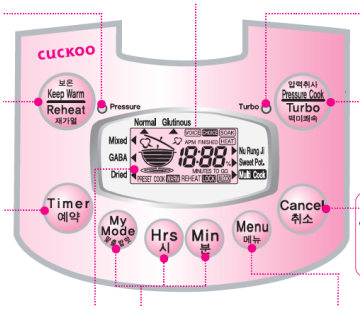
There is no pattern in the placement of the buttons and Keep Warm/Reheat button is no exception. To make things more complicated, it is placed on the upper left of the device, with a digital light called Pressure placed right nearby. Pressure light has no relation with Keep Warm/Reheat button; it is actually an indicator for the whole system. It turns red whenever the device is ready to operate.



One of the main reason behind placing them so close together may be due to an aesthetical concern, since every single button on the interface of the rice cooker represents a bilateral placement. Besides, when looked at the whole interface, buttons form a smiling face that consist of two eyes and a smile (see Fig. 1), which may be a good example to verify the findings of Gestalt psychologists, who believe that a variety of mechanisms inside the brain lends to pattern-forming (Kelso, 1997). This may be pleasing to look at in terms of our natural tendency to find symmetrical shapes more attractive, since it's been proposed that preferences for symmetry have evolved because the degree of symmetry indicates the signaller's quality (Enquist & Arak, 1994), but it has no advantages in this case in terms of usability and makes the system more complicated than it needs to be.

In order to save time and space, it will be more meaningful to describe the inefficiency of the manual with one example. A short excerpt from the "turbo function for glutinous rice" section may summarize the complexity of the situation.

"Press twice to Turbo button after choosing glutinous rice from the menu button in order to switch to quick cooking mode and shorten the cooking time. Keep in mind that the preset time function is not for glutinous rice turbo cooking. The turbo cooking function is allowed up to 6-persons in an 8-persons capacity jar, 4 persons in a 6 persons jar. It takes about 18 minutes when you cook the glutinous rice for 2 persons."



At the very same page, there's a description for cooking times for each menu and the menu indicates that, in a 6-persons jar, it takes 18~24 minutes to cook turbo glutinous rice for 2~6 people and 28~36 minutes to cook glutinous rice; and in an 8-persons jar, it takes 18~27 minutes to cook turbo glutinous rice for 2~8 people and 31~37 minutes to cook glutinous rice.

After reading one full page of the manual, it's still unclear why a user would find it more advantageous to choose normal mode instead of turbo mode where the only visible difference is that it takes a few minutes longer to cook. Also, there's no indication of how the amount of rice cooked for 2-6 people is defined, or why there's a preset time for every type of rice (there's 7 types of rice) except glutinous rice.

This section above is a good example of how complicated a device as simple as a rice cooker can be designed, both on the device itself and the manual.

The interesting point is that the designers could design something that is easier to understand, simpler to use and still aesthetically pleasing. Aesthetics is not considered by many as an attribute in terms of usability. Nielsen defines usability with five attributes including learnability, efficiency, memorability, errors and satisfaction. Although he doesn't mention aesthetics, satisfaction may be embraced as something that gives pleasure, as Nielsen refers to how pleasant it may be for the user to use the system. He emphasizes the importance of entertainment value by comparing it to speed of a system, where, according to Carroll and Thomas' findings, there are times entertainment wins (Nielsen, 1994). Karvonen adds more to the discussion: "Could it include, among other things, the kind of pleasure we get, when encountering with a pleasurable, beautiful object? In fact, could there really be satisfaction without the beauty element, in the first place?" (Karvonen, 2000).

Thus, either it is an overall bad design, or making the design look more complex than it needs to be was an intentional decision. Instead of blaming a designer for their lack of skills in the first take, it's more meaningful to probe deeper and look for reasons behind this complexity. Besides, it's apparent that a lot of effort has been shown to design this rice cooker. It's also fairly obvious that a lot of time was devoted to prepare its manual as well. Further research on the cultural aspects may shed light on the overall complexity of

the design.

But first, let's define what simplicity in design refers to.

Simplicity in Design

"One should use common words to say uncommon things"

Arthur Schopenhauer

According to Maeda (2006), simplicity is about subtracting the obvious, and adding the meaningful. It is a trade-off between how simple a design can be made and how complex it has to be and the simplest way to achieve simplicity is through thoughtful reduction. Norman defines simplicity to be lack of obtrusion, or lack of complexity (Norman, 1998).

