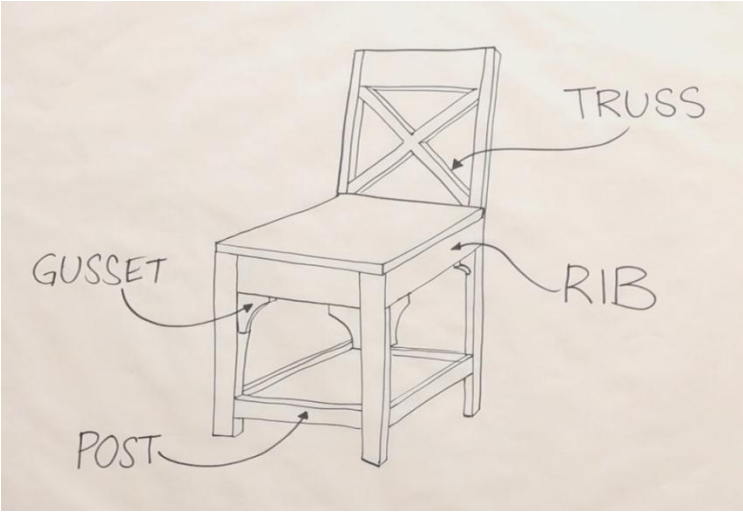
Design for Durability

Companion to the video: Script and Illustrations

Many products can be designed to last a long time, even a lifetime. If your product's function is not likely to change much, like a chair or briefcase, your job is to make it last. How? Design it to be physically and stylistically durable.

Making a product physically durable means making it resistant to damage and wear. You can resist damage using the same reinforcing strategies we talk about in the lightweighting sessions. It's important to strengthen the parts most likely to fail first.



Even mobile phones, which change quickly and may only last a few years can benefit from increased durability, because they often break before they become obsolete.

So run stress analyses - and test scenarios for dropping or hitting your product.

Autodesk Inventor software can help you understand IF your product will fail based on loads and constraints you apply.

Autodesk Algor software goes a step further, and can simulate mechanical events, telling you HOW the product will fail during use.

Here's an Algor simulation of a dropped smartphone. Analyzing these forces can tell you if the screen will break.

Often, you'll want to test for fatigue strength as well. Some materials are strong initially but fail on repeated use.

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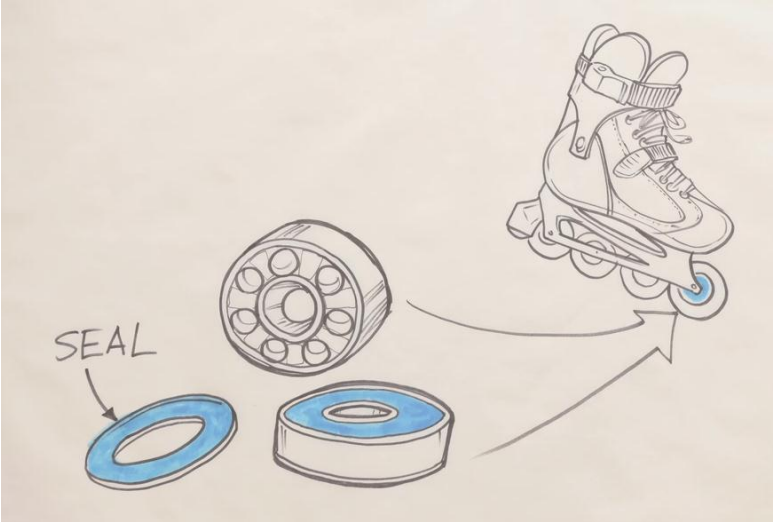
For instance, one reason springs are made out of steel, and not aluminum, is because steel holds up better to long-term fatigue.

Fatigue is also influenced by temperature, surface finish, and manufacturing process. Autodesk Algor can take all of this into account and can help you determine how and when products will fail under repeated load cycles.

Making products strong is relatively straightforward. But what about the more subtle effects of wear?

