

The Use of Psychology in Consumer Electronics Engineering and Design

A brief look at the influence and application of psychology in engineering and design

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Abstract — With the rise of consumer electronics in the recent years, the market has grown increasingly competitive and design, rather than functionality, has become a more dominant factor in a product’s success. As people rely on technology now more than ever before in their everyday life, it is essential for engineers to understand the psychology of the users in their design process. This paper provides a quick look at some of the successful products and their application of psychology in engineering and industrial design, and also compares them to a few poor designs to show the importance of such application.

Keywords — Psychology, Design, Engineering

I. INTRODUCTION

“Isn’t the bottom of our computer prettier than anyone else’s top of their computer?” Philip W. Schiller, senior VP at Apple Inc., famously asked this question during Apple WWDC 2012. One could debate which companies have superior design, but one cannot deny the importance of this “prettiness” – the elegance in looks and experience – in a product’s and even a company’s success in today’s market. This elegance, of course, does not come randomly. It comes with careful application of knowledge in psychology and other fields to engineering and industrial design, a practice that was much less common even just a few decades ago when engineering was very much driven by functionality and specs – things that are important to engineers, not consumers. Here, we will focus on the use of psychology in engineering and industrial design.

II. THE SHIFT FROM SPECS TO EXPERIENCE

There used to be a time when specifications of a machine is the most important marketing ploy. The clock-frequency and core-count of the processor, the amount of RAM, and the capacity of the disk drive used to be compared on a spreadsheet for the average consumer to decide which machine is their best choice. As engineers, we fundamentally understand that higher specs in each of the components do not add up to a machine that *feels* faster to the user. For example, the difference between a high-end discrete graphics card and an integrated solution could be night-and-day for a professional photographer or a gaming enthusiast, but makes little difference to a casual user who just wants to browse the web and edit documents. But the consumers did not, and still do not, understand this. Thus the specs, to the average consumer, is more of a marketing ploy than it is

anything else. And the marketing workers, many of whom don’t even understand the technical details themselves, make compelling arguments for the consumer to pay extra for each added feature to bring home a generic-looking and generic-feeling machine.

However, the times have changed. Despite the continued rise in performance of the personal computing devices, the need for performance did not grow at nearly as fast a rate. Consumers are now less motivated to upgrade their products and less inclined to pay a premium price for better performance. In the meantime, companies that focused on making a better experience for their users enjoyed great success. A good example is the iPod family. To this day the iPod has limited support for high-quality audio and has been often criticized by audiophiles for its poor performance and lack of features as a premium flagship product. But the iPod has not only become a success but a symbol of its time, much like the Sony Walkman series. What made it such a success despite the obvious imperfections in performance? The answer is the experience. Look through all of Apple’s marketing materials filled with colorful iPods and silhouettes of dancing people and you will not find any emphasis on its performance specifications. Instead, they appeal to the consumers with the experience – the combination of elegant hardware and software design that allows the users to ignore the technology and enjoy the experience. The iPod arguably made itself a fashion accessory, a statement of personality rather than a utilitarian tech product. The product was so successful, in fact, that it saved Apple as a company and paved the path to its current success. [1] Macworld summarized the iPod’s influence on Apple’s business in one sentence: “The destiny of Apple changed drastically ... with the release of a deceptively simple digital music player.” [2]

Underneath the changes in the market and consumer’s behavior, psychology is at play. In 1995, Dr. Robert W. Veryzer, Jr. concluded in his research that “Product aesthetics (i.e., design) can exert a significant influence on consumer behavior.” [3] The research also points to psychology as the driving force behind product aesthetics. Although there are countless other products focused on specs, the market’s shift to focus on experience is undeniable. This is exemplified by almost every major player in the market spending large amounts of time and resources to develop better experiences. Samsung, after some serious backlash in its recent sales [4], has finally decided to

move its flagship smartphone product line from cheaper, plastic exteriors to more premium glass and metal casing. Such change requires tremendous work (for example, metal used in casing can be challenging for engineers to keep up the RF performance of the device), yet Samsung, previously famous for its marketing push for performance and features, decided to adopt the experience-over-specs philosophy that has long been centric to its competitors such as HTC and Apple. Thus, a good engineer in this field must understand this trend and use it to his/her advantage.

III. EXAMPLES OF GOOD USE OF PSYCHOLOGY IN ENGINEERING AND DESIGN

Very commonly known among designers, a grid system is a set geometric layout pattern that is used to guide a design process which leads to a more coherent, intentional and harmonious result on an otherwise blank canvas. The grid system makes arrangements of shapes more cognitively pleasing. In fact, it is so important in design that Rune Madsen, a New York-based Danish designer, said during one of his lectures about the grid system: “There is nothing worse for an artist than a blank canvas. [5]”

In 2013, Apple released a new version of its popular mobile device operating system known as iOS 7. In this new iteration, a big focus was the redesign of the user interface, which has been kept mostly untouched for the first 6 years. Making a dramatic change to a popular and wildly successful line of products that are loved for their simplicity and familiarity is an inherently risky move, and the designers at Apple certainly did not take this lightly. Among many other features, a grid system for icon designs was introduced to the developers for them to follow the same guideline so that all app icons could be unified in style and contribute to a more fluid user experience.

