Extend Normans Example Collection

IC1007 Human-Computer Interaction

Grupp B3

Mustafa Ali (19990905-8571)

Larisa Cof (19981121-7323)

Benjamin Jansson Mbonyimana (19980226-3633)

Sebastian Lihammer (20000121-1655)

Sara Moazez Gharebagh (19991106-4260)

KTH Royal Institute of Technology
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Innehållsförteckning

1. Introduction

The difference between good and bad design is more ingrained in our daily lives today than ever before. A well-designed app can bring hours of entertainment and satisfaction, whereas a poorly designed one only brings anger and frustration. Though one can often intuitively sense whether the design of a product is poor, examining the product using design principles is the best way to produce a definitive verdict.

In 1988, Donald Norman published the book *The Psychology of Everyday Things* (later republished as *The Design of Everyday Things*), wherein he introduced several design principles. Though the book is more than thirty years old at this point, the principles introduced by Norman; *visibility*, *feedback*, *affordance*, *mapping*, *constraints* and *consistency*, remain relevant to this day. By adhering to Norman's principles, designers and developers can ensure that their product is well-designed, which in turn means that it will be understood and used correctly by users.

In this assignment, we will be examining two examples of things we believe have design shortcomings. These examples are the entrance doors at Kista Mall* and a radiator at KTH Campus. Through looking at these examples and applying Norman's principles we intend to clearly illustrate how and why these shortcomings poorly impact intended usage. We will also suggest design improvements for the examples, in line with the shortcomings found and with Norman's principles.

* In this evaluation the reference to the entrance doors at Kista Mall refers to the doors facing Kistagången.

2. The entrance doors at Kista Mall

The entrance doors at Kista Mall are two consecutive sets of heavy doors. Each door has the ability to be pushed or pulled, regardless of the side you are facing, indicated by a square looking black handle. The same type of handle is present on both sides of the door. The doors are the main entrance to the mall from the direction of KTH Kista and since the mall contains not only stores but also restaurants, other enterprises as well as access to the subway, hundreds of people move through them each day.

Fig 1: *The entrance from Kistagången at Kista Mall. The exterior entrance doors are in the bottom center-left.*[2]

[2] **Image source**: Ekberg, Henrik. Picture of Kista Mall entrance. "Infrastrukturen är nyckelfrågan i Kista", 15 Oct. 2014. *Lokalnytt.se*
https://www.lokalnytt.se/artiklar/93/infrastrukturen-ar-nyckelfragan-i-kista

2.1 Design shortcomings

2.1.1 Visibility

The definition of visibility is that the more visible an element is, the more likely users will know about it and how to use it.[3] Swinging doors often have a distinct design which makes it easy for users to identify them. They are typically lightweight and thin which makes pushing them open easier. In sharp contrast to this, the doors at Kista Mall are very robust and heavy.

Fig 2: *A typical set of swinging doors. Note the standard and lightweight design*.[4]

Because the doors are inconsistent in regards to the design of other swinging doors, a first-time user will not immediately understand how they are intended to pass through the door.

2.1.2 Affordance

2.1.2.1 Design of the handles

When it comes to the affordance design principle, the user should intuitively understand how to use an object when they see it.[5] In the case regarding the entrance doors at Kista Mall it is

[3] Preece, Sharp & Rogers (2019), p. 26
[4] **Image source**: (Unknown author). Picture of swinging doors. "Choosing the Right Automatic Door", (unknown date). *ADC*
https://www.theautomaticdoorco.com/resources/choosing-right-automatic-door/
[5] Norman (2013), p. 11; Preece, Sharp & Rogers (2019), p. 30

unclear whether you should pull or push the doors. People are used to a certain standard design for door handles at malls (pictured below), in which a door handle indicates that the door is to be pulled and a lack of a handle or a square shaped handle indicates that it is to be pushed.

Fig 3, 4 & 5: *Standard designs of door handles (left*[6] *and center)*[7] *and the door handles of Kista Mall (right)*.[8]

The doors do not accommodate the standard design in comparison to doors at other malls. There are square shaped handles on both sides of the doors which can cause confusion since there are multiple ways to interpret how to open the doors and in what direction to push them.

