Why Robotics Companies Fail

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Both ARC Advisory Group and Forbes report that robotics is one of the fastest-growing industries either has ever researched. Much like the early years of personal computing, we're seeing more and more robotics businesses spring to life every year. Companies are building on each other's successes and failures in order to offer new and innovative platforms with varying degrees of autonomy, intelligence, and personality.

Yet, for a wide variety of reasons, the robotics industry is still plagued with an incredibly high failure rate. Many in the industry have offered thoughts and opinions on the topic, but no single answer seems to provide a complete picture. Likely because there's rarely ever just one clear reason for why robotics companies fail. For this reason, the robotics team at Fresh Consulting decided to go a bit deeper hoping to uncover the patterns of failure and success through some of the more well-known stories and names from the last decade.

Our team analyzed some of the most significant case studies, from Rethink to iRobot, looking for patterns of failure or success, and what factors may be behind those patterns. On the surface, several factors emerged that seemed to offer clear explanations for why *it's challenging* for robotics companies to succeed:

- High cost of engineering and talent leading to shorter capital runways

- Expensive components, materials, and manufacturing leading to expensive product iterations

- Lack of mature business models and pricing models

- Lack of common reference development platforms for new entrants to leverage, creating inordinate expense to "reinvent the wheel"

- Long sales cycles with expensive customer acquisition

- Costly support and maintenance after hardware delivery

- Immature distribution and partner channels to launch with

- High cost of ownership, making scaled deployments challenging to achieve

- Pressure from investors and stakeholders to achieve unrealistic growth objectives and development milestones

- Overall misalignment of expectations or agreement on what's achievable

- Fear and resistance of change for workflow integration requirements

- New markets that require time to develop and mature

While these factors make running a robotics company hard, they aren't the reasons why so many robotics companies fail. In looking closer at these challenging factors, and exploring how each are interconnected, we identified five central themes that are consistent among failed robotics companies:

1. Lacking business fundamentals
2. Poor market fit and timing
3. Bad user experience and integration
4. Misaligned investors and partners
5. Focusing on the wrong problem

Image source: Evan Ackerman/IEEE Spectrum

Throughout this paper, we will expand on these themes and challenging factors outlined above, and connect them with examples of companies who met those challenges head-on and succeeded, as well as the many others who couldn't rise above.

As a disclaimer, this paper is not intended to be an exhaustive list of all robotics companies and every reason for their success or failure. We have also specifically decided to exclude a number of established industrial robotics giants (like Mitsubishi, ABB, FANUC, KUKA, Yasakawa, Omron, and others) from the analysis of this paper. While it's clear these companies are shining examples of international success in the robotics and automation arena, we are choosing to focus our analysis on the many other robotics companies trying to make their mark outside of the established walls of industrial robotics/automation.

By looking deeper into these patterns of success and failures, we hope to provide some helpful strategies and tools that new robotics companies can implement to improve their odds of success.
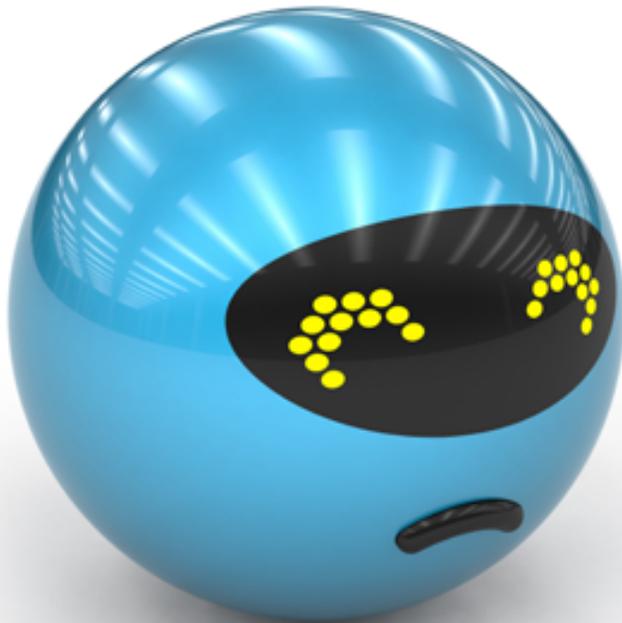
1. Lacking Business Fundamentals

It's rarely ever the case that one bad business decision causes a company to fail. New and old businesses alike typically go under because of a combination of several bad decisions, and sometimes a mix of unfortunate circumstances as well. For robotics companies, this equation can be a little trickier. Since most are blazing a new trail in some fashion or another, there are very few established business models, pricing strategies, and other best practices available for new entrants to emulate and learn from. The resulting effect seems to be a generation of robot companies marching to market in similar ways, making similar business mistakes along the way. From the case studies we examined, this lack of business fundamentals emerged early as a central theme among the majority that failed.

Strong Business Acumen

If we're being honest, technical founders of robotics companies are not all great business leaders. Some

are, but many are not. Managing funds, board members, supply chains, logistics, demand forecasting, sales and marketing efforts...in addition to a host of other challenges unique to building a product – it takes a lot to build a company, even for the most seasoned business leaders.

Having the impressive technical knowledge and talent required to bring a successful robot concept to reality is one thing, but it doesn't necessarily mean you'll be an equally capable or savvy business executive. Eric Klein, Partner and Founder of Lemnos Labs, has seen this firsthand. Even though a company's founders may be "the greatest mechatronic engineers of our generation," if unit economics, scale potential and ability to get to the customer don't work, Klein reasons, "it doesn't matter how good the robot is."

Making sure to complement the technical expertise of your team with others that have equally strong business expertise or industry knowledge is a great

way to help avoid making costly business decisions down the road. Building a working, reliable, user-friendly robot is hard enough, so getting help with building a company can position you for greater chances of success.

Managing Funds Strategically

Building a robotics company is an expensive endeavor, and among the case studies we reviewed, funding challenges were a root cause of failure for many of them. Simply generating enough funding to bring your robot vision to life can be challenging enough. Once you get funding, managing it wisely can be even harder. A lack of clear product and market strategy will force a robotics company to burn through capital quickly as they pivot and progressively re-engineer toward a solution with a better market fit. Similarly, overspending on expensive engineering talent and large office space early on is another quick way to create cash flow challenges. Treating a small company like a big company early on can kill it.

Saving Enough for the Future

Assuming you're fortunate enough to generate the funding you're looking for, running a lean operation and spending that precious capital wisely is the next challenge robotics companies face. Designing and developing robotics hardware and software is costly: there's no way around it. Robotics ventures require specialized talent and expensive materials and equipment – and generally take much longer to productize and sell. Often creating a truly market-ready robotics product can take several years.

Even when you've successfully launched a product, you're still not out of the woods. The next challenge is sales and marketing, customer adoption, integration, and support...surviving until you turn a profit. Assuming you've made it through the long, expensive product development process, this is the next most common point when robotics companies run out of cash and are forced to shut their doors. Not because of any shortage of great products, great ideas, or excited customers, but because the company never got beyond product creation and its overhead wasn't sustainable long term.

Case Study of Failure: Airware Overestimated Their Value

Airware is an example of a startup that overextended itself after early excitement. Founded in 2011 by Jonathan Downey, Airware produced software and hardware for the drone industry. The goal was to create autonomous drones that gathered data, such as monitoring work at mines, looking for damage to buildings, and creating maps of construction sites. Airware was one of the first companies to envision drones as something other than a war device, which led to massive support from consumers and businesses alike.

Everything seemed like it was going great for the startup; in fact, there was little warning upon the company's closure. Things were fine one day, and the very next morning, employees were told not to come to work. Despite interest from companies like Caterpillar and Mitsubishi, no deals ever came to fruition. Airware hadn't prepared for this outcome. Instead, they'd spent heavily on new office locations and expensive talent from groups like Google and NASA. When Airware failed to secure deals for additional funding, they were left with a swift and unexpected end.

Case Study of Failure: Laundroid's Lack of Product Strategy Led to Insurmountable Debt

In 2015, Seven Dreamers debuted its robot-powered laundry machine Laundroid. While the robot's exterior looked like a simple cabinet, its complex internals made it a unique offering in the home robot industry. Specifically, Laundroid was designed to fold your clothes for you after you tossed them into the machine. You could place them inside the machine in any orientation, even wadded up, and receive a folded garment within minutes.

