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At Digi-Key we work with thousands of startups every year. Some make it and unfortunately some don’t. Being engineering driven we tried to find patterns of commonality between successful startups and reached out to the experts at Startups Magazine to help compile, design and create this first ever Startup Survival Guide. In it you will find tools, resources and first-hand accounts from successful startups to help guide your journey from ideation through production and beyond.

Digi-Key was founded and is still owned by a Maker Professional. Even though we stock a wider selection of electronic components than any other distributor and we sell products to startups in over 100 countries we still retain that entrepreneurial spirit and we are committed to making every startup a success. No one has more tools and resources dedicated to help you take your startup to wherever you want to go.

This guide follows the same ‘Design Roadmap’ that we have created on our startup’s website called Maker.io. When you visit www.maker.io you will find an overview of every stage along that journey: Concept/Ideation, Research, Evaluation, Design, Prototyping, Funding, Marketing, Production, Distribution and Support.

On Maker.io you will also find a Roadmap Dashboard designed to help you with tasks, resources and a checklist for each of these stages. This is just one tool that Digi-Key has created to help startups become successful. The rest of this section will be dedicated to some of the Dashboard as well as other tools and resources available from Digi-Key.

Please let us know if there are other tools you would like to see Digi-Key create as well as provide any feedback to help us improve the value of this guide in future iterations. You can reach us at support@maker.io and remember, Digi-Key support is always available 24 hours a day, 7 days a week and 365 days a year at www.digikey.com.

Thanks so much and we can’t wait to see your product in production!

David Sandys

Director, Business Ecosystem Development, Digi-Key
NINETY PERCENT OF STARTUPS FAIL...
...BE IN THE TEN PERCENT " 
01
CONCEPT

Perhaps your great idea occurred to you in a dream, came to you in the shower, or sprung up as a result of a persistent problem.

Either way, you've got a concept worth exploring.
THOUGHT BECOMES ACTION
Before you can do anything else, you need to have an idea. Concepts can come in a variety of guises, shapes and sizes and are the starting point for all startups. But the concept of a startup is not as simple as just having your eureka moment, that moment needs to be followed up with thorough research and brainstorming to refine your concept into a viable foundation for a business.

If there is something wrong with your concept, then you are going to encounter major problems further down the line, when it is much harder to make changes to the very core of your business. So take your time, and make sure that your concept is rock solid before attempting to build anything on top of it.

Eventually, having proof of concept will become integral to your startup’s ability to grow. Future investors will want to see a strong proof of concept before they commit any money to your startup, and if there is a flaw in the concept, then this stage will become very difficult.

The best concepts grow from wanting to solve a problem, so an important part of the concept process, is to work to really understand the problem, rigorously define it, and then find the best way to solve it.

First and foremost, it is important that there is a problem that needs solving, which sounds obvious; however, a common trap that startups fall into is building an awesome product without checking whether it actually solves a problem that people want fixed.

Many founders are inspired to begin when they encounter the problem themselves, having their eyes opened to a problem that needs fixing first-hand. But it is important to establish whether that same problem affects a large enough group of people for a solution to be a viable business foundation. A simple way to begin to find this out is by asking people if they have encountered something similar.

‘Two heads are better than one’ is a common saying, and one that holds true when talking about business concepts. As well as being useful for deciding whether or not enough people are affected by the issue for it to be viable as a business concept, talking to people can also be an invaluable way to gain a stronger understanding of the problem you are trying to solve. By doing this you can not only define the problem more closely, but also start to build an idea of your future market.

What is also likely to emerge from talking to people who experience the issue your business is aiming to solve, are the most common factors. It is likely that everyone will have a slightly different experience, but within that, there will be a few issues that almost everyone has encountered. These common factors will almost certainly be the root of the problem, and after establishing this, you can really start to figure out the best way to solve it.

You will also need to think about why it is that this problem has not been solved before, as this could warn you about potential obstacles further down the road. Have people tried before and failed? If so, why did they fail? Is this a new problem? What happened recently to cause it? Is it more complicated than it
seems? Or has it simply failed to be properly identified before?

When thinking about these questions, searching for other concepts that have tried, and failed, to rectify this problem can be a valuable guide of 'what not to do'. Understanding the problem, is what remains at the heart of all of these questions.

The next stage in nailing down your concept is brainstorming until you come up with a viable solution. This is another stage where working alone is difficult. It is far more effective to brainstorm in a group, as it is much easier to bounce ideas off of other people. Brainstorming alone can quickly leave you stagnated and your ideas stale. Brainstorming also gives you the chance to get creative with your ideas. There is no harm in testing out an idea in the brainstorming stage, even if it doesn't end up as a part of your final concept.

During the brainstorming process, remember that there are no bad ideas, keeping the environment positive is often vital to keeping the creative ball rolling.

There are lots of different ways to brainstorm and all of them can produce results. The most well-known example of brainstorming is likely the infamous 'mind-map' that most people will remember from school. It is a classic because it works, so if you find yourself in a bit of a concept-rut, try dusting off a large piece of paper and mapping out your ideas.

Other great ways to brainstorm include looking at the problem from a different perspective, imagining what you might prioritise about the problem if your circumstances were different, examining similar successfully solved problems, and even attempting to reverse engineer the problem. Hopefully, after some successful brainstorming sessions, you will be able to compile a list of ideas, which you can then review with more scrutiny, until you have a shortlist of ideas that you are confident would solve the problem. With this shortlist, it is the time to assess the ideas, until you are certain which one will be the most effective to both solve the problem, and function as a business.

When assessing, it is a good idea to look for outside opinions, whether from industry experts, surveys, or friends and family. They may well come up with something you have not thought of before which makes one idea more viable than another.

At the end of this process, you should have a perfectly understood problem and a viable solution to it, which means you are ready to start your research.

When you first get struck by that initial idea, it is easy to let the excitement blind you to everything else and prevent you from taking it slowly and tackling your concept properly. When refining your concept, try to remember these wise words from Albert Einstein, to stop yourself from rushing the foundations of your startup:

"If I had an hour to solve a problem I'd spend fifty-five minutes thinking about the problem and five minutes thinking about solutions."
Smart underwear from LifeSense Group empowers men and women, and puts an end to suffering in silence.

Did you know that one in three women will experience urinary incontinence at some point in their life? Although this a common health issue, it is still viewed as taboo subject. Women often feel too embarrassed to talk about their problem and can even suffer with it for up to 25 years before they seek help. This is a challenge that can be met with a product called Carin, which is a piece of smart underwear that absorbs without mess thanks to the smart textile, Bluetooth sensor and a tailored exercise programme.

Julia van Zanten (pictured above), co-founder and CCO of LifeSense Group and a social designer with a background in textile design, completed her studies at Central St. Martins College of Art and Design (London, 2010) and Social Design at Design Academy Eindhoven (2014). She was working in interior design when she realised she wanted to do something more meaningful. It was after spending a summer with her grandparents that she discovered her grandfather was suffering with urine loss. After realising that he could no longer do the things he enjoyed because he felt too ashamed to use a nappy, she had her lightbulb moment. As a designer, she asked herself: “How can I come up with a better solution? Why are these products designed in a way that make people feel bad about their body?”

It was later on that van Zanten met her co-founder, Valer Pop, now the CEO of LifeSense Group, who completed his PhD at Philips and is now focussing on new technology sales and business development. The two realised that they shared a very similar goal and decided to join forces in 2015.

LifeSense began its journey in 2012 when it received €1m seed funding. Throughout 2012-2015, Carin was developed by involving more than 100 different women on its advisory board. In 2016, Carin was CE and FDA Class II approved and established a global client base from the company’s offices in Eindhoven, the Netherlands and Tokyo, Japan. Then in 2015, LifeSense Group was founded as a spin-off of the R&D Institute at the Holst Center in the Netherlands.

In 2017, LifeSense Group received an investment of $3m from a Danish entrepreneur, taking the company’s investment total to $5m since van Zanten’s and Pop’s idea was born four years earlier.

The smart underwear works in conjunction with a wearable sensor and a tracking app that creates a tailored exercise programme designed to eliminate future leaks. Menopause, childbirth and weight gain can often result in weakening of the pelvic floor muscles. This can cause uncomfortable situations by simply sneezing or coughing.

Carin’s Bluetooth sensor sits comfortably and discreetly inside the underwear to measure the leakage and collect data. The sensor also allows users to track their progress in real time without changing their active lifestyle. This product differentiates itself from its competitors by its non-intrusive design.

van Zanten explained how they really wanted the smart textiles to look like normal underwear: “The intention was to make the underwear look as normal as possible so that it fits into daily life. We want it to help women feel confident and empowered as we understand it is an embarrassing problem to have to deal with.”

The underwear can be put in the washing machine on a delicate wash alongside the rest of the laundry. Carin underwear is also available in two styles.

The app allows users to log in and complete a measuring programme once a week to track their progress. van Zanten said: “The app helps the users to remain motivated throughout the whole process.”

Within the app there are also tailored pelvic floor exercises. The training programme is designed for up to an eight-week cycle but van Zanten explained how women often get cured sooner than that. The app encourages users to exercise for ten minutes per day to strengthen and gain control in their pelvic floor muscles. The online coach demonstrates the exercises on a smartphone and tablet so that users can exercise anywhere at any time. The app is available for download on Android and iOS. The focus for Carin was to show how well design and technology can work together, as well as making women feel empowered and confident again.
From Maker to Market: 01
The Roadmap Dashboard

*The Roadmap Dashboard is a step-by-step guide to take your project from concept to market!*

We've conveniently provided resources and tools needed to handle every twist and turn you'll encounter on your road to success.

The dashboard is available to you after a project has been created. The navigation on your left side is used to view each step.

Simply click on the area you wish to work on and dive right in!

The progress bar mirrors your actions in the checklist, it will move forward or backward as items are checked and unchecked.

1. Head over to the maker.io website
2. Click 'Start a Project'
3. Victory is yours!
How ’Ladyada’, Founder of Adafruit developed Circuit Playground

From maker to market

by Alex Lynn, Startups Magazine

Limor Fried, known as Ladyada, is an American electrical engineer and owner of the company Adafruit Industries. She has been a force in open source hardware and was named the most influential woman in technology in 2011 by Fast Company.

In an informative video series, engineer Ladyada (pictured opposite) talked about the concept stage of the product development process, and has offered some key pieces of advice, using her project ’Circuit Playground’ as a running example.

The initial phase of creating any product, is concept. Before you can do anything else, you need to know what it is you want to achieve. This is not just having an idea of a product, but also knowing exactly what your goals for that product are. Having the idea for a cool gadget is all well and good, but what is that gadget hoping to accomplish? Why do people need it? Why will people buy it? Is there a demand for it? All are very important questions to ask during the concept phase.

Concept also tends to be the stage that gets discussed the least, when in many ways, it is the most important, as the foundation of your project. Inspiration for a concept can be found anywhere. Perhaps you keep being foiled in your work by a glaring gap in the market, and finally decide to set out to fix it, perhaps it is something you have had on the backburner for a while, or perhaps someone else brings up a problem that needs fixing, and an initial idea leaps to mind. However your concept begins, the most important questions to ask yourself are; what is the goal, and what is the purpose?

When you’ve answered those two vital questions, you can move on to developing your idea. It is also worth noting that the more thoroughly you understand the problem and the more tightly you define your goal, then the more structured the rest of the process will be.

Ladyada also explains that another way of developing your concept, is taking the time to find out what other people have tried, why they failed, whether they had anything that was working, and move on from there. There is no need to make mistakes that have already been made, when you can instead be learning and growing from the example.

Sometimes, concept takes a long time to fully develop. For Ladyada, Circuit Playground was many years in the making before becoming fully realised. It took many years for the concept to become refined enough to be successfully turned into a project. Developing a concept involves walking down many different paths, and finding another one if the one you tried turns out not to be right for your project. There is no one way to do something, and taking your time with a concept will always be more effective than rushing the foundations of your project.

In some ways, concept never stops. Throughout the process, you will be refining and adapting your concept to better fit your goals and the ever-shifting market, and even after launch, concept will continue, as you work to improve and update your product.

Be flexible, keep in mind your goal, and don’t be afraid to adapt if it changes.
02

RESEARCH

While you’ve probably done a bit of Googling, now is the time to get serious about researching your idea. You’ll need to review platforms, evaluate price points, and perform a competitive analysis. Now might also be a great time to look into existing intellectual property.
DO YOUR HOMEWORK

maker.io
So you’ve probably done a bit of Googling, but now it’s time to get down to business. Research should never be overlooked by any business, big or small. One of the most important things you can do to start off on the right foot is conduct thorough research.

According to studies, some of the main reasons why startups fail are due to the lack of planning, the absence of supplier knowledge, and various issues with pricing. The chances of these occurring can be reduced, if not removed, with the right research.

However, conducting market research is a lot harder than it seems. With the overwhelming amount of information on the internet nowadays, it can be a challenge to sift through what’s relevant for growing your startup.

**WHAT REALLY IS RESEARCH?**

Research helps businesses understand their marketplace from the start, enabling them to create strategies that will allow the business to grow. The main forms of research are primary and secondary – combining the two creates reliable results that can be used more than once.

Primary research is new research, carried out to answer specific issues or questions. It can involve questionnaires, surveys or interviews with individuals or small groups. Secondary research makes use of information previously researched for other purposes and publicly available.

**WHERE TO BEGIN?**

It can be difficult for startup businesses to get their foot in the door, particularly when very little research has been carried out. Startups need to know who their target audience is so that they can tailor their product to suit them.

Clara Toombs, CEO and Co-founder of Apptimisation, who created an app that helps users find fellow festival lovers who share the same interests, shared her top tips for startups at a crossroads.

1. Get customer feedback on your idea/concept very early on and continue to do so, it’s important you are listening to your customer needs.
2. Be clear on what problem you are trying to solve!
3. Understand who your competitors are and how your USP differs to theirs.
4. Use prototypes to bring your idea to life. This makes it easy to share with potential customers to gain valuable feedback.
5. Take a Minimum Viable Product (MVP) approach, don’t spend ages perfecting your idea, get it out to the market and iterate based on user feedback.

**WHAT CAN YOU EXPECT?**

Well, there will be far less stress and organisational problems. The results you gain from your research will allow your business to set achievable goals and reach out to the best audience possible, and an audience that will actually want your product/service.

By doing your research before investing time and money into your business, you will be assured that your service is correctly priced and will reach out to the best market possible.

**WHAT RESEARCH METHOD SHOULD I USE?**

There are many different avenues you could go down, but let’s start with the basics.

**Quantitative surveys** – these are one of the more common research methods. A quantitative survey allows you to quantify data and generalise results from a sample to the population of interest, and measure
THE TOP MARKET RESEARCH MISTAKES
- NOT TO MAKE

the incidence of various views and opinions in a chosen sample. It is usually a large number of cases representing the population of interest. It features structured techniques such as online questionnaires, on-street or telephone interviews.

Focus groups – these can be a more refined approach to research. Focus groups are usually a small group of people that fit the profile of your target audience. Focus groups enable people to bounce ideas off one another and build upon each other’s suggestions. It would be a good idea to run more than one focus group to ensure you receive an accurate representation of your target audience.

Case studies – they can provide you with even more of an understanding on how an individual interacts with a product or service. It can give you a complete picture of satisfaction, usage and attitudes towards the product. It is a good way to refine your business proposition by using target customers to help create a product that’s meaningful and will set you apart from your competitors.

For example, you could get a professional in your industry to test the product over a period of time. This could solve many teething problems with your concept as well as meeting needs that consumers are looking for within your industry.

Research interviews – these one-to-one interviews are similar to focus groups as they include unstructured questions that allow the interviewee the freedom to express their views on the product. This provides an opportunity to gain a deeper understanding of the user’s point of view.

Successful market research takes planning and strategy. Here are some of the most common mistakes startups make when conducting market research.

1. Not knowing what you’re looking for. It is important you know what information you need before you even begin so that you don’t waste time. Gather a list of questions, such as “What are the specific needs of my customers?” and “How much would my customers be willing to spend?”

2. Overspending. Performing market research doesn’t require a huge budget, if you’re smart about it. Many businesses fork out for the first market research firm that promises to provide them with all the data they could ever need on their target audience. Shop around for the best deal if you are hiring an outside firm.

3. Poor choice of reference materials. The internet is a great place to start your research, however, business libraries are also worth a visit. This may seem like an obvious one but it’s important to consider the source of the information you are getting as websites on the internet can include inaccurate data and biased material.

4. Not looking into your competition. Gather as much information about your competitors as you can. The more you know, the more you can use effectively to establish your competitive edge.

5. Ignoring your market research. The only thing worse than not doing market research at all, is not using your results. It would be easy to discard research that did not provide the answers you wanted, but what would be the point in spending all that money just because it didn’t support the answers you wanted to see?
Get to know your users

By Daisy Stapley-Bunten, Startups Magazine

Felcana is the new generation of digital pet care. It is an ecosystem of connected and responsive smart devices that monitor your pet. It was designed by experienced vets and developed by inventive engineers.

One of those vets, and one of the co-founders of Felcana, Dr. James Andrews, explained the source of their inspiration: “We saw a huge gap in the market when it comes to pet technology. So we founded in 2016 and we’ve gone from two co-founders to over ten members now. It’s all very exciting.”

The Inspiration

Co-founders James Andrews and Kimberley Schiller, both vets, hatched the idea for Felcana when they started looking at wearable devices and how they could gather information that’s clinically relevant and helpful to pet owners and vets.

“We had seen some of the connected devices that existed in the ‘human’ world and thought ‘well why don’t we have something similar for pets?’ We did some research on the devices that were out there two years ago, and the devices didn’t have a clinical focus, it was more fun for your pet.”

Design Stages

Felcana gathers information on all the fundamental things that indicate disease in cats and dogs: lethargy, lack of appetite, change in appetite, drinking frequency and temperature. Something as simple as a dog drinking more water than normal can be a sign of polydipsia which is caused by diabetes – and is not something that a pet owner might necessarily notice.

The Felcana app processes this information in real time and provides a breakdown of the data and a historical trend. In the future, the startup plans to offer a bespoke veterinary dashboard with a granular analysis for vets.

Since then that idea has grown quite a lot. “Now we think of ourselves as a pet data company, we undertake pet data acquisition through connected devices or other opportunities for acquisition. We are a pet data storage company, and we are a pet data analytics company because we really analyse that data we get to gain an insight,” explained Andrews.

