

Lean Startup

Eric Ries - 2011

Vision

- ❑ In fact, having worked with hundreds of entrepreneurs, I have seen firsthand how often a promising start leads to failure. The grim reality is that most startups fail. Most new products are not successful. Most new ventures do not live up to their potential.
- ❑ Yet the story of perseverance, creative genius, and hard work persists. Why is it so popular? I think there is something deeply appealing about this modern-day rags-to-riches story. It makes success seem inevitable if you just have the right stuff. It means that the mundane details, the boring stuff, the small individual choices don't matter. If we build it, they will come. When we fail, as so many of us do, we have a ready-made excuse: we didn't have the right stuff. We weren't visionary enough or weren't in the right place at the right time.
- ❑ After more than ten years as an entrepreneur, I came to reject that line of thinking. I have learned from both my own successes and failures and those of many others that it's the boring stuff that matters the most. Startup success is not a consequence of good genes or being in the right place at the right time. Startup success can be engineered by following the right process, which means it can be learned, which means it can be taught.
- ❑ There are more entrepreneurs operating today than at any previous time in history. This has been made possible by dramatic changes in the global economy. To cite but one example, one often hears commentators lament the loss of manufacturing jobs in the United States over the previous two decades, but one rarely hears about a corresponding loss of manufacturing capability. That's because total manufacturing output in the United States is increasing (by 15 percent in the last

decade) even as jobs continue to be lost (see the charts below). In effect, the huge productivity increases made possible by modern management and technology have created more productive capacity than firms know what to do with.

- ❑ A comprehensive theory of entrepreneurship should address all the functions of an early-stage venture: vision and concept, product development, marketing and sales, scaling up, partnerships and distribution, and structure and organizational design. It has to provide a method for measuring progress in the context of extreme uncertainty. It can give entrepreneurs clear guidance on how to make the many trade-off decisions they face: whether and when to invest in process; formulating, planning, and creating infrastructure; when to go it alone and when to partner; when to respond to feedback and when to stick with vision; and how and when to invest in scaling the business. Most of all, it must allow entrepreneurs to make testable predictions.
- ❑ When I worked as a programmer, that meant eight straight hours of programming without interruption. That was a good day. In contrast, if I was interrupted with questions, process, or—heaven forbid—meetings, I felt bad. What did I really accomplish that day? Code and product features were tangible to me; I could see them, understand them, and show them off. Learning, by contrast, is frustratingly intangible. The Lean Startup asks people to start measuring their productivity differently. Because startups often accidentally build something nobody wants, it doesn't matter much if they do it on time and on budget. The goal of a startup is to figure out the right thing to build—the thing customers want and will pay for—as quickly as possible. In other words, the Lean Startup is a new way of looking at the development of innovative new products that emphasizes fast iteration and customer insight, a huge vision, and great ambition, all at the same time.
- ❑ turned out to have been utterly flawed. The Lean Startup method, in contrast, is designed to teach you how to drive a startup. Instead of making complex plans that are based on a lot of assumptions, you can make constant adjustments with a steering wheel called the Build-Measure-Learn feedback loop. Through this process of steering, we can learn when and if it's time to make a sharp turn called a pivot or whether we should persevere along our current path. Once we have an engine that's revved up, the Lean Startup offers methods to scale and grow the business with maximum acceleration.
- ❑ Startups also have a true north, a destination in mind: creating a thriving and world-changing business. I call that a startup's vision. To achieve that vision, startups employ a strategy, which includes a business model, a product road map, a point of view about partners and competitors, and ideas about who the customer will be. The product is the end result of this strategy (see the chart on this page).
- ❑ Products change constantly through the process of optimization, what I call tuning the engine. Less frequently, the strategy may have to change (called a pivot). However, the overarching vision rarely changes. Entrepreneurs are committed to seeing the startup through to that destination. Every setback is an opportunity for learning how to get where they want to go (see the chart below).