At least that's how it was intended to work. The Verge's Dami Lee found Laundroid took **5-10 minutes to fold a single t-shirt,** and even then it didn't always work. The robot also cost $16,000, though Seven Dreamers was working to lower the price point. Unknown to the public, Seven Dreamers had racked up over $20 million in debt to more than 200 creditors. The company shut down its operations in 2019 before they had the chance to improve Laundroid's price or functionality.

Case Study of Failure: Reach Robotics' Innovative Technology Killed by a Poor Business Model

Founded in 2013, **Reach Robotics** was a company working to bring a four-legged robot to the education and entertainment market. MekaMon, the company's robot, was released in 2017. It featured unique, lively movements, the ability for users to modify the robot via an app, and an interactive augmented reality game that users could play with their MekaMon.

In terms of technology, the progress that Reach Robotics made was huge. By starting with a simple foundation and mission, the team was able to create a robot more lifelike and responsive than nearly anything else on the market. Similarly, the combination of robotics, artificial intelligence, and augmented reality made for a highly innovative product that showed the potential for each of these technologies when brought together.

Unfortunately, it was the overly ambitious nature of the product that contributed to the company's shutdown in 2019. MekaMon was in high demand, especially during the holidays. However, the lack of business experience and the newness of the technology made it difficult for Reach Robotics to fulfill orders. This led to products arriving with technical issues, an overworked customer support team, and immense sales pressure that disrupted the flow of the company's innovative efforts.

The consumer market is a challenging space for robotics, as many of the stories in this paper have shown. Reach Robotics tried its best to overcome these challenges, but in the end, it didn't have the business expertise to navigate the marketplace. Its business model was unsustainable, and after facing pressure from a creditor, Reach Robotics closed when it couldn't find additional funding or sales.

Image source: **ReachEDU**

Image source: **ReachEDU**

2. Poor Market Fit & Timing

While poor market fit and timing may sound like obvious causes of failure for any new company, they're particularly relevant for robotics startups. Arriving too soon, too late, or with the wrong solution all together can be detrimental to your success. Over the past decade and more, there have been quite a few robotics ventures whose ideas and concepts could be considered about 5-10 years ahead of what current technology, market demand, or even industry infrastructure could truly support. On the market fit side, we've seen a similar number of companies enter the market with grossly over-priced, over-engineered, and otherwise under-delivered solutions that are misaligned from what the market truly needs or is asking for. Said another way, sometimes the feature set is too ambitious and the cost of the robot solution is more expensive than the problem it solves.

The Right Market Timing

Generally speaking, bad market timing can cause any new company to fail. For robotics companies specifically, market timing is an especially difficult thing to get right, and it seems to boil down to a factor of technology readiness level and the associated usability, mentioned below. Either the cost of the technology being developed is too expensive to solve the problem in a cost-effective way, or the problem a robot is setting out to solve simply cannot be achieved efficiently with today's technology. If your new robotics concept is on either side of those two paths, then you may fail because you're either too early to market, or your concept may be too expensive to bring to market in a reasonable amount of time. For the most part, there are still many limitations to modern-day motors, actuators, sensors, and

other critical robotics hardware that make it challenging to develop certain robotics concepts efficiently enough, functionally enough, and at a reasonable cost to the customer.

The Right Market Fit

On the other side of market timing is an even more subjective perspective of market fit. Are you delivering something the market genuinely wants, can afford, and can easily/intuitively use? There are many interconnected variables that impact a product's overall market fit, but the underlying principles behind market fit are all about finding the right balance and proportionality for the product you're bringing to market. What does your market absolutely need from your robot, and what can your team promise to deliver with the resources you have at this time? As evidenced by some of the case studies in this section, finding this "balance" is still a big challenge for some robotics companies.

From our research on market fit, one of the biggest challenges for robotics companies seems to be pricing. In many instances, we've seen robotics companies create fantastic tech that truly delivers on what its market is looking for, but the price of the solution ends up being more expensive than the problem it solves. That said, one positive direction is that the cost of robot parts has been dropping dramatically over the past decade, which will help reduce the inputs that make prices higher.

Anecdotally, through many of our personal experiences, most large enterprises have said that the often high CAPEX required to deploy and maintain most robot systems has continued to be a primary obstacle in adoption. A lack of successful business models and pricing strategies across the industry is certainly a driving factor for this. Convincing businesses to buy large quantities of expensive robotics hardware is a difficult task, especially if it's new and relatively unproven tech. For this and other reasons, we're starting to see several robotics companies explore various robot as a service (RaaS) models as a way to alleviate expensive upfront hardware costs for customers.

As Aaron Prather, Head of R&D at FedEx, recently told us, "Investors are pushing the RaaS model. This may work fine with some players. However, for large corporations that can capitalize these purchases, RaaS is not really a feasible option sometimes." While RaaS certainly seems like the right direction for some new and future robot companies to follow, it's proving to be sector-dependent and doesn't yet work for everyone, at least today.

Case Study of Failure: Jibo Failed to Capture Market Interest

jibo®

In 2012, an MIT roboticist named Cynthia Breazeal founded Jibo, a robotics company centered around a social robot of the same name. Jibo was a robot for the home that performed a broad range of functions, almost like a hybrid between Google Home and Roomba. The goal of Jibo was to become a fully-fledged robotics platform, something the startup's founder believed was missing in the robotics industry. Jibo went on to raise $3.5 million in funding by the end of 2014 and was featured in Time Magazine in 2017 as one of the year's best innovations.

Despite early momentum, Jibo is believed to have gone out of business sometime between 2018 and 2020 after failing to receive additional funding. There are many causes for Jibo's failure, all centering around its lack of focus. Though Jibo was capable of performing many tasks, the majority of these tasks were not things on the consumer priority list.

Additionally, all of the features Jibo offered made it an expensive product to manufacture and purchase, resulting in fewer orders, delays in deliveries, and customers who felt the end product didn't provide enough value for the price. Externally, Jibo faced fierce competition from more established businesses like Google and Amazon, who produced competing products like Google Home and Amazon Echo. Jibo's inability to provide a quality, focused, niche product left an initially well-received device with no clear practical uses or justifications for its higher price.

Image source: jibo.com

Case Study of Failure: Aria Insights Outpriced Its Market

Aria Insights, originally CyPhy Works, was a robotics startup that had all of the components to be a huge success. It was founded by one of the cofounders of iRobot, Helen Greiner, who led iRobot to great success during her time with the company. Aria Insights created innovative drone solutions that were used in agriculture, law enforcement, and the military. Law enforcement and military contracts made up the bulk of Aria's income for most of the company's lifespan, though this changed when Aria shifted focus in early 2019.

Greiner had left the company in 2018 to focus on work she was pursuing with the military, which marked the beginning of the company's end. In January of 2019, Aria Insights announced that it would now focus on collecting and storing massive amounts of data through its drones. The idea was to monetize this data and provide deeper insights into its customers' operations. While an innovative concept, no company had the resources on hand to interpret the data being gathered by Aria's drones. The task of sorting through massive amounts of data generally falls onto artificial intelligence and machine learning, technologies that many companies don't easily have access to. Additionally, each of Aria Insights' drones cost $5,000, which made it a steep investment even from a B2B perspective. The end result was a product that no company could afford to purchase or understand how to use, and Aria Insights shut down just a few months later.

Image source: Aria Insights

"We failed because we had a price point that was too high for a consumer product. Our price was coming out at around $5,000, which is a lot of money. Additionally, the Internet technology wasn't ready yet, and it wasn't consumer-friendly."

Helen Greiner, co-founder of iRobot and Aria Insights, in Robotics Business Review

Image source: Aria Insights

Case Study of Failure: Keecker's Popularity Wasn't Profitable Enough

keecker

Keecker was a robot for the home in the shape of a small, egg-like pod. It would roam around the house, using sensors to follow its users, providing useful information, projecting video content onto walls and ceilings, and hosting video calls. Keecker was founded in 2012 and raised $8 million, with lots of hype as one of the first home robots to demonstrate practical, clear use cases – primarily its projection features.

In 2019, however, despite over a thousand robots in customers' homes being used an average of 3.5 hours each day, Keecker couldn't bring in enough revenue to remain profitable. It never generated the same levels of attention as robots like Jibo and Kuri. The passionate founders fought hard not to fall to the same challenges as their competitors, but their efforts proved to be ineffective. In the end, Keecker was simply too expensive to produce and purchase to get traction with mainstream consumers.