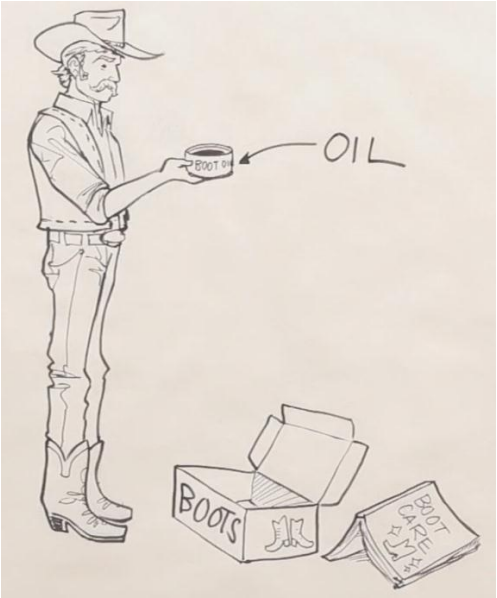
Harder finishes tend to resist scratches and scuffs better. For instance, ceramics are harder than plastic and even most steel. Brushed steel is great because it's a pretty hard finish and it's already textured so that scratches won't show.

Moving parts that slide or roll are susceptible to wear from their own friction as well as friction caused by dirt and other particles. To reduce wear here, choose zero-maintenance connections like self-lubricating bushings, or the sealed bearings found in good inline skates.

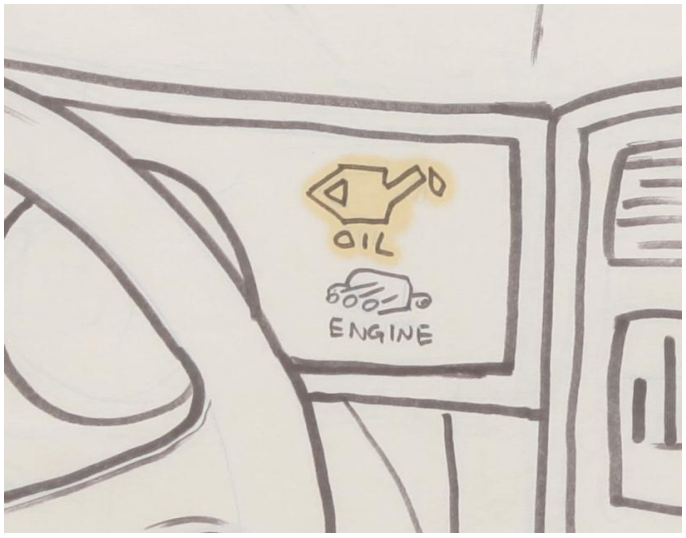


Influencing user behavior can also be key to extending a product's life. Design can help make users your allies.

Enlist the wearer of your leather boots by including care instructions and a small tin of oil or shoe polish. Even these subtle cues can help establish care and maintenance as an established and easy part of ownership.

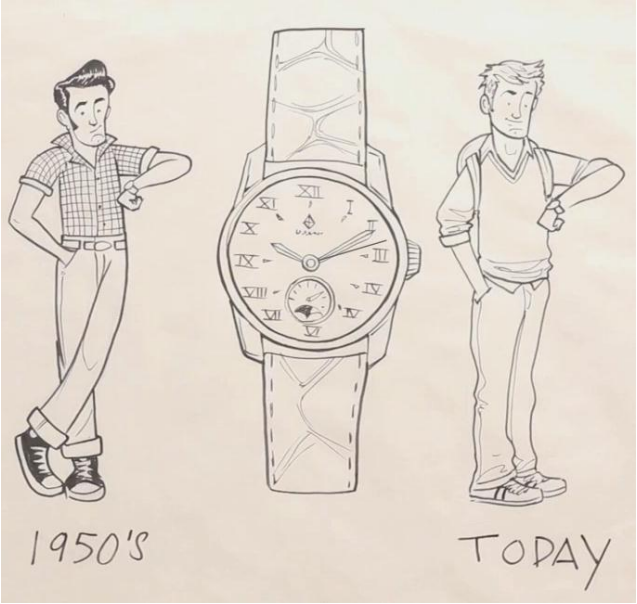


Even better, enroll the driver of your car by designing-in a dashboard light indicating it's time for an oil change. The more you build maintenance into the user interface, the more you encourage long life and sustainability.