Understanding the Market

The first step for Felcana was market research. They established that the market opposition was opportunistic for their startup and that there was market demand through research with pet owners. They then undertook an exercise to
understand how to build the business through fundraising.

“What you find out is that fundraising is not trivial. Raising £5m off the bat was not going to happen. We went down the route of applying for government grants – there is a lot of money for innovation supported by the Government.

“We went through Innovate UK and applied for a small proof of concept grant and were lucky enough to be successful in the very first round. This allowed us to raise capital in the private investor market because we had the government grant already in our business,” said Andrews.

CROWDFUNDING JOURNEY
Felcana fundraised on Kickstarter in November 2016 and raised £26,191 with 250 backers. “Kickstarter was an interesting experience. We did it to test our product on the market,” said Andrews. “The other learning curve was that it is really time-consuming, especially if you want something credible. Anyone can knock together a Kickstarter campaign in a day, but to do a good campaign requires a lot of up front investment.

THE (HUMAN AND PET) USER EXPERIENCE (UX)
“We spent a lot of time talking to pet owners and vets, and built prototypes to let people play with them and get a feel for it in their home. We went to people’s homes for hours and interviewed them very early on,” said Andrews. “Also we tried the different iterations of the product on their pets, to see whether the pet was bothered by them.”

“Going to Crufts in 2017 also gave the team a real morale boost, to see the demand from the people we will eventually be selling to. We then integrated all of their feedback into our product,” said Nolan.

Even the startup’s name ‘Felcana’, a play on feline and canine, was born out of a competition and thought of by pet owners. The name was important as it allowed them to build a brand that wasn’t just focussed on the single product.

DESIGN PRIORITIES
“Miniaturisation,” said Andrews, “Especially for any of our products that go on an animal. Again many of our competitors’ products weigh 60-70g, which when you’re placing that on a four kilogram animal, it can be substantial. It’s the equivalent of carrying a can of coke around your neck. Something that pet owners might not necessarily realise. Ours weighs 8.3g.”
According to CB Insights, 42% of startups fail because there was no market demand for their product or service in the first place.

In a world awash with data and information, how can so many founders, so routinely launch things that people don’t want? And what can you do to avoid this fate?

In this chapter on research, we’ll tackle these questions head-on.

YOU ARE NOT THE MARKET
The most difficult problem is realising that you are not the market, and acknowledging that you should actually do some rigorous research in the first place. Two things frequently happen here that makes this particularly difficult for founders.

Firstly, you probably have a bunch of friends and colleagues who are pretty similar to you. When you tell them about your idea, they nod along enthusiastically and tell you that “I’d definitely buy that!” Unfortunately, they are also not representative of the mass market. And while selling to friends, family and colleagues...
may help you in the early days, it can quickly mask problems with what the wider market wants. This can be a very expensive and difficult lesson to learn, and could be avoided by stopping to dispassionately evaluate the market before you launch.

Secondly, ‘dispassionate’ and ‘entrepreneurship’ are practically oxymorons. This means many entrepreneurs pay lip service to research. Rather than trying to gain a genuine understanding of consumers, and building their vision around that; they spend their energy finding data and research that fit into their existing narrative. This is completely understandable - if you're trying to raise investment you don't want anything that pokes holes in your story - but it does often mean that “No business plan survives first contact with real consumers” to paraphrase Helmuth Karl Bernhard Graf von Moltke.

While software companies can nimbly adjust their offering even after launch, it's a trickier and more expensive move to pull off for hardware startups.

**LOOK FOR PROBLEMS, DON'T ASK FOR SOLUTIONS**

Many arguments against research cite mavericks like Steve Jobs and Henry Ford, who is said to have quipped “If I had asked people what they wanted, they would have asked for a faster horse.” Indeed, consumers don’t always know exactly what they want or need.

But drawing the conclusion from this that research doesn’t lead to breakthrough ideas is completely missing the point.

Sure, asking consumers to design the solution they want will often lead to them asking for slightly better version of the things they already have: a little faster, cheaper, longer-lasting etc.

But if you ask them for all the things that frustrate them, you'll have a rich set of data to work with when designing your own visionary solution to fix their problems.

Need to go from A to B faster and in more comfort? A car is better than a faster horse. Need a more reliable way to get from A to B on a rainy evening? An Uber is better than a cab.

In other words, focus the research for your hardware startup on understanding consumer problems and frustrations - not on asking them to tell you the specifics of how they'd want to solve them. That is your job as a founder. But engineer a brilliant solution to a problem that doesn't exist, and you're on a road to nowhere.

**USE FRAMEWORKS TO GUIDE YOUR RESEARCH**

One of the great challenges with research is how broad it is. What should you research, beyond problems?

To help you with this, it's good to consider popular strategy frameworks, and use them to guide your research by filling in the gaps.

Jobs To Be Done, Strengths, Weaknesses, Opportunities and Threats (SWOT), Political, Economic, Social and Technological (PEST), Blue Ocean Strategy, 5 Whys and Business Model Canvas are all proven ways to think about the way your product can success in a competitive landscape.

**HARDWARE CAN BE AGILE TOO**

As referenced earlier, one of the defining aspects of successful software companies is their ability to take an iterative approach to product development, using real life data to inform and shape their strategy.

Why should a hardware startup settle for less? Understanding your market is only the first step in your research journey.

There are now agile, rapid feedback platforms out there that can help hardware companies enjoy the benefits of iterative development much like their software counterparts. The difference is, you'll have to frontload your research earlier in the process than a pure-play online startup.

What can you test? Here’s a list for starters: Messaging and positioning, pricing, packaging, product design, features and functionality, taglines, logo, ads and creative assets, promotional plan, consumer awareness of your product/category, distribution channels, influencers and partners...what you can test is now only really limited by the imagination, rather than the technology.

If you can embed the discipline of real consumer research across your business from the earliest stages, you'll stand the greatest chance of delivering consistent, predictable and repeatable growth as you look to expand your product range, launch into new markets and reinvigorate your original idea for the next generation. Success is just a few questions away.
From Maker to Market: 02
Digi-Key Research Resources

It's time to pull up a chair, grab a notepad and pen, and make yourself a brew. You've got some research to do, and Digi-Key can help.

1. Startup and Maker website at www.maker.io: Offering the tools, resources and support you need to bring your project to life
2. Article and Video Library: Offering the latest technology news, product information and supplier updates
3. Digi-Key’s blog The Circuit: Timely updates, industry thought-leadership and entertaining educational posts
4. eeWiki: Real solutions to tough engineering problems
5. App Note Archive: Thousands of quality indexed documents and white papers from Digi-Key manufacturers and other sources
6. Solution specific microsites including IoT, Industrial and others
7. Product Training Modules: Simply the best way to learn how to use the technology from our 700+ suppliers
8. Newest Products: A complete microsite dedicated to highlighting the latest products from our suppliers
Before you spend a lot of time designing your project, it is essential that you give it careful evaluation. First, weigh the pros and cons of your project. Begin thinking about possible team members, test your technology, and establish a realistic timeline. Everything check out? You’re ready to design!
BE REALISTIC AND PLAN AHEAD
Before you spend a lot of time and money designing your project, invest some time in evaluating both the concept and the market.

It’s tempting, to want to get started as soon as possible, once your research indicates this idea has legs, but a careful and through evaluation will save a lot of headaches later in the design and development cycle.

**Avoid ‘Black Swans’**

Evaluation can help a startup avoid ‘black swans’ (unforeseen events which have a major impact). Weighing up the pros and cons of your project can identify some risks and help you to plan to avoid them.

This process can also help you identify skillsets you may lack and possible team members you might want to work with to fill these gaps. For example, is there someone in your network that has knowledge of distribution or marketing which you will need later in the process?

Following your research (see Research - Survival Guide), ensure that the current project matches those results, or assess what may need to be altered. This may mean adding features or functionality to meet customer or logistical needs. It may even lead to conducting a short survey to find out might be most useful to customers and clarify what features they expect.
The problem with asking many people is that you may receive more ideas than you bargained for! Ritam Gandhi, Founder and Director of Studio Graphene, a company that works with entrepreneurs and product development teams to bring a digital idea to market, suggests: “Show people the product, and watch how they use it and how they interact with it.”

Consider each one with a view to how practical they are to implement and then draw up a checklist of what likely to be manageable and profitable. This exercise may mean some design changes have to be made, making it also an opportune time to evaluate the materials and/or components you are using. This also helps in assessing what resources need to be available for the different stages of production and to firm up what a realistic development timeline will be.

**Planning Scenarios**
Planning scenarios can highlight potential trouble spots, which can be addressed before production begins. This is the time to evaluate the product life cycle, from its introduction, to growth, to maturity and decline.

Thinking ahead to what testing processes will be used, can focus your mind on ‘what if’ scenarios so that an avoidance or coping strategy can also be formulated.

For example, is there enough rigorous testing for production? For software, Gandhi recommends making sure sufficient regression testing is in place. This is the re-running of functional and non-functional tests following a change, to ensure that software already in production still performs after changes have been made. “In a pre-production environment this can be done by the user base in [the user’s] environment to make sure that changes are not affecting existing users,” he says.

Another production evaluation is the smoke test, the end-to-end production flow in a real environment. “It is very important to have an accurate set of tests cases and mirror test cases with a checklist of what is best and what is expected,” adds Gandhi.

**Evaluate the Market**
Once there is an idea of how long the testing process will be, what the production costs will be and a general timeline to bring your product to market, it is easier to establish the market price for your product or service.

For a product to succeed, it has to meet the market’s needs. To establish just what those needs are, you need to evaluate the current marketplace and potential competitors.

Discussions with manufacturers, or service providers, can help determine the timeline of your project, so consider which manufacturer to use carefully and decide if your product is time sensitive. Will it need to be produced and available at a certain time to capture a zeitgeist? It may be important to establish if the product will come out before, during or after a particular trend.

**Don’t Dismiss the Competition**
Competition is very important, says Gandhi. It can reveal what to do and what not to do, as well as the commercial viability.

“It is easy to identify the incumbents via a Google search, and this potentially demonstrates that there is market need for your idea,” he says. “Identify if the marketplace is saturated and learn what they have done well or badly,” he advises. Evaluating your competitors’ projects for pros and cons is also helpful: “Try and see [the project] from a customer’s point of view,” says Gandhi.

He concedes it is harder to identify the market where there are no competitors, adding, in which case, startups have to rely on market intelligence to evaluate market conditions and opportunities.

Examining a range of competitors’ offerings can also indicate the price point that the market is able to bear; this can affect your pricing strategy. If it is going to be priced higher than others that are currently available, the differentiating features and value have to be made clear.

The price you set is dependent on several factors. There are the development and production costs, of course, including the cost of any raw materials, as well as operating costs such as salaries, office space, retail space and distribution costs. Gandhi also lists server hosting costs, which may need to accommodate spikes in activity or be scaled down according to demand, and the costs of any licenses.

The cost of a product may go up or down depending on many factors, so evaluate that your price point and costs have sufficient margins to weather any market storms that could raise the cost of production.

**Set a Definite Course**
Defining your product and how you will make it be reality, helps you formalise the initial production. The process also helps to crystallise ideas for the next steps in your roadmap, such as design, marketing, production and distribution.

To evaluate effectively, you must have a clear set of criteria against which you can rate outcomes or performance. Within these, there has to be an element of identifying the ‘unknown unknowns’, the things you don’t know you don’t know. These may become apparent during the research phase or they may rear their head further along your roadmap. The evaluation process has to ensure you are in a position to adapt swiftly and without damaging penalties.
Making hardware is hard

By David Jakes, Director of UX & Design at Pigzbe
Making hardware is hard. So is making software or launching a new crypto token. When you try and do these at once, so that they all work together, things get complicated really quickly.

That’s the challenge we have at Pigzbe. If you don’t know it already, Pigzbe helps kids aged six and over learn how to earn, save and budget through a fun educational app, the Pigzbe Piggy Wallet (kind of like a hand-held notifier) and their very first cryptocurrency, Wollo. In essence, at Pigzbe we’re working to reinvent pocket money for a digital world.

The build began last year, and in projects like this with so many moving parts, testing, evaluation and responsiveness are fundamental. Particularly if - like us - you want to make something that is user centric, and doesn’t just work, but delights its users every step of the way.

This delight is an emergent property of the entire system. It’s not something that can be achieved just by adding a particular bit of technology, but by making everything work together so that it’s more than the sum of its parts.

So how have we worked to achieve this? Unsurprisingly, planning has been really important, so the process of defining and validating our concept involved intensive work. When we kicked off, we obsessed over every detail at the planning stage to cover as much ground as possible. It’s the equivalent of sketching something out before applying paint to canvas - a mistaken assumption here will cause no end of headaches later on.

The result of diligent planning, speaking with users and testing our concepts meant that Pigzbe’s first prototype was quite similar to what will be the final version. This consistent vision has allowed us to focus on the details of the design.

Just as important has been a high degree of coordination between different creative workstreams. At Pigzbe we’re split into three teams: product, hardware, and software. From the beginning, all three teams have worked closely together, sharing central project planning.

Integration between User Interface (UI) and hardware is a critical part of developing an ecosystem of embedded products; something that is often forgotten in the age of cross-platform apps. Hardware design choices like materials, weight and even technology components such as screen type, haptics and chips can impact the digital experience, and vice versa.

For example - a slightly different power management chip may affect the maximum number of LEDs that can be lit and to what brightness, which in turn constrains the user interface. And so on.

Similarly, maintaining a constant flow of ideas and feedback between hardware and software team is critical - without it, you can run into difficulties. Having a high-level of cross-disciplinary knowledge in the team makes us aware of the consequences of our decisions on each other’s work.

Third and finally, user testing has also been crucial. We’re working to build a unique and fundamentally new interactive experience that connects parents and families together. Throughout the process, we’ve constantly demoed what we’ve been working on internally to make sure that the experiences link seamlessly.

Having guided the process through to the final revision of the hardware we’re now in the last phase of development - writing the code that will run on the device for the first generation of Pigzbe customers.

It’s an exciting time to see our hard work come alive in the hands of kids who are testing our beta units. And for me, and the team at Pigzbe, that’s what makes it worthwhile.

This way of working is essential in Internet of Things (IoT) - you cannot depend on new and expensive technology to do your work for you. It’s a long and sometimes challenging process, but at the end of it all something quite magical can emerge.

"It's an exciting time to see our work come alive."

- David Jakes, Director of UX & Design at Pigzbe
Coming from a Design Thinking background, I often recommend that entrepreneurs integrate customer feedback early, ideally at the ‘rough’ idea stage."

**VALUE CUSTOMER FEEDBACK**
- Keep talking to your customer for a deeper customer understanding

Although many entrepreneurs I have spoken with in the past say they are customer friendly, they often fail to understand customer needs as they seek out customer feedback intermittently.

From a Design Thinking standpoint, customer feedback must be iterative and constant. After integrating the feedback, entrepreneurs can tweak the prototype and then ask customers to test the new version, gain feedback, and so on. Technologies, such as 3D printing, enable rapid prototyping.

From my experience, this approach is much faster and avoids investment in an expensive prototype at a late stage, or even worse, production starting, only to find a major flaw.

**PLAN FOR PRODUCTION**
- Production planning has to be flexible and
I would push entrepreneurs to run multiple rounds of feedback at this stage, particularly with low-tech, inexpensive prototypes prior to production. Of course, this varies largely on the type of product or service.

One startup I consulted was working on a travel mobile app, and thus, did not have a physical product. We brainstormed with a simple, paper version of an app and asked for customer feedback. We worked with freelance engineers to come up with a draft of an actual mobile app, but with minimal investment.

The main benefit that startups have is the lack of rigidity of larger corporations. Keep an open mind and pivot when necessary, if customers point towards another path.

**OPTIMISE YOUR AGILITY**

- Startups have agility and can react quickly to market changes

It is easier for them to react to changes in customer taste and they are able to monitor future trends and integrate them. A variety of research tools is available to assist in identifying technological and social trends.

- Startups can be proactive and can shape customer taste

They can change the world that customers live in and create new needs. For instance, Uber has taken into account every aspect of customers’ and drivers’ unmet needs to create a new type of experience. Instead of being reactive to trends, it created a new world that spurred its own set of direct competitors.

- Competition is not necessarily who we think it is

Steer away from classifying direct competition as the only competition and think as broadly as possible. Think in terms of customer needs. Who else could satisfy those needs and in what way? This is your competition.

**LEARN TO NETWORK**

- Status is transferable

In one of our research projects at Imperial College Business School, we found many high growth startups aim to associate with high-status companies by establishing partnerships with large corporates or obtaining a prestigious client.

- Network. And if you aren’t a networker, learn to network

As well as activating existing networks, also build a new one. If you attended business school, who do they know who could introduce you to a star contact in the industry? Another approach could be attending networking events or joining an accelerator.

Building relationships and genuine interactions with key stakeholders (VCs, potential customers, other entrepreneurs) can all contribute substantially to a startup’s success.

Dr Rand Gerges Yammine is a Research Associate at the Innovation & Entrepreneurship group at Imperial College Business School London. She is currently working on a research project examining the networking behaviours of entrepreneurs and is interested in digital entrepreneurship, interorganisational networks, interfirm collaboration, open innovation and creativity.
Scheme-it is an online schematic and diagramming tool that allows anyone to design and share electronic circuit diagrams.

The tool includes a comprehensive electronic symbol library and an integrated Digi-Key component catalog that allows for a wide range of circuit designs. Additionally, a built-in bill of materials manager is provided to keep track of parts used in a design.
Once a schematic drawing is complete, users can export it to an image file or share it via email with others. We are Beta testing an export to KiCad for schematics.

Scheme-it works natively in all major web browsers without requiring the use of any plugins.

You only need to be a registered user if you want to share and save designs.

1. Ability to diagram at the Block, Icon, System, or Schematic level
2. A library of over 700 generic symbols, as well as custom symbol creation
3. Access to over four million components via Digi-Key Catalog integration
4. Freedom to keep designs private, make public, share via link, or embedded into web pages, blogs or emails
5. Rapid design evolution via Bill of Material (BOM) import capability
6. Integrated Bill of Materials and quoting
7. Export into PDF or PNG files and now other tools
8. A direct link to Digi-Key Technical Support for help with component selection activities
9. Export functional schematic to KiCad design software
04

DESIGN

The design phase should be fun and exciting because this is where the magic happens!
WHERE THE MAGIC HAPPENS

maker.io
As a startup, once you have your idea and you are ready to move forward, the design stage is such an important stage in your journey. So when it comes to designing where do you start and what are the really important things you need to think about?