Image source: Keecker

Case Study of Failure: Rethink Robotics' Bleeding Edge Tech Missed the Market

Rethink Robotics launched in 2008 and quickly became one of the most exciting robotics startups of its time. The goal of its founders (Rodney Brooks and Ann Whittaker) was to create a robot that could assist workers in skilled labor, making manufacturing easier, cheaper, and safer. Rethink's robots would reduce the level of education required to work in these jobs, decreasing the amount of manufacturing jobs being outsourced to countries outside of the U.S. The startup won several awards and was an Edison Awards finalist in the early 2010s.

Despite so much early momentum, Rethink's history was plagued with problems that the founders struggled – and ultimately failed – to overcome. Its two robots, Baxter and Sawyer, were robotic arms with friendly faces and equally friendly hardware, as it was a big part of Rethink's mission to create safe robots for human workers. Series elastic actuators (SEAs) in the device joints increased flexibility so that in the event the robots made contact with an employee, the joints would have enough give to avoid harming their human counterparts.

The SEA advancements did make the devices safer for employees to work around, but they also made the robots much less accurate. The added flexibility reduced the repeatability of Baxter and Sawyer, making them too inefficient for industrial work. Rethink Robotics tried to overcome this by modifying the software, though in hindsight, it seems more likely that this was a hardware problem. This didn't stop Rethink from marketing its devices to manufacturers, who in turn became less and less interested. Despite how bleeding-edge Rethink Robotics had been when they initially launched, by 2018, the ten-year-old company was battling technology problems that newer startups had surpassed.

In 2018, after $149 million in funding over its lifespan, Rethink Robotics sold off its assets to the HAHN Group, a German automation specialist, and shut down its operations. Many robotics experts believe that had Rethink managed to bring a more complete product to market when Baxter initially launched, they could have succeeded, while others believe the safety features made Rethink's robots better suited for demonstration purposes in universities than real-world jobs. Whatever the case, Rethink's inability to bring the right technology to the right market outweighed its innovative concepts.
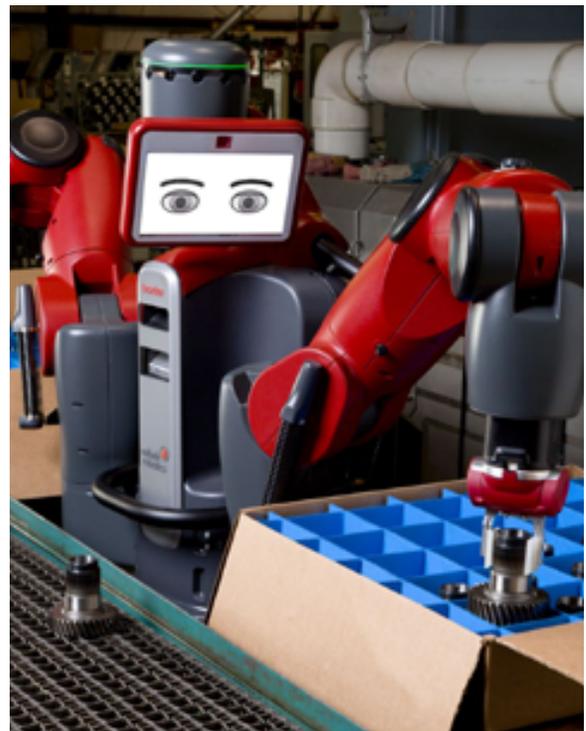
Image source: Rethink Robotics

3. Bad User Experience & Integration

It may not surprise you to learn that many robotics companies still miss the mark on user experience. Modern-day customers (B2B, consumer, industrial, or other) have become tech-savvy enough to know when a product is going to create more problems than it solves. When building a robotics solution, having impressive hardware and software is often only 50% of the battle. The other half is heavily weighted on having an equally well-thought-out UI/ UX design. At Fresh, we like to call this the "soft" side of robotics.

For most customers, purchasing a robot not only requires a large financial investment (in many instances), but also a commitment to learning how to operate and maintain this new piece of cool technology. For industrial and commercial users of robotics, there's a big consideration to be made for how this new robot tool (or fleet of tools) will integrate with any existing workflows and infrastructure. These important, often emotional factors tied to user experience are a large part of any purchase decision, and can ultimately determine market success or failure.

In a recent conversation we had with Carnegie Mellon University Robotics Professor Howie Choset on this topic, he brought up Intuitive Surgical as a great example of the power of a well established user interface:

> "The reason Intuitive Surgical succeeded is because they made a UI that was so easy to use. It allowed others to go play with it, which led to the discovery of the real uses of that robot. Intuitive Surgical didn't discover prostate cancer remediation for their product; their users did. They figured out how to make an intuitive user interface, and they were so good at it, that it became the name of their company."

Howie Choset, Carnegie University Robootics Professor

In the same conversation, **HEBI Robotics** Co-Founder Dave Rollinson brought up drones as an example of the importance UX plays in the adoption of robotics. While there have been incremental advancements in the motors and electronics of drones, their fast rise to success happened when non-experts could confidently pick up the controls, fly, and avoid crashing. Rollinson explained, "There's enough intelligence baked in now, that there's no longer a steep learning curve for people to use that tool."

The truth is that, at this time, robots are still asking a lot of their operators even under the best of circumstances. The more costly and frustrating a robotics solution is to set up, operate, service, and maintain, the harder it will be to learn, integrate, and scale. Aaron Prather, FedEx's Head of R&D, can attest to this. In a recent conversation with us, he explained, "Too many times we have had companies overpromise and under deliver. Sometimes this can be due to a salesperson who is really good at sales but does not understand the technology and its limitations. This leads to frustration and finally just walking away."

From our research, one of the more prevalent user experience failure points for robotics companies is simply reliability. This is by no means the primary reason so many robot companies fail, but it's certainly near the top. Sadly, many robots today still fail while carrying out the core tasks they were built for, requiring human intervention to solve the issue, and resulting in a potentially costly outcome. Robots need to consistently create less work, not more work, to be adopted.

Let's use the example of a remote-operated robot inspection tool. These inspection robots help save lives by eliminating the need for humans to venture into confined and other hazardous spaces to collect high-value inspection data. While this is a fantastic user experience value proposition, consider what happens if the same robot loses connection from its operator, and gets stuck inside, or damages the multimillion-dollar critical asset it's inspecting? In many instances, the total cost of retrieving that robot is likely three to five times what the robot is even worth. Worse yet, leaving a robot inside an asset for multiple days could result in millions of dollars of lost production and operational downtime for each day that critical asset is shut down. For the many who look to robots for help with NDT and other visual inspection, the reliability of the solution is the most important factor.

Below we highlight a few companies who saw the importance and value of great user experience and made it work to their successful advantage.

Case Study of Success: Northrop Grumman's Attention to Customer Experience

NORTHROP GRUMMAN

Northrop Grumman Remotec is often referred to as the gold standard when it comes to reliable, tactical robot platforms (not unlike Endeavor Robotics). Remotec develops and sells semi-autonomous, remote-operated platforms to bomb squads and other tactical units to help remove humans from dangerous tasks and environments. Their robots are used for intelligence and surveillance, as well as detecting, removing, and disrupting bombs and other hazardous materials. Remotec understands that their users rely on their technology when lives are on the line and that having a tool that always works when you need it is mission-critical. Remotec's focus and commitment to building high-quality, reliable robots that are also easy to use has made them a **preferred solution** among bomb squads and other tactical organizations globally.