Of course, the grid system is not a new concept to designers, but this is arguably the first time on such a massive scale that developers are introduced to the same grid system.



Figure 1. The grid system used in iOS 7 icon design. [6]

What is more interesting is that upon further investigation by many design enthusiasts, this grid system published by Apple in 2013 was not merely a new invention for unifying software interface design, but it is more ambitious. It is an attempt by

Apple to even unify the hardware design, including the bottoms and tiny details in their industrial designs.

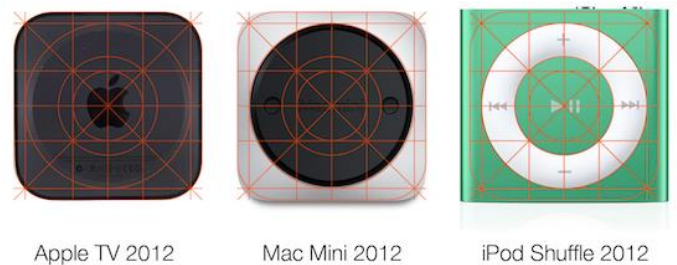


Figure 2. The grid system in Figure 1 applied to other Apple hardware. [7]

This use of their knowledge of psychology, exemplified with this grid system, extends throughout many other pieces produced by Apple’s chief designer Jonathan Ive, who was knighted for his extraordinary contribution to design and enterprise [8]. One can find numerous examples of his use of color palettes, motion and depth – concepts previously more known in psychology than engineering and design – in practical, utilitarian consumer products.

Another good example of a successful use of psychology in engineering and design is the Google Material Design announced in 2014. Instead of starting with what’s technologically possible and new, Google’s new cross-platform design language starts with human cognition. It is built on the idea of a “digital material” that behaves in many ways like a real world material: it has mass (inertia), shape, depth and it “exists” in a world with similar physical laws as ours. This approach replaces the cold and electronic feel of screens and elements that just appear and disappear, jump from one place to another, with lively elements that come in, react to user inputs, and move out.



Figure 3. Google Material Design illustration of “cards”, an element mimicking the physical properties of paper and exists in 3-D space with the use of shadows. [9]

This idea, while not entirely new (the inertial scrolling feature initially introduced on the iPhone is an earlier example of digital elements behaving like physical ones), is an excellent application of psychology in engineering and design. It introduces a parallel between the digital world and the physical world. Since our brains are already attuned to the physical world around us, this significantly reduces the amount of learning required on the user’s end and achieves an intuitive and appealing experience. And without a doubt, this change Google introduced to its wildly popular Android operating system has been critically acclaimed by reviewers and users alike.

IV. EXAMPLES OF LACK OF APPLICATION OF PSYCHOLOGY IN ENGINEERING AND DESIGN

There are countless examples of poor design resulting from the lack of understanding of psychology on today's market. One example is a smartwatch named Puls.

This product, developed by a company lead by famous rapper entrepreneur "will.i.am", is considered the worst piece of engineering on the wearables market by a number of famous reviewers [10] [11]. It took an outdated approach to engineering a consumer product: starting with the technology and electronics, and then find a packaging to wrap it around someone's wrist. The result is the Puls watch, which is a bulky device resembling a cuff more than a watch, and has "the worst experience... (the author) [has] had all year [10]." The same reviewer went on to say that "The Puls feels like a Kickstarter project that never should have made it to production [10]."



Figure 4. The Puls Smartwatch. [12]

The designer ignored the basic rules of consumer psychology and instead started with the goal of compressing everything in a smartphone into a wrist-worn device. The unsurprising result, of course, is sacrificing the user experience. Of course, every engineering product is about compromises and focusing on what is important, but Puls seems to have done every compromise the wrong way. From having a full QWERTY keyboard on a tiny screen to using its own operating system (the ongoing struggle of the Windows Phone platform tells us just how hard it can be, even for a well-designed operating system, to enter the already-dominated smartphone market), Puls shows an appalling level of disregard for user

experience and is a prominent example of bad design due to the lack of understanding of consumer psychology.

V. CONCLUSION

From examining the examples of both good and poor applications of psychology in engineering and design, one can gain a sense of the importance of psychology to the seemingly unrelated field of engineering and industrial design. In a world that is growing more and more competitive for consumer electronics designers and engineers, it is critical for technical workers to understand this importance. As engineers, we may use this to not only benefit from the cross-disciplinary approach but also help push this young principle even further.

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