The Hardware Code: How Hardware Startups Succeed Or Fail

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We cracked the code!

A few weeks ago, the folks at CB Insights dug into their data to identify the causes of hardware startup failures.

Their short list included:

1. Lack of consumer demand,

2. High burn rate,

3. Lack of interest after initial crowdfund,

4. Product strategy mistakes.

Yes, make something people want, and don't run out of money.

But how to prevent that? We looked into what happened to our pool of 200+ hardware companies and came up with some insights, which became the presentation we gave in Paris at the ATOMS conference organized by Hardware Club (an early stage hardware VC). More details below.

Following the Toyota "Five Why" method for "prevention of repeat mistakes" (再発防止対策), we tried to find the root causes.

How to avoid lack of demand?

- Do proper research
- Clarify your and
- Determine , don't get carried away by the appeal of the spectacular-yet-useless (the "" problem)
- Make sure your price is ok (too expensive = no sales)
- Don't forget PR, marketing and distribution (the best tech won't win without visibility and a clear message)

How to avoid high burn rate?

- Move to where you have , and where you can . Time is money! The most suitable location might change depending on the focus (R&D, prototyping, production, sales, etc.).
- If your gives you not just a good price but . They can act almost like a bank and save your cash flow. Same deal for .

In fact, startups die because **they don't reach milestones that unlock new resources**. In some cases, it's not really "verified" demand — look at Magic Leap who raised billions without a product on market. In hardware, those milestones are generally: Lab prototype / Work-like-look-like / DFM / Product / $1M sales, then $3M, $5M, $10M… until profitability (though it doesn't seem to be necessary — Razer just IPO with a loss and is now worth almost $5B).

How do you reach milestones?

By understanding it's all about **learning**, and **learning curves**. Beyond tech, founders need to learn about positioning, prototyping, manufacturing, PR, marketing, sales, distribution, logistics, financing, customer service as well as product management, team management and… self-management.

Learn fast, then execute. HAX was designed to accelerate learning. Our programs cover most of the skillset described above thanks to our team, curriculum, mentors, peers and alumni. Having over 100 experts in the same room is a tremendous advantage for problem-solving of any kind.

Which Startups Failed?

We haven't had major failures of late, but the **four main reasons for past failures** were:

- Sometimes they can expand, sometimes not. This was more common in the early HAX programs 4–5 years ago. Much less today.
- While not frequent, this is probably the highest risk before shipping.
- If founders tried hard for 2 years, are broke, and see no hope, we'll probably understand (and help). Before that, it might feel you just didn't try hard enough and that our money and efforts would have been better spent on someone else.
- You're running against the clock. Execute slowly and you'll surely run out of money before your next milestone. In some cases, this happens when founders go back to R&D — a risky move — instead of delivering a first less-than-ideal-but-still-acceptable product.

Which Did Well?

A fairly large number! To share a few examples (you will also see how Kickstarter results don't predict much):

- is a STEM robotics company. Came to HAX with early prototypes. Ran a Kickstarter, raised $185k, shipped quickly with almost no extra cash. It became profitable in its first year thanks to a low-cost HQ in Shenzhen and online sales. It kept growing, raised a $6M series A from Sequoia, then a Series B of $30M. About 500 staff now and dozens of millions in revenue.