Remotec's robots feature swappable parts for easy maintenance, and customers rarely have to replace a robot unless it is completely destroyed (which is a rare occurrence, as the materials used in these products are extremely durable). Alongside crafting products that work reliably when you need them, Remotec also provides excellent customer service. This commitment to customer service ensures that even when a customer does encounter an issue, Remotec staff are available to resolve the error as quickly as possible. The result is satisfied customers and an enduring reputation among their core users.
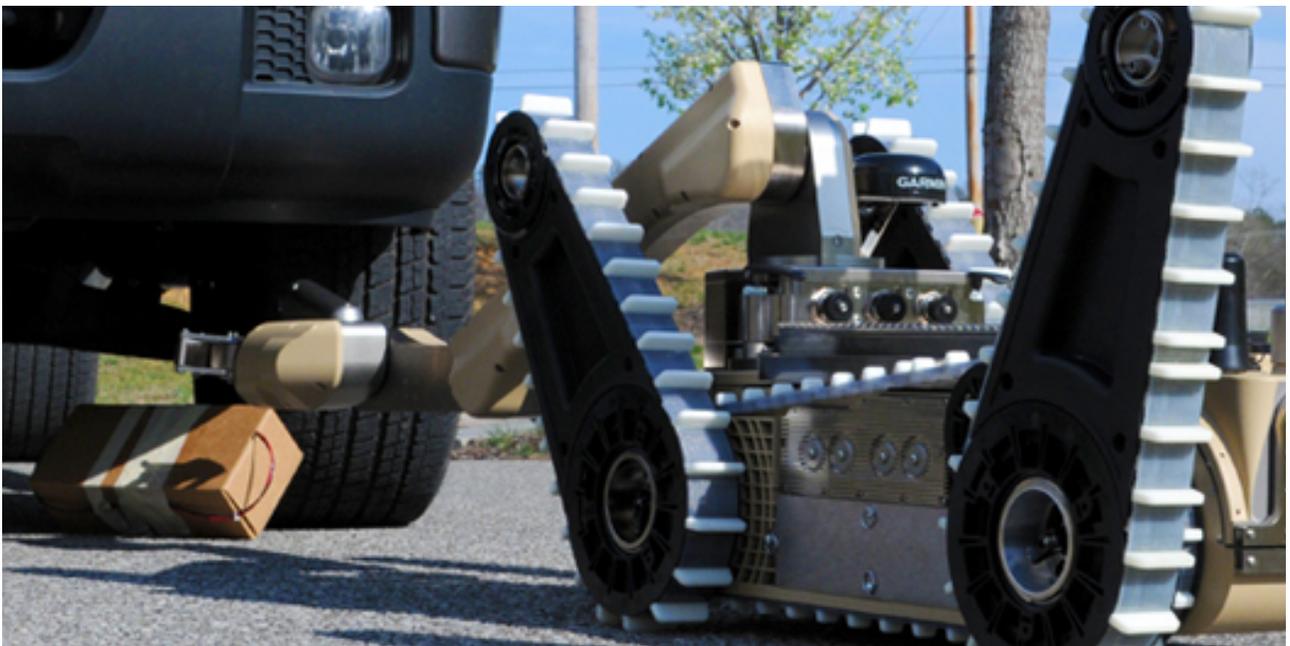

Image source: **Northrop Grumman**

Case Study of Success: iRobot Sustains Long-Term Consumer Interest

iRobot®

iRobot is the company behind the popular Roomba home vacuum, a robot for the home that automatically vacuums your floors without needing human intervention. It will periodically notify you when it needs its bin emptied, but otherwise, it's completely self-sufficient. iRobot was founded in 1990, making it one of the oldest and most successful robotics companies in the last three decades. iRobot has sold more robots than any other company to date. It invests heavily in its sales and R&D, steadily releasing new and innovative products to keep consumers interested. Despite only operating a few product lines, iRobot continues to grow year over year. In 2019, the Roomba line of products accounted for **$715 million of iRobot's $787 million revenue** during the first nine months of the year.

It could be argued that the reason iRobot has such a stronghold on its market, being the dominant leader in the home robot industry by a wide margin, is because of its streamlined, highly focused, easy-to-use products. Rather than coming out with consistently new and exciting products, iRobot has created a family of related products (a self-operating **vacuum, mop,** and **lawnmower**) that work well and directly address consumer needs. It's a great example of a robotics company having a tight focus, and then building on that success with a family of related products.

Image source: **iRobot Corporation**

Case Study of Success: SoftBank Robotics' User-Centered Robot Designs

SoftBank

Robotics

SoftBank Robotics (formerly Aldebaran Robotics) has succeeded in creating two of the most iconic humanoid robot platforms, **NAO and Pepper.** While SoftBank Robotics is still not a profitable company, what has made them a success among their peers in the humanoid robot space is the unrivaled appealing design of the NAO and Pepper robots. Despite their lack of profitability, the Pepper and NAO robots are still some of the best-selling and most widely recognizable humanoid robots around the world. Contrary to some of the points made so far in this paper, the founding team from Aldebaran designed

the original NAO robot with no real customer, problem, or solution in mind. It was more of an artistic experiment in human-centric robot design, wrapped around some impressive mechatronics. There was also a decent amount of faith that if you create an appealing-looking two-foot-tall robot with an above-average set of capabilities, it will sell. Thankfully it did, and the global academic community was among the first to see a lot of value in what the $9k platform could offer to STEM Education, and other advanced HRI research.

Aldebaran and SoftBank's focus on appealing design as the foundation for their robot has resulted in elegant, unintimidating, lovable humanoid robots with a friendly disposition and fun personality. As evidenced by the plethora of robotics companies trying to imitate NAO and Pepper's design, it is clear the products have found an ideal position within the uncanny valley.

Image source: **Softbank Robotics**

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4. Misaligned Investors & Partners

Robotics companies often make one of their biggest business decisions before they even begin building a product. We're talking about the important step of selecting the founding team, investors, and other early business partners. For many robotics companies, this first big decision can either set them on a path toward success, or spark an early indication that trouble is on the horizon.

Investor-Founder Alignment

A few months ago, our team sat down with Andra Keay, managing director of **Silicon Valley Robotics,** to get her insight on the topic. According to Andra, robotics startups often fail because of a lack of a shared vision between investors and founders. The goal of venture capitalists is to see their investment grow by 100x or even 10,000x, which is impossible for most robotics companies to achieve.

Keay goes on to explain that because robotics startups are creating new markets, they usually need twice the amount of time to take off than a typical startup. Since most venture capitalists' primary goal is to make a return on their investment, they often pull funding as soon as they see favorable returns, leaving the startup to fail shortly after. You can see this pattern reflected most commonly in Lux Capital, who routinely pulls funding from robotics startups after three to five years.

"[Robotics startups] need to interview investors carefully and make sure that visions are aligned. Some investors, those with a deep tech background...will be focused on growing a new robotics industry and be looking at the long-term returns. Robot startups need to be more selective about funding, and the marketplace needs to step into the gap left by imploding venture capital. Ultimately, we need to increase productivity and support an aging population without sending work overseas or destroying natural resources further. I believe robotics is the only way forward for the planet."

Andra Keay, Managing Director of Silicon Valley Robotics

Eric Klein, Partner and Founder of **Lemnos Labs,** has a different perspective: that VCs and founders are equally accountable for ensuring the mutual success of their relationship. In a conversation with us, he pointed out that the 2-4 year primary investment window and 10-year payoff have been an established VC model since the 1950s. Founders and VCs are equally at fault if they enter into a relationship that cannot support that timeline. And "a lot of robotics companies have not reached the window where they are a 'venture back-able' business," Klein argued.

He added, "I'm going to get on the phone here in a few minutes and I'm going to screen a new robotics company...but the thing I'm going to spend the most amount of time on in the next hour has nothing to do with the technology." For Klein and Lemnos, the math, the unit economics, and the scalability is most important.

As we commented earlier, ensuring alignment also means maintaining open communications and setting clear expectations with your investors, early and often. As we will see in the example of Acutronic Robotics (below), impatient, poorly informed, and otherwise misaligned investors will pull their money fast.

Overconfident Founders

From our research, it seems common for founding teams of robotics companies to fall into a trap of believing themselves to be too capable. They may underestimate the work required and overestimate their personal ability to handle it all. These proud founders often try to take on more of the work than they can manage instead of hiring strategically or outsourcing certain portions of development to more experienced companies and partners. While there are near-term cost benefits of keeping full-time headcount low, the net long-term outcomes are delays in development milestones and larger amounts of engineering rework later down the road, all extending the timeline to market – which is critical to success or failure.

Investing in Strategic Investors & Partnerships

Identifying strategic partnerships early on can play a big role in the success or failure of the company. For robotics startups, the most beneficial early partnerships are the ones that provide "friendly" environments for prototype testing. Even better when that partner is a potential marquee customer who's giving you invaluable insight and feedback on how your solution performs in relation to their needs and expectations.

Too many robot companies fail because they miss out on key opportunities to test their bots early and often in real-life environments, and with understanding users who share a mutual interest in seeing the robot succeed. For anyone who's ever built a robot that's meant to navigate in our world, you know that you can only go so far and achieve so much through simulation. The biggest value in having multiple testing partners is that you validate or disprove your assumptions quickly. In most cases, you'll likely find that every customer environment is unique, and every one will challenge your robot in an equally unique way. The sooner you can identify partners that have a mutual interest in seeing your robot succeed, the better your chances.

Case Study of Failure: Acutronic Robotics Lost Capital when Investors Lost Interest

Acutronic Robotics was founded in 2016 after Acutronic Link Robotics AG acquired Erle Robotics, a company working on communications technologies centered around the Robot Operating System (ROS). Before its closure, Acutronic was working on the Hardware-Robot Operating System (H-ROS), which would make it simpler for different robotic hardware to integrate with one another. The technology would facilitate modular robot designs, like Acutronic's MARA robot, which could have revolutionized the robotics industry.

