Why hardware startups fail or struggle

vator.tv/news/2017-11-07-why-hardware-startups-fail-or-struggle

November 7, 2017

Hardware founders share their advice on how to scale a hardware startup

In November 2016, I wrote a piece about the top 10 biggest deals in the healthcare wearables space, listing the companies that had raised funding up until that point. They included companies selling direct to consumer products, as well some that were developing sensors to be fitted into other devices, but all had been fairly successful in getting investors interested.

Not even a year later and already two of the companies on that list have been forced to shut down.

Last week, wearables technology company Doppler Labs announced in a blog post that it would be closing operations. That followed a similar announcement from the company with the largest funding round of 2016: Jawbone, which shut its doors in July.

"This is not because our vision of the future is not going to happen. We are actually more confident than ever that it will. Amazing hearing aids will be available at lower prices, and you will be able to tune them yourself. Tens of millions of people will be interacting with audio-based smart assistants, translating hundreds of languages instantaneously, and even going without their phones because smart earbuds will give them access to the people they love and the data they need," Doppler wrote.

"We wish we could have been the company to establish this future, but we know others will build on what we started, and we'll be rooting them on."

So what happened? In an extensive interview with Wired, Doppler Labs founder Noah Kraft explained some of the reasons his company was forced to shut down, including running into a situation where the company did not have enough money to get its second product into production, but had raised too much to ask for more. Founded in Doppler had raised a $24 million Series B round of funding in July of last year, bringing its total funding to $50.5 million.

Stuck in no man's land, it tried to sell itself, but the deals all fell through. With no other options, it had to shut down.

If companies like Doppler and Jawbone, which itself had raised nearly $1 billion before its own downfall, couldn't make it work, what does that mean for companies still looking to raise money for their own companies? What are the challenges and problems that companies face that make it difficult to succeed in hardware?

I reached out to a slew of hardware founders and CEOs to ask them about some of the problems that they've experienced in trying to get their hardware companies off the ground.

Hardware is hard

Surely you've, at some point, heard someone utter the phrase, 'Hardware is hard.' It's almost a cliche at this point, a mantra that's repeated over and over to explain away the difficulties of an entire space. But what does it actually mean? Why is it so difficult to start and maintain a company that actually makes something?

Some of the issues that affect hardware startups simply come with the territory: these companies are actually making a physical product, not just lines of code, and that means additional manufacturing costs and time.

"In my experience, when building a disruptive hardware product, it always takes longer and costs more than expected. There are many unknowns that you can't always plan for," said Michael Garel, Founder and CEO of eyeQ, an in-store brand management platform.

"Many components, especially the more complex, and typically critical, components usually have long lead times - meaning it could take weeks or months after placing the order with a component manufacturer, before the component arrives. When building a new product, you may not have the bill-of-materials finalized until you are nearly ready to ship the product. As a small, lean, startup - you need to carefully balance the risk of ordering components early, always knowing that you might not actually use that part, or need to order a completely different one. Especially if you are expecting significant volume at launch. In our experience, however, some of the component distributors may be willing to work with you to help secure the supply with limited risk. But, it's hit or miss depending on the component, vendor, and distributor. So, in the design process, make sure to take into account lead times when selecting components."

One problem that founders may not anticipate, for example, is having to deal with foreign countries to get parts made, Ned Sahin PhD, founder of Brain Power, told me. The company makes wearable artificial-intelligence systems to aid people with brain-related challenges.

"Pretty much, if you are making some kind of gizmo or anything with plastic shell or a circuit board inside, you are probably doing to have to deal with China for manufacturing. That could be directly or indirectly, via a contract manufacturer, but nonetheless you are dealing with some major issues you may not have anticipated," he said.

"What do you think are the chances of something NOT going a bit wrong in translation when dealing with a country and culture and language so far from your own? How do you think you are going to get into queue with a manufacturer there who is shooting off a million parts for one client and 10 million for another - before breakfast? Do they really

care to listen to some millennial flaming them out because their 2000-unit low-production-volume mold yielded parts 1 millimeter too short in one dimension? Why should they care?"

As a result, the iteration process for a hardware company takes much longer, and therefore costs a lot more, than a company doing software, where, if there's a problem, someone can just go into the code and fix what's wrong. With hardware, going back and fixing a potential problem means having to redo all of your work, something that can be a costly, and potentially fatal, problem.

"My father taught me to measure twice and cut once," said David J. Whelan, Managing Director of Bespoke Business Strategy, a company building businesses and inspiring entrepreneurs at the intersection of technology, health, and wellness. "That rule of thumb is especially important in the world of hardware. With software, you can roll out a buggy beta and keep updating the product, sometimes daily, until you get it right. If you make a mistake, you can fix it. The product gets better over time. With hardware, you have to get it right the first time. You have to plan ahead, test ahead, and make sure you are getting it right. Your second chance is not a software update but a second version of the product, months or even years later. But if the first version doesn't work, you might not get a chance to make a second version."

Kraft may have summed it up best in his Wired interview, when asked what the biggest mistake he made with Doppler.

"We fucking started a hardware business! There's nothing else to talk about. We shouldn't have done that," he said.