We may think that simplicity may restrict the features of an interface, on the contrary, simplicity should be approached with the notion that it enables the user to engage discussion about better organization and aesthetics. Since users are overwhelmed with too much disparate content represented in similar fashion, simplicity is known to foster novel interaction techniques (Chang et al., 2007). Keeping it simple has been the motto of generations of engineers in all engineering disciplines worldwide, however it has always been difficult to keep systems simple. One reason for lack of simplicity may be the never ending pursuit of rich features and high performance. Moreover, we feel like we should stretch the limits of our understanding. As a result, useful bot not essential features cause most of the complexity (Sha, 2001).

Simplicity concept has a long history. In ancient times, Greeks believed the soul to be eternal because it was regarded to be simple. Roman poet and philosopher Lucretius' quest for truth led him to postulate atoms as the elemental units of matter in its simplest form. German mathematician Leibniz stated that the world is made up of an infinity of substances called monads. A man of many talents, Thoreau's essay on simplicity has been adopted by many thinkers throughout history: "Let us first be as simple and well as Nature ourselves, dispel the clouds which hang over our brows, and take up a little life into our pores." (Stoller, 1956). Ockham's razor, a problem solving principle devised by William of Ockham stated that among competing hypotheses, the one with the fewest assumptions should be selected. The idea has also originally been expressed as "plurality must not be posited without necessity." (Jefferys & Berger, 1992).

For psychologist and philosopher William James, simplification was a methodology requisite to productive thought: "The facts of the world in their sensible diversity are always before us, but our theoretic need is that they should be conceived in a way that reduces their manifoldness to simplicity.... The simplified result is handled with far less effort than the original data." (Barton, 1987). The world of science had things to say in the ideal of simplicity, too. The Law of Parsimony was a scientific principle that things are usually connected or behave in the simplest or most economical way. Widely regarded as one of the pioneers of modern architecture, Ludwig Mies Van der Rohe was often associated with his famous quote: Less is more. After his death, a new wave of post modernism emerged, advocates of this movement such as architect Venturi, attacked his

thoughts on simplistic design and traditional notions of visual simplicity with a counter-argument: Less is bore.

For another psychologist, Rudolf Arnheim "adherence to the demand for simplicity leads to a lamentable poverty of abstinence in visual design" (Barton, 1987).
Mathematician John Tukey opposes to the approach that the main goal of using data graphics is to display the obvious to the ignorant; to him, sophisticated graphics should be used to explore complex data.

One of the most prominent names of graphic design and an expert in data visualization, Edward Tufte, also supports the notion that visuals should be simple and graphics should be reserved to display richer, more complex, more difficult statistical material. His principles of graphical excellence consists of using complex ideas with clarity, To him, graphical excellence is a blend of speed, precision and efficiency where the design gives the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space (Tufte, 1983).

This is where the preconceived notion of "simplicity as the design ideal" starts to collapse, since the findings of experimental researchers contradict with the design principles that seem to have been praised by many. Just like Tufte who addressed visual complexity as part of visual design, other experimental researches also stated that performance and complexity are directly related. According to their findings, there's an inverted-U relation between performance and visual complexity: subjects prefer visual

complexity and performance improves as complexity increases, up to a point. Many studies show that animals including humans prefer the more complex of two stimulus situations (Vitz, 2006).

Findings prove that embracing simplicity as our ideal notion may not be meaningful in every design situation. Likewise, it doesn't mean that, we should discard the simplicity concept as an ideal in visual design either. It's an ongoing problem-solving process and analyzing the problem is the essential first step.

"As industrial designer David Pye astutely observes, all practical designs are in some degree failures, either because they flout one or another of the requirements or because they are compromises, and compromise implies a degree of failure. If there are no ideal solutions, it is, nonetheless, possible to determine provisionally the best available accommodation in a given design situation. And that's the simplest a visual representation should be." (Barton, 1987).

There may be situations where complexity may improve our design as well. To clarify, we also have to make sure we understand what complexity in design refers to.

Complexity in Design

"The guiding motto in the life of every natural philosopher should be, seek simplicity and distrust it."

–Alfred North Whitehead

Donald Norman states that one should distinguish between "complexity" and "complicated", since "complicated" includes a second meaning, "confusing". A good example for appropriate complexity is the cockpit of an airplane. It may look very complicated and even confusing to a novice user like us, but to a pilot, everything is in its right place and nicely organized into meaningful groups. One button per function feature throughout the design looks complex, but this may be a misconception because complex appearance does not have to represent complicated design. Likewise, perceived simplicity does not equal to operational simplicity either (Norman, 2010). When the number of buttons on an interface increases, the perceived simplicity drops. This paradox may be deceiving. The things that make life easier may be perceived as more difficult. Likewise, the things that look (or sound) easy to do may be very difficult to operate, as jazz drummer, Bill Cobham gracefully states in his book, Directions for Percussion: "The simplest things to listen to may be the most complex to play".