2.1.2.2 Door weight

Since doors at malls in general do not tend to be very heavy, users will not expect a set of doors in a public place to require a lot of force to be opened. In sharp contrast to this, the doors at Kista Mall are unusually heavy. Perhaps, if children, relatively weak or disabled people were to open the doors they would encounter several difficulties. In conclusion these doors do not meet the expected affordance and are therefore not applicable for these people.

[6] **Image source**: Own work
[7] **Image source**: Hwan Soo, Jeon. Picture of door handles. "Pull and Push door concepts makes coming and going a lot easier", 31 Oct. 2010. *New Atlas*.
https://newatlas.com/push-pull-door-concept/16721/
[8] **Image source**: (Unknown author). Picture of Kista Mall door handles. "Misstänkt skottlossning i Kista galleria", 1 Dec. 2019. *Nyhetsbyrån Järva*.
https://www.nyhetsbyranjarva.se/skottlossning-i-kista-galleria/

2.1.3 Constraints

Constraints restrict the forms of user interaction available with objects, making the type of interaction intended by the designer more readily apparent.[9] The design of the entrance doors at Kista Mall enable several different interpretations of how to open the door. Through looking at the doors, a person is likely to conclude that they should be pushed open. However, this holds true both for people exiting the mall and for people entering it, meaning that the doors are constantly pushed in different directions. An observer of this is likely to become very confused in regards to the correct way to open the doors.

Since hundreds of people use the doors each day, it is likely that there will be people approaching the same door at the same time. This is an impractical consequence of the poor design where people have to read the situation in order to determine the correct course of action.

In these respects, the doors fail to fulfill the constraints principle. The presence of the same type of door handles on both sides of the door and that the doors are too narrow are major design flaws which cause confusion and difficulty among users.

2.1.4 Consistency

Designing consistent interfaces facilitates the use and learnability for the user. The main implementation of a consistent interface is that it follows rules, enabling the user to recognize a usage pattern which results in similar-looking things producing a similar output.[10] The entrance doors at most malls (including some at Kista Mall) are sliding glass doors or revolving doors. However, the entrance doors towards Kistagången have several inconsistent design implementations. Furthermore, most doors are expected to close by themselves. Because the doors are swinging doors, users have to pay attention to the action that follows when letting the door go. Perhaps, the door may swing towards someone coming from behind, causing a potential danger. As stated in 2.1.1 and 2.1.2, the doors are unusually

[9] Norman (2013), pp. 124–125; Preece, Sharp & Rogers (2019), pp. 28–29
[10] Preece, Sharp & Rogers (2019), p. 29

heavy, which may cause a potentially dangerous situation when they are swinging towards a person that is approaching the door.

Secondly, the swinging entrance doors come in sets of two. The user is forced to pay attention to the actions that proceed when closing the first door and at the same time be cautious of the situation in front of them, for instance if there is someone approaching or a door swinging towards them. These flaws are huge disadvantages regarding consistency as they differ from the doors at other malls and even from other doors in Kista Mall.

2.2 Suggested Improvements

The doors at Kista Mall are very narrow and are placed in sets of two. The doors are heavy and because of this, they might injure someone. One improvement for the doors could be to add a controlling door closer that enables slowing down the closing of the door. This will improve safety for the people walking through the door, eliminating the risks of getting hurt, especially for children.

The door has a handle which makes it misleading, so the improvement which we suggest is that we make the door one way and add the appropriate door handle for either side.

The best improvement altogether overall would be to add sensors that automatically open the doors when a person is approaching. This makes more sense for a shopping center considering the fact that a lot of people have heavy groceries, and therefore don’t have both hands available and are unable to open doors with regular handles.

3. The radiator at KTH Campus

The radiator at KTH Campus is a radiator in the computer room "Gul" in the "E" building, located beneath the left window in the room. Placed on the radiator is a thermostatic radiator valve (TRV), intended to regulate the temperature of the radiator, and in turn the overall temperature of the room. As with other computer rooms at KTH, the Gul room sees hundreds, if not thousands, of students studying there each semester.