How Important is Design?
The design of a product is essential for it to step up from idea to prototype. To really make a product come to life the main elements are the design, materials and components, but obviously design qualities will be different for hardware and software products.

More often than not it is the design that sells a product. Heather Corcoran of Kickstarter said successful design goes hand-in-hand with successful campaigns and that goes hand-in-hand with successful businesses long term. "Design is more than what a product looks like, the material choice and the design language. It's about solving a problem for the user."

Where do I Start?
The design stage can be quite daunting but can also be quite fun. If you tend to stick to asking yourself the following questions, your design will be built from a strong foundation:

What is the function of my product?
Will my product be able to withstand use?
Is it reliable?
Can it be produced at a cost effective price?
Will the manufacturing process be easy to produce?
How high quality will your product be?

The Whole Product
People succeed the most in design when they take their time, and enable a proper merger between product and packaging. The design of a product needs to be consistent throughout, with every element of design tying into one experience. For example Corcoran explained with the Kano Computer Kit its design strategy was to make their design intuitive and accessible for children with lots of custom colour coded parts. Their packaging design was well suited for neat storage as well as being able to fit through a letter box. The process was really about creating a brand experience across the whole product.

Think About Everyone
A certain type of design might work really well for a percentage of your target audience, but you need a design that will essentially be perfect for everyone. It can be difficult tailoring to a vast range of people, but you just need to look at your product from all angles.

For example with JIVR, a foldable, electric and chainless bike, the design included an electric feature so you use less energy and sweat less – perfect. The design all also included being chainless so as you fold it there is no complications – perfect. But one design fault in a lot of bikes for females is not being dress friendly, so Joseph Cardone, Sales Representative for JIVR explained: "The bike has been designed to be unisex, it includes a low bike frame on purpose with women in mind, this means they can just step over it without having to lift their leg right up."

Don't Be Afraid of Change
It is very unlikely that you will design the perfect product first time round. Don't be afraid to change the design, the blueprint, and the key elements to
the body of the design, after all Rome wasn’t built in a day. When it comes to building a successful idea, design is the most important feature, in fact some would argue it is the stage that dominates and can give you a real edge over competitors.

Obviously it is impossible to provide a universal design process to fit all projects, but one thing that will apply to all projects is that you need to learn on the way, and there is no harm in taking one route to a certain level and it not being the correct one.

Tiernan Mines, Co-Founder of Hello Lamp Post, a playful system that brings citizens and their city closer together by using text messages to allow people to talk to objects such as statues and post boxes, explained that when it comes to design he is a strong believer, especially at the early stage of building a product that no idea is a bad idea. This is what drives innovation: “It’s easier to ask forgiveness than it is to get permission.”

HAVE A CLEAR GOAL
As long as you stay focussed on what you want to achieve in the end, and define your product vision and strategy it will work out in the end. If you have ever worked on a project where the overall goal wasn’t clear then you will know if you only vaguely understand the idea and what direction the design needs to head it has negative consequences.

Having a clear vision and end goal will set the direction and guide the way, the vision will essentially capture the essence of the product which is critical for a successful product.

Mines said as a team they were initially driven by two observations. “The first was that codes exist on street objects which are hyper-local reference points that aren’t used for anything but maintenance. The second was that when we move through cities/past objects, we all have ideas/stories/memories triggered, but these are never shared with anyone left anywhere.”

Basically Mines’ vision was to combine these two observations and create a digital journal across the city, where objects would learn about their surroundings and people’s stories, and share them with other citizens. This vision evolved into recognising a massive disconnect between city governments and their citizens and by making the city urban environment interactive, we might be able to bridge that gap.

HOW DID YOU DESIGN IT?
Following Mines’ journey he explained: “The idea was made a reality by winning the Playable City award, which enabled us to bring our idea to life. When designing the actual product, we spend a lot of time thinking about the end user - a person in the urban environment, before even thinking about the tech.”

How do people move through the city?
How do people act in their built environment?
What do people consider a ‘friendly’ conversation?
What would make people more ‘open’ to an interactive built environment?
And many other considerations.

The end user is one part of the design journey that must remain at the focus point. By realising exactly who you are designing for and engaging how they will feel and react to your product will make your design as effective as possible.

Mines added: “Not keeping focus on the end-user can become a huge time burn and distractor.”

One technique a lot of startups use when it comes to design is ‘working backwards’ which can add clarity and definition to the end vision.

TOP DESIGN TIPS
Focus on the user: Mines said: “Whether the business is B2B or B2C, continually listen to users - this will ultimately be the best and often quickest route to adding value to the product/service.

He added that often it can be easy to focus on the ‘sexy’ elements when building a product. “For example in our case, the potential tech. But it’s of no value to build a product that you’re excited about, but no-one will use.”

It is also important to note to use your potential users and ask for feedback.

It will never be perfect: Mines said from his own experiences he learnt very quickly that when designing a product, you will never reach your own idea of perfection.

Know your competitors: There is nothing wrong with a bit of healthy competition, so keeping an eye on what they are designing and how they have worked their process is fine as long as you are not copying.
As Reid Hoffman said: “If you are not embarrassed by the first version of your product, you’ve launched too late.” I love this quote as I think it is very true, especially when launching a hardware and software product.

After three years of product development, delivering our 24/7 horse monitoring technology to the first paying customers was one of the most rewarding but also one of the most stressful moments of our startup journey. Designing the product was a real roller-coaster and we learnt a lot in the process, so I hope that sharing our learnings can help fellow entrepreneurs progress faster and more effectively.

In this article I will go through the different phases of product design and share our learnings from each of these phases. My aim is to demonstrate how it really is possible to develop an Internet of Things (IoT) product from scratch on a very low budget. I will finish by reflecting on my top three lessons learnt from this journey.

**GETTING TO A PROOF OF CONCEPT**

The objective of this first phase is to identify a feasible product that will serve to solve the market need. The major part of this phase is about interacting with future users and industry experts in order to confirm that it is worth continuing to develop the product. This affirms whether the product you have in mind is technically feasible and will suit user expectations.

You should start by identifying the assumptions that need to be validated and then design what you can with the lowest budget.

In this phase it is important not to over-engineer. There are a lot of assumptions that can be tested without a single line of code or complicated mechanical design. By using simple solutions and being creative, you can save a lot of money for the same result.

Our very first prototype was composed of a £50 smartphone attached to the girth of the horse. This was enough to inform us that from simply tracking the speed of the horse, you cannot accurately detect the gait of the horse. Thus, we had to use an accelerometer.

Marvel App is an amazing tool to test what potential users would really like to see on the app and what you can eliminate, without coding anything. If the product you have in mind involves an electronic component, try first to find something off-the-shelf that could satisfy what you need. Only start doing some hardware development if there isn’t anything suitable. It is much more important to get a work-alike than a look-alike prototype. With tech products the important thing to validate is whether the product you have in mind answers the needs of your future users, not whether they will like the colour of it.

The earlier on you are in the project - the less you have to lose. Be bold and test as much as you can: you can build different prototypes, test them quickly and iterate from the result of the test. I’ll let you in on a trade secret that served us well: Make up stories to encourage people to test your product more seriously (we were telling our testers that the data they were seeing on the mock-up was from real horses, this was of course, completely false…)

In most products the technical validation is the easiest, so you should focus your efforts on validating your ideas by having potential customers test things as often as possible.

As you validate your assumptions, your prototype is becoming better and better and after having enough users become enthusiastic about it, you can then move into the design for manufacturing phase.

**FROM PROTOTYPE TO PRODUCTION**

This was the most challenging phase of the product development for us. My biggest takeaway was: to achieve a production level design of the product, everything will take much longer than you think.

When you design a prototype, you don’t need things to work perfectly. When designing for manufacturing, things cannot be approximative and must be good enough to prevent customer complaints. Your product must be secure and robust enough to be used in various intense conditions as well as be within the legal requirements to be certified.

All in all, this creates many more challenges than you initially think.

My strongest piece of advice here is
to run as many small batches as you can before scaling up the number of products you manufacture. There are several problems we didn’t identify with only a handful of testers. They reared their ugly head when we had 10 users intensively using the product. Even if it’s much more expensive per unit to run small batches, you will still save a lot of money compared with manufacturing a full batch again with the corrected specifications.

Similarly with the software design: working incrementally to add new features and progressively improve the quality to satisfy the users is the best way to go. We made the mistake of spending a substantial amount of money on migrating our app to a native app. We decided to stop this halfway as it wasn’t what was needed at that moment. Our time and money was better spent on making the existing app better.

Developing a product on a very tight budget is possible, but it is important to take baby steps that will allow you to readjust your trajectory quickly if needed. Re-evaluate your priorities often and manage the budget in minute detail. This will ensure you’re spending on the right things and that you have enough runway to go to your next milestone.

In my opinion, the hardware design phase and development between the Minimum Viable Product (MVP) and the production product is largely underestimated by many founders. I learnt that the hard way. This why I like to share my experience with as many people as possible. Feel free to connect with me on LinkedIn if you’d like to discuss further. Lastly, I’d like to share my top three lessons learnt during these three years spent building an IoT product and business.

**Things Take Time**

Things take time when you’re talking about designing a hardware and software product. When we started to work on Trackener in September 2015, we were convinced that in a year or two we would already start making revenue...but we finally delivered our product to paying customers in October 2018! Every phase of the product development took longer than I thought:

- Doing enough trials with users to validate the choice of the sensors and connectivity of the device
- Modifying the design of the electronic board from a prototype to a production suitable design
- Getting the firmware and software to be stable enough for users to be satisfied with

All took an age - and you have to keep in mind, with a physical product, every time you have to manufacture a new prototype the lead time slows things once more.

**Hardware Is Hard**

It’s been said thousands of time, but you can’t imagine how true it is until you’ve been there! Whenever I meet someone who is working on a project involving an electronic device, I always discourage them. Use off-the-shelf products as much as possible rather than building custom hardware. Building a hardware business is really ten times harder than building a software business, so avoid it as much as you can. Software is less costly; you can iterate more rapidly and change your product with relative ease. It also has less bugs, as hardware means electronic problems and bugs in the firmware.

**Having A Strong Network Is Key**

I think this is true when building any business, but I think this is especially useful when designing a complex product. You can’t be an expert on every subject, so knowing some people you can reach out to when you have technical questions or just have no idea how to solve a problem is super useful. Even if that person doesn’t have the answer themselves, they probably know someone who does.

Never hesitate to reach out to your network. Dare to contact anyone who you think could help you: people are more happy to help that you think. Being asked for advice is flattering. It is always worth sending a message to someone, even if you think they’re too busy or too successful to be interested in you.

Let’s face it, you’re building a startup, you deal with failure at least five times a day - sending a quick message on LinkedIn is child’s play, you have nothing to lose and everything to gain!
TESTING THE RESISTANCE OF THE DEVICE TO 500KG WITHOUT PAYING FOR A LAB

THE VERY FIRST PROTOTYPE
Instead of searching many manufacturer sites or calling on companies to find and compare designs, now you can search for designs based on the circuit’s performance using Digi-Key’s Reference Design Library.

1. Save Engineers time
2. Deliver ideas, fast
3. Sift through designs based on performance
4. Provide designs conveniently accompanied by their schematics
Technology threads through every aspect of our lives. Yet most people know very little about how it works, how it is made or how to fix it when it breaks. Tech Will Save Us is on a mission to fill the technology skills gap by providing fun, educational and accessible experiences for children to creatively engage with technology. Our kits provide tactile experiences and hands-on exposure to modern technology tools and concepts.

Many consumer devices being created today are designed for obsolescence. Tech gadgets all have short-term life spans because as soon as the latest and greatest device comes out – with more speed and functionality – desire is mistaken for need. We believe in a world where individuals have the skills to design and imagine devices that are more bespoke and more meaningful because they made them with their hands. Design is more than making products desirable.

Great product design and branding has been key to our success and we’re proud to have products featured in permanent collections at both MoMA and London’s Design Museum.

Creativity and fun is at the core of our child-inspired product development process. We design our play experiences around themes children love like music, gaming, sustainability, wearables and more. Inspiration from everyday life taps into the hobbies and passions that kids love.

When we embark on the design process, we follow a user-centred product development process unlocking a series of gates.

Here are the steps we value during that process. We consider these before bringing a new kit to market:

**SET THE BRIEF**

During this first stage, we combine inspiration and insights from our customers, the world of tech and finally pull from interesting R&D projects we’ve been working on behind the scenes. It’s an exciting exploratory stage but we make sure to validate our findings with a wider audience.

**CONCEPT**

This is where we take those great ideas and begin to shape them into products. We constantly question - why is it fun, what are you learning, what does it do?
Test & Learn - We like to get hands on as quickly as possible and make prototypes we can test with kids as soon as possible. Changes come thick and fast as you see children interacting with a new kit. We’ll go through countless revisions at this stage. It was during a user testing session for our Sew + Glow kit, that we experienced a ‘lightbulb moment’. The kids created their own designs in the sessions and two days later sent us pictures of all the effort and work they’d put into finishing them and making them unique to them. This feedback gave us the confidence to move to the next stage.

SPECIFICATION
We know what we’re developing now and it’s time to turn something raw into a polished product that jumps off the shelf at people. This is where we get detail oriented from electronics, to plastics, to packaging and messaging. We constantly check in with people outside the business to make sure we’re on the right track.

PRODUCTION
Our products are both physical and digital so this is a busy time where we’re bring our experiences to life - from hardcore electronic engineering and material finishes to robust digital tools.

All of this user testing means our products can change dramatically from how we first envision them. In the test and learn phase of our Creative Coder Kit which uses an accelerometer to track movement, we were looking at how kids could use, collect and control their own data. We discovered that having to constantly check a screen got in the way of the fun they were having running around. The kit soon took on a more portable form and could be programmed to give you the insights in a simple way once you were done going crazy. Think celebratory rainbow lights or angry red flashes.

When it comes to getting real products out of the door, it requires diverse approaches. Hardware is hard. Stay close to your product from design to user experience; from manufacturing to margins. Find people to support you and who can grow with you, advisers, employees and mentors. And finally ask for help and help others!
05 PROTOTYPING

The prototyping phase can also be fun and exciting because this is where the proverbial 'rubber meets the road'. When prototyping, you truly discover if your idea and design actually work as expected. During this phase, prepare yourself for heartache, setbacks, and, most importantly, lessons learned.
Of all the stages in the process from getting a product from vision and concept through to post-production, prototyping is perhaps one of the most enjoyable for the startup involved.

And with good reason. It is of course the first time that founders and entrepreneurs get a physical glimpse of their product idea. The research and proof-of-concept has been done, you’ve done all your CAD drawings and now you actually get to feel and touch your product in the flesh for the first time.

Of course it won’t be identical to the final version, but that’s the whole idea behind the prototyping process in the first place. It’s the place where you can really conduct the acid test and discover how viable your idea is and if it will actually work as expected.

The path from concept to production is never a straight line and startups should be prepared for setbacks. The prototyping phase is where errors and oversights are discovered, but most importantly, it is where lessons can be learned, and problems are put right.

WHEN TO PROTOTYPE?
In terms of when to prototype, Kurt Dammermann, Senior Technical Director, Mechanical Engineering, at product innovation lab Bressler Group, commented: “Prototypes are basically designed to answer questions. So the best time to build a prototype is when you have a question that you can’t answer with CAD, or when you need feedback from users. Basically any time you have a question you can’t answer, building something is a good idea.”

And as Alex Millington-Jung, Startup Lead at design and manufacturing firm RPD International explained, successful prototyping is about planning and process. Having a clear and appropriate approach laid out makes for a better product, reduces time-to-market and results in less sleepless nights. “However, the frustrating truth when it comes to hardware prototyping is that an approach of ‘throwing stuff at a wall and seeing what sticks’ is all too often adopted,” he said.

FOUR STAGES
Prototyping can be made palatable by breaking it down into four stages: proof-of-concept, design (looks-like), engineering (works-like) and optimisation (combining works-like and looks-like). Your maker-to-manufacture journey will be made up of multiple prototypes within each stage, each serving as a tool to incrementally test, optimise and validate your idea.

“The name of the game is to identify the unique and audacious parts of your idea,”
Millington-Jung added. “In doing so, you can focus on what makes your product different and bold, rather than over-investing and re-inventing the wheel.

“Before beginning any prototyping journey, you must have answers to the fundamental product and business questions: what problem am I trying to solve? Who is my customer and how do I build their feedback into my prototyping plan? What am I looking to achieve with each prototype?”

Crucially, you should make a habit of asking yourself reflective questions throughout the prototyping process. Ideas change and goalposts move as you prototype, that’s supposed to happen, but defining the key questions and hypotheses you are looking to solve at each stage will ensure you don’t deviate from the problem you’re trying to solve.

ROUGH AND READY
In the early stages of prototyping, the focus should be on building quick, cheap and dirty – this is your opportunity to move quick, make mistakes and not get hurt. It’s good practice for early prototyping to utilise proven technologies, processes and tools to validate your idea. Millington-Jung added: “For example, when proving the Google Glass concept, apart from the single piece of glass that projected light into the eye of the user, Google used only off-the-shelf equipment. Later prototypes progressed to proving that the computing power could be reduced in size and that the product could be worn. But initially, it was just proving that projection could be put into your line of sight without you instantly falling over.”

Dammermann added: “The most important thing to remember when prototyping is to make it as basic, as rough and as quick as possible. We often talk about the level of resolution for a prototype. In the beginning of a project, everything tends to be low-res, it’s hacked together. That is very appropriate in the beginning.

“As the project progresses things become more refined and you get closer to what we call a high resolution prototype that is very close to the product you might ship. And really the key to prototyping is making the lowest resolution prototype that will answer the questions you have at that stage of the development process.”

Dammermann explained that it’s especially important for startups, as typically their product has to be revolutionary as opposed to evolutionary. When an established company is prototyping it already has a lot of answers before it starts, it knows where the product fits within its makeup, and it knows how to develop products. However, for startups the field is wide open. They are trying to establish who they are as a company, what they make, and who their customer is - all at once. So prototyping becomes essential for them to answer all those questions. They also have limited money, which equates to limited time.