Unfortunately, just three years after its founding, Acutronic Robotics was shut down. The company faced two primary challenges, the first being a market too young for Acutronic's technology. Although the concepts were solid, there wasn't enough interest in modular robotics at the time. The second issue was funding, which was made worse by the first issue. The cost of developing MARA and H-ROS required more capital than the company had on hand. Acutronic's investors didn't believe that the company was viable anymore and pulled their funding.

Acutronic looked for funding elsewhere, but it was too little too late. Robotics Business Review reported Acutronic confirmed that while "several parties" showed acquisition interest, no agreement was ever made.

Image source: Acutronix Robotics

Case Study of Success: GreyOrange's Outside-of-the-Box Partnerships

GreyOrange

GreyOrange, considered to be one of the top ten robotics companies in the world today, is an excellent example of a robotics startup whose success can be partly attributed to strategic partnerships. Rather than looking for traditional venture capital investors, GreyOrange's investors are also the companies helping it sell, deploy, and service its products. This makes for much stronger alliances, as all of the involved parties have more at stake than money alone. They all understand each of the other's visions, goals, and needs. This reduces the chances of one party letting the other down and creates a compounding synergy that is necessary for robotics startups to succeed. GreyOrange raised $140 million in 2018 and is continuing to grow in 2020.
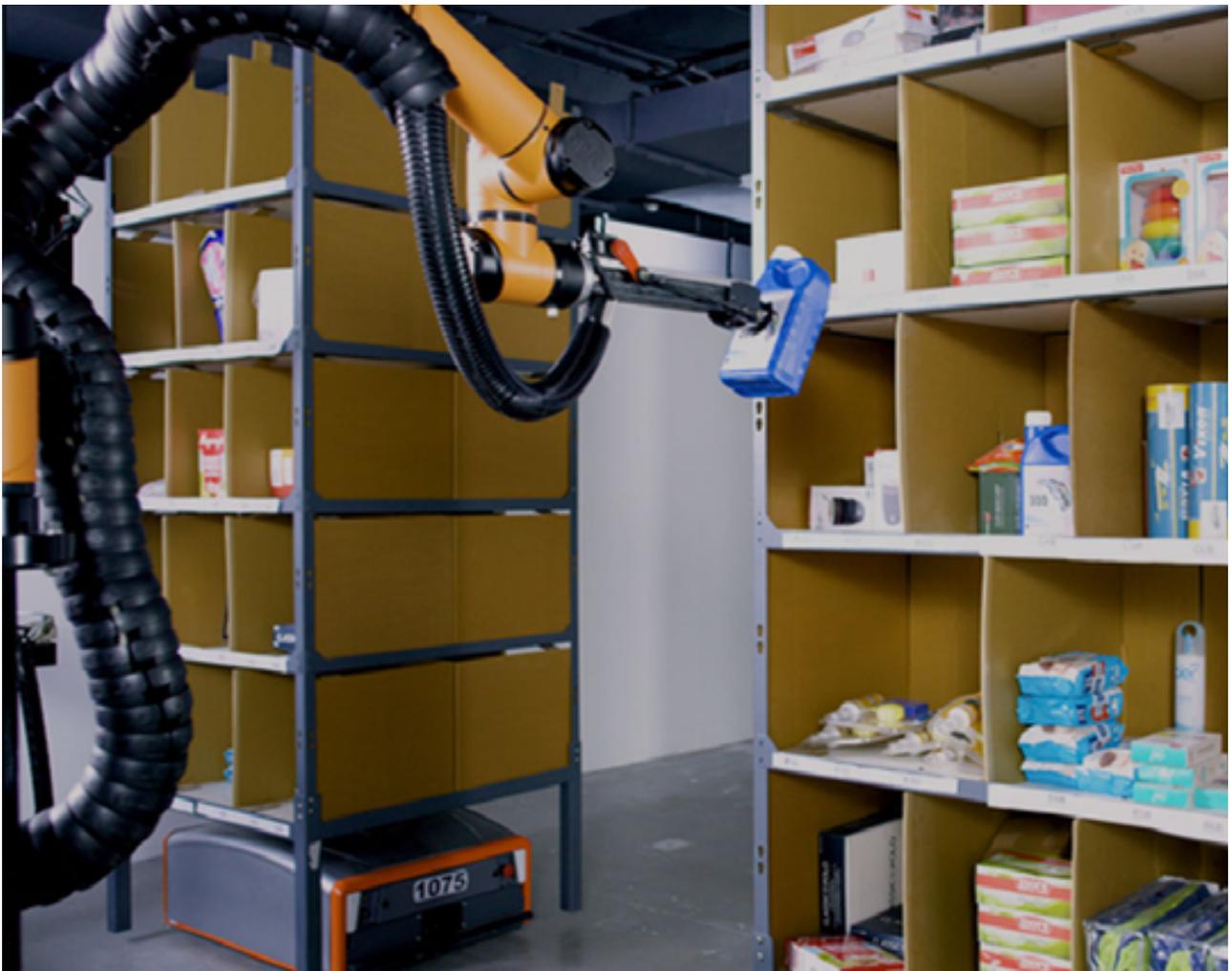
Image source: GreyOrange

Case Study of Failure: Mayfield Robotics Lost Critical Alignment

MAYFIELD ROBOTICS

Mayfield Robotics was a robotics startup founded in 2015. It partnered with Bosch's Startup Platform, which allows select startups to grow with Bosch's support. Mayfield Robotics produced a single product, the Kuri Robot, a robot for the home that performed similar functions to smart speakers like Google Home and Amazon Echo. The device was nominated for the Best of CES award in 2017, and was the only robot to receive the nomination.

Even though Mayfield fostered a promising relationship with Bosch early on, the two companies were faced with incompatible goals and visions. Bosch wanted to use Mayfield Robotics to test the robotics market and see if it was worth investing in, while Mayfield was looking to use Bosch for its manufacturing expertise. As discussed in this paper, the robotics industry is volatile, and Bosch quickly determined that Mayfield was not worth the risk. Unable to find additional funding or compete with products like Google Home, Mayfield Robotics closed later in 2018 and halted production of the Kuri Robot for good in July of 2019.

Image source: **Mayfield Robotics**

5. Focusing on the Wrong Problem

As most of the aforementioned examples illustrated, it's critical to choose the right problem and scope to solve with your robotics concept. Accomplish this early, and you're off to a fantastic start toward becoming a success. Arrive at this a bit late, and it's likely you've eaten up a lot of time, burned through a small mountain of cash, and may only have some fun prototypes to show for it.

As Steve Blank puts it, **"a minimum viable product (MVP) is not always a smaller, cheaper version of your final product. Defining the goal for an MVP can save you tons of time, money, and grief."** In his book *The Four Steps to the Epiphany,* Steve also discusses the importance of not developing your solution inside of a vacuum. Forgetting to complement product development with a parallel customer discovery process is a nearly statistical guarantee that your venture will fail. Far too often, new robotics companies fail to successfully define the goal for their MVP, or the minimum viable problem their robot will solve. If the problem that a robot is intending to

solve is just as niche or as complicated as the robot itself, the odds of market success are much slimmer. Simple as that.

Rather than trying to sell all of your robot's capabilities, sell the reason you decided to create a robot in the first place.

As Simon Sinek recommends in **The Golden Circle,** "start with 'why' your product exists rather than 'what' your product is." Rather than trying to sell all of your robot's capabilities, sell the reason you decided to create a robot in the first place. The more compelling the reason, the more your robot's value proposition will resonate with your customers. From our experience, if you need an inordinate training, marketing, and sales budget to educate your customers on why the problem your robot is

solving is important, then you've likely chosen the wrong problem to solve in the first place. That said, it's worth acknowledging that the often-high cost of educating new customers is something most robotics companies deal with when beginning to market and sell their solution.

Given everything we know about the high costs of robotics development, attempting to build too many features and capabilities into your solution from day one can deplete precious capital and resources in record time. It's easy for teams of engineers that like to solve problems to focus on more features that land the product with feature bloat, making core solutions weaker and product focus scattered in the end. We've learned from product development in general that too many features can also 1) increase cognitive load, 2) increase usability risk, 3) increase technical debt, 4) increase cost prior to testing and launch where critical pivots are needed, 5) increase time, and 6) increase training effort. Robotics companies are no exception. In our related white paper **"The Strategy of Starting with Less,"** we offer recommendations for how to focus on a true Minimum Viable product (MVP) to test with, and a true Minimum Lovable Product (MLP) to launch with.

