Nine hard steps towards success in a hardware startup

Nine hard steps towards success in a hardware startup. It this article we discuss the Technology risks, Team risks and Market risks any hardware startup faces.

In recent years, I've seen hundreds of scientists and researchers willing to commercialize their lab invention. Engineers and scientists, having worked for one or two decades on their laboratory technology often dream about their research to be brought further in the form of a device, industrial technology or a product. At the same time, nearly all of these innovators had one thing in common – a lack of understanding of how to bring their development to the market.

To cut the further story short, the success of a hi-tech startup in bringing the product to the market depends on several factors: it is a working technology, appropriately allocated investment, great team (yes, an investor is a part of the team), prominent entrepreneurship skill of the founder / CEO and a great leader who can push the project through different hardships. But where can a scientist or an engineer find these ingredients of success?

Risks, chances of success and investment

Any technology startup, starting with just an idea or a laboratory technology, has a number of risks:

- Technology risks – will the engineers be able to implement the laboratory technology in batch production? Note that the idea itself may require considerable effort and investment to demonstrate the worthiness.
- Team risks – the presence of an entrepreneur in the team. Ability to work together and ability to play down ambitions and focus on the project delivery. It is also crucial to have an engineer in a founding team as a CTO / product owner.
- Market risks – will the product be able to get into an open market window? Is there a market demand for the product?

Statistics say that more than 90% of startups fail at the earliest stages. According to the world-famous accelerator Y Combinator, only 0.4% of startups become successful. Do you remember the much-discussed failures of hardware startups Juicero, Pearl and Hello in 2017? And these are just the failed hardware startups featured in media. Most of others died quietly and never grew into a large company or business with a positive cash flow.

From investor's point of view, high risks of the project failure mean high-interest rate. So, venture capitalists expect to receive at least a 35% return on investment per annum (doubling the invested amount every 3 years after the project exit), because the likelihood

of the startup's death is extremely high. Thus, most of the investors are indeed quietly hoping to invest in "the next unicorn". However, there is one paradox here: the investor's money can't buy a great team or motivation.

Dream-team

Have you ever heard about a scientist combining entrepreneurial, management and engineering skills? Hardly ever. So the team should comprise professional design engineers, electronics engineers, software programmers, manufacturing and production engineers and marketing/PR specialist. In my opinion, having a neat management execution is absolutely crucial as most of the challenges the startup will face will not be easy. There are numerous examples of "combo-personalities" – such as a talented scientist who can manage and supervise further business development as a CEO.

As the startup develops, the importance of technology owners, engineers, manufacturers and market specialists shifts. During the R&D stage the role of the scientists and engineering team rises high, as technology developing and building hardware is critically important here. R&D management is another tricky thing – development never goes predictably smoothly and there is a great number of compromises to be made.

When the product is developed, it's time for a marketing and sales specialist to rise and shine. There is nothing more important than first sales for any startup. A talented entrepreneur (and a manager) is this "glue" that sticks together the mosaic of the project and the team.

Technology readiness

Technology is the foundation of a startup. New products are emerging on the basis of technologies, allowing the startup to create value for consumers and get a considerable added value and pay off the money invested. Not every startup can offer a breakthrough invention. Historically, new technologies tend to emerge either in centers of excellence created in the past 100 years by a willful decision of the state for military advancement (Silicon Valley in California, Houston, Minsk, Novosibirsk, the LAVI project in Israel), or within the universities and large corporations (MIT, MFTI, Bell labs, Samsung, IBM, Xerox, Toyota, Dupont and others). The main asset of these centers of excellence is smart people who create future technologies in the labs. Sometimes, these technologies, having found no application in the military or in corporations, emerge as startups in public life.

In my experience, some of the scientists and investors lack the understanding that their idea or even technology has a very-very long way to mass application and investment. In reality, in order to bring your technology to the market, you have to pass nine circles of hell, in other words – the stages of technology development. When assessing the stage of high-tech projects, we employ actively the methodology of technology readiness levels (TRL) developed by NASA. It's hardly possible to get from an idea and laboratory prototype to the batch production of your product without a pretty sum on your bank account.

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Investments into development

No one is ready to invest in just an idea. Virtually none of the professional investors are ready to invest in a project that has not reached TRL-4, a prototype "mockup" or PoC (proof of concept). At this stage of development, the project / technology will be of interest only to desperate business angels with industry expertise or state development institutions that are committed to support research and development.

I often have to see the mistakes of business angels and venture funds investing in a "ready-made prototype" (which actually is TRL 3-5). These funds, having no technical insight and expertise in technology evaluation, invest in too raw technologies that are at much lower stages of TRL than the startup declares. It all turns to be a waste of money, time and nerves for the venture capital funds. The majority of angels, having gained the experience of investing "in ready-made prototypes," keep saying it was the last time they invested into a hardware startup.

We believe that the development of a proof of concept (PoC), demonstrating the working capacity of the technology, should take place in the research institute or in the garage and hackerspace, using startups' or a scientist's own resources. Technology development may take years. The components will cost several hundred dollars. For example, Jobs and Wozniak put together a keyboard and a TV set and, thus, developed their first PoC in the garage, having shown the prototype of the first Macintosh (and, by the way, the sales of the Macintosh started only in 5 years).

TRL levels fit perfectly the investment rounds: pre-seed (development stage) and seed (batch production and market entry). Actually, pre-seed investments are needed to bring the technology to pre-production prototype. Our experience suggests that the necessary investments in developing industrial prototyping (TRL-5-8) of a hardware product can amount to 50k to 500k. Rare investors take the risks associated with the product technology. I want to stress this once again: venture and seed funds do not know how to assess such risks, because they are not engineers themselves. Risks, associated with the technology, are extremely difficult to identify without going into development. Therefore, at this stage, it is very difficult to raise investments from venture funds. But don't be discouraged – the closer your prototype is to TRL8, the higher are the chances of receiving the investment.

Market risks

Professional funds (Sequoia Capital, Baseline Ventures, Lowercase Capital and others) will review a project only at the seed stage when there's already a prototype ready for pilot batch production. But these funds are even more eager to invest when the money is needed for commercialization and market entry, i.e. marketing and sales launch. Closer to TRL 9, a project will require $ 2-10 million of investments for batch production, logistics, working capital and marketing. At the same time, you should understand that there are still no sales, and it is necessary to prove the demand for the product by sales. At this stage you will need a proactive manager (if you aren't this guy yourself), a talented market specialist and sales guru. The proceeds from the sale of the first product may be spent on hiring additional engineers to improve and optimize the product on the base of the first customers' feedback.

Long way to Fiji starts with the first step

Each of the steps, especially the first four levels of TRL, can take years of scientific research and laboratory experiments. Therefore, the result of any individual laboratory development, invention and technology is almost impossible to predict. But if we assume that there's a 50/50 chance that a startup gets to the next TRL, then we get a 0.39% probability that a startup will eventually reach TRL9 from just an idea, which corresponds to the statistics of 0.4% for the Y Combinator projects.

If you managed to demonstrate the efficiency of the technology by creating the simplest prototype "with a bluetack and scotch tape" (TRL-4), then you can easily start looking for cooperation options with successful technological accelerators (HAX, BOLT, Y Combinator, EnCata + HACKSPACE); partner with design studios and design engineering companies, which have experience in development and manufacturing, and bringing such projects to the market.

Partnership with accelerators, development catalysts and engineering companies increases your chances of success in the eyes of investors. Most accelerators engage in cooperation with the projects that have reached TRL4, and the participation of professionals in a project certainly increases the chances that a team or a specific development will succeed.