- ❑ A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty.
- ❑ We often lose sight of the fact that a startup is not just about a product, a technological breakthrough, or even a brilliant idea. A startup is greater than the sum of its parts; it is an acutely human enterprise.
- ❑ To open up a new business that is an exact clone of an existing business all the way down to the business model, pricing, target customer, and product may be an attractive economic investment, but it is not a startup because its success depends only on execution—so much so that this success can be modeled with high accuracy. (This is why so many small businesses can be financed with simple bank loans; the level of risk and uncertainty is understood well enough that a loan officer can assess its prospects.)
- ❑ Usually, companies like Intuit fall into the trap described in Clayton Christensen's *The Innovator's Dilemma*: they are very good at creating incremental improvements to existing products and serving existing customers, which Christensen called sustaining innovation, but struggle to create breakthrough new products—disruptive innovation—that can create new sustainable sources of growth.
- ❑ Brad explained to me how they hold themselves accountable for their new innovation efforts by measuring two things: the number of customers using products that didn't exist three years ago and the percentage of revenue coming from offerings that did not exist three years ago.
- ❑ As Cook says, "Developing these experimentation systems is the responsibility of senior management; they have to be put in by the leadership. It's moving leaders from playing Caesar with their thumbs up and down on every idea to—instead—putting in the culture and the systems so that teams can move and innovate at the speed of the experimentation system."
- ❑ However, learning is cold comfort to employees who are following an entrepreneur into the unknown. It is cold comfort to the investors who allocate precious money, time, and energy to entrepreneurial teams. It is cold comfort to the organizations—large and small—that depend on entrepreneurial innovation to survive. You can't take learning to the bank; you can't spend it or invest it. You cannot give it to customers and cannot return it to limited partners. Is it any wonder that learning has a bad name in entrepreneurial and managerial circles?
- ❑ Yet if the fundamental goal of entrepreneurship is to engage in organization building under conditions of extreme uncertainty, its most vital function is learning. We must learn the truth about which elements of our strategy are working to realize our vision and which are just crazy. We must learn what customers really want, not what they say they want or what we think they should want. We must discover whether we are on a path that will lead to growing a sustainable business.
- ❑ Validated learning is not after-the-fact rationalization or a good story designed to hide failure. It is a rigorous method for demonstrating progress when one is embedded in the soil of extreme uncertainty in which startups grow. Validated learning is the process of demonstrating empirically that a team has discovered valuable truths about a startup's present and future business

prospects. It is more concrete, more accurate, and faster than market forecasting or classical business planning. It is the principal antidote to the lethal problem of achieving failure: successfully executing a plan that leads nowhere.

- ❑ IM is an example of a market that involves strong network effects. Like most communication networks, IM is thought to follow Metcalfe's law: the value of a network as a whole is proportional to the square of the number of participants. In other words, the more people in the network, the more valuable the network. This makes intuitive sense: the value to each participant is driven primarily by how many other people he or she can communicate with. Imagine a world in which you own the only telephone; it would have no value. Only when other people also have a telephone does it become valuable.
- ❑ Lean thinking defines value as providing benefit to the customer; anything else is waste. In a manufacturing business, customers don't care how the product is assembled, only that it works correctly. But in a startup, who the customer is and what the customer might find valuable are unknown, part of the very uncertainty that is an essential part of the definition of a startup. I realized that as a startup, we needed a new definition of value. The real progress we had made at IMVU was what we had learned over those first months about what creates value for customers.
- ❑ For one thing, think of all the debate and prioritization of effort that went into features that customers would never discover. If we had shipped sooner, we could have avoided that waste. Also consider all the waste caused by our incorrect strategic assumptions.
- ❑ We adopted the view that our job was to find a synthesis between our vision and what customers would accept; it wasn't to capitulate to what customers thought they wanted or to tell customers what they ought to want.
- ❑ The Lean Startup is not a collection of individual tactics. It is a principled approach to new product development. The only way to make sense of its recommendations is to understand the underlying principles that make them work.
- ❑ Instead, the way forward is to learn to see every startup in any industry as a grand experiment. The question is not "Can this product be built?" In the modern economy, almost any product that can be imagined can be built. The more pertinent questions are "Should this product be built?" and "Can we build a sustainable business around this set of products and services?" To answer those questions, we need a method for systematically breaking down a business plan into its component parts and testing each part empirically.
- ❑ I come across many startups that are struggling to answer the following questions: Which customer opinions should we listen to, if any? How should we prioritize across the many features we could build? Which features are essential to the product's success and which are ancillary? What can be changed safely, and what might anger customers? What might please today's customers at the expense of tomorrow's? What should we work on next?
- ❑ The value hypothesis tests whether a product or service really delivers value to customers once they are using it. What's a good indicator that employees find donating their time valuable? We

could survey them to get their opinion, but that would not be very accurate because most people have a hard time assessing their feelings objectively.