It's understandable why companies might feel compelled to design their robot to be the Swiss Army knife for solving all the problems when, in reality, you should only be focusing on finding the quickest and most cost-effective way to automate the solving of "X" problem, and nothing more. Assuming, of course, that you've done your customer discovery and know that there are a lot of people or companies who want to automate X and see measurable value in spending Y to do so.

Our recommendation: focus on creating a robot that can perform one or two tasks exceptionally well. Highly focused objectives like these demonstrate clarity of vision to investors and customers and are more manageable for a startup to undertake. A team can spend two to three years creating a robot that can do a lot of things poorly. In that same timeframe, another team with better focus can create a near-perfect, market-ready robot that does one thing really well. The latter is much more in line with what most investors and customers are looking for today.

Case Study of Failure:
Anki Robotics' Lost Identity

Anki Robotics is an excellent (and unfortunate) example of a robotics startup that failed for a multitude of reasons and could likely fit into any one of the categories we've covered throughout this paper. The company's first product was an **AI-enabled set of race car toys,** similar to the popular Hot Wheels brand, which launched in 2013. Unlike Hot Wheels, however, these toy cars were equipped with sensors and artificial intelligence and could be controlled via a smartphone app.

Then in 2016, Anki released its first huge success, the Cozmo robot. Cozmo was a palm-sized robot vaguely in the shape of a bulldozer. A screen on the front gave the robot the appearance of having a face, enabling it to communicate and interact with children. The robot also used AI and sensors and was able to navigate and interact with the user's home without any interference from the owner. It was essentially a pet robot for kids and became the best-selling toy on Amazon in 2017.

In 2018, **Anki launched Vector,** a product that marked the beginning of the end for the once-promising robotics startup. As you more than likely noticed,

the initial two products from Anki were, by design, toys. They may have been using sophisticated technology, but at their core, they were created for children to play with. Vector, on the other hand, had a much less clear intent. It featured a nearly identical physical design to Cozmo and was even the same size, but was instead marketed to serious tech enthusiasts as a smart pet and virtual assistant. It could do everything that Cozmo could, as well as things like answering questions, setting reminders, and checking the weather.

The problem was that by the time Vector came out, Anki Robotics had been making children's toys for eight years and was known as a toy manufacturer for five of those years. It may have been the company's intention to use these toys as a way to test the waters and see what they were capable of creating, but it unintentionally pigeonholed them in the eyes of the public.

Image source: **Anki**

During an episode of Recode Decode, Anki CEO Boris Sofman stated, "For us, it was never meant to be a toy company, or even an entertainment company. It's a robotics and AI company." The discrepancy between Anki's version of its identity and the public's version was too vast, and the company closed down just months after Vector's product launch. As reported by the Failory.com, Anki's problems weren't just tied to a poor market adoption of their Vector product. To receive a much-needed loan in 2018, Anki had to offer up a rather large security interest in its copyrights, patents, and trademarks. If Anki failed to repay, the Silicon Valley Bank had the right to claim all of that intellectual property to make up for the money lost in the loan. The Robot Report also uncovered that Fisher & Richardson (a Global IP Law Firm) filed a lien against Anki in mid-2019, stating that Anki had failed to compensate them for patent and trademark prosecution services. When all was said and done, Anki CEO Boris Sofman stated that ultimately a failed round of financing was to blame for Anki's closing, having told employees that a deal had failed to materialize "at the last minute" even though there was acquisition interest from companies such as Microsoft, Amazon, and even Comcast.
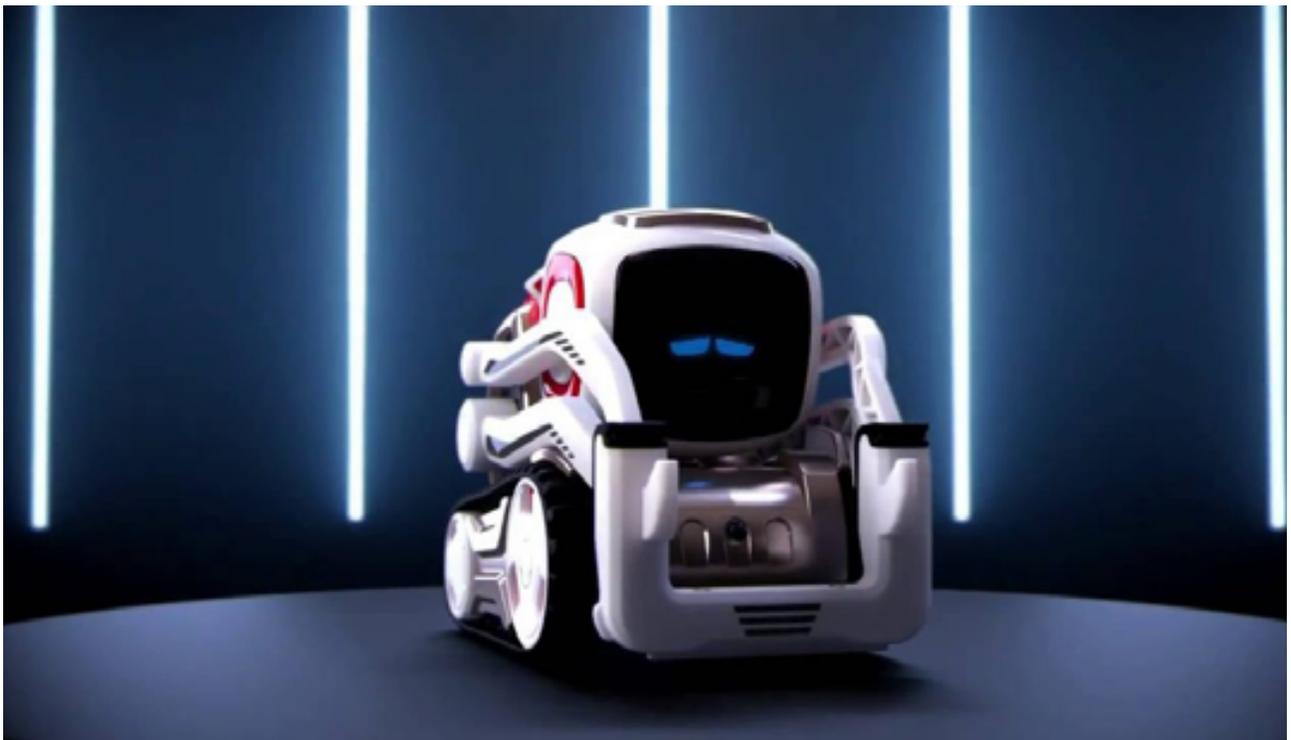
Image source: Anki

Case Study of Failure: Startups Café X & Zume Pizza Struggle to Find Traction

Early in 2020, two once-promising robotics companies faced significant challenges and hard decisions. Café X, an automated coffee shop in San Francisco, closed three of its stores and laid off members of its staff in order to mitigate falling profits. Meanwhile, Zume Pizza, originally meant to be an on-demand, robot-operated pizza shop, closed its doors and laid off over 200 employees. Zume is now becoming a sustainable packaging manufacturer, leaving the world of robots and pizza behind. Without trying to lump these two companies too closely together, generally speaking it appears both suffered a similar fate of bad market fit and perhaps a larger issue of lack of customer understanding.

To dig into Café X's case study a bit, it's not terribly surprising to find them on this side of the list. Customers today (particularly those in San Francisco) have a seemingly endless supply of coffee shops available to them. With a Starbucks, Pete's, Philz, and many other small coffee chains on every corner in cities like SF, why is having coffee prepared by a robot suddenly going to disrupt the industry?

The differentiator can't be speed: plenty of people are already ordering coffee on their mobile devices before they arrive at their local shop to cut down on wait time. It can't be a better quality of service: Café X was a fully automated solution; other than reliable repetition, there's no real heightened degree of service available to offer. It can't be the "low cost" business model, since Café X required a physical commercial space for each installation and that's not a cheap way to scale a business.

Image source: Café X

All of that said, and to be fair to their achievements, their tech was good. It was entertaining, and it worked well. Despite this, Café X seemed to have misjudged the importance of the human element that is steeped within coffee culture. When the novelty of a robot making coffee wears off, customers will go back to getting their tall blonde latte from Starbucks, and you're left with an expensive chunk of hardware, inside of an expensive piece of real estate, with little cash coming in, and no clear way to pivot the company in order to keep things going. None of this is to say that all automated food startups are doomed to fail in the future simply for entering the space, but the food and restaurant business is a fickle sea to navigate, with or without fancy robots automating portions of the process.