The most common problem seen in prototyping is the romance of an idea. The challenge is to be as objective as possible and develop a stringent plan of validation stages and proof points.

The most successful startups are adaptable and can quickly accept when an idea needs to be realigned or reimagined. “Adding complexity or throwing more money at a prototype will not solve the problem. We’ve seen many a startup shipwrecked by the shining lights of ‘the latest tech’ or making the most beautiful prototype,” Millington-Jung added.

CONSIDER ‘DFM’
One key element often overlooked in the early stages of prototyping is scale production considerations. The final prototype you will create in the optimisation stage will be ‘design for manufacture’ (DFM) ready, meaning your device is production and cost optimised. The pitfall here is that many startups will only consider DFM right at the end - often when it’s too late or costly to change anything.

The most efficient prototyping processes start with a focus on manufacturing. As you develop your commercial specification, unit cost should become a feature. Ask yourself, what does this product need to cost for my business to work? Working backwards from this cost, you should begin to identify the manufacturing processes available and therefore the design features that need to be considered. Seeking knowledge and advice on these restrictions early in the process will save you cost and time.

In summary, don’t prototype for prototypes sake. Always prototype as part of your bigger picture that includes DFM. Share your prototypes, talk to people, get feedback, and don’t prototype in a vacuum. Companies only look to copy proven ideas - they have the same risks as you in launching an unproven product. Your biggest differentiator is your ability to execute.

Ji Li, Managing Partner of innovation consultancy, Prototype Thinking, said: “We encourage companies to look for what we call magic moments – those moments of genuine true added value for the user,
when their eyes light up. So startups need to look for these real moments of clarity for the user, when they are made aware of something that they didn’t think possible.”

**BUILD WITH YOUR COMMUNITY**

What shouldn’t be underestimated is the importance of involving your customers and end users during the prototyping process, as Dammermann highlighted:

“This is really one of the main reasons to prototype in the first place. It’s very easy in a startup to become very insular – you’re working around the clock on making your vision a reality, but it’s so important to get out there and speak to potential customers to make sure you’re on the right track.

“Most startups don’t have a history of products to look back on, and probably don’t have a marketing department to be able to tell them if they are including the right features at the right cost. So they have to figure all this out themselves and a prototype is an awesome vehicle for that.”

Further discussing working closely with your end users Li continued: “Founders and users have different perspectives so you should be involving a true representative of your users from day one. A lot of founders typically get nervous about showing an unfinished idea to a user, but ultimately around 90% of the social capital of your business is about getting the right user through the door to give their feedback. They will immediately make your product better, and you’ll be able to use that to get more social capital, even if you don’t have a product yet.

“We’ve actually seen companies make hires out of user testing, and we’ve seen companies get major corporate sales contracts out of user testing when they weren’t even testing anything more than a mock-up.”

Prototype Thinking has an eight-stage process for companies to work through their prototyping process. These are the eight tools of prototype thinking: think by doing, not by thinking; maximise the rate of learning by reducing time to try new ideas; conjectures become experiments, actuals become decisions; watch what users do in the real world; build a one-hour prototype; test weekly with real users; look for the magic moment; nail it before you scale it.

Discussing some of the potential pitfalls of prototyping Dammermann added that startups often try and make a prototype that is too much like the final product too early. He stressed the importance for startups to understand their technology before they understand their product. In addition, some companies get hung up on their technology and never get their prototype in front of the end users.

“It’s surprising how many startups spend a significant amount of time making a prototype and then it’s only looked at internally. And they then move on without ever testing it properly or showing it to end users. So getting the proper feedback from prototyping is a must.

“One of the wonderful things about prototyping is that if you design your prototype properly you learn what you want to learn and the answers to the questions you need answering.

“However, because it’s an unpredictable physical process you also learn things you didn’t expect. And in many ways this is the real bonus of prototyping. It illuminates things that you didn’t know you didn’t know.”

Following the suggestions laid out in this article will undoubtedly make the prototyping process easier for you. However, that doesn’t mean it will become easy. How did Mike Tyson put it again? “Everyone has a plan until you’re punched in the mouth.”

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**From Maker to Market 05**

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The SwimAR prototyping journey

By Mark Hester, CEO at SwimAR and Co-Founder/Technology Director at Imagination Factory

The startup business I am heading up began like most other disruptive tech businesses - with an idea. But from day one the team knew we would need to spend significant time prototyping and testing that idea.

We have the benefit of being professional designers, so we have worked on numerous projects that required the process of design-make-test-iterate. But now we had to listen to the advice we have given to others and not cut corners!

That raises the first question about prototyping. Why do it at all? It can be time consuming and expensive and there are so many different ways to make things. Using SwimAR as a case study let’s unpack the power of prototyping.

Firstly, to bring an idea to market a startup must understand as much as possible about what could make it fail. This includes technical, behavioural, economic and even cultural pitfalls. Prototyping enables your team to stress-test your idea in different ways before it gets into the hands of customers.

For this reason, it’s important to note that not all prototypes are made alike. We have used every single kind of prototype in the development of SwimAR (a heads-up display for swimmers) so let’s go through some of them one by one.

It’s important to understand that prototypes do not all have to be very sophisticated. And in fact, you get the best value if you start at the very low fidelity level. As the architect Frank Lloyd-Wright said, “You can use an eraser on the drawing board or a sledgehammer on the building site”. So, one of the very first prototypes we made is called a “Cover Story Mockup”. This is a vision of how your product might appear in a magazine that your future customers are likely to buy. We chose a Triathlon magazine and imagined what might be on the front cover and then how a 2-page spread might appear.

We’ve done it using professional graphics software, but you can just as easily do this with Sharpies and some A4 paper. The key is to think about how you would like the media to present your successful product to customers who are eager to purchase it. The benefit of this kind of prototype is it helps you test the idea with your team, potential users and many other stakeholders. It’s much easier to get someone’s response to something like this rather than sending a dull document or email.

Staying with the theme of low-fidelity prototyping we discovered early on in the development of SwimAR that customers would prefer to attach a device to their existing pairs of goggles. This meant we had a challenge to design something that could retro-fit to a range of organic shapes. The simplest approach to this was to purchase a bunch of goggles and some model-making foam and cut a
HIGH-DENSITY FOAM MODEL OF SWIMAR

TESTING WATERPROOFNESS IN SLA
HIGH QUALITY VISUAL MODEL (MADE BY OUR FRIENDS AT OGLE MODELS)
load of different shapes by hand. You can buy foam in a variety of densities from model-making shops. The very low-density ones can be cut with a knife or hot wire and shaped with sandpaper. The medium to high density foams need a bandsaw or handsaw but hold their shape better and allow you to carve some details and drill holes.

These “rough and ready” prototypes can also be used to get early feedback from target users. Many startups are worried about showing anything that doesn’t look finished to potential customers. But we discovered early on that it’s actually one of the best ways of getting honest feedback. When a prototype, model or picture of your idea looks highly polished people have less of a tendency to suggest how it might be improved. When you show them something that is still obviously in its infancy they don’t hold back as much from pulling it apart, modifying it or scribbling on it.

However, there does come a time when you want to move on to something with a higher fidelity than your rough and ready prototypes. This is where it is worth understanding what can be achieved with modern rapid prototyping techniques. We are fortunate to have an Ultimaker 3D printer in our studio which has enabled us to make multiple block models of SwimAR. 3D printing has become mainstream over recent years and even if you don’t have one in-house there are many online services where you can upload a computer model, get an instant quote and order models within a few days at a very reasonable price. If you plan to use 3D printed models there are a number of different technologies that all have their place so you should do some background research to understand what’s right for your needs.

In simple terms there are three kinds of 3D printing; SLS, SLA and FDM.

SLS makes models from nylon powder using lasers to sinter the powder to itself. This means the parts are very strong and ideal for testing functional parts such as mechanisms. But it is also usually the cheapest method of rapid prototyping, so it is ideal for quick block models. SLS parts can be dyed but for anything that requires a high quality finish they are not the right choice. For SwimAR we used SLS parts to make some early stage block models that we used to evaluate the hydrodynamics in the pool when attached to a pair of goggles.

FDM models are what most people think of as 3D printing and are made by heating up a filament of plastic that is extruded onto a flat bed as the extruder head moves around. The kind of printer we have in our studio does a good job of building parts that we can use to test mechanisms and demonstrate shape and form. We have made dozens of variations of SwimAR to test everything from the fit of electronic components to the ergonomics of the device on the side of people’s heads.

More expensive 3D printers exist that can build much faster, larger parts or even in materials such as Titanium. Most startups will not be able to afford a printer like this but they might be able to access them through specialist bureaus or collaborations with universities and industry.

As a final word on prototyping it’s never too early to start making and testing your idea. Just like most of us loved drawing as children we all used make things as a way of learning. For some reason many of us seem to grow out of this habit and need to be persuaded of its value again.

Startups – go forth and make...
Prototyping sounds quite technical, and while I was thinking about how to write this article, it struck me that one challenge would be to make it actually interesting... Let’s start with the etymology; Prototypus is the Medieval Latin, and prototypon is the Greek and literally means “a first or primitive form.” This begins to make things a little more exciting as the startup world should be about a journey of adventure and exploration, and creating the first of something is by definition explorative.

HARDWARE PROTOTYPING
We’re working with a robotics startup at the moment and building a couple of prototypes; one of which is an autonomous vehicle for the agricultural industry, a wheelbarrow or trailer with a mind of its own! It will be demonstrated to investors and customers, and on its successful completion will allow us to raise money and sell the next version, the Minimum Viable Product (MVP), to the customers. So, at a high level, it is demonstrating an ability to deliver on a theoretical concept.

On a more micro level, this autonomous wheelbarrow... needs to demonstrate some more critical technical features. Can it:

- Recognise a moving object, and a non-moving object
- Avoid these objects
- Follow a person (a product requirement)
- And work in tandem with another autonomous vehicle

Our engineers are experts in all-terrain vehicles, so there’s no need to prototype this element of the product in too much detail, as we have a track record and it’s in the market. The features above are what is going to differentiate our product and needs to be tested to be validated, and demonstrated to the people with the money.

Let’s dwell on this for a moment...Given a prototype is a primitive version or a first or primitive form, there is little point creating something that has already been created. Hence why in the Robotics example above, we’re interested in the challenging technical features, and not the all-terrain vehicle element. So, prototyping is not something every startup needs to do, the most cost and time efficient method is to take only what has not been done before and prototype that.

SOFTWARE PROTOTYPING
To further this point; a software startup looking to create an application for buying and selling holistic medical services such as reiki, massage, or Ayurveda is not doing anything particularly groundbreaking and would not need to be prototyped. A user will need to create an account, search some listings, and make a payment, all of which is a very well-trodden path and could easily be illustrated by picking out some competitors or comparable businesses.

However, if the app was going to collect information on the user profile setup and then use an algorithm based on that profile data, as well as the additional data collected by the user actually using the application, essentially a machine learning task, it would be good to prototype that. It’s a differentiator, demonstrates something new, original and primitive.

THE PROCESS
From the two examples above, we can begin to see the pattern; Before we even start the process of building a prototype, we need to first ask whether it’s even necessary, are we doing anything new and explorative.

Then we need to isolate that new feature or product, outline a simple road map for building it out, ensuring that it demonstrates the innovation well enough for someone relevant to green light the next stage of the project. Probably, your MVP.

We see so many startups spend far too much time in engineering and product development but it’s important that you’re critical of why you’re engineering and for what reason. When it comes to prototyping, it must be to solve something new, otherwise, it does not make sense, and your just wasting precious time and money. You can go straight to your MVP and miss out the prototyping step.
Money may be the root of all evil, but it is also the most necessary of all evils. Now, you’ll need to secure those dollars for your project. If you need to create accounts, round up investors, or apply for grants or fellowships, there’s no time like the present.
There is no avoiding how important money is to the success of a business. As a startup it is absolutely vital not only that you get funding, but that you get the best kind of funding for your business.

There is a plethora of different funding routes you can take, and each route suits founders and businesses differently. Just because one source of funding worked really well or was disastrous for another business, does not mean it will have the same result for you and yours.

The first thing on the to-do list then, is identifying which source of funding is most suitable to you.

The main methods of funding a startup are: Crowdfunding, Angel Finance, Venture Capital, Incubators and Accelerators, Bootstrapping and Grants and Schemes.

Although there are similarities, each one of these options works differently, and knowing how they all work is important to selecting the right one for you.

**CROWDFUNDING**

Crowdfunding platforms are designed to help you get your company to its goal, however, it will not do all of the work for you; it isn’t as simple as creating your campaign and sitting back to wait for the pledges to come in.

To create a successful crowdfunding campaign, you need to put in the legwork. Creating a buzz around your project before you have even launched is a great way to work towards a successful project. If you can ensure a decent amount of pledges in the first couple of days of your campaign, then the platform will likely pick it up as a project with momentum, and push it on the website as well.

Crowdfunding also has the added bonus of acting as a proof of concept, as successfully funding your project through a crowdfunding website proves that there is a market of people who want to buy your product.

When considering crowdfunding, also consider if your product is customer or business facing, as it might affect how suitable crowdfunding feels as a method of fundraising.

It is also important to pace yourself, funding a company is a marathon not
a sprint. Instead of attempting to raise enough to reach your ultimate goals in one single round of crowdfunding, think about what it will take to create a minimum viable product (MVP), and make absolutely certain that you can deliver that, before promising anything else.

There is no reason why you can’t come back and do more rounds of crowdfunding after the first, but if you are unrealistic with your initial goals and fail to deliver, then you run the risk of looking unreliable to future investors.

**ANGEL FINANCE**

Angels are individuals who agree to invest in return for equity. Increasingly, angels are beginning to operate through crowdfunding platforms, however, it is still perfectly possible to access them outside of crowdfunding.

When deciding whether or not to invest in you, an angel will be assessing the founding team, how great the risk is, and what returns would they be expecting upon success. Therefore during a pitch, it is important to allay fears and answer as many of these questions as you can. Because of this, it is important to have proof of concept before entering talks with angels and doing whatever you can to tailor your pitch to the angel as an individual.

Another consideration is that the same amount of money does not always represent the same amount of value. Finance isn’t the only thing they can bring to the table, angels also come with experience and guidance. So an investment from an angel with little to no knowledge and expertise in your market, is not nearly as valuable as one who does.

Ultimately, an angel will be someone who you have to work with and has a stake in your company, so making sure that you share the same – or at least compatible – visions of the future, and that you work well together, can be just as important as the money.

**VENTURE CAPITAL**

If an angel is an individual, then venture capital is a group. Usually, venture capital can be found from investment banks, financial institutions and larger businesses. First and foremost, to attract venture capital investors, a startup generally has to be willing to sell chunks of the company.

This type of investor is looking for a high potential return from investing in a startup. Therefore, as well as everything that it is important to show to an angel investor – such as proof of concept – it is also vital to be able to prove your scalability and ambitious but achievable future plans.

Like angels, venture capitalists gain equity in return for their investment, so when looking for this kind of funding, startups should consider not only the money brought to the table, but also the skills, expertise, market knowledge, and personality of the people they are offering a chunk of their company to.

**INCUBATORS AND ACCELERATORS**

Both of these programs aim to nurture a startup and increase its chances of success out in the world, however, an incubator looks to help younger startups than an accelerator. An incubator will help a startup to stand, whereas an accelerator aims to teach them how to run.

An incubator program is geared towards very young startups and usually does not run on a set schedule. Incubators aim to help startups to pinpoint their core idea, create a business plan, carry out relevant market research, and jump any early hurdles the business might face.

Unlike incubators, accelerators work on a specific timeframe, and take on startups a little further along in the process, and then focus on early market validation, achieving proof of concept, and making sure that there is enough of a market for success.

While neither of these programs are primarily about getting funding, what they both provide is the skills, development and network to get startups interviews with investors, and answer the key questions those investors will have.

**BOOTSTRAPPING**

Bootstrapping your startup has the potential to either be a fantastic way to get started, or entirely unrealistic, depending on your personal financial situation. Some people simply will not have the means to finance their startup by bootstrapping, but if you do, it can be a brilliant way to kick-start your business, without having to give away equity.

Using your own savings and earnings to fund your startup is a risky business, however, it has the potential to prove to future investors – as very few startups could make it all the way to the finish line solely through bootstrapping – that you are both confident and committed to your startup. If you can produce a prototype, proof of concept, or even an MVP by bootstrapping alone, then you are in an excellent position to attract external investment in the future.

By beginning your funding journey through bootstrapping, your early days are spent beholden to no one but yourself, not having to make compromises, and in a great position for the future; however, the downside of this is that you miss out on the expertise external investors can bring, as well as it being your savings on the line if the business fails.

**GRANTS AND SCHEMES**

Granted, it is highly unlikely that you can fund your entire business just on grants and schemes; however, make sure that you look for as many as you possibly can, and apply to everyone you are eligible for.

Grants and schemes are money that does not need to be paid back, taken from your own pocket, or bought with shares of your company, so there really is no reason not to chase after as many compatible ones as you can find.
There’s an allure to the current trend of democratisation in industry, based on a cultural and historical desire to give the people what they want. Luckily for startups and small-time investors, there has been democratisation in investing, too. These days anyone can put a few tens or hundreds or thousands of pounds down on a startup. On the receiving side, there are also plenty of people willing to take money for their ideas, some great, some not so great. But the essential point is that people are free to do what they want, within reasonable limits. This concept helped us launch, helped us survive, and this is our story.

OUR EARLIEST INVESTORS
CityFALCON is a single founder startup, so the first investor was just me. The stakes were high as I’d just quit my job at Skype to pursue the dream of entrepreneurship. This was mid-2014, and, by the end of the year, I had already convinced some friends and family to invest £200,000. But these were the low-hanging fruit since my friends and family already knew me, understood my personality and whether I was fit for entrepreneurship, and supported me even if the idea was not yet perfect.

From here, though, there was plenty of work to be done, and the company really needed more cash. There was a round of angel investment for another £200,000, which was stretched for over a year while the company grew. We had built a proof of concept for BNP Paribas, had built smartphone apps, and continued to improve the web platform, but once again, we ran out of cash. It was late 2016, and internet investment campaigns were all the rage. So, that’s when we turned to equity crowdfunding (ECF) on Seedrs.