- ❑ In the Lean Startup model, an experiment is more than just a theoretical inquiry; it is also a first product.
- ❑ “Traditionally, the product manager says, ‘I just want this.’ In response, the engineer says, ‘I’m going to build it.’ Instead, I try to push my team to first answer four questions: 1. Do consumers recognize that they have the problem you are trying to solve? 2. If there was a solution, would they buy it? 3. Would they buy it from us? 4. Can we build a solution for that problem?” The common tendency of product development is to skip straight to the fourth question and build a solution before confirming that customers have the problem.
- ❑ “Success is not delivering a feature; success is learning how to solve the customer’s problem.”

Steer

- ❑ We can visualize this three-step process with this simple diagram: This Build-Measure-Learn feedback loop is at the core of the Lean Startup model.
- ❑ Once clear on these leap-of-faith assumptions, the first step is to enter the Build phase as quickly as possible with a minimum viable product (MVP). The MVP is that version of the product that enables a full turn of the Build-Measure-Learn loop with a minimum amount of effort and the least amount of development time. The minimum viable product lacks many features that may prove essential later on. However, in some ways, creating a MVP requires extra work: we must be able to measure its impact. For example, it is inadequate to build a prototype that is evaluated solely for internal quality by engineers and designers. We also need to get it in front of potential customers to gauge their reactions. We may even need to try selling them the prototype, as we’ll soon see. When we enter the Measure phase, the biggest challenge will be determining whether the product development efforts are leading to real progress. Remember, if we’re building something that nobody wants, it doesn’t much matter if we’re doing it on time and on budget. The method I recommend is called innovation accounting, a quantitative approach that allows us to see whether our engine-tuning efforts are bearing fruit. It also allows us to create learning milestones, which are an alternative to traditional business and product milestones. Learning milestones are useful for entrepreneurs as a way of assessing their progress accurately and objectively; they are also invaluable to managers and investors who must hold entrepreneurs accountable. However, not all metrics are created equal, and in Chapter 7 I’ll clarify the danger of vanity metrics in contrast to the nuts-and-bolts usefulness of actionable metrics, which help to analyze customer behavior in ways that support innovation accounting.

- ❑ Finally, and most important, there's the pivot. Upon completing the Build-Measure-Learn loop, we confront the most difficult question any entrepreneur faces: whether to pivot the original strategy or persevere. If we've discovered that one of our hypotheses is false, it is time to make a major change to a new strategic hypothesis.
- ❑ The Lean Startup method builds capital-efficient companies because it allows startups to recognize that it's time to pivot sooner, creating less waste of time and money. Although we write the feedback loop as Build-Measure-Learn because the activities happen in that order, our planning really works in the reverse order: we figure out what we need to learn, use innovation accounting to figure out what we need to measure to know if we are gaining validated learning, and then figure out what product we need to build to run that experiment and get that measurement. All of the techniques in Part Two are designed to minimize the total time through the Build-Measure-Learn feedback loop.
- ❑ What differentiates the success stories from the failures is that the successful entrepreneurs had the foresight, the ability, and the tools to discover which parts of their plans were working brilliantly and which were misguided, and adapt their strategies accordingly.
- ❑ The importance of basing strategic decisions on firsthand understanding of customers is one of the core principles that underlies the Toyota Production System. At Toyota, this goes by the Japanese term *genchi gembutsu*, which is one of the most important phrases in the lean manufacturing vocabulary.
- ❑ There are two ever-present dangers when entrepreneurs conduct market research and talk to customers. Followers of the just-do-it school of entrepreneurship are impatient to get started and don't want to spend time analyzing their strategy. They'd rather start building immediately, often after just a few cursory customer conversations. Unfortunately, because customers don't really know what they want, it's easy for these entrepreneurs to delude themselves that they are on the right path. Other entrepreneurs can fall victim to analysis paralysis, endlessly refining their plans. In this case, talking to customers, reading research reports, and whiteboard strategizing are all equally unhelpful. The problem with most entrepreneurs' plans is generally not that they don't follow sound strategic principles but that the facts upon which they are based are wrong. Unfortunately, most of these errors cannot be detected at the whiteboard because they depend on the subtle interactions between products and customers. If too much analysis is dangerous but none can lead to failure, how do entrepreneurs know when to stop analyzing and start building? The answer is a concept called the minimum viable product, the subject of Chapter 6
- ❑ Before new products can be sold successfully to the mass market, they have to be sold to early adopters. These people are a special breed of customer. They accept—in fact prefer—an 80 percent solution; you don't need a perfect solution to capture their interest.
- ❑ Early adopters use their imagination to fill in what a product is missing. They prefer that state of affairs, because what they care about above all is being the first to use or adopt a new product or technology.