Image source: **Zume Inc. via Facebook**

Case Study of Success: Kiva Systems' Solution Acquisition

Kiva Systems was a robotics company founded by Mick Mountz in 2003. Mountz decided to launch the company after his former employer closed its doors. Realizing that high costs and inefficient processes led to that closure, Mountz decided to launch Kiva Systems, a robotics company dedicated to streamlining the traditional warehouse infrastructure. Tools like conveyor belts and forklifts were replaced by robots in constant motion, moving packages between one another in the most efficient manner possible. Kiva quickly found success, selling its robots to various companies.

One such company was Amazon, which was quickly growing in size. Realizing just how valuable Kiva Systems could be and having the cash on hand, Amazon made its second-largest acquisition (at the time) and purchased KIVA for $777 million. Today, Kiva Systems has been restructured into **Amazon Robotics** and the robots that KIVA developed have remained a foundation for Amazon's use of robotics.

Although this is one of the more prominent stories of a customer acquiring its supplier, it's not a lone incident in the robotics industry. **Shopify recently bought 6 River Systems, FLIR Systems purchased Endeavor Robotics last year,** and **Eddyfi Technologies purchased Inuktun Robotics.**

Image source: Kiva Systems

Case Study of Success: Inuktun & Eddyfi Technologies' Solutions Help Save Lives

Eddyfi
Technologies

Inuktun's success in the field resulted in them being **acquired by Eddyfi Technologies in 2019,** a provider of non-destructive testing and inspection tools. Through this acquisition, Eddyfi has been able to provide more sophisticated machinery to more customers in more industries, expanding its vision of creating a safer workplace. The success of Inuktun and Eddyfi's mission shows that focusing on a singular goal and creating clear, simple, reliable robots leads to the greatest success.

Eddyfi offers a really unique suite of remote operated robot inspection tools for visual inspection and other non-destructive testing. Eddyfi's suite of confined space crawlers come with modular track/drive configurations optimized for certain environments, a suite of sensors, cameras and lighting to explore dark, dirty, and dangerous environments, and a reputation for reliability. These machines can navigate tight, dangerous spaces and provide highly valuable visual and other NDT inspection data back to operators in real-time.

With leaders from the oil & gas, energy, and chemical sectors promising to eliminate confined space entry for humans by the mid-2020s, Eddify is in a great position to capitalize on the lifesaving value their robots deliver. To this day, human inspectors risk their lives entering hazardous and confined spaces to gather high-value inspection data that helps companies maintain critical infrastructure and assets.
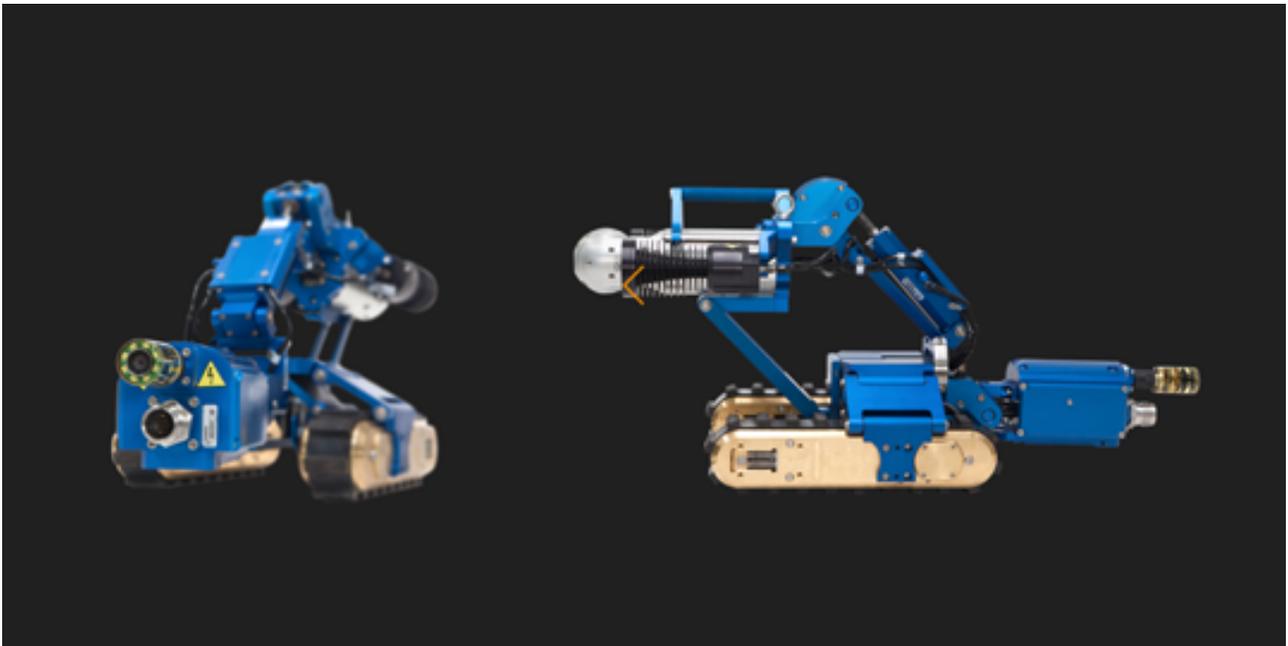

Image source: **Eddyfi Technologies**

Case Study of Success: Blue River Technology Innovated an Industry

Established in 2011, **Blue River Technology** was founded by two Stanford graduates looking to achieve more sustainable agriculture practices. The duo combined robotics with computer vision, a field of artificial intelligence involving image recognition. Blue River accomplished this goal by creating the Lettuce Bot, a robot capable of determining which lettuce plants to remove from a crop in order to yield the best crop results. Automating this time-consuming process saved Blue River's customers significant amounts of money and earned them recognition on a wide scale for proving that robotics and AI have a place in agriculture.

Shortly after the success of its Lettuce Bot, Blue River moved on to create the See & Spray, a solution similar to the Lettuce Bot that uses deep learning to apply its technology to other types of plants, namely soybeans and cotton. See & Spray is able to accurately separate these plants from weeds, greatly reducing the percentage of weeds in any given crop. The improved accuracy and speed of the See & Spray over the Lettuce Bot was enough to win the robotics company several awards in 2017 and led to Blue River being acquired as a subsidiary by agriculture giant John Deere. Blue River remains an independent subsidiary, benefitting from the vast resources and experience of John Deere.
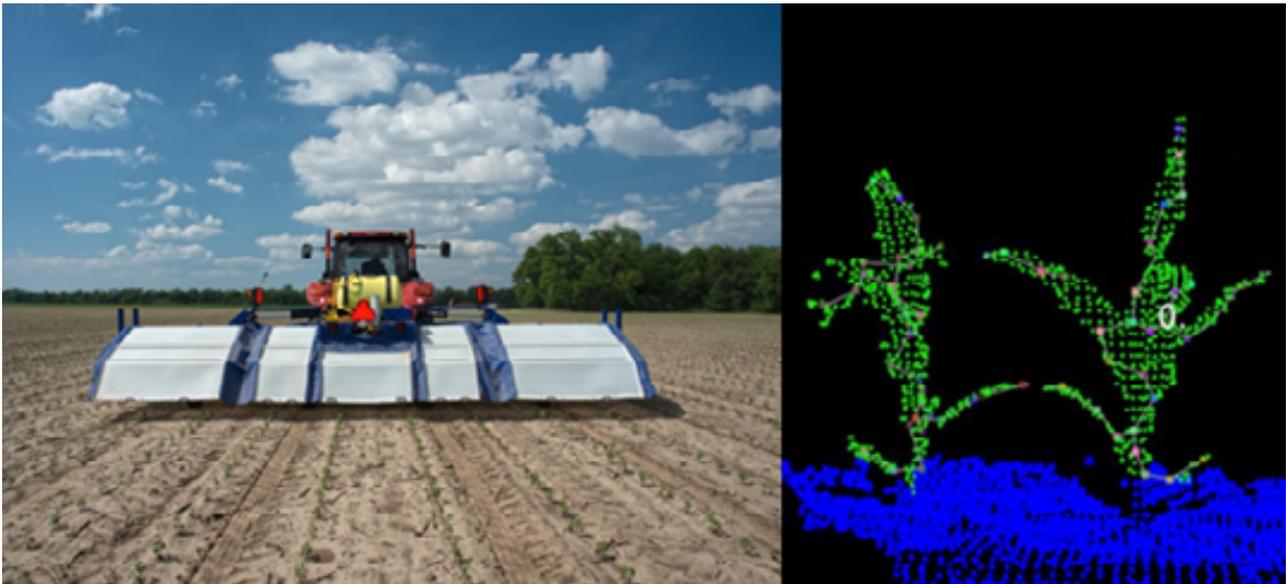