Fig 6 & 7: *The thermostatic radiator valve (left) and the radiator in its context (right)*.[11]

3.1 Design shortcomings

3.1.1 Constraints

A significant design flaw with the TRV of this radiator is a total lack of constraints. The TRV can be turned around indefinitely, which makes it impossible for users to determine from the TRV alone what heat the radiator is producing.

3.1.2 Feedback

In order for users to know that a system is working on their request, even if the effects are not immediately apparent, the system needs to generate some form of feedback (such as a noise or some other form of sensation).[12] In the case of the radiator, there is no visual or auditory way of telling whether it is on or off. The only way of knowing is by touching it and feeling

[11] **Image sources**: Own work.
[12] Norman (2013), p. 23; Preece, Sharp & Rogers (2019), p. 28

the warmth it generates after a while. By turning the TRV in either direction, there is no immediate and straight-forward feedback that indicates the consequence of the action taken. As such, users are left unaware if turning the TRV had any effect at all.

3.1.3 Visibility

By looking at the radiator confusion arises regarding how to interact with it. We can see a TRV on the left side of the radiator but on that TRV, we have no information. This is problematic in and of itself, but combined with the fact that the TRV can be turned indefinitely (see 3.1.1), it becomes essentially worthless. Without clear indicators of temperatures, it is exceedingly difficult to pinpoint where the TRV should be turned to. The TRV does not give a clear indication on how it is supposed to be used. On the TRV there is no information about how hot the radiator can get. Without a scale that indicates what level of heat they are going to radiate, the TRV is highly impractical for users.

3.2 Suggested Improvements

The first suggestion for an improvement concerns the TRV of the radiator, where we can add a text or an arrow that will inform the user that it is supposed to be turned. Another possible improvement is adding some scale to the TRV which indicates the heat of the radiator. The scale can be written in degrees or with numbers.

Another improvement is to add a feature that enables feedback, such as a light that turns on to indicate that the radiator is turned on or is heating up. This light could be in the form of a single LED located around the TRV area, decreasing the level of confusion when trying to use the radiator.

The last suggestion is adding a constraint for when the TRV is turned. A constraint would be a restriction that prohibits the possibility of turning the TRV indefinitely, which facilitates the understanding of where the highest and lowest temperature is. This would also give us additional feedback, which will make the usage of the radiator more clear and simple.

4. Discussion

The two examples that were presented, the entrance doors at Kista Mall and the radiator at KTH Campus have been evaluated by examining them in the light of Norman's six principles. After evaluating the doors, it is clear that there is a significant need for improvement. The doors are heavy, confusing, and dangerous for disabled and physically weaker people which is not optimal for a mall. Improvements were suggested that could be made to the doors. These improvements were in direct response to the issues uncovered when evaluating the doors using Norman's design principles. The biggest issue with the doors is that the door handles are confusing. That the door handles are the same on both sides of the doors, in contrast to standard door handle arrangements (see figures 3, 4 and 5), means that people intending to pass through will get confused in regards to how to correctly open them.

After evaluating the radiator at KTH Campus using Norman's principles, it is clear that it is poorly designed overall. Because of the lack of constraints and information, there is a lot of room for confusion. Add to that the impossibility to interpret how to use the TRV because of the lack of visibility, as well as the impossibility to know whether or not you have performed the right action because of the lack of feedback, the result is an impractical mess. The suggested improvements, if added to the radiator at KTH Campus, would make operating it significantly more understandable.

5. Conclusion

In conclusion the doors at Kista mall are very heavy and impractical. They do not not follow the basic standard for a swinging door or the standard for a door at a mall. The same goes for the radiator, which not only is inferior to most other radiators, but also, like the doors, impractical.

Both the examples evaluated in this report have major design shortcomings in regards to the design principles of Donald Norman. These shortcomings make them impractical and confusing, but there are improvements, in-line with Norman's principles, that could be made. If these improvements were to be implemented, the most important design flaws of both examples would be addressed, leading to increased practicality and understandability.

6. Sources

- Norman, Donald (2013). *The Design of Everyday Things: Revised & Expanded Edition*. Basic Books.
- Preece, Jennifer; Sharp, Helen; Rogers, Yvonne (2019). *Interaction Design: Beyond Human-Computer Interaction*, Fifth Edition. John Wiley & Sons, Inc.