An example of inappropriate complexity may be anything we use in life where the problems lie in the interaction of complexities of technologies (such as a rice cooker with an unnecessarily complicated interface) and the complexities of life (such as a user who gets lost inside the manual while trying to cook a bowl of rice). The problem arises when

there's a conflict between the mental model of the user and the mental model of the user in the mind of the designer, and the model designed and programmed by the designer, also called the implemented model, follows a different logic.

In the best-case scenario, when a system operates smoothly in the mind of the user, it means that the system was designed in a way that enables the user to form a harmonious conceptual model. Most of the systems where we can see each component separately provide that opportunity. However, when we start reviewing an electronic system such as a rice cooker interface where it's not possible to see the connections backstage, we are left at the mercy of the designers who provide us with some clues and hints as to what may be going on behind the scenes. Therefore, it is a designer's responsibility to provide the user with an appropriate conceptual model, otherwise we are completely lost. Therefore, the source of the problem between an appropriate and inappropriate complexity demonstrate that the major cause of frustrating systems is not complexity, but comparably unintelligent design.

Maeda states that some things can never be made simple. That holds true especially when we realize that some complexity is desirable in our lives. In his book (2006) he gives examples from intangible values such as close friendships or a collection of art. Actually, not-so-simple things surround us and apply to many things that makes us who we are, such as the songs we like, the books we read, the stories we tell or the games we play.

The irony lies in the fact that the more expert we become at a subject, the more

complexity we seek. Thus, it's fair to quote from Norman who emphasizes the importance of complexity in our lives where the goal is to achieve level of pure simplicity, addressing it as an ideal that we seek to reach, while it continues to move: "we need complexity even while we crave simplicity" (Norman, 2010).

Maeda touches on the relation between simplicity and complexity on a higher level, and implies that there's no way to connect with simplicity when how complexity feels has been forgotten. To him, simplicity and complexity not only need but also complement each other: "Complexity implies the feeling of being lost; simplicity implies the feeling of being found."

Additional remarks (from a cultural and psychological perspective**):**
One of the reasons Korean products seem more complex than non-Korean products may be due to the symbolic meaning of complex design in its culture: complexity indicates status. "In South Korea, for example, products like refrigerators are designed to appear more complex than non-Korean ones, even when the prices and specifications are very similar." (Norman, 2007).

Another reason is that people intend to pay more to devices that have more features on them, regardless of their usability. When people are given a choice to select a device, they tend to select the one that as more features. So, simplicity is something people praise, but when it comes to buying, a different behavior takes place. People feel that they should be paying more to a product that has visually apparent features. Rohe's "less is

more" sound good only in theory and people say they want simplicity but they also don't want to give up on any of the cool features either.

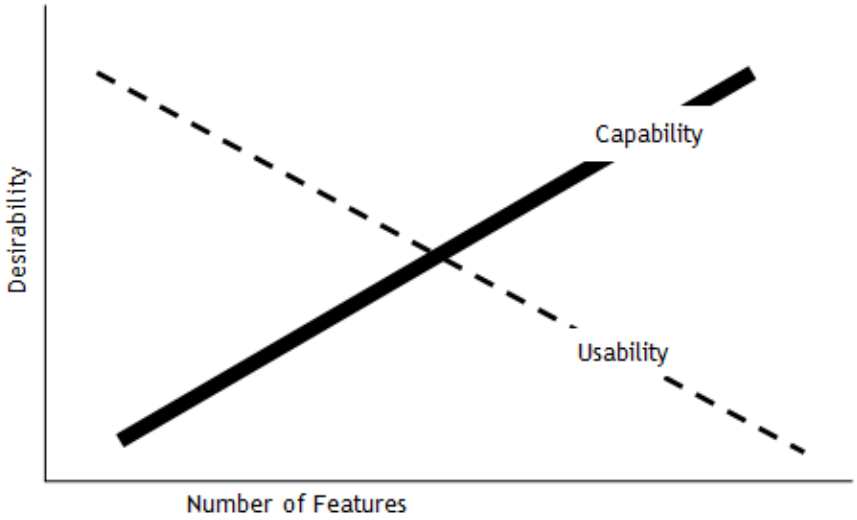


Fig. 4 Don Norman's graph on Features vs Desirability in terms of Usability (Norman, 2008).