GOING TO THE PEOPLE
Raising money is one of the most stressful parts of running a business because it is a survival situation: without the money, the company cannot continue. It might not even be able to get off the ground. That’s why ECF has been so important to so many startups, us included.

We closed our first ECF round in December 2016 with a similar amount of money as the previous two rounds: £205,000. Unfortunately, this was just after the Brexit vote, and those (depreciating) pounds sterling did not go as far as before, especially when employing development teams abroad. Nevertheless, efficiency and prudent business choices led the company onwards to success.

The following two rounds, spaced about 1.5 years apart, brought in £550,000 and nearly £750,000, ensuring we had ample runway for operations, as the revenue base had also grown dramatically in this time. The company was big enough to employ more than 25 people, so the investment money wasn’t just financing a business idea, it was financing people’s lives. And that is one of the most uplifting aspects of the democratisation of startup funding. Anyone with a few pounds sterling can finance a venture and even the livelihoods of others, often generating outsized returns in the process.

Those small-time investments also build a type of traction from the investing side. If someone sees a company with three hundred small investors, they might conclude the company is strong enough that lay people with less cash to spare believe in the company. On the other hand, if a billionaire drops £50,000, and that’s the only funding, potential investors might conclude it’s a long shot investment.

Additionally, large investment-VCs often come to the table with less-than-equitable term sheets, requiring high returns for low risk, at least when compared to the company and the entrepreneur. With ECF, we were able to avoid some of the most extreme cases because small investors could make up any shortfall caused by refusing VCs who insisted on one-sided terms. Democratisation isn’t just allowing people to participate, it affords participants a collective power that is not centred in any single individual.

THE PROCESS
Each round has its own set of challenges. During the first one, you need to prove your idea is worthwhile. In the second round, you need to demonstrate that the
"Raising money is one of the most stressful parts of running a business because it is a survival situation."

- Ruzbeh Bacha, Founder & CEO of CityFALCON

company is viable, since it didn't become profitable with the first round of money. By the third, investors are starting to ask why you haven't turned a profit yet and why they should give you yet more money. But in general, there are a set of steps that apply to all rounds.

For new investments, we needed to build relationships first, then prove our worth with properly timed and marketed product releases. Then we moved through a pledge phase, where we got a feel for the market's appetite. Next, we had to plan the campaign itself and solicit people privately. Finally, since we were able to gain enough traction privately, we opened to the public, who then helped us reach our goal (and far exceed it in rounds 2 and 3).

These steps won't lead to a successful fundraise, unfortunately, and a campaign can fail at any one of these steps. Lots of people think we just posted the campaign on the platform and suddenly everyone threw money at it. That is far from the truth, and overnight success is almost always preceded by years of hard work.

**ECF BROUGHT US MORE THAN MONEY**

A sometimes insurmountable challenge for startups is gaining traction, both from customers and from investors. In the UK, risk aversion is a strong force, especially right now with the Brexit debacle, and that can make amassing investment difficult. But sometimes the ECF platforms bring us more than just cold, hard cash. They also bring us a network and great ideas.

Due to the risk-averse culture, it is immensely helpful to know someone that knows someone. With an ECF platform, we can advertise exactly who knows us, which means their network might be more inclined to invest in us. Moreover, because investors can be almost anyone (from the EU), big ideas from small capital don't go unnoticed. Previously, someone with an idea may not have been able to participate because they didn't have the requisite cash or they simply didn't know about our campaign. But now, connections between investors and businesses are out in the open, exposed to the whole internet, and great ideas can flow. We've picked up B2B partners because some of our investors were also involved in other enterprises and thought we might be a match for each other.

On the other hand, this also meant we were sometimes dealing with unsolicited ideas that had non-investment intentions. These could be other startups looking for business, and we've even experienced people investing in us in order to ask for jobs. This can be frustrating when the time is so limited, especially in a company with a single founder whose time is capped at 168 waking hours a week.

**LOOKING FORWARD**

We will remain grateful to the investing public, which has allowed us to raise more than £1,800,000 over the past four years. We haven't been burdened with excessive regulatory requirements for reporting due to the nature of the investments, which saved us thousands of pounds and countless hours of paperwork. Of course, we would like to go fully public and list on a stock exchange in the future, but until that time, we are happy to say that ECF has been good to us.

We hope we won't need another round of funding and that our revenue will grow beyond the breakeven point, but if we do, we can safely turn to ECF for a fourth time without any regrets.
Raising money is essential to a startup’s success. Without cash, a startup can’t grow. More traditional startup funding, such as receiving investment from angel or venture capital investors, is still very much at large. However, the last decade has seen a number of alternative finance options appear.

There are a number of ways you can raise money for your business, from government-backed schemes such as The Startup Loan, which can lend you £25,000 at a fixed 6% interest rate per annum, as well as other options like business cash advances facilitated by companies like Worldpay.

The rise of alternative finance over the last few years has seen a number of other options appear. Popular routes of SME alternative finance funding include debt, equity and rewards-based crowdfunding:

- On the debt side, platforms like Funding Circle & Zopa give you money in exchange for interest yielding returns. This type of funding is typically suited to startups with a proven track record of revenues.

- Platforms like Kickstarter & Indiegogo are altruistic and more suited to B2C companies. This type of funding is where backers give startups money in return for perks, such as a free t-shirt or first access to the products when they’re ready.

- Platforms like Seedrs facilitate what’s known as equity crowdfunding (ECF). This is where investors receive equity in the business, with the hope of achieving high returns in the future when the business goes on to succeed.

At Seedrs, we specialise in equity crowdfunding, and so we thought we’d give you a few top tips to consider in 8 steps:

**STEP 1**
Is equity crowdfunding right for your business?

Having a clear understanding as to why you are looking to raise capital via equity crowdfunding is key. It is a very public way of raising money and you can engage thousands of investors, who will be future brand ambassadors and evangelists.

The second question to ask yourself is do you have a community? Your community and ability to reach them is vital to the success of the campaign. They provide early support, feedback and most importantly investment into the campaign which can pique the interest of other investors who might not have heard of your business before.

Lastly, there is a common misconception that a business either equity crowdfunds or raises from institutional investors. This is not the case - you can do both simultaneously. Since inception, Seedrs has co-invested alongside some of the most reputable VC firms in the industry, such as Draper Esprit, Index Ventures, and JamJar Investments and Oxford Capital. 650 institutional investors have invested in Seedrs funded deals, with roughly 60% of deals on the platform having an institutional investor in the round.

**STEP 2**
Decide which type of campaign is right for your business

Seedrs offers three different types of campaigns:

Equity - By far the most popular type of campaign, offering investors the opportunity to buy shares in your company.

Convertible - This is perfect for a business that knows it is going to be raising a larger round in the near future. A convertible is short-term
debt that converts into equity upon the closing of a follow on round of financing.

Funds - If you are an accelerator or incubator, you will run a fund campaign. When someone invests in a fund on Seedrs, they become a shareholder in each of the underlying businesses that the relevant fund organiser or manager chooses.

**STEP 3**
Select a dedicated person to manage/own the campaign

Raising investment in any form is really hard work, but even more so with ECF. It’s important to have a dedicated person managing all the activities that surround the campaign. There is a strong correlation between prompt responses to investor questions within the discussion forum, and that investor going on to invest in the business.

**STEP 4**
How to value your business

Some key pointers to bear in mind when valuing your business:

Market Forces - One of the biggest determinants of a startup’s value is the market forces of the industry in which it plays. When an investor is trying to determine whether to invest, they basically gauge what the likely exit size will be for a company of your type and the industry it plays, then judge how much equity they need to invest to reach a ROI goal.

Industry - There are certain ‘hot’ industries out there (i.e. fintech / sustainability / AI / healthtech), which can command a higher valuation than another company at the same stage in a different industry.

Market size – If operating in a space where the market for your industry is depressed and the outlook for the future isn’t any good, clearly what an investor is willing to pay for the company’s equity is going to be substantially reduced in spite of whatever successes the company is currently having.

Experience - Your team - founders experience and skill set, founders flexibility, completeness of the management team all contribute to the make-up of a high profile team, which in turn enable the business to command a higher valuation.

Stage of development – If a business is still just a concept then clearly it is unlikely to get the same valuation as a company that has a product in the market with a user base.

Traction – Every customer contract and relationship needs to be monetised, even ones still in negotiation. If a company is gaining amazing traction, this will demonstrate to investors that the business has potential and could result in a higher valuation.

**STEP 5**
Start creating your campaign

Your campaign page is one of the most important aspects to ensure you succeed in ECF. It’s unlikely you will be able to meet all your prospective investors face-to-face so you need a compelling written pitch, a three minute video to accompany it, alongside any key documents you can share e.g. financials, pitch deck etc. With an average of 25 campaigns live at any one time on ECF platforms, you need to stand out. Communicate concisely what your company does, its market potential, its intended impact and how you will use the money raised to scale.

It’s a top line business plan that tells a story, highlighting achievements to date whilst presenting a clear route to future growth. Investors should gain a sense of who a founder is, where his/her passion lies, why he/she started the business, and why it could become the next big thing. Research other successfully funded campaigns for ideas to help you stand out! A few key elements:

**Idea**

Bring your business to life and get people feeling as passionate as you do. Give an intro to what your business does and who you are.

**Intended impact**

What solution does your business create? Talk about existing gaps in the market and how your business fills those gaps.

**Substantial accomplishments to date**

Shout about your achievements - use key support materials such as data, revenue, media coverage and awards to really showcase your credibility.

**Monetisation strategy**

How do you plan to generate revenue? Investors want a future return on their investment.

**Use of proceeds**

How are you going to use the cash - how do you plan to grow the business with your new funding?

**Market**

Who is your target market and what are the characteristics of this market (size, distribution, behaviour, scope)?

**Marketing Strategy**

How are you going to reach your target users or customers? Get colourful and describe how you plan to raise awareness of the business and attract new users.
**Competition Strategy**

Who is the competition and why do you blow them out of the water? Give investors an overview of the competitive landscape so they can really understand the scope.

**Providing evidence**

Make sure everything you say is fair, clear and not misleading. Platforms like Seedrs have a responsibility to investors to ensure that the information they read in each campaign complies with FCA financial promotion guidelines.

**STEP 6**

Create an engaging video

Crowdfunding videos don’t have to be expensive, but they’re very important, so it is crucial to get them right. This is an investor’s chance to get to know you in a 2-3 minute window. A video should be slick, engaging, insightful and sincere. Tell your story and talk about your service/product and its market potential to remind investors why they should back you. Good practice is to watch a number of previous crowdfunding videos for inspiration and gauging what sits well with the Seedrs investor community. Here are our tips on what you should include:

- **Product demo** - a quick teaser providing an intro to your product lasting no more than 30 seconds in length. Ideally the first 10 seconds should show your product, the next 10 should explain it and the final 10 should offer a quick overview of key features and USPs.
- **Why** - show investors your founding team and tell your story, cause or belief. This is the human element and it’s so important to explain why you’re doing what you’re doing.
- **How** - Use this part of the video to explain how your product/services solves the problem, how it works, and demonstrate any customer testimonials you might have.
- **What** - Here you can discuss the investment, market size, current success, competition, scaling options, investor testimonials as well as why your team can take the business to the next level.

**Call to action** - End with a clear closing statement summarising your offering. Outline the future of your company and the investor’s potential contribution to it.

**STEP 7**

Create a marketing and PR strategy

Considering who you want to communicate with is key. Marketing and PR around your campaign can really help build awareness and traction. Before sending any communications, draft an outreach list to manage when you are speaking to potential investors in an orderly manner, avoiding any repeated conversations or missed opportunities. Outreach categories include:

- **Family** - these people are highly likely to invest in your business, but are unlikely to have a Seedrs account. Ensure that your contact with them makes it clear how to sign up and invest on the platform.
- **Friends** - This group may need to be split into smaller cohorts (close friends, acquaintances etc.) in order to tailor more specific emails to them. Similarly, you will need to instruct these recipients on how to sign up for an account.
- **Customers** - Getting your customers or suppliers is a great way to build relationships. If they have invested in your business, it is highly likely that they will want to maintain the relationship in order for the brand to grow. You might want to discuss a pre-registration with Seedrs if you have a large community.
- **Previous investors** - People who have already invested in your business are reliable for follow ons if you have demonstrated growth since they last invested.
- **VC’s and Angel investors** - If you have relationships with any angel investors, then you will certainly want to create a tailored email for outreach. If you are approaching professional investors for the first time, then you will need a professional pitch deck to send in advance of setting up a meeting.

**Your extended network** - This group will include people you have previously worked with, your LinkedIn network, people who work in relevant industries and other people within your email list.

**Media** - getting the word out about your campaign is really important. Spend some time looking at which journalists from newspapers and online publications write about crowdfunding and startups. Start engaging with them on social media and follow what they are writing so that when the time comes you can send a personalised pitch to them.

**STEP 8**

Going live

Private Campaign: Only people with the URL to your campaign will have access at this stage so it’s not public to a wider audience. This let’s you manage the launch in a controlled way. Keep the timing tight, only stay in private for 3-5 days. When you launch your private campaign plan to invite everyone who pre-registered their interest and the outreach lists you prepared. Getting 50 to 100 investors whilst in private is a great starting point. This will, ideally, generate early momentum into the campaign before you go public.

Public Campaign: This is where all your hard work pays off and your campaign is visible to a wider pool of investors. You’ve already reached out to your direct audiences, so this is when you want to use marketing and PR to drive a new audience to learn about the business opportunity, whilst remaining active in the investor community – attending and pitching at events is a great way to keep up momentum driving potential investors to your campaign.
From Maker to Market: 06
The Article Library

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07 MARKETING

Makers are a passionate group, inspired by their surrounding and buoyed up by creativity and creation. That passion can sometimes shield a maker from the reality that their idea isn't nearly as interesting to others as it is to themselves. It's time to generate buzz amongst the outside world.
TIME TO GO VIRAL

maker.io
When it comes to marketing a startup, there can often be some misconceptions such as it being too soon to start thinking about, or your company is too small. Some people think marketing isn’t a priority and budget should be spent elsewhere (something that bigger corporations also fall foul of), or that any type of marketing is good. Well we are here now to teach you why marketing is so important and what steps you should be taking.

**HOW DO YOU KNOW WHEN YOU ARE READY FOR MARKETING?**

Marketing is not all about the huge adverts in the press magazines, or prime time TV adverts. The word marketing actually covers a vast range of actions, and realistically if you are past the design stage you should definitely start to think about what marketing path you are going to take.

Speaking to Alex Gash, Co-Founder at Marylebone Difference Marketing, he clearly stated if you are raising early stage capital you should have a marketing plan in place. "Even if it is just a topline marketing strategy, you need to think about your marketing objectives and how you're going to get there. I sometimes recommend using the Lean Canvas one-page business plan template, created by Ash Maurya, as a way of deconstructing ideas and assumptions about your business, to make you think about your marketing in a different way."

Marylebone supports the startup and scale-up ecosystem by helping keep costs down for businesses, offering tiered marketing and PR packages, and Gash has also had previous experience with the startups industry himself.

**WHERE DO I START?**

Gash said: "You need to know your customers, and know you are targeting the right people." By really nailing down your target customers you will then be able to build the right product for them, so start with identifying the following: Who your customers are?: What price they will be willing to pay?: What business model you will be using?: Is there a big enough market for what you want to sell?

James Rix, Founder of StreetPR, part of Crowdfify Global said what you need to begin with is an education and activation campaign: "Explain this is what we do, this is how we do it, this is how easy it is for you to use, this is how it will change your life for the better, and here's a voucher off your first try."

And how do you do this exactly? Gash said: "Do loads of market research." This means putting aside the time for some marketing work, no matter how big or small the team, and work on the personalisation of your product, making sure the product fits in the right market, and importantly make sure the strategy is always aligned, and everyone on the team is on the same page.

Then it comes to the right approach. One of the most effective channels to reach your existing or potential customers is email marketing, Gash explained: "No one goes on to a website once a week or month, but people do check their emails every day so this is one way your company will be kept front of mind."

People often underestimate the power of email marketing but in the beginning it can be one of the most powerful tools that sets your marketing journey off in the right direction, especially for startups.

**DON'T BE FOOLED...**

It is important to remember that marketing is about intelligent targeting, not a scattergun approach. It's quality not quantity. "It's about focusing on the channels that work for you. Analyse the performance and optimise, i.e. quickly adjust and adapt if you're not getting the ROI (Return on Investment) you need to win customers and additional revenues," said Gash.

Rix added: "Not every startup is destined to become a Unicorn: but clever use of your marketing budget can at least ensure that you thrive and grow, even if you don't hit the magical $1bn valuation."

You need to be mindful when it comes to traditional mass marketing, even when it's online, as it can be very wasteful for some startups. Rix expanded: “You need something cost-effective right from the start to give yourself an initial boost."

**TOP TIPS?**

He can appreciate that running a startup company takes a lot of time and effort, and you probably have a million and one things to do, but Gash stated one of his top tips would be to make sure you put the foundational work in when it comes to marketing.
“Don’t build your product, service or company in secret. Make sure you’re always communicating with your potential audiences and customers across all your owned channels. Take them on the journey with you, as you build your product and community.”

Start with the bare minimum, because if you don’t do that no one is going to know who you are. Building up relationships with the press and your core customer base is very important.

He continued: “PR is one of the most powerful and cost-effective tools you can use to build awareness and credibility. But don’t just use it to announce your latest fundraise. Talk about your startup story; your team; your roadmap; your mission and how you’re going to get there. You’d be surprised how the momentum can quickly build from getting coverage in the trade media, to getting noticed by national and international top tier titles.”

It can be boring reading the same thing over and over again, people want to know what you’re doing is different and how. “It is about finding the stories that the industry can cling on to,” Gash added.

Jane Henry, Co-Founder at Marylebone Difference Marketing explained in a recent blog, PR can be a tool to help protect your startup from bad publicity that could end up destroying your reputation, or worse, shut it down.

You could find yourself in a situation where it is a PR strategy that keeps your customer base onside while you fix the situation. If things do go wrong – don’t panic. Gash said: “Every company encounters issues, but the good news is that if you’ve been investing in your marketing and PR effectively, then the first time people hear your company name won’t be in connection with a major nightmare that you’d rather nobody knew about.”

