You cannot understand requirements precisely until a product is used “in anger.” Surprising? I don’t think so. But let’s explore the evidence, look at possible remedies for poorly designed products, and think about the future of such products. Is there a kind of natural selection that favors good design?

My obsession with design, especially of things I’ve used in anger, coupled with my day job as a user interface (UI) designer, conspire to make me boring company at times. When I rant about my latest product-inflicted misfortune, generally people think I’ve gone mad. They’re usually right—I’m hopping mad about missed requirements. Cooling off, I sometimes wonder what designers could have done to identify the requirements that came to light when I used their product in anger. Three prevalent approaches often help in getting product requirements and design right during the design process:

1. **User interviews** with the user population before design commences.

2. **Usability testing** as opportunity allows. Most human factors folks consider usability testing important, and I am always surprised by what I find when I get the chance to do it.

3. **Design patterns** that reinforce an understanding of the requirements for a class of products with an “off-the-shelf” solution.

Don Norman, author of *The Design of Everyday Things*, is renowned for his focus on design and bears partial responsibility for getting me started on all this. I wish I could count on a principle of Normanian Natural Selection. I want to believe that market forces will trigger a kind of evolutionary natural selection favoring good designs and successful adaptations and denying the long-term survival of bad designs.

OK, on with the evidence! Let’s look at some products.
Some Products Used in Anger

BICYCLE LIGHT

First under the spotlight is a white LED bicycle light by CatEye. The light has a high specification: three bright LEDs, easy fitting to and removal from the bike, and a 100-hour battery life. Although the product cost was high ($30), I decided to buy the light, particularly since I’ve had a great CatEye rear light for years.

When I used this light in anger in my daily commute, a critical requirement became apparent. Can you guess what it might be?

Think about it: When you park your bicycle, you remove the lights so that they are not stolen. Now encumbered by two lights, you shove them into a pocket or a backpack. The designers clearly—and mistakenly—did not consider the inside of a backpack as a normal environment for their product. Have you guessed the requirement yet?

The light, used in anger, needs a switch firm enough so that it does not easily get switched on while it is being jostled in a backpack—a 100-hour battery life is unimpressive if your light is switched on all day!

Could this requirement have been identified earlier?

User interviews? Given enough cyclists, some would probably have had the switch problem. But would talented interviewers have been hired to extensively interview cyclists for a $30 bike light? Unlikely.

Usability testing? Would physical prototypes have been available for the real-world usability testing that could uncover this problem early enough to change the product design? Unlikely.

Design pattern? A design pattern for bike lights could solve a problem like this, if designers were aware of it and could be forced to follow it.

Will we see Normanian Natural Selection?

A cyclist that has experience with this problem will avoid a similarly designed light, so one survival gene of the weak switch design is triggered off.

Avid cyclists are vocal and likely to contact CatEye about their light’s failings. Magazine product reviews may also bring problems to their attention. CatEye’s reputation may motivate them to act on customer feedback. Who knows? Their designers may even get to hear about it. So, there could be a connection from the users back to the designer—another trigger.

To have a positive effect, evolution requires only the slight favoring of an adaptation. If some sales potentially were affected by this problem, Normanian natural selection could work—and perhaps bike lights will evolve into having stiffer switches. Working against natural selection, though, is that many millions of bike lights are sold to casual cyclists who are
motivated only to buy the cheapest light and would probably never notice the problem with the switch.

**LAVATORIES**

Can you guess the missed requirements in these products that were discovered through use in anger?

You don’t really notice the toilet paper holder when you walk in because it is deep grey and hard to see through. But when might you notice there is no paper?

What about the door lock? Well, sometimes when you lock the door you might like to try the handle to see if the door has locked properly; with the design below, as soon as you try the handle the door unlocks itself. You have no way to confirm that the door is locked from the inside.

Could this requirement have been identified earlier?

**User interviews?** Possible, but do door lock designers ever talk to a user?

Come to think of it, *they* are users, too. Do these things not strike them?

**Usability testing?** These problems could be discovered by testing, but would anybody ever do such testing?

**Design patterns?** These could be effective, but who is going to enforce them?

**Will we see Normanian Natural Selection?**

Designers of such products seem to be completely dissociated from the users (and cleaners) of lavatories because lavatories are so anonymous. It would take quite a crank to write to a door lock manufacturer, and the destiny of the letter would be predictable.

Therefore, I fail to see any triggers for Normanian natural selection for aspects of lavatory design to evolve, an observation borne out by the prevalence of such bad designs today.

**FOOTPATHS**

As early as 1912, planners have known that it is better to wait until paths are used in anger before completing their design. Often, when putting up new buildings, planners will leave out the footpaths and watch where people actually walk and then build the footpaths there, on what are called “desire lines.”

Could this requirement have been identified earlier?

**User interviews?** Better to hold interviews in buildings without paths and watch where the tracks form.

**Usability testing?** Footpaths make their own usability test report in the grass to show where the designer went wrong. Sadly, I guess many desire lines don’t actually become proper footpaths because of poor timing.

**Design patterns?** Desire lines for footpath design are the ultimate patterns for a design approach, flawlessly acknowledging human behavior. The pattern is perhaps successful because it’s well known. When placing scratch protection pads on his new motorcycle’s tank, a friend of mine used “the same principle used to place paths at Warwick University”—he waited to see where his jacket’s zipper scratched the tank and then put the pads over the scratches!