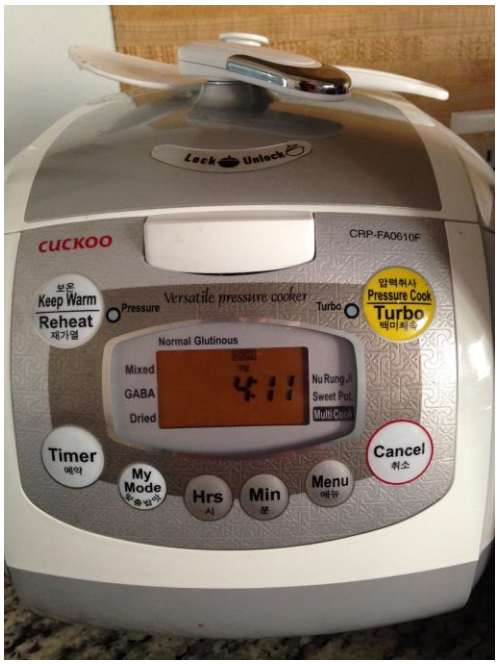
Conclusion:

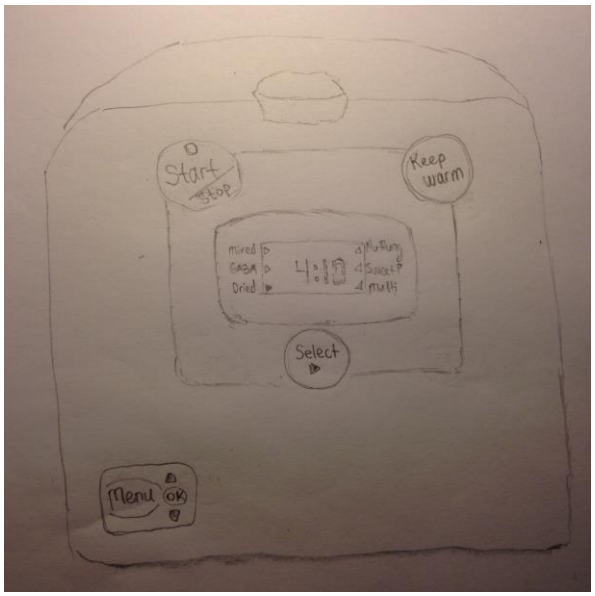
We may be designing with simplicity or complexity in mind, since both have pros and cons depending on our approach to design and how the users perceive it. However, whichever route we take, we should avoid confusing design. Confusing design has nothing to do with complex design. A design can be perfectly simple, yet still confusing. A door knob that does not reveal if it needs to be pushed or pulled to open, a hamburger menu icon that needs to contain a text that says menu so that users may understand what it is, or a touch screen that does not indicate the difference between a back arrow and a home arrow, we face relatively simple but still very confusing designs in every environment all around the world.

Therefore, regardless of the simplicity or the complexity level of an interface, a designer has to consider if the interface delivers the same affordance to every user and if it fulfills what it promises.

Appendix:

One suggestion would be to simplify the interface to see if it makes sense. Since it's out of scope for a research paper, I decided to add it into the appendix. Basically, I decided to make a rough sketch as an improvised version to see what it would look like. During this process, I followed some universal design principles such as Poka Yoke, Law of Similarity and Hick's Law.





The menu bar at the bottom hides the not-so-important functionalities within the application. The original interface has 8 buttons. This is redundant. I redesigned the interface by simplifying it. \

In general, I tried to lessen what I could and conceal everything else without losing the sense of inherent value. When there are too many buttons with no added value to the design, it may cause frustration in the user.

- I placed the 3 most used buttons around the screen all with the same color (Start/Stop at the upper left, Keep Warm at the upper right, Selections in the bottom middle of the screen) and placed them all inside the rectangular line that surrounds the screen. I used similar colors for the least used functions on the bottom left of the interface.
- I combined Timer, Hour, Minute and Menu buttons and merged them into one button.
- I added an up and down arrow, and OK button within the menu button. Then I replaced it to the bottom left of the interface, since these are the least used buttons. Actually, unless the user is setting up the time of the rice cooker, they won't be using Hour and Minute buttons. Again, if the user is not scheduling the cooker for a specified timeframe to work on its own or looking for specific timeframes to cook something special, there's no point in using the Timer either. Note: The device has been used by 3 people since 6 months and these buttons have never been used (except when actual time was set).

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