

thing Tom really likes about open source. If key people leave, or a company shuts down, an open-source product lives on. In Tom's view, "Open sourcing makes it easier to trust a product."

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With the school closing, David and some of the other Arduino founders started a consulting firm and multidisciplinary design studio they called Tinker, in London. Tinker designed products and services that bridged the digital and the physical, and they taught people how to use new technologies in creative ways. Revenue from Tinker was invested in sustaining and enhancing Arduino.

For Tom, part of Arduino's success is because the founders made themselves the first customer of their product. They made products they themselves personally wanted. It was a matter of "I need this thing," not "If we make this, we'll make a lot of money." Tom notes that being your own first customer makes you more confident and convincing at selling your product.

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Arduino's business model has evolved over time—and Tom says *model* is a grandiose term for it. Originally, they just wanted to make a few boards and get them out into the world. They started out with two hundred boards, sold them, and made a little profit. They used that to make another thousand, which generated enough revenue to make five thousand. In the early days, they simply tried to generate enough funding to keep the venture going day to day. When they hit the ten thousand mark, they started to think about Arduino as a company. By then it was clear you can open-source the design but still manufacture the physical product. As long as it's a quality product and sold at a reasonable price, people will buy it.

Arduino now has a worldwide community of makers—students, hobbyists, artists, programmers, and professionals. Arduino pro-

vides a wiki called Playground (a wiki is where all users can edit and add pages, contributing to and benefiting from collective research). People share code, circuit diagrams, tutorials, DIY instructions, and tips and tricks, and show off their projects. In addition, there's a multi-language discussion forum where users can get help using Arduino, discuss topics like robotics, and make suggestions for new Arduino product designs. As of January 2017, 324,928 members had made 2,989,489 posts on 379,044 topics. The worldwide community of makers has contributed an incredible amount of accessible knowledge helpful to novices and experts alike.

Transitioning Arduino from a project to a company was a big step. Other businesses who made boards were charging a lot of money for them. Arduino wanted to make theirs available at a low price to people across a wide range of industries. As with any business, pricing was key. They wanted prices that would get lots of customers but were also high enough to sustain the business.

For a business, getting to the end of the year and not being in the red is a success. Arduino may have an open-licensing strategy, but they are still a business, and all the things needed to successfully run one still apply. David says, "If you do those other things well, sharing things in an open-source way can only help you."

While openly licensing the designs, documentation, and software ensures longevity, it does have risks. There's a possibility that others will create knockoffs, clones, and copies. The CC BY-SA license means anyone can produce copies of their boards, redesign them, and even sell boards that copy the design. They don't have to pay a license fee to Arduino or even ask permission. However, if they republish the design of the board, they have to give attribution to Arduino. If they change the design, they must release the new design using the same Creative Commons license to ensure that the new version is equally free and open.

Tom and David say that a lot of people have built companies off of Arduino, with dozens of