It is important that if you say you’re going to deliver on a marketing plan, actually deliver, do not hang about. Gash said: “Your competitors are likely to be proactively marketing, so you need to keep an eye on what they’re doing, but you really need to focus on what you’re trying to achieve. Set benchmarks, Key Performance Indicators (KPIs) or Objectives and Key Results (OKRs) to keep you on track, be creative and true to your product and company mission. That way, you’ll stay ahead of your competitors at any given time.”

In this digital-first world, other core marketing skills include Search Engine Optimisation (SEO) and Search Engine Advertising (SEA) to ensure that your company and products appear at or near the top of Google.

“You can improve your SEO by investing in content marketing, video and social media. Also, double-check every one of your webpages to make sure the SEO is as good as possible; a surprising number of companies miss this step,” said Gash.

The key is to start advertising, or push advertising when things are going well, using it as a tool to boost, not to try and recover when things might not be going to plan. Marketing is about trust. People want to trust in you, trust in what you are advertising, and trust in your product. Remember: A business without marketing is like smiling in a dark room. You know you’re doing it but no one else does! Marketing is an investment but it does pay off in the long run.
At 27 years old, David Mayoral (pictured above) is the CEO and founder of Alias Robotics, located in Vitoria-Gasteiz, Spain. Alias Robotics is a cybersecurity firm focused on robots which provides assessment on how to build, program and deploy robots while caring about safety and security.

Alias was formed to create the first Robot Immune System (RIS) as a form of cyber security for robots after David found a gap in the market and potential to make an impact on the robotics industry.

Alias is the second startup for this young and influential entrepreneur. In 2014, at 19 years old, David and his brother created Erle Robotics, which has since been sold to a Swiss Multinational, Acutronic Robotics.

Aside from creating two companies, David gained international recognition for his entrepreneurship when he joined the elite membership of Forbes 30 Under 30 Class of 2019. Although Mayoral has experience and success as an entrepreneur, he said that his journey has not been without challenges.

According to Mayoral, strategic team building is crucial to the overall health and success of any startup. Now that Alias is established and growing, he happily admits that applications come in regularly, but says that wasn’t always the case. Mayoral said, “In the beginning, finding the right people was a challenge in itself, convincing them to believe in a ‘crazy idea,’ which required starting a new career was something else entirely.”

Growing the team at Alias required patience, finding the right people, immense confidence in an idea,
“Startups need to be creative and develop a unique marketing strategy.”

- David Mayoral, CEO and Founder of Alias Robotics

and strategic execution. Mayoral finishes by saying that, “Our team is strong but continuously growing as Alias expands.” Another challenge has been putting Alias in front of its clients.

“There’s a huge demand for our services,” Mayoral explained, “but it requires a willingness to make sacrifices and enough money to do so. I’m constantly travelling and that means less time with my family, adapting to the schedule of each country I’m in, and having a large travel budget.

“Just this year my meetings have taken me to The United States, Romania, Germany, and The United Kingdom. The opportunities in each country are great, but the cost of travel, the flights, and the time differences, not so much.”

Mayoral explained that he is able to stay balanced and energised by taking time for himself, knowing that he can rely on his team, and having passion for what Alias is accomplishing.

Aside from team development, Mayoral also explains that startups, such as Alias, have to think outside the box when it comes to marketing. When Mayoral was asked about marketing strategies at Alias he responded, “If resources are more limited, marketing at a startup is very different than at an established firm. Startups need to be creative and develop a unique marketing strategy in order to promote themselves. We (startups) often don’t have the funding to go to top PR firms to gain publicity.”

Mayoral and his team are building brand awareness by participating in networking events, using media such as LinkedIn, speaking on the radio, and engaging in interviews.

“I put myself out there,” said Mayoral, “in this business a personal win can be converted into a company win. For example, when I became a member of Forbes 30 Under 30 back in January, I took advantage of the interviews, platforms, and networking events and put Alias in the spotlight as well.”

The last core challenge for any startup is obtaining substantial funding. Mayoral stated that they’re currently in the process of closing their seed round.

“Receiving funding, especially in the beginning, is similar to convincing someone to leave their job to start a new one at Alias. It’s a risk and I need them to believe in the idea, the company, and in me.” Alias has been self-funded and received capital from various investors, but more funding is needed to take the company to its next stage of growth.

Every startup has to have three things, said Mayoral, they need a purpose, a team, and funding. “In our case, our purpose is to create a bio inspired hardware solution. A solution that mimics the defensive principal of the human immune system in order better protect robots from various cyber security threats.”

“Regarding our team, it is continually expanding and made up of talented individuals from diverse backgrounds. Each member offers an area of expertise.

“Lastly, our short-term funding has been established and we are working on securing the investment needed to meet our long-term goals.” Mayoral knows the challenges of running a startup, but has a proven track record of defeating entrepreneurial challenges and leading companies and his team to success.
You may have a groundbreaking idea but it's so important that you're able to grow a trusting, happy and engaged community around it. This will help you grow awareness, stand out amongst competitors and ultimately lead you to become a sustainable long-term business that goes beyond any hype.

Your initial marketing efforts mark your first steps into connecting and communicating with the outside world and making sure people take note. Here are some important things to think about as you start to build your presence online, market your offering and grow your community.

1. GET OUT THE DOOR
Before you do anything else, you need to go out there and talk to potential customers about your idea (yes in real life!). It'll help you see the things that people are really excited about, help you find your position and understand what makes you really stand out.

As you dive deeper it's really important to learn about the type of people that are interested in your project, and of course, identifying those who are willing to spend money on what you have to offer. For innovations and firsts, you'll benefit from also identifying the cross section where early adopters exist as they'll be easier to convince at first. It's a mistake to go for everyone, make sure you're targeting a smaller engaged audience to get the most out of your efforts.

2. FIND YOUR AUDIENCE AND GET THEM TO TRUST YOU
As you grow your understanding of your audiences, develop detailed personas that include not only who they are but where they hang out online. Think about what publications they read? What brands do they like? What social media channels do they use? Use this to understand what content they like and what stories resonate with them. Feed this into your content and social media strategy.

Another key thing to discover is who they follow? Remember, an 'influencer' doesn't have to have a huge following, they could be an expert, a leader of a relevant community or someone who openly shares the same values. When you're starting out, and especially if you have something never seen before, it's incredibly important to make your audience feel like they can trust you. You might not have many reviews or much awareness of your brand so having someone your audience respects on board can really help you build trust from the start.

3. GO ABOVE AND BEYOND
Make sure that any customers or followers that join you are treated like gold. Every touch point needs to be a super positive experience, from your website, to emails, to content, to when they first try you out, and especially when they get in touch with questions, problems or complaints. It's hard work getting your first customers so be sure to go beyond their expectation so that they'll leave positive reviews and recommend you to others.

4. MAKE THEM FEEL PART OF IT
They were the first to try you out, through any snags you were there right on call to make things right. They provided you with important feedback and you took their ideas on board to make your business better. Moving forward you need to keep them engaged and feel part of the community. Keep in touch by sharing relevant content through a blog, on social and through newsletters.
Make sure you don’t just broadcast about yourself, share feedback from your community, talk about other relevant projects and brands, share things your audience are interested in. Your aim is to position your business as a thought leader or important voice amongst your wider community.

5. GO BIGGER
Once you understand what resonates you’ll want to try turning things up. Spending a little more working with others that will help amplify your brand. This can be partnering with paid influencers to create more compelling content, collaborating on an exciting campaign with other relevant brands, or developing a newsworthy campaign to help position or grow awareness around your brand.

For the most impact, try and align these efforts alongside important dates around your audience’s calendar. Like targeting sci-fi fans by collaborating with Marvel and launching it at Comic Con. Or getting a bunch of developers together at a conference to play about with your new tech.

6. GET CREATIVE
Follow the numbers and double down on what’s working but to stay ahead of the game you’ll need to get creative too. Sometimes it works to take the road less travelled instead of the well-beaten path. It can help you find ways of reaching your community that your competitors did not think of yet. Just be sure to track results to make sure what you find works continues to work, and so that you’re able to understand why new strategies are resonating.

7. HOLD ON TIGHT!
Growing a startup is a wild ride, there will be many twists, bumps and turns along the way. You’ll need to be perceptive, intuitive, creative and have a whole lot of persistence. With a startup many things won’t go to plan or along the timeline you’ve planned out, it’s important to always focus on making the most out of a situation and not getting caught up in what went wrong.

Your product is important but you’ll need to work hard to get people to it and convince them to try it. Growing your brand and making people feel part of your community will help you attract new customers as well as keep a loyal following. Experiment and track to find out what works with your community. Keep it together when things feel too much and focus on what lies ahead. It’s important to be positive and see the road ahead is “Paved With Gold”. That’s definitely something we’ve always focused on through our experience so much so that we turned that mantra into our business.
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IT'S DECISION TIME
Production: Now things get really exciting
by Joe Bush, Startups Magazine

Now things get really exciting. You’ve conducted all your preliminary research, done your design and evaluation and achieved your required amount of funding. It’s now time to actually make your vision a reality and move into production.

It’s time to make some serious decisions around Bill of Materials (BOM), order quantities and level of demand, and the manufacturing supply chain (board houses, manufacturers, assembly houses, etc). It is of course crucial that the manufacturing process is designed to not just build your product, but to produce it to the quality required, the correct quantity and at the right cost to succeed in the long term.

This means that you should be prepared for some design changes. Startup projects start with a vision, and it’s that vision which drives the design stages forward. However, there is a far more practical element to the production process, and what has been thrashed out during the design stage may not be feasible in reality, so startups need to be flexible to change. Feasibility issues can be ironed out during prototyping and with CAD simulation.

These changes may impact the actual manufacture of the product to make the process easier or to offer a greater level of support further down the line, or it may be to improve the actual features of the product for the consumer (which hasn’t been considered before).

It is also important to validate your processes and the product early, so that changes or tweaks can be made before they are set in stone and become costly to change. In short, as Alex Millington-Jung, Startup Lead at design and manufacturing firm RPD International, explained: "Production is all about attention to detail and your ability to communicate and manage."

Production is not something you should only consider when you’re ready to go to manufacturing. Advice from potential production partners should be sought at the earliest possible time. It is very common to see startups get to the point of production and then realise all their hard work doesn't make sense at scale.

Maja Köberl, Co-Founder of Voxos, a startup producing wearable smart glasses, commented: "We had an idea in mind, which we wanted to turn into a product. This is easier imagined and said than done. We had to find the right manufacturing partner that was able to produce the product the way we wanted. When developing something completely new that does not really exist in a similar form factor, there is not really a norm you can align your production with. So we had to spend a lot of time on finding the right manufacturing partner that understood our values and was able to share the same vision."

“There are a number of potential production pathways,” Millington-Jung continued. "Unfortunately, in most cases there is not an obvious 'best' path, but rather a number of routes, each with their own advantages and disadvantages. Your decision should rest on the technical specification of your product, how many units you need to make and how much time and effort you can afford to dedicate to production."

Millington-Jung went on to explain that the first decision you have to make is what relationship you want with your supplier. You’re faced with three options: (1) source and manage your supply-chain, (2) work with one supplier who either manages sub-contractors or has the capabilities to develop everything in-house, or (3) work with a partner to manage production for you. This decision should hinge on your team’s manufacturing competency and how much resource you can afford to invest, both financially and in terms of time.

WHERE?

So the next stage in the production process that you need to consider is the ‘where’. Scott Miller, CEO of Dragon Innovation, a company that specialises in taking companies from prototype to production, highlighted that, for consumer electronics, the rule of thumb is that if you want to manufacture more than 5,000 units then it makes sense to look towards China. If production volumes are less than that it’s better to manufacture in your own country or at least nearby.
The majority of consumer electronic products are Cost of Goods Sold (COGS) sensitive so once companies start to get into the higher unit volume then China begins to have an edge due to labour rates.

“There’s also really strong knowledge in China in terms of designing for manufacture and assembly,” Miller added. Factories can provide tremendous domain expertise and can offer assistance in how to make a design mouldable, how to reduce the number of components used, and how to shorten lead times by selecting different components – getting factory partners engaged early can be a real advantage.

Speaking at the Fortune Global Forum in 2017, Apple CEO Tim Cook succinctly summarised this point when he said: “The popular conception is that companies come to China because of low labour cost. The reason is because of the skill and the quantity of skill in one location.”

However, manufacturing on the far side of the world does have some downsides. The challenge you face is communication and cultural differences. You must be prepared to be on the ground to micro-manage pre-production and early production. The distance to China means that shipping costs time and money so that will also need to be factored in. Miller added: “If you have a product that someone can order today and get tomorrow then you either need a really robust supply chain and logistics, or you need to build locally.”

Local manufacturing is great for lower volume products as it’s much easier to control. If you need a shorter, tighter supply chain, local manufacture is much quicker, more responsive, logistically quicker than shipping from the other side of the world and significantly cheaper than air freight. IP is also easier to control domestically due to stronger relationships with the factory.

“Don’t assume that you should instantly go to China. Think through your process. For a consumer electronic product it’s in truth, probably the right choice, but it shouldn’t be a knee-jerk reaction,” Miller added.

**WHO?**

Once the geography of manufacture has been established, the next phase is what Miller described as the most important part of the production process – picking a factory, and he explained that there is a clear definitive process to ensuring you make the right choice: “Step one is establishing who the factories are in your cohort that you would consider for the job, so talk with trusted network connections who have manufacturing experience.”

You should then create a shortlist of around five to ten contract manufacturers who are qualified. From there you need to narrow it down to three to five based on your product category. You’ll then need to create the Request for Quote (RFQ) package, and get the factories under a Non-Disclosure Agreement (NDA).

Miller then highlighted the importance of getting boots on the ground in terms of factory visits, to understand the team that is going to build the product and to develop a relationship. “Good factories are like venture capitalists,” Miller added. “They have limited funds and opportunities and they want to work with super high growth, high potential companies, and as a startup you probably don’t have a big brand name, and you probably haven’t built hundreds of thousands of units, so you’re a risky bet in truth. By meeting with them and developing a relationship and a real partnership you can give them confidence that your business is going to take-off.”

A company will then need to analyse the results, pick the top two factories and negotiate on the big items. This will include looking at the different margins, the payment terms that will determine the operating capital you need, and a list of the five most expensive components in your product to try and negotiate down. It’s important to remember that prior to selecting a factory the startup has real leverage. The minute you start working with a factory, that disappears until you start shipping goods and have the ability to go to another factory.

Once the winning factory has been selected it’s important to leave the other ones on good terms because you may need to dual source production further down the line so it’s a good idea to keep the door open.

**MANUFACTURING TRIANGLE**

When entering into the production process Miller highlighted the importance of the manufacturing triangle, the key factors of which are costs, quality and schedule. “Starting with the cost of goods sold (COGS) – this is basically what you pay the factory to buy your product and it’s something in consumer electronics you want to control,” said Miller. “If you can achieve a good BOM, you can build a great business, but if you’re losing money on every product you ship then you won’t last long.”

In terms of schedule it’s important to have a firm date of production that is not going to move. If you do miss it then you throw away an element of revenue so it’s important to understand how long things can take and then...
take corrective action early if it’s not going according to plan. Miller added: “Remember, hope is not a strategy. It’s important to get things right the first time, because you may not get a second chance.”

Miller added that with something like crowdfunding, people are essentially investing in a product that doesn’t exist. This is fantastic in one regard as it shows that there is faith in the vision. However, startups can jump into it and be so focussed on the marketing, the look and feel of the product, that they don’t think through the manufacturing process properly. “They can achieve their funding goal only to realise that they need more in order to make manufacturing a reality, which is then hard to recover from,” Miller said.

“Your backers can really turn against you, and your biggest supporters can be your biggest detractors if you ship late. The way to look at crowdfunding is like a chainsaw – if you know what you’re doing it’ll make short work of the problem, but if you don’t you’ll cut off your leg.” To this end Dragon Innovation has created Dragon Certified, which has been designed to help you understand how much you have to raise for manufacture, how long it’s going to take and from the design point of view, how close you are to being able to hand over to the factory.

The final part of the manufacturing circle is quality. Miller continued: “Everyone thinks about cost; most people think about schedule; but nobody tends to think about quality until it’s too late so it’s something to prioritise from the beginning.” When you get the call from the factory saying your product is ready, the one question a startup needs to ask is whether they are going to accept those products, or whether something needs reworking. “And that decision has a profound impact on the success of your business – if products get returned then it’s a major dent to your brand and one that a startup may not recover from,” Miller added.

**TOOLING**

There are several options available to startups which can make the production process easier. On-demand production or bridge tooling can provide a link between prototyping and serial production. Bridge tooling is also known as development tooling or rapid tooling, and defines a stage in development where there is a need for moulded parts but production tooling is unavailable. Its name comes from the fact that it forms a bridge between prototyping and production.

There are a number of instances where bridge tooling is useful. For example, if the final product material is essential for the evaluation process; if the quantity of parts required makes prototyping uneconomic; if a trial batch is required prior to product release; if the design is not sufficiently stable enough to allow production tooling; or if the parts required are too low to warrant production tooling manufacture. Often on new projects, quantities are far from certain, making justification of tooling spend difficult. Therefore, bridge tooling allows startups to dip a toe in the water.

However, when moving from bridge tooling or small volume to serial production, it’s important for startups to consider tool longevity. Protolabs is a company that provides rapid manufacturing of low-volume parts for prototyping and short-run production. The company’s EMEA Special Operations Manager, Steve Dyson explained: “Hard metals and steels will last longer in general, but a well-made bridge tool made out of aluminium for example, can last many thousands of cycles.

“So given an anticipated sales rate it’s important to consider how much time this provides and if an alternative option exists – such as lifetime tool maintenance support – before steel tooling is needed, because with steel tooling it’s usually a capital expenditure that has to be written off over a number of years. So maybe a lower cost tooling/higher part ratio may be the best way forward.”

Dyson added that when parts start to come out of the tool, they are often left in an unfinished state so will need to be finished. This adds costs and time, so tooling should be set up to eliminate as much of this work as possible which will help the company move more easily from prototyping to production.

“Another thing to consider is tool modification.” Dyson continued. “Aluminium is a soft metal and easily modified, but it is costly, so it’s preferable to freeze design prior to cutting metal. It’s important to remember that if you develop strong ties with your manufacturing partners then you can discuss this in advance.”