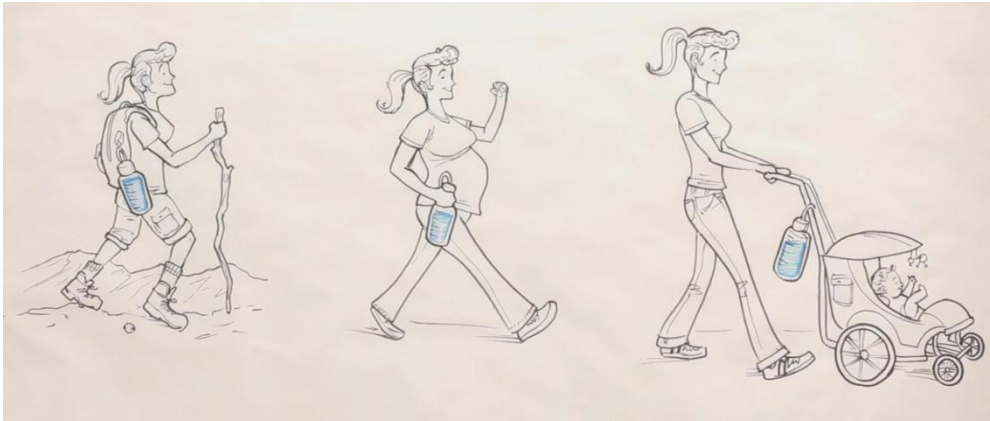
Physical fatigue is one thing, but what about style fatigue? An aesthetic that's the height of hipness today can be embarrassing tomorrow, causing users to throw products out while they're still perfectly functional.

You can't stop people's love of the new, but your design can encourage an equally powerful attraction: love of classics. Classic watches look much the same today as 50 years ago, and they're still in style. Make sure your product timeless and you've made it more sustainable.

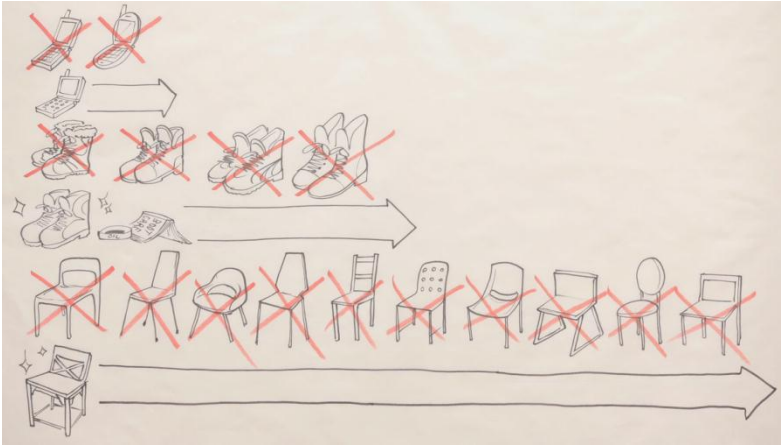


How do you do this? In addition to the form, you can use finishes that either resist wear or get better with age. Leather, wood, denim, or metals with patinas can all look better with a bit of wear.

If fashion doesn't kill your product, evolving user behavior can. Habits change quickly and staying relevant will help you keep your products alive. Can a water bottle that fits into a hiking backpack also fit just as well into a stroller?



There are infinite possibilities to combine these strategies and make your products last. You might double the lifetime of a mobile phone by making it physically stronger and resistant to wear. You might quadruple the life of a pair of boots by encouraging maintenance and classic design. And you might increase a chair's life by a factor of ten using all of these strategies.



If we design things that people really love, their users will want them to stand the test of time. Let's make sure they can!