Going up against Apple and Google

As if the time and cost didn't hinder hardware companies enough, then there's the fact that a small hardware company is also going up against extremely formidable opponents, including the most valuable company in the history of the world. In his Wired interview, Kraft noted that Doppler once wasn't able to beat Apple's AirPods to market, the company was likely doomed to always be in second place.

It's incredibly difficult to go compete with companies with almost unlimited resources, who can bounce back from a bad product or mistake much quicker than a company that needs to raise its next round of funding, said Dr. Steven LeBoeuf, Co-founder and President at Valencell, a developer and manufacturer of biometric sensors for electronics.

"Say you want to make a wearable device, it has to compete against one of the big guys, and you really are spreading yourself thin because there's so much that goes into a wearable device that you can't control and you know nothing about other than the core technology you bring to it."

In fact, he said, that is one of the reasons that his company decided to create the sensors that power the technology, rather than its own devices.

"We decided to focus on what the big guys couldn't compete with, the core sensor technology, because that's thing we could own, we could wrap our hands around it and be the best at it, because they're focused on so many different things with the product, not that core thing. I think for a lot of startups, it's good to think about where do you really add value?" he said.

"It may be better to collaborate with those folks than to compete with them."

While everyone agrees that the big companies are formidable, not everyone sees them as being unbeatable, given how difficult it can be for them to innovate, compared to the young and nimble upstarts.

"Start-ups can always compete where they are innovating and/or thinking ahead of corporations. Decision making happens slowly in bigger companies and plans tend to be set years in advance. Innovation is hard to make its way into corporations and this is to a start-ups advantage. Innovation typically comes from the people who see the the world differently," Rose Haft, CEO of augmented reality platform Lumenora, said.

"It is unusual for corporations to hire innovative people to do one thing or another. Innovators tend to be called 'chaotic' or not fit into company culture or are seen as a threat because of their intelligence or not a good fit because of diverse skills. Tile and Tesla are good examples of this. Microsoft or Apple could have made Tile but they didn't and many car companies could have made the leap or purchased the rights to use the tech that Tesla started with but they didn't. It is hard for corporations to pivot quickly or they don't have the capacity and resources allocated to make it happen."

Rather than going head to head with big companies, smaller companies should innovate in a way that makes the larger companies more likely to acquire them than to compete with them, said Alan Levy, CEO of Chrono Therapeutics, a developer of a digital smoking-cessation system.

“On the med tech side, most of the innovation has come from small companies that were willing to take risks, and then that technology was eventually acquired by one of the larger companies. There are obviously advantages to the big companies, but there are advantages to the small companies as well and I think to be successful you have to identify an opportunity where not going head to head with a company right in their sweet spot, in their core area, where they’re going to defend that tenaciously. You want to be able to innovate quickly, take risks, move quickly; large companies, in general, can’t move as quickly, particularly if it’s not part of their core business and core revenue source," he said.

"Even if they’re in that same space, if there are opportunities where you can get there quicker, if you can get there with a better product, it’s often, from the large company’s point of view, better to acquire you than to develop a competitive product on their own. That’s happened again and again in the med tech space.”

Impatient investors

With all of the above challenges, perhaps it's not very surprising that investors aren't exactly jumping up and down to fund hardware companies. This may ultimately be the most difficult aspect of getting a company off the ground.

According to data from CB Insights, less than a quarter of hardware companies that raised an initial round in 2012 or 2013 have since gone on to raise a second round; for comparison's sake, 46 percent of all tech companies get a second round. Even more alarmingly, 97 percent of the consumer hardware companies that the firm tracked "died or became zombie companies."

It's no wonder that more than half of consumer hardware startups had to turn to crowdfunding to get money.

"Hardware companies typically have more difficulty receiving investment," said Haft, listing a number of reasons for that, including how many iterations it takes to get a product right.

"It typically takes several iterations of product as well as manufacturing set-up and tooling and coordination with manufacturing teams in order to bring a full product to customers, and one slight overlook can cost the company a lot of money. Palm Pilot and Samsung have both seen this with their batteries and charging circuits for the batteries that caused a great deal of issues, even after having well developed teams. Investors really need to love a product and believe in a team in order to see it come into life."

Investors may have certain expectations for when a company is going to go to market, or when they will be profitable, and that may take longer than anticipated, Levy noted.

"Where investors may have had one set of assumptions that made it an attractive opportunity, a year or two later, things may have changed. The competitive situation may have changed, they have needed more money and, therefore, it affected the return," he said.

"In general, med tech has become less attractive to healthcare investors than pharma, for a variety of reasons. One is the fact that there are fewer potential acquirers, and, generally, the potential upside is not as great for a med tech company as it is for a pharma company. So you've seen over the last several years much more money going into pharma biotech than med tech primarily for those two reasons. Med tech is not getting the same returns, often it's taken longer than people had anticipated, and you can see some very attractive returns in biotech and pharma side."

In the end, it may comes down to hardware companies getting the right investors, those who will understand the difficulties of hardware and who have the patience to see it through, said David Utley , President and CEO of Carrot, a developer of a digital health and wearable technology to help people quit smoking.