Dyson commented that there are some additional issues to consider during production that can be overlooked due to pressure on time. And to hit the manufacturing start button factories usually need a commitment from project sponsors, leaders or senior managers upfront. “Quite often this isn’t done and is skipped, production is commenced too early and things like ordering machines, parts and other investment can be missed. Packaging, shipping and storage are also stages often missed.”
Tech startups, whether launched in a garage, from a kitchen table or a university classroom, usually have at least one thing in common – designs requiring hardware, software, and an embedded system to control and command them.

Through a variety of ways, semiconductor companies like STMicroelectronics want to get their products into the hands of those nascent entrepreneurs as well as to help make a tech startup’s job manageable. While testing the waters of the supply and demand world, students and startups get a hand up from programmes and competitions focused on helping them navigate their applications into and through the embedded world.

Here’s how.
Embedded systems are everywhere, controlling many of the devices you own – your smart watch, your smart phone, and the smart devices in your car, among many others.

Wikipedia tells us they are controllers programmed and controlled by a Real-Time Operating System (RTOS) with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints — and since this is within the complete device like your smart watch, it is called embedded.

Our lives are increasingly enhanced by embedded systems and the devices they control. And the market for such devices is only bound by the creativity of their makers.

Knowledge of the hardware itself may only be half of the challenge in such endeavours; what if you want to design a new wearable blood oxygen monitor or a pulse oximeter? Are the intricacies of light sensing a skill in your portfolio? Do you understand how sensors work? How does one combine a hardware architecture with a software solution?

Questions like these led UCLA Professor William Kaiser to design a course introducing the fundamentals of designing embedded systems with sensors. And not just any embedded system with sensors: He chose to use the SensorTile evaluation board and development kit from STMicroelectronics.

**WHY THIS BOARD?**

SensorTile is an incredibly dense sensor board with more useful hardware on it than you probably could use for one application. And this is one of the factors that makes it integral to the course: students can design any number of applications for real-world problems that can actually end up enhancing lives.

In a footprint smaller than a regular US postage stamp—13.5mm x 13.5mm — this embedded system includes a microcontroller, an inertial sensor for measuring movement, an eCompass for determining direction, a barometer for pressure sensing, a miniscule microphone, as well as a Bluetooth processor for connectivity. Professor Kaiser’s course makes use of the development board, which ST has made easily accessible through open source code and online documentation.

The eight-part, self-explanatory course that Professor Kaiser created, Introduction to Embedded Systems with SensorTile, guides students through opening source files and manipulating code, even without an extensive knowledge of C (a general-purpose computer programming language) or a background in computer engineering. And there is no need to attend UCLA to take the course: it’s free and available online, and the SensorTile kit you need for the coursework is around the price of a college textbook at less than USD100.

As UCLA students began to post their projects online, the success of Professor Kaiser’s course inspired another professor to follow suit.

In the autumn of 2018, Jose Luis Ramirez Herran of the Harvard Extension School integrated the online course to feature in his course for Masters Students of Digital Media Design. He wanted to help creative students express their ideas through an accessible prototype, and the SensorTile fitted the bill.

One application of this creativity was based on the concept of synesthesia, which is where the occurrence of one sensory or cognitive experience leads to a simultaneous secondary experience, as for example when the colour blue triggers the sense of taste of peanuts or the smell of flowers.

One student project used the microphone and Bluetooth features on the SensorTile to stream audio, and by applying a common algorithm, transmitted the sound as colours. This application was intended for entertainment or to help those with hearing impairments experience sounds in a visual way.

The existence of such coursework – and the SensorTile - allows anyone, from student to startup, to learn more about Embedded Systems in general, and in particular about sensors and microprocessors, how they work, and how they can be used to contribute to the disciplines of their art, their business, and their lives.
You may be a university engineering student, professor, graduate student, or a retired engineer. You've taken the leap and done the research. Your technology has traction, your embryonic company has legs, and you are pumped for the marathon of starting a business by building and marketing your solution.

Whether you are tweaking an existing electronic product or developing one from scratch, you'll need a team and partners in the tech world to coach and run with you. One approach to consider is a design competition.

Major suppliers often sponsor competitions, like the Wearable Technologies Innovation World Cup - or offer their own - and are good sources for the development tools, evaluation boards, and components for entries based on their products.

In addition, they generally have built valuable ecosystems containing libraries and more, including reference designs and more sophisticated development tools.

Some competitions may even offer prizes of valuable business and/or technical benefits, with features akin to what you might find in accelerator programs - which also offer significant value to promising entrepreneurs and innovators, including mentorship and networking possibilities.

One such competition based on STMicroelectronics' (ST) full product portfolio is the ‘Open Innovation Challenge’ for French startups, launched at CES 2019. Those interested in participating still have time: it closes May 31. Like most company-sponsored challenges, the aim is to promote the organising company's own technology and solutions, but the benefits to the winners are both monetary and experiential: free workspace as well as access, guidance, and coaching from tech and business experts.

Other sources of support could include the free seminars and webinars offered by established electronics companies to help engineers solve specific design challenges. Distributors of electronic components are also reservoirs of ready-to-hand resources for engineering startups with specific prototyping needs.

Potential startups have two primary considerations when designing a prototype: "make it scalable and make it industrialisable."

Designing and manufacturing an electronic prototype whether it is a wearable, an automotive enhancement like in-vehicle connectivity, or an Internet of Things (IoT) device, demands a certain set of skills as well as the discipline to keep things as simple as possible, cost-efficient, and robust: i.e. industrialisable.

Finding complementary experts who can supplement your contributions, whether in engineering, manufacturing, marketing, sales, or customer support, are not merely items on a wish-list, they are basic requirements.

ST engages its target audiences via multiple channels across its international reach. Of course, its marketing and promotional efforts are the most obvious. In addition, ST is also making a more fundamental effort through school and university initiatives in curricula, sometimes sparked through competitions like the bi-annual World Solar-Car Challenge or spear-headed by professors. One such example is Professor William Kaiser’s Introduction to Embedded Systems with SensorTile course.

The most ambitious outreach effort is through ST-Up, an 18-month, 5-step comprehensive mentorship program in Israel for startups that takes participants from vision to development, through prototype to industrialisation, and
"Finding resources to mentor the startup process is not for the faint-hearted."

- Giorgio Mariano, Strategic Marketing Manager

for STMicroelectronics, Americas region

finally to marketing strategy. With a significant investment of its own resources, it’s no surprise that ST selects participants on the strength of their design ideas and the compatibility of their vision with the company’s offerings.

Once ST has selected a company—generally a relatively mature startup, it provides through the ST-Up mentorship program tools, seminars, and samples while empowering the startup through the access, technical knowledge, and expertise of mentors to help the achieve their goals.

ST-Up is based on three principles—Facilitate, Accelerate, Collaborate. With these, ST aims to cultivate promising startups by facilitating access to the company’s broad portfolio of products, technologies and development tools, accelerating the industrialisation of their innovative products by collaborating with ST’s divisional resources, R&D, as well as manufacturing and test organisations. With all of this, ST also enables increased visibility of the startup’s prototypes to appropriate strategic partners, customers, and channels.

ST’s Israel office established solid footing in ST-Up with a program for hardware startups in Tel Aviv. From the beginning, the ST-Up team met with promising candidates, those with a solid vision of a prototype for development, to bring to through all the stages of industrialisation and finally to marketing strategy.

“In 2018, ST’s Israel office launched ST-Up to help guide startups from initial outlining of the vision to developing a proof of concept to industrialisation and the final go-to-market strategy,” said Stephane M. Chouchan, ST Israel Country Director and General Manager of ST-Up. “We began giving access to ST internal resources and experts in R&D, manufacturing and test, providing guidance, support and mentoring on B2B sales and marketing, and introducing our selected partners to the broader ST ecosystem of suppliers, partners and global OEMs.”

At the heart of the development segment are ST’s technology and product building blocks from brains to brawn: power and energy management, motor control, conditioning and protection, connectivity, sensing and actuating, security, and processing. Not coincidentally, these are all the essentials for IoT and Smart Driving applications, as well as many app stops along the way.

Because of its breadth of experience and width of geographical presence, as well as a history and culture of strong, long-term partnerships, ST has considerable experience - with startups in France and Israel, for example, with universities around the globe, and in research and development efforts with many of its suppliers, customers, and even competitors. In fact, engineers, hobbyists, and students in almost every country in which the company operates benefit from ST’s technology tours, workshops, and seminars on topics close to an engineer’s heart, such as how to develop innovative electronic designs and how to make them viable and marketable.

Whether you are designing a new motor control unit for refrigeration, a tiny gadget for tracking your pet’s whereabouts, a device for unifying a smart city, or something we haven’t yet even considered, remember: make your prototype scalable and industrialisable. And surround yourself with experts.

"Finding resources to mentor the startup process is not for the faint-hearted."

- Giorgio Mariano, Strategic Marketing Manager

for STMicroelectronics, Americas region
Digi-Key was started by a maker professional and has a long history of being a destination for entrepreneurial engineers. Maker.io is the first site to help those people take their ideas from concept to product.

No matter where you are on your design roadmap, Maker.io can help you bring your product and dreams to market, and help you with any stumbling blocks on your journey with its support system.

1. Customer Sales and Technical Support: Available 24 hours a day 7 days a week. Available via chat, phone or email

2. TechForum: Online technical support forum supported by Digi-Key technical support team and Digi-Key customer community

3. Design Services Providers: Network of design firms offering fee-based development, prototyping and manufacturing services
For engineers and makers trying to move into production, distribution can frequently be forgotten, ignored, or underestimated. Distribution is an essential and complicated part of the process and is the point where your end customers will have their first physical interaction with your product.
LET'S GET PHYSICAL
Congratulations, it’s now time to give your product metaphorical wings and send it out into the world and into the eagerly awaiting hands of your customers!

There are many factors that need to be considered from packaging, lead time, postage costs, international shipping and plenty more, but to determine these factors you must first choose a level of distribution.

FOUR LEVELS OF DISTRIBUTION

According to Repsly, the company offering retail execution software for Consumer Packaged Goods (CPG) brands, there are four levels of distribution: Level 0, Level 1, Level 2 and Level 3.

• Level 0: Manufacturer to Customer
• Level 1: Manufacturer to Distributor to Customer
• Level 2: Manufacturer to Distributor to Retailer to Customer
• Level 3: Manufacturer to Distributor to Retailer to Agent to Customer

Once you have determined which level of distribution is suited to your product you can then plan your product’s distribution journey.

A CASE STUDY

Let’s take the example of a consumer product being sold on Kickstarter.

Creating the world’s first sleep sensing EEG headphones, the startup Kokoon had 8,489 backers pledging $1,936,825 on Kickstarter. Of course, any startup would be thrilled to surpass their funding goal and have concrete market validation with such a result on a crowdfunding platform, but once the deadline closes and the figures are in - it comes down to 9,000 units to ship to customers all over the world. Time to panic?

Tim Antos (pictured left), Founder of Kokoon explained that although it was not an issue for them to organise the distribution process to fulfil these orders in advance of the Kickstarter campaign, you need to do some research to factor in the cost into your product and understand lead times: “We were wildly unrealistic,” Antos said, “Distribution is a complex and odious process, and you need to anticipate unforeseen costs like product returns for example.”

Kokoon initially signed up with Arvato, a large conglomerate distributor, which was running a startup programme. Unfortunately only Kokoon and four other companies qualified for their volume production, and the programme was pulled. After much wasted time, Kokoon then partnered with a Hong Kong distributor (Kokoon manufactures in China) which had offices in the US and UK. However, this company was not delivering a great enough level
of attention and the process was overly complex. This led Kokoon to their third and final distribution partner - TBM.

Kokoon met this distribution partner through the hire of its Distribution Manager who had a working relationship with TBM and had worked on other startup distribution journeys.

Kokoon use multiple levels of distribution. It ships products from its factory partner in China to a distributor in Hong Kong which then ships direct to the customer (Level 1), but in the US and Ireland, the product is sent from factory to warehouse to retailer to customer (Level 2) using Tech Data Corporation, a global distributor of technology products, services and solutions.

"We use distributors to connect with retailers because they are plugged into the retailer systems and have a much better understanding of managing stock and inventory than we do," Antos explained. "They also help us manage our cash flow by fronting the retailer payment in a shorter lead time than the retailer would."

PACKAGING

With different distribution channels, there are different packaging considerations. When shipping direct to a customer, the Kokoon product is packaged in a box, but for the retail units it is packaged in a sleeve. Though, as Antos found out, this caused issues when products needed to be switched from one channel to another as a result of a surge in online orders, for example.

"We modified the packaging as a result," said Antos. "All the units are packaged in the same packet and can go to all territories with a booklet inside translated into multiple languages for consumers."

"When shipped to a retailer we have individual sleeves with copy in the destination language."

Antos explained that while they tried to explore eco-friendly packaging options, be aware that this will be dependent on the factory you manufacture with: "We reduced our packaging as much as possible and minimised all our non-recyclable plastic use."

TAX CONSIDERATIONS

When asked about the tax considerations for product distribution, Antos said: "This is really quite complicated, and to be honest, the real experts are the distributors, make use of their advice. The average accountant or CFO just won’t know as it is so domain specific."

Following its initial Kickstarter orders of 9,000 units, Kokoon has gone on to secure an additional 11,000 orders and has so far fulfilled 80%: "We completed the shipping of the Kickstarter orders over six months, so we had time. We de-risked our manufacturing by ordering small batches of products, first starting with 500, then 500 again, then 1,000. With such a complex product, we had to de-risk as much as possible."

To appease their Kickstarter backers, Antos said that they ensured they kept their customers in the loop and updated: "Throughout the course of the shipping we sent 62 updates in total. The biggest lesson I have learned from this is to work out a prediction of the time and cost of distribution - and then double it. It is better to beat your prediction, than to put your campaign under unnecessary pressure."

Kokoon is currently raising investment on the equity funding platform Seedrs.
Every startup needs a contrarian belief. At Limbic, ours is that technology doesn’t need to be cold and emotionless. That’s why we work on emotion detection AI - giving computers the ability to recognise and respond to human emotion. We’ve spent the last 18 months developing a new type of emotion AI system. This analyses data from consumer wearables to predict the emotional state of the wearer. In effect, we’re turning physical fitness trackers into mental fitness trackers.

Our goal right now is to bring quantifiability to mental health. Mental illness is a global problem, economically and socially. Depression and anxiety annually costs the economy around one trillion dollars, and it will personally affect one in four people this year. But if you can’t effectively measure the problem, it’s hard to effectively manage it.

At Limbic we’re building the world’s first scalable solution for mental health monitoring, continuously and non-invasively tracking emotional state in the background. All you need is a fitness tracker. When we detect a significant emotional event, we prompt the user with the same questions a therapist would ask. We then feed this data back to the therapist in a simple dashboard, tracking clinical measures, measuring the impact of clinical intervention, guiding conversation in therapy, and providing correlations between lifestyle choices and mood.

So that’s where Limbic is today. But it’s taken us over a year to get here. Limbic started life on London’s Entrepreneur First programme. During this time, I met my co-founder, Sebastiaan ‘Bas’ de Vries.

In my opinion, it’s really important that 1) first-time founders co-found with someone else, and 2) your co-founder has complementary skills. I did my PhD in computational neuroscience and I oversee development of our AI; Bas turns this into a product that people love to use. It’s a match made in heaven, and we make sure to regularly ask ourselves, “what makes our team better-placed than others to bring this idea to life?”

Another characteristic of Limbic’s growth is that we are not working in isolation. We’ve drawn tremendous support from startup communities such as Entrepreneur First.

More recently, we were selected to be part of the Google for Startups 2019 residency cohort, which has provided us with mentorship and workspace, and extended our network within the startup ecosystem.

Founders have to do a lot of ‘just-in-time’ learning. It’s a huge time-saver to source as much knowledge as possible from other founders going through similar challenges. We’re also lucky to have some excellent advisors (shout out to Chris Mairs who’s been with us from the start) and were careful to choose investors who would open doors and help us grow as a company.

It’s with all this support that we’ve managed to get to where we currently are in the startup journey. Our emotion AI algorithms are now best-in-class and we’ve got some exciting academic collaborations underway. We’ve also been lucky enough to win a few awards (e.g. Lloyd’s Bank National Business Award) and grants (e.g. Horizon...
which extends our runway and is a sign we’re moving in the right direction.

As a software provider, our distribution journey is vastly different from that of a hardware startup. Limbic is emotion detection AI which sits on top of a wearable device - if a clinician prescribes our product, we either integrate the software into the patient’s existing fitness tracker or send them an off-the-shelf product which we integrate Limbic into. In this sense our distribution is dependent on the presence of pre-existing hardware and the partnerships we make.

We’re now working with a number of clinical partners and have over a hundred therapists in the UK waiting to trial our mental fitness tracking product.

We’ve found that platforms for online health consultations are a great way to access the more tech-savvy and entrepreneurial medical professionals. Such platforms are themselves a disruptive force within healthcare - Limbic is well-positioned to provide standardised quantification and accountability to this rapidly evolving space.

Starting a company is inherently risky. Most startups fail. In my opinion, all we can do is stack the odds in our favour: plug into an active startup network, surround the company with expert advice, make sure that you’re playing to your strengths, and have a clear vision that everyone on the team can get behind. We’re trying to tick all these boxes at Limbic. Our team is growing and we’re looking for talented individuals to join us for the exciting journey ahead.

Limbic is part of the Google for Startups 2019 residency cohort. The latest cohort is focused on spotlighting startups using machine learning to create social impact. You can find out more about how Google for Startups is helping startups by visiting campus.co/google-for-startups-residency/
Streamlining your distribution

By Kiel Harkness, Director of Marketing at UPS

You've had a great idea and have set up your business... but now what? Starting a business is an exciting time but knowing how to get your product into the hands of customers can seem like an impossible task when faced with it for the first time. This is made even more challenging in the age of e-commerce, where buyers and sellers expect to connect with speed, precision and ease, regardless of the distance that separates them.

UPS was once a startup too and we know what it's like to set up a business from scratch. Below are some of our top tips for businesses setting up their distribution channels for the first time.

1. DETERMINE YOUR NEEDS
   The first step to setting up your distribution system is determining how much flexibility your business needs in order to meet the demands of your customers. You should consider factors such as where your distribution will be based out of, your overall volume and frequency of orders, how far your products will need to travel and at what speed to determine which distribution options provide the right flexibility for you and your customers.

