



The Science Behind Great Product Design

Companies that produce highly user-friendly and innovative products are those that know how to mix functionality with design.

Back in 2004, I was saddled with a two-hour commute to work almost every day. Fortunately, I had something with me to make the experience more bearable: my new third-generation iPod. Many of you probably remember your first iPod experience, how great it was to be able to carry your entire music library in your pocket and cue up any song quickly and easily. This little device and the iTunes Music Store that was launched with it transformed the music industry forever. During those long commuting hours, I had ample time to ponder what made this innovation so special.

“It can’t just be the technology,” I thought. There were **mp3 players with similar functionality** on the market years before the iPod, but none of them made a comparable impact. It wasn’t what the device could do that really set the iPod apart, but how it made you feel. A design coup if there ever was one.

Codifying design

This got me thinking about how design propels innovation. In those years, my research focused on how to improve the performance of organisations that design complex systems such as aircraft engines. “Design” in these cases was strictly a measure of performance and could be expressed in numbers. For consumer products such as the iPod, it

was just the opposite: people mostly thought of design as an uncanny, unquantifiable, know-it-when-you-see-it quality.

But some sort of science seemed to lie behind the iPod’s seamless integration of form and function into a unique, innovative experience. Otherwise, how can we explain Apple’s sustained advantage over its MP3 player competitors (corroborated a few years later with the game-changing debut of the iPhone)? Codifying that science would unlock immense value for companies.

It also seemed fertile territory for research, provoking interesting questions such as: How can we measure aesthetics that become mainstream? How can we measure the collaborations that produce these designs? How can we calculate ROI for the investment companies make in design?

Design patents

Normally, if we want to gauge how innovative an organisation or product is, we consider the number of patents associated with it. So I began my investigation by looking at the patents granted behind my iPod.

As you would expect, I found many patents describing in great detail its processes,

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components, etc. – in essence, the nuts and bolts of the iPod. These are called *utility patents*, the type of patents that cover how something works. There was, however, another patent type – one describing appearance (the official terminology is “ornamental design”) rather than functionality – for the iPod itself as well as its accessories. These are called *design patents*, and for me they were a treasure trove, as they contained not only the original drawings but also designers’ names and the companies they represented.

And this goes way beyond the iPod. It turns out that in the last 35 years the U.S. Patent Office has granted more than 400,000 design patents that protect the “form” (the way it looks) rather than the “function” (the way it works) of products across many different industries. I joined forces with [Prof. Jürgen Mihm](#) and three INSEAD doctoral students Tian Chan (soon to join the faculty of Goizueta Business School at Emory University), [Haiho Liu](#) (now on the faculty at University of California, Riverside), and [Christophe Pennetier](#) (INSEAD PhD student) to consolidate all these design patents into a comprehensive database, which we analysed from several angles in order to discover some fundamental truths about design.

Our research is ongoing, but so far the data seem to be telling three exciting stories.

Evolving styles

We all know that, for example, mobile phones look very different now than they did ten years ago. In fact, they’ve gone through several style changes in that time period. With access to all the design patents (including the ones from products in the telecommunications industry), we can actually cluster them according to their visual similarities, thus creating a kind of evolutionary timeline charting the successive styles of mobile phones, from “clamshell” to “touchscreen slate” and everything in between. (You can read more about this research in our [working paper](#).)

Across all the product categories in our design patent database, we’ve noticed an increasing randomness. In recent years, it has simply become much harder to predict what the next hot style will be based on the current trends. This is especially salient in non-tech categories such as furniture and fashion. Companies with the capability to manage this increasing uncertainty will have a significant competitive advantage in future.

Star designers

About 200,000 designers are listed in our design patent database. Among them are some heavy-hitters, including Apple’s Jony Ive who led the iPod

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design team. We were very interested not just in tracking Ive’s illustrious career but also in following what his iPod collaborators went on to do. (This research gave rise to another [working paper](#).) In other words, would having worked closely with a “star designer” affect their future output? Moreover, would collaborating with a star designer increase the chances of becoming one? Is collaborating with a star designer significantly different than collaborating with a non-star?

When analyzing the design patent database the answers to these questions is *yes*. Designers who collaborated with stars had greater productivity in their later work, garnered more attention from the design community, and were much more likely to attain star status themselves. Interestingly, these findings were much stronger when the collaboration with a star designer is embedded in a very cohesive network and when the collaborator of a star designer shares similar design domains with the star.

We can conclude that design skill is not solely a manifestation of innate talent but can be cultivated by working closely with a master, and that creating a cohesive collaborative network around a star does pay off. Good news for companies aiming to develop their own in-house design competencies.

What's the Return On Design?

When considering investing in design, senior leaders will always want to know about ROI. Can we put a precise number on the bottom-line impact of good design? It’s a complex question that may never receive a satisfactory answer. However, our preliminary analysis of design patents yields some interesting implications.

We looked at the ratio of design patents to utility patents for the companies in our database that were consistently innovative in both areas, to get a general sense of how much emphasis they placed on design vs. purely technological concerns. When we factored in publicly available financial information for these companies, we discovered that after the late 1990s, a high design/utility patent ratio was associated with more sales and higher profits.

Whether or not their financial success was directly attributable to design, companies that invested in patenting design seemed to have the right mix of competencies to win in today’s marketplace.

The importance of design

Great design doesn’t rely on a spark of inspiration alone. Examining design patents offers fascinating insight into how design works. We are hoping that our studies will shed more light on the intricate,

deep-rooted relationship between design and business successes. Since it has become clear that design will be one of the most important competitive advantages in years to come, the implications here are far more than academic.

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This post is based on a presentation at [TEDx INSEAD](#) entitled "Imagine the Science Behind Design." Click [here](#) to watch it.

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