Image source: **Blue River Technology**
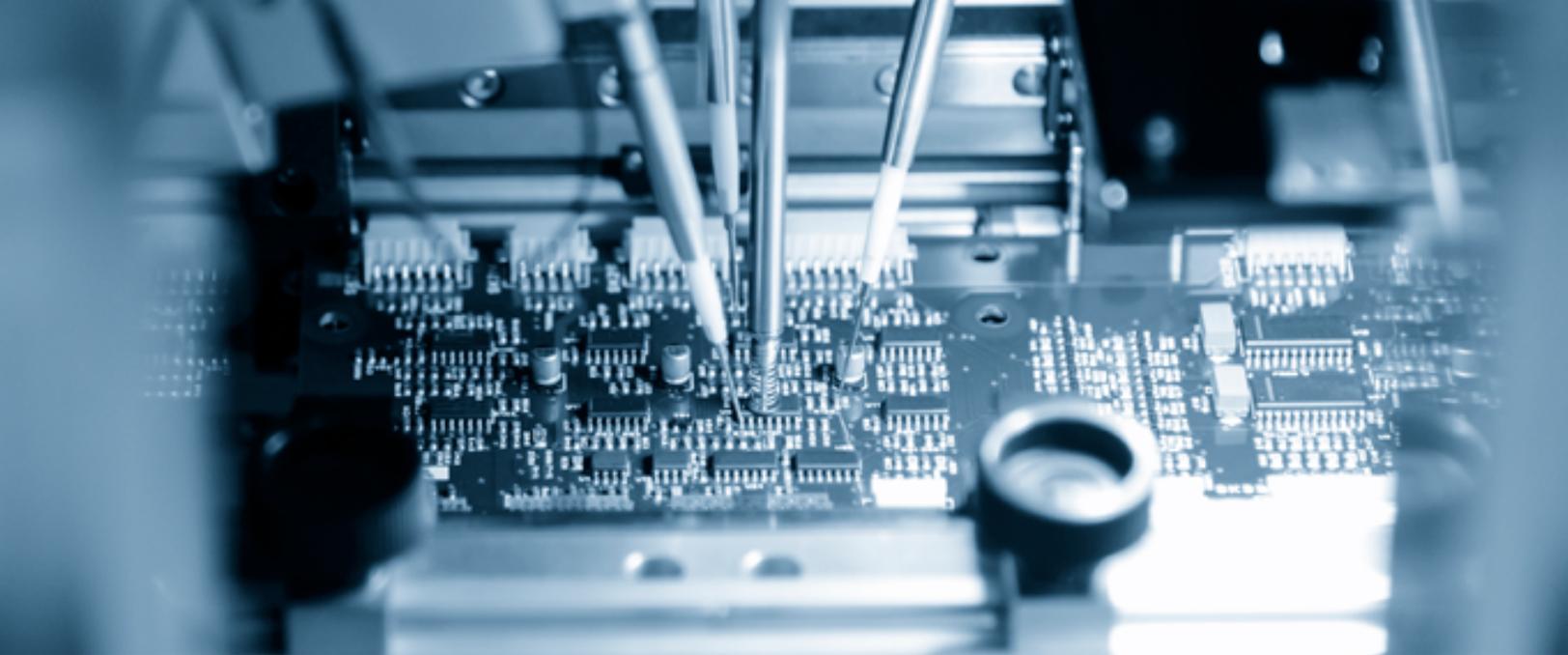
Conclusion

It's clear the past decade has shown incredible innovation and advancement across the robotics spectrum, but it has also left a considerable wake of failed products, bad investments, and likely some bruised egos along the way, as we've detailed in this paper.

Despite this, our team at Fresh believes there are still many reasons to be excited about the future of robotics. We're seeing a lot of evidence the industry is growing stronger and more focused. Some of these positive indicators include:

- VCs are regrouping after some big losses and are actively recalibrating on **new investment models** to better support the needs of new robotics companies and help reduce future investment risks.

- We're seeing more and more **successful robotics exits** take place each quarter (some examples below).

- **New business models and pricing strategies** are emerging, allowing robotics companies to get more creative in how they deliver solutions to market and meet customer demands, needs, and expectations.

- New robotics companies are showing signs they've learned from industry mistakes, and are becoming **savvier in how they approach building and scaling** concepts.

- We're seeing a rise of **more enabling technology companies** with platforms, tools, services, and other critical components that robotics companies can leverage to **streamline and reduce the cost** of robotics development.

- Robotics hardware, sensors, and other critical components continue to get **cheaper, better, faster, stronger, and smaller.**

- Global markets are continuing to change rapidly, with new sectors becoming aware of the **need for robotics and other smart systems** to help meet pressures for increased productivity, throughput, and a declining workforce in key job categories.

Throughout this paper, we've been critical about many of the reasons why robotics companies fail, but it's worth noting there are many robotics companies currently succeeding in the market, or at least showing all of the right signs pointing to that. Judging by the number of robotics companies acquired in 2018 and 2019, it seems like we may be approaching a "second wave" or perhaps a "golden age" of robotics in the coming years. **Pulling from an article in the Robot Report,** these are some of the more notable acquisitions from 2019 alone.

- 6 River Systems - Acquired by Shopify
- Endeavor Robotics - Acquired by FLIR Systems
- Renesas - Acquired by Integrated Device Technology
- Corindus Vascular Robotics - Acquired by Siemens
- CANVAS Technology - Acquired by Amazon
- Drive.ai - Acquired by Apple
- Blackmore Sensors - Acquired by Aurora Innovations
- Kinema Systems - Acquired by Boston Dynamics
- Auris Health - Acquired by J&J
- JR Automation - Acquired by Hitachi
- Root Robotics - Acquired by iRobot
- OrthoSpace - Acquired by Stryker
- Mobius Imaging & Cardan Robotics - ALSO acquired by Stryker

In a recent conversation we had with Andra Keay, Managing Director of Silicon Valley Robotics, she predicts:

"Overall, robotics startups are poised to have a major impact on every industry over the next decade. Various market sectors, [including] agriculture, health, logistics, [and] retail, are crying out for smart automations that can improve their productivity. The most robust startups I've seen in the last decade have sourced their investment in part from the market that needs them."

**Andra Keay, Managing Director
of Silicon Valley Robotics**

While these positive indicators should make you hopeful about the future of robotics, companies looking to increase their odds of market success, or perhaps secure an exit like those shown above, should remember to pay close attention to the themes we've outlined in this paper:

1. **Business Fundamentals**: Physically engineering a robot is one difficult challenge – turning it into a business and running a successful company is an entirely different type of challenge. Make sure to have someone on your team that knows how to also run a business, with all of its challenges.

2. **Market Fit & Timing**: Be strategic about your market fit and timing. Arriving too early, too late, or with the wrong offering all together can be detrimental to your future success. Test early to evaluate fit and interest without betting your product and company on your first take.

3. **User Experience & Integration:** Whatever you do, don't forget to focus on the customer experience. It plays a much bigger role in determining the success or failure of your robotics company than you might think, especially given that industry maturity and workflow integration with something new might already be challenging to begin with.

4. **Choosing the Right Investors & Partners:** Ensure alignment (and expectations) between founders and investors, and look for strategic partners who share a mutual interest in your success. A misaligned vision can cost you vital funding and resources when you need them most.

5. **Focusing on the Right Problem:** Streamline your initial scope by finding the quickest and most cost-effective way to automate a solution for your market's problem, and nothing more. Attempting to deliver too many features and capabilities from day one can deplete capital and resources in record time.

The truth is, that even when robotics companies fail in this volatile market, they don't fail in their mission to push the industry forward. Every robotics startup – failure or success – plays an important role in improving public perception and trust in robotics, and creating new concepts that future robo-preneurs can be inspired by. From our robotics team at Fresh to all the companies we discussed in this paper, we thank you for your passion, creativity, ingenuity, and for having the guts to try and build something innovative. Robotics is hard, and if it were meant to be easy, everyone would be doing it. While the road we've been traveling has been bumpy and dark at times, the road ahead is looking smoother and more promising every day. Let's keep pushing forward together.

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