   Shippers like UPS can also assist with a "guided shipping" approach, allowing your business to send one-off shipments or schedule regular collections according to your needs. This flexibility is crucial for business owners that see fluctuations in their shipping volumes, and as a startup having distribution options to choose from will help.

2. KNOW YOUR COSTS UPFRONT
   As a new business, trying to plan your business's future while only being able to estimate costs and revenues can be a difficult task. This flexibility is crucial for business owners that see fluctuations in their shipping volumes, and as a startup having distribution options to choose from will help.

   UPS offers a Landed Cost service. This helps to make your estimates more accurate, making sure that you haven't forgotten a small detail that could impact your profitability.

3. KEEP ORGANISED
   One key to keeping your distribution on track is maintaining an organised warehouse. Whether you have a large warehouse or small inventory in your garage, ensuring you have the right arrangement in place for your business can save you a headache during busy periods. This includes putting processes in place to retain shipment and order history to use as a guide for future sales or reference for past activities.

   Take the busy season for example. Being able to locate products and packages quickly and with ease during high-volume periods...
will not only make your life easier – it will also allow you to distribute them sooner. This will make your customers happier, ensuring on time deliveries and eliminating the fear of disappointment. This will all help to improve the reputation of your business and first impressions count!

4. CONSIDER YOUR EXPORT NEEDS

The global trade and business landscape are rapidly evolving, and this presents both an opportunity and a challenge for companies with global ambitions – particularly small businesses. When you’re first starting out, exporting may seem risky, complicated, or too competitive.

Logistics experts can assist businesses in making this jump. For example, UPS has recently helped UK-based company Precision Technology Supplies (PTS) grow its business through export, providing advice on how to get goods landed and cleared in new markets.

This is done through providing expertise and tools that help optimise your supply chain and adapt to local market regulations, customs, languages and currencies, allowing your business to take advantage of new market opportunities. Businesses expanding abroad also need to consider landing costs, compliance and international forms that could cause delays when crossing borders, and country specific holidays.

A good logistics partner can provide the necessary consultancy and tailored logistics solutions to access new markets, navigate regulations and achieve growth objectives. In fact, UPS has a dedicated page on the UPS website, ups.com/tradeability, to help our customers navigate these very questions.

5. STREAMLINE FULFILMENT

Integral to the distribution process is order fulfilment. From a customer’s first click on your website to the final delivery, distribution partners like UPS can help streamline your order fulfilment services through package preparation, to tracking, to collections options.

Putting an integrated fulfilment system with detailed tracking measures in place allows you and your customers to know where a package is throughout its whole journey and – most importantly – ensure you know that the customer has received their order on time. Some shippers also offer tailored local distribution solutions, such as the use of the UPS Access Point network to provide quick and flexible collection and drop off options for customers at local businesses, or UPS My Choice, which allows customers to schedule their deliveries at times convenient for them.

We know that distribution can seem daunting, but it doesn’t need to be if you approach it alongside an experienced logistics partner. Whether you're just starting up or looking to expand, the logistics experts – and UPS – are here to help your business grow.
Cut through all the noise subscribe free for practical advice

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A network of design firms offering fee-based development, prototyping and manufacturing services.

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4. Prototype/Manufacturing  
5. Software Design  
6. System Level Design  
7. Wireless Design

Serving multiple industry verticals from aerospace to wearables, this Digi-Key network is on hand to assist with your product development and working with development tools such as FPGA/Synthesis, IDE/Computer, Mechanical, Simulation and Schematic/Board Layout.
Now that you’ve successfully entered your choice market, it’s time for a little maintenance. During this phase of your process, you’ll focus on processing potential returns, troubleshooting early problems, scaling your operation, offering warranties, and gathering positive reviews. Your reputation will be key—find a way to manage it.
Pretty much every possible market you can enter today is already close to being a saturated one. The main thing that separates a successful business from a failing business, is the type of experience you create for your customers.

Great customer experiences are what set companies apart in crowded marketplaces, because they create vocal customers. This advantage is hard for any other businesses to break down, because they have to battle that existing business-to-customer relationship first.

Creating a great customer service experience can be a difficult one for startups because unless your startup is well funded, then you probably don’t have the budget to hire a customer support professional.

DON’T BE AFRAID TO SHOUT YOUR NAME FROM THE ROOFTOPS

Most people understand that founders and CEOs have their hands full, so when one of those leaders make the time to help customers, they are more likely to appreciate the response.

This is how you show your commitment to your customers. You tell them: Even though I’m juggling a million and ten things at once, your problem is important to me and I’m here to help!

By signing your email off as Founder or CEO, your deepening the relationship with a customer who could well go off and tell their friends about it.

PRODUCT WARRANTIES?

When you buy a product, you want to be reassured you’re making the best possible decision right? You want to know that what your spending your money on will last, and if it doesn’t, that you can reach out to the company for support.

That’s where warranties come in! But why are they so important?

Well they are beneficial for both the customer and the business owner. Warranties set expectations, customers know what they’re getting into if they ever need to fix or return the product. They also protect both parties because customers know if they have trouble with the product, they can turn to the company. Therefore, the companies need to spell out what exactly they’ll cover so that customers don’t try to claim anything not written down in print. Warranties also encourage repeat sales because if customers know that they can trust certain businesses, then they’ll be going back to them over and over again.

DEALING WITH RETURNS

No business likes dealing with returns, however, it’s just part of running a business – especially around the holiday season. No matter how great your product is, there will always be customers who aren’t satisfied or need to return the product. Instead of viewing returns in a negative light, try to see them as an opportunity to turn unsatisfied customers into loyal ones.

Make it as painless as possible – don’t make your customers jump through hoops just to return a product. By getting rid of the hassle of

Stand out from the crowd

Lanna Cooper, Startups Magazine
returns, you’ll build loyalty with your customers who will be more likely to purchase from you again in the future.

Returns can actually give you a bucket full of insight about your product, customers and even your marketing strategy. So instead of dreading processing a return every time, make it a point to gather as much feedback as you can. You could ask: why are they returning the product? Were they not satisfied?

You can use the feedback to improve your product and maybe even introduce some new features. Or maybe tweak your pricing strategy.

STARTUP STRUGGLES

The launch of the product is the start of your journey, not the end goal. Before launch day, you have many assumptions about who you’re selling to and why it matters to them. But the picture becomes clearer after launch day.

To your surprise, you might find that the biggest issues aren’t with the actual product, but with everything surrounding it.

POSITIVE REVIEWS

According to a Zendesk survey, 90% of participants claimed that positive reviews influenced their buying decision, and 86% said their decision was influenced by negative reviews.

Many businesses focus too much about what to do about a few bad reviews, but the most effective way to deal with those negative nellies is to load up the good reviews! But you’ll need to encourage your happy customers to take the time out of their day to write about their experience.

You’ll need to make it easy for customers to leave reviews because unless someone has a negative story to share, the average customer isn’t going to go out of their way to look for ways to leave the company a review. The sad truth is that people are all too quick to leave a negative review, while getting them to leave a positive one can take a little more cajoling. That’s why when you ask them to post a review, you need to make it easy for them to do it. One of the easiest ways to do this is by including direct links to your review profiles in multiple places; like a follow up email, newsletters or your website.

Even your happiest customers might need some extra incentive to write a review. Offering a small incentive is a great way to show your appreciation! You just need to make sure your offer is for writing a review, and not for writing a good review.

If the site allows it, make sure you thank each person who reviews your product. In addition, you could even treat a top reviewer by sending them a discount code or freebie. This simple gesture will turn a happy customer into a happy and loyal customer.

SPEAKING FROM EXPERIENCE...

Christina Friis Blach Petersen, Founder of LYS Technologies, a startup that created a way to track your light intake for a healthy sleep-wake cycle, described her experience with customer service.

“As a young startup with a consumer product on the market, it is very important to make sure your customers feel your product generates value and that they trust your brand.

“A big focus for us at LYS Technologies has been to learn as much as we can from our users and their needs, and adjust our customer service, our returns policy, product and service accordingly. It is crucial to listen to the right users - which is why nurturing a group of evangelists is key. The reason for this is that if you adjust the product to every feedback or issue, then you might end up adapting the product in the wrong direction. Stick to your guns as they say but don’t be afraid to adjust and change along the way.

“We’ve learnt so much from our users, especially the early adaptors and avid users who we call ‘superusers’: I think that coming into the consumer tech market in 2019, at a time when users have such high standards of what service means to them, it only makes sense to listen, learn and design with the users in mind.

“The only way to get good reviews is to have a good product and service out there, there’s really no other way around it - that’s what we continue to focus on.”
It was 2am in mid-January 2018 and we were staring at over 600 open customer support tickets. We had fallen into one of the classic startup traps: after launching a Kickstarter in 2016, we had just shipped our product and now had thousands of users – sometimes adding hundreds in a day. Although we were getting great feedback from our users for the product, we hadn’t put in place a structured customer support system – and the list of pending requests and questions was starting to get out of control.

Today, despite having three times as many users, we have half the number of support tickets and decreased our response time by a factor of six. Here’s how we kept our customers happy and got our development time back.

**LESSON 1: GET A CUSTOMER SUPPORT PLATFORM THAT FITS YOUR NEEDS**

Our product is a digital ski coach called Carv. The product combines hardware and software to give detailed in-app feedback at the end of each ski run as well as real-time audio instruction whilst skiing. The hardware is a thin insert that fits into the ski boots, which collects the relevant pressure and motion data and then sends it wirelessly to the Carv smartphone app.

By the nature of the product, we have many touch points with the customer: the Facebook page, our website, shipping emails, the unboxing and installation experience, in-app chat... Before launching, we chose to use a platform that aggregates all of these customer channels into a single interface. There are a number of platforms that offer this service, but we chose Intercom because of the robust live-chat feature and scalable pricing. Collecting all tickets into one place quickly became an invaluable tool to make sure nothing slipped through the net. We had a great tool, but we weren’t prepared for the onslaught of tickets that was about to occur.

**LESSON 2: PREVENT CUSTOMER SUPPORT**

The best approach to getting on top of customer support is preventing it in the first place. You’ve got two options: implement an FAQ or ‘help desk’ section on your website that allows users to find the information themselves. Or better, improve the product itself. This may sound obvious, but when you’re frantically bailing water out of a sinking ship, it’s very easy to forget to plug the hole.

Focusing on low-hanging fruit, we quickly realised that many of the tickets were basic queries related to how to install and set up Carv. To fix this, we had a two-pronged approach:

1. Improve the in-app instructions that Carv guides you through when you first connect the units. This is our first line of defence and helps many, but not all, of our customers.
2. Create a detailed instructional video – lasting over 10 minutes - that plays from within the app and goes into detail on many of the edge-cases that we’d seen in earlier customer support tickets.

The result was that it worked. Installation related queries all but disappeared. Things were getting better.

**LESSON 3: HAVE A DEDICATED TEAM MEMBER**

Initially we distributed support around the team. While this is a great way of bringing your team closer
Carv is a digital ski coach that gives real-time audio and detailed in-app feedback to improve your skiing technique.

Carv broke the record for a sports product on Kickstarter in 2016.
to your customers, it led to a lack of responsibility: no one is sure who is ultimately responsible for the customer’s request and tickets fall through the cracks. By giving ownership to a single team member for ‘customer success’, we created someone who can champion the customer and follow up with the relevant team member on the customer’s behalf, if a ticket is outstanding for too long.

**Lesson 4: Make it a Team Sport, Some of the Time**

Having a dedicated team member on support was great. But when technical queries were escalated to the development team, it disrupted their concentration.

To reduce this effect, we created a dedicated daily ‘customer support hour’, where the whole team would work on solving tickets together. This had a myriad of benefits: it improved the speed of response when input from multiple team members was required, kept it fun whilst ensuring nobody was skipping their duties and has created a time when the whole team is working directly together focused on a single goal - helping the customer - which has been great for culture.

**Lesson 5: Growing the Community**

When doing customer support myself, I increasingly found much of my time was spent speaking to people who were incredibly enthusiastic about the product. They would write thousands of words about their experience and feature requests they most wanted. I wanted to provide considered responses to each of them, but needed to manage my time effectively.

To address this, we created the Carv development community, an invitation-only Facebook group where we can interact with our most dedicated customers. But our responses are shared and discussed by not only us but other users in the group. This allowed the bubbling enthusiasm of the members to self-reinforce itself, allowed us to focus our responses to the critical
points, and most crucially, it’s built a community spirit that we can use as a seed for future growth.

**LESSON 6: DON’T OUTSOURCE TOO EARLY**

Customers are at the core of any business and early on, you really have no idea who they are or what their needs really are. Keeping customer support in-house means you naturally get close to your customers and gather the maximum amount of feedback from them. This is valuable knowledge that you can use to improve the product. Another positive effect: it brings your team closer to your customers, helping them to empathise with the users’ problems and fix the issues.

**LESSON 7: IF IN DOUBT, GET ON THE PHONE**

There’s nothing worse than opening up your ticket platform and seeing an angry message. Someone who’s so annoyed they’ve resorted to capital letters. It’s at times like these that genuine empathy can help - and we’ve found the most effective solution is picking up the phone. Often, an angry message isn’t their fault. It’s hard to effectively communicate how annoyed you are over an email without resorting to spicy language. By talking to a customer they feel they’re getting the level of respect, service and attention they deserve and they can more easily vent on the phone on a personal level. This goes a long way to calming the situation down and you will likely end up learning more about your product and may even gain a friend.

We know we still have a long way to go in offering the best possible experience to our customers, but taking these steps has allowed us to start moving quicker as a company and keep our customers happier.

As a startup, your product is guaranteed to have some bugs or issues that aren’t fully ironed out when you ship. (If it doesn’t, you might have shipped too late). Customer service is the best antidote to these issues, and when done well, can convert an angry customer to your best ambassador.
You’ve had the idea, got the business up and running, secured the premises and hired the staff. They’re the ones that keep your company running, no company has thrived with an unhappy workforce, and we know that when people feel supported, they are more efficient and productive, so what can you do to ensure they’re happy and feel appreciated and supported by you?

Creating a strong network of support within the workplace can help attain a high level of morale within the group, as well as create an environment that fosters open communication where people are far less likely to burn out.

Providing support should be a main focus of leadership. It’s not to be tucked away only to be revealed and used when someone has reached breaking point.

Of course, there are moments when more support than usual will be required, for example when a member of staff is new to the role, when someone is experiencing difficulties in their personal life or when the pressure is on in general. Regardless of the situation, it’s important to remember support should be omnipresent within the workplace at all times.

There are many ways that you as a business owner can ensure that your people are supported. Investing in your people, by leveraging external help as needed or having a head of people, is something that companies should consider as they expand and grow, but even then, it does not negate your leadership involvement. Some things you might want to consider implementing include:

**A SUPPORTIVE ATMOSPHERE**
Fostering an open and positive atmosphere should be a priority, where no question is a silly question, where support can be readily accessed from both peers and management. Taking the time to build an environment like this can really help improve the confidence of the workforce and gives them peace of mind that it’s available to them whenever they need it. Providing avenues (internal or external), for people to raise any issues they’re having, both professionally and personally, or a system where employees can take time out of the day to relax and unwind, are simple to implement but highly effective.

**BE TRANSPARENT - MAKE SURE TO MANAGE EXPECTATIONS**
Managing expectations amongst staff is another way of ensuring that staff are feeling supported. Make sure that staff are fully aware of what is expected of them, as well as what is expected of you as the business leader. It’s a simple but effective way of sustaining a good level of trust and being transparent goes a long way to ensure that there is no confusion, so all team members’ expectations are aligned, and they know what level they need to perform at.

**STRIKE A BALANCE**
Giving your staff the opportunity to work flexibly wherever possible and supporting their other interests outside of work will keep staff happy and working to the best of their ability. Simply asking about their hobbies or interests outside of work will remind staff that they are far more than just a payroll number.

Some members of your staff may have children or commute a long way, so giving them the opportunity to work flexibly or work from home may motivate them more, they’ll certainly appreciate the improvements in their day to day life.

**Supporting your team**

By Rita Trehan, Business Transformation Consultant and Founder of Dare Worldwide
HELP STAFF ADAPT TO CHANGE
Keeping your people informed on what’s going on in your business and what your plans for the future are, will make your staff feel included in the process. By giving people an idea of what’s happening in the company, you’re giving them the time to adapt to any changes in the business as well as providing them with the opportunity to share their ideas on how to implement the change successfully. Some people may need more help than others when there’s a change, and knowing who these people are and giving them the support they need will empower them rather than leave them behind.

ALLOW FOR DEVELOPMENT
Staff development usually happens at the beginning of the job and for many companies, that’s it. But I feel it’s important to continually invest in developing your people’s capabilities. Development does not have to equate to training courses. Opportunities to shadow others, giving people the opportunity to lead a new initiative or manage a difficult situation, can all help to grow people’s “career currency.”

By investing in development, you are nurturing a person’s potential and that ultimately means they are more likely to feel a greater level of responsibility and motivation towards their work. When budget is tight, money put aside for training and development is typically the first to be cut. Don’t make that mistake, it will hurt you in the long run. Consider carving out a pot of money specifically for outside development activities, not only will it have a positive impact on your business from an operational standpoint, it can be a great retention strategy.

LISTEN TO THEM
Listening to people’s concerns and addressing them as soon as they arise will prove to people that you care, and their opinions matter.

It’s the ultimate morale booster but also a cost-saving exercise for businesses. Employees that feel listened to translates into happy employees, resulting in increased productivity and decreased staff turnover, so you save money on recruitment and training new staff whilst getting the best results from your team. Having an idea or concern addressed in a timely manner gives people an amplified sense of ownership within their role.

GIVE PRAISE AND SAY THANK YOU
Probably the most effective way of ensuring that your people feel supported is showing them that they are valued. Saying thank you and giving small tokens of appreciation will go along way to keeping morale high. A birthday card, recognising people publicly or simply organising team get togethers, can be surprisingly effective. These little things may not seem like a lot, but can really help cement your people’s loyalty and happiness in your company.

At the end of the day, your people are human beings with feelings and motivations, and it’s about understanding these and seeing how you can make the work environment and the culture one that other companies envy. Value your people and what they do and you’ll get the best work out of them, and as a direct result your business will thrive.
Helping startups connect the dots on their entrepreneurial journeys.