"In the tech world, technology investors are not as used to the longer haul of a medical device march that’s trying to help a chronic disease that kills a lot of people. The tech investor community, I’m just learning because I never had tech investors on my board

before, are used to quicker development. We don't go that fast and that's okay. You can be very successful by having a diligent strategy that helps save millions of lives over and I just have to prove that to my investors over time," he said.

"I'm very happy with my investors, but, in general, tech investors are used to much quicker milestones."

Lessons learned from hardware founders

I asked all of the founders and CEOs I spoke to share their lessons learned, and to tell me what advice would they give to upcoming hardware founders. Here are some of the answers they gave:

Utley: "If you're talking about a medical device, they need to have some really veteran regulatory and medical device engineering teams. It is really hard. Our FDA submission was over 2,000 pages long. It's not like creating a consumer device that can help you count your steps or your elevation change. It's complicated. So if you're talking about something that's regulated as a medical device, you better have a really awesome team that's got a lot of experience. You want to get on a plane, you want a veteran, grey haired pilot, you want people who really understand how this is done and they do it well.

If it's not a medical device, there's a lot more competition out there and all sorts of other types of things, like fitness. You've got to see, see how am I different and do I have people on my team who can make this thing into a business? Is selling a $150 step counter three million times every quarter, is that a business? How long until I saturate the market with the competition pressure at that price point? It only took Fitbit a few years. They're an awesome company, but everybody's got one. So the question is, how special is your thing that you're trying to create?"

Haft: "My top pieces of advice are: Build for your customers... and please build something that makes the world a better place. Build, build, build. Put off fundraising (if you can) and just build a good prototype. Try your best to have something that shows what you're talking about. MVPs can be a demonstration of how it will work, it doesn't have to function. Ask customers and/or make sure you have tested your thesis before trying to fundraise. Make sure you have a business plan. Many technical founders don't understand the ins and outs of starting a business and having a plan and being able to communicate it to investors and customers is critical to fundraising and building a company. Help everyone who is willing to be a cheerleader and champion for you to see and know your vision. Ask for help when you need it. Build a support network to keep you up and going in the hard times. Don't lie or always try your best to be honest. Build things people want. This will challenge everything you know about yourself. It is just as rewarding for the founders as it is for the world when a successful product, that makes the world a better place, makes it out into the world," said Haft.

Levy: "What is the market? How is that market currently being met? What is the unmet need you're fulfilling and how large is that opportunity? Then you get all of the issues related to, what's the regulatory path? What is your intellectual property position? What

is the development path? What is the reimbursement? Those are all key questions that you would ask for any medical device startup. Those are the initial questions, and then after that questions like: how are you going to manufacture it? What are the cost of goods? What is your selling price? What makes you think you can get that price? Also management team, and importantly, how do you plan to distribute this product? That's where large companies have advantages, their greatest strength is their distribution capability in the med tech space and the brand as well."

LeBoeuf: "The first thing I'd so is ask them a question: what do ya'll do extremely well? And, if they focused in on a particular thing, I'd say, 'Focus all your efforts on that first.' What is the best thing you can provide the marketplace, focus on what you do really well without adding any of the things that force you to dilute yourself or to compete with other folks that can outstrip you in that area. What is it that you do extremely well, and focus on that, is the first thing I would say because with hardware it's so easy to dilute yourself and make an irreversible mistake."

Sahin: "I wouldn't say no startup should do hardware. That would be absurd, and we need innovation. However, do consider if you can meet your goals by making software and capitalizing on an installed base of highly refine and powerful hardware that is already out there.

Then I would say: remember the hardware development and debug cycles are very long and frustrating, and remember that customers will expect magic. Also, they have zero idea how hard hardware is, so you may want to educate them and let them in on the frustrations early so they are rooting for you. You have that ability as a startup.

Finally, i would close by invoking Hofstadter's Law: Hofstadters Law states that all major projects take much longer than you think, even if you already took into account Hofstadter's Law!"

Adam Greenberg, CEO and Co-Founder of iUNU, an AI greenhouse startup: "We had our fair share of challenges with hardware when we were focused on lighting. We built an intelligent computer vision system into the lights and have since licensed out the lighting business to another company and are solely focused on the industrial computer vision solution. Some big learnings for us in the hardware realm include: never have single source supply; always expect shipping delays; something will always go awry you won't expect; cost rises dramatically if you want speed to market."

Jaya Rao, COO of Molekule, an air purifier that captures and actively destroys harmful pollutants: "When founding the company, we took conscious, measured steps to ensure Molekule could be referenced as an example of "hardware done right" -- it certainly wasn't by accident. This was a journey that we were very personally invested in seeing all the way through.

A couple of things in particular: we took the time to do in field beta testing -- a lot of it. We used early (and unattractive) versions of the product, that still had our core air purification technology in it, to give to people test. We kept our beta testing program

going up until we started shipping, to be confident we were delivering the best version of Molekule possible. We used this feedback to ensure that we were constantly improving the experience. That's what allowed for us to go from a literal black box (with our air purification technology in it) to the device that is shipping today. We're still taking feedback from customers and on a constant journey to make the experience better and better."