- is a brain stimulation medical device to treat depression, founded by a neuroscientist and a clinical psychologist. They came to HAX with an early prototype. Raised seed funding on an advanced prototype.
- makes camera-free home security devices. Came to HAX with little more than a concept. Clarified positioning. Ran a first Kickstarter, raised some angel funding, delivered their first product, signed B2B customers, raised seed funding, now running a new Kickstarter for their (2 years after the first) that is almost ready to ship.
- makes commercial cleaning robots for airports, hospitals, etc. They came to HAX with a rough prototype, which they greatly refined. Built the team in Canada at lower costs, signed customers, shipped products. Raised funding on traction.
- makes headphones that tune to you. They have been praised all over the web. They came to HAX with a rough prototype of earphones (not headphones), pivoted to an in-ear-over-ear design. Ran a Kickstarter and raised the most money for an Australian startup (). Raised a strong seed soon after. The press is now as they are shipping.
- is a watch to help kids build good habits. They came to HAX with a rough concept and prototype. We refined positioning, dropped all non-core features. They went to Kickstarter and , then prepped for retail immediately. Within 18 months they went from concept to shipping to Kickstarter backers, over 1,000 Target stores, and to Softbank in Japan. It was busy but they did it. They raised a seed round quickly. Today, their R&D team is in France, their sales in US, their manufacturing in China. They are taking advantage of several ecosystems.

As you can see from the examples above, **the milestones and trajectory of each company is different.**

What they have in common is **setting good milestones, being frugal, and executing well**. Funding comes, increases, and terms improve as you show time and again that you get things done and that money is in good hands with you.

> What successful startups have in common is **setting good milestones, being frugal, and executing well**.

Bootstrapped

These are even more extreme cases: **startups entirely bootstrapped**. Multiple milestones with no extra VC money after HAX! It's hard to believe a hardware startup could do that, but it's true, and not even that rare.

- is a ping-pong training robot. The two Taiwanese founders (both Forbes Asia 30 under 30) prototyped furiously during HAX (one new version per week!), raised on Kickstarter and decided to live in Shenzhen frugally until they shipped. It's imminent.

- is a desktop printer for PCBs. The Canadian company won some awards (TechCrunch Hardware Battlefield, Dyson Award, etc.) and some grant money. They , built their team in Canada, and shipped their product. They are now growing organically, and profitably.
- is a shape-shifting tool for manufacturing. It's a R&D-heavy product. The team is split between Canada and Shenzhen. Won some grants. Bootstrapping.
- is a "home barista" coffee maker. + amazing online marketing and pre-sales. Thai team based in Shenzhen until they ship (soon).
- is a desktop waterjet cutter. Team between Shenzhen (hardware) and New York (business / software). Raised —they could have shipped with that alone but raised a seed for safety and speed. Shipping first units soon.

Last but not least: Recoveries

When all seems lost sometimes there is hope, and some teams rose like phoenixes after a painful setback.

- , the IoT connectivity solution, had before joining HAX. They pivoted at HAX. The rest is history.
- is a smart toy for cats. Or more precisely, a tiny, low-cost, fast and smart robot. Despite cats and robots, the product scored just above (the custom rap song wasn't enough). The 3 founders (PhD in robotics) went back to R&D for 2 years living on… whatever they live on in Illinois, raised a seed round when a local angel realized the incredible tech they had (cats were not mentioned). Shipping their first product soon — your cat won't believe it.

- on Kiskstarter, then one of the two co-founders left. Tough spot! The remaining one rebuilt a team (and lost some time of course), got the interest of B2B customers, then . Boom! Not your average Juicero here ;)
- , the everyday smart glasses. Their first product was a bluetooth earpiece to help drivers avoid drowsiness, a fairly niche business. The second product — over 2 years later — (I know that's a lot of HAX projects over $1M —they are just good. And don't imagine they had tons of advertising money for it!). It wouldn't have happened without the knowledge gained from their first product!
- the anti-stress patch. A wellness device, borderline medical. Investors were reluctant to finance it before FDA or clinical trials. Almost out of money, they turned to Kickstarter and raised , the highest amount for such health tech device. They are now manufacturing in Shenzhen.
- the pipetting robot for biotech labs. Initially targeting big labs. We suggested crowdfunding it in case there was an audience of biohackers. They but got useful visibility with university labs and biotech startups. They also realized big labs were slow or unwilling to change they ways. Today most of their customers are uni labs and small startups. Interestingly I think something comparable happened to FormLabs (the 3D printer): their customers are neither individuals nor big companies, but smaller engineering and design shops.