**Will we see Normanian Natural Selection?**

The connection between the user and the designer of a footpath derives from use in anger but is communicated as an etched desire line. If the designer waits for these etchings to form before completing the footpath, the finished path will be in the right place. If not, the desire lines could become a living statement of inadequacy and promote “keep off the grass” signs.

Does Normanian natural selection, then, favor footpath design? I would hope so, because of the pure genius of waiting for their use in anger before finalizing the design. But I wonder...
what percentage of footpath designers uses this well-known pattern for the
design approach? A small percentage would be my guess—\( \frac{1}{4} \) certainly see a
lot of dirt tracks etched into grass while taking unpredicted shortcuts.

**HOBS (aka COOKTOPS)**

Why is it almost impossible to buy hobs (or cooktops, as they are called in
the U.S.) with controls that afford switching on the right element without
ambiguity? Sampling 400 hobs revealed three configurations for sale
in the U.K.:

- 86 percent have inappropriate mapping of con-
trols to elements

- 4 percent have poor mapping but use a visual aid
to link element to control

- Only 10 percent have a good mapping of controls
to elements (but these include ceramic cooktops
riddled with other usability problems).

An overwhelming 86 percent of hobs have an inappropriate mapping—and
one of the best designed hobs for

human use is ironically called The
Alien!

**Could this requirement have been identified earlier?**

**User interviews?** Users are not design-
ners and would probably not highlight
this problem if asked.

**Usability testing?** A 1997 Home Office
(a department in the British govern-
ment) report cited cookers as the sec-
ond most common source of household
fires. Poor hob design is never cited as
a possible cause, but usage error rates
of 11 to 19 percent found in usability
testing should be taken seriously.

**Design patterns?** Could vastly
improve hob design, but designers
must follow the patterns instead of
indulging their needs for funky
expression.

**Will we see Normanian Natural
Selection?**

We have known about this problem for
almost 45 years, and 86 percent of
hobs on sale today still suffer poor
mapping of controls to elements.

Usability testing has failed to improve
hob design, and Normanian natural
selection isn’t working. We know
cookers cause household fires, and
hobs probably contribute to the prob-
lem, but designers, playing in the
sandpit of aesthetic self-expression,
remain ignorant of the problem.

**MICROWAVE OVENS**

This brings me to microwave ovens
and the one I bought for my grand-
mother.

I researched this well—you just turn one timer
dial to operate this.

What design flaw became apparent
when this appliance was used in anger?
I had missed the context. This
microwave oven resides in a house fre-
quented by grandchildren whose toys
teach them the fun of turning dials. A
microwave oven switched on when
empty does not last long.

**Could this requirement have been
identified earlier?**

**User interviews?** Users are not design-
ners—I doubt this requirement would
have surfaced.

**Usability testing?** No lab test would
identify this kind of requirement.

**Design patterns?** Could evolve, per-
haps when a microwave oven designer
buys a microwave for her grandmother!

**Will we see Normanian Natural
Selection?**

I think the evolution of microwave
ovens has stopped—I can’t see any use-
ful evolutionary triggers. The drive to
make them look funky seems far
stronger than the evolution of useful
product design. Or should I say, further
evolution. A friend pointed out to me
that microwave ovens have evolved.

Ovens in the first generation were a
mass of buttons and most are now far
tanker design. I wonder what triggered
this evolutionary step. My guess is
sales—I reckon a designer tried a sim-
pler design and it sold quickly.
**Questions to Ponder**

**Do many requirements remain hidden until the product is used in anger?** Yes.

**How can we discover requirements earlier?**

*Interviewing users* has some potential to ferret out hidden requirements. Hiring decent interviewers and getting them a good sample size to work with could be an effective way to uncover certain hidden requirements.

*Usability testing* invariably seems too late. Given the nature of production cycles, real-world testing often cannot be done early enough to feed into the design. Perhaps the best chance for usability testing is to identify hidden requirements between product versions. For this to happen, there needs to be a connection between user and designer.

*Design patterns* have endless possibilities for ruling out bad design, so long as they are followed. Japanese firms such as Toyota force engineers to go through “lessons learned” books, so perhaps this is a way forward.

**Will Normanian Natural Selection come to our aid?**

I want to believe that companies that make a good job of design—such as Palm, Apple, Smile Banking, Google, and Amazon—will become supremely successful, allowing market forces to show other companies that they *must* take design seriously. Their success would be a key evolutionary trigger for good design. Design patterns seem a natural part of this evolution because if you want to beat Amazon you’d better learn from what they do and what patterns work for them.

For some products, evolution appears to have stopped—cooktops and lavatories seem destined to never improve collectively.

For all products, often something is wrong somewhere; the connection between the actual field use of the product and what the designers did is broken. I wonder if a classic usability issue worsens the situation—we often don’t notice well-designed products because they do not stand in our way, so they fail to gain evolutionary favor. Bad design stands in our way and we complain about it, but perhaps nobody is listening, or perhaps we are just blaming ourselves.

What depresses me most about the evolution of design is that poor design adaptations survive, even in the harshest commercial conditions where losing money is a direct consequence of bad design. The design of automated teller machines is a stark example: To a bank, the most valuable asset in the transaction is the bank card; to the user, the goal is money. So, when do you give the user the exciting cash—before returning his boring card or after he has put it back in his wallet? It amazes me that some U.S. banks fail to follow the normal interaction design pattern. How many of their cards get lost? How much does this cost them?

Does nobody think this is about design?