- ❑ Minimum viable products range in complexity from extremely simple smoke tests (little more than an advertisement) to actual early prototypes complete with problems and missing features. Deciding exactly how complex an MVP needs to be cannot be done formulaically. It requires judgment. Luckily, this judgment is not difficult to develop: most entrepreneurs and product development people dramatically overestimate how many features are needed in an MVP. When in doubt, simplify.
- ❑ The lesson of the MVP is that any additional work beyond what was required to start learning is waste, no matter how important it might have seemed at the time.
- ❑ Modern production processes rely on high quality as a way to boost efficiency. They operate using W. Edwards Deming's famous dictum that the customer is the most important part of the production process. This means that we must focus our energies exclusively on producing outcomes that the customer perceives as valuable. Allowing sloppy work into our process inevitably leads to excessive variation. Variation in process yields products of varying quality in the eyes of the customer that at best require rework and at worst lead to a lost customer. Most modern business and engineering philosophies focus on producing high-quality experiences for customers as a primary principle; it is the foundation of Six Sigma, lean manufacturing, design thinking, extreme programming, and the software craftsmanship movement.
- ❑ If we do not know who the customer is, we do not know what quality is.
- ❑ Even a "low-quality" MVP can act in service of building a great high-quality product. Yes, MVPs sometimes are perceived as low-quality by customers. If so, we should use this as an opportunity to learn what attributes customers care about. This is infinitely better than mere speculation or whiteboard strategizing, because it provides a solid empirical foundation on which to build future products.
- ❑ Thus, the Lean Startup method is not opposed to building high-quality products, but only in service of the goal of winning over customers. We must be willing to set aside our traditional professional standards to start the process of validated learning as soon as possible. But once again, this does not mean operating in a sloppy or undisciplined way.
- ❑ As you consider building your own minimum viable product, let this simple rule suffice: remove any feature, process, or effort that does not contribute directly to the learning you seek.
- ❑ The solution to this dilemma is a commitment to iteration. You have to commit to a locked-in agreement—ahead of time—that no matter what comes of testing the MVP, you will not give up hope. Successful entrepreneurs do not give up at the first sign of trouble, nor do they persevere the plane right into the ground. Instead, they possess a unique combination of perseverance and flexibility. The MVP is just the first step on a journey of learning. Down that road—after many iterations—you may learn that some element of your product or strategy is flawed and decide it is time to make a change, which I call a pivot, to a different method for achieving your vision.
- ❑ A startup's job is to (1) rigorously measure where it is right now, confronting the hard truths that assessment reveals, and then (2) devise experiments to learn how to move the real numbers closer to the ideal reflected in the business plan.

- ❑ We all know stories of epic entrepreneurs who managed to pull out a victory when things seemed incredibly bleak. Unfortunately, we don't hear stories about the countless nameless others who persevered too long, leading their companies to failure.
- ❑ Accounting allowed GM to set clear milestones for each of its divisions and then hold each manager accountable for his or her division's success in reaching those goals. All modern corporations use some variation of that approach. Accounting is the key to their success.
- ❑ Unfortunately, standard accounting is not helpful in evaluating entrepreneurs. Startups are too unpredictable for forecasts and milestones to be accurate.
- ❑ How do we know that the changes we've made are related to the results we're seeing? More important, how do we know that we are drawing the right lessons from those changes? To answer these kinds of questions, startups have a strong need for a new kind of accounting geared specifically to disruptive innovation. That's what innovation accounting is.
- ❑ For example, a startup might create a complete prototype of its product and offer to sell it to real customers through its main marketing channel. This single MVP would test most of the startup's assumptions and establish baseline metrics for each assumption simultaneously. Alternatively, a startup might prefer to build separate MVPs that are aimed at getting feedback on one assumption at a time.
- ❑ Before building the prototype, the company might perform a smoke test with its marketing materials. This is an old direct marketing technique in which customers are given the opportunity to preorder a product that has not yet been built. A smoke test measures only one thing: whether customers are interested in trying a product. By itself, this is insufficient to validate an entire growth model. Nonetheless, it can be very useful to get feedback on this assumption before committing more money and other resources to the product.
- ❑ To demonstrate validated learning, the design changes must improve the activation rate of new customers. If they do not, the new design should be judged a failure. This is an important rule: a good design is one that changes customer behavior for the better.
- ❑ Compare two startups. The first company sets out with a clear baseline metric, a hypothesis about what will improve that metric, and a set of experiments designed to test that hypothesis. The second team sits around debating what would improve the product, implements several of those changes at once, and celebrates if there is any positive increase in any of the numbers. Which startup is more likely to be doing effective work and achieving lasting results?
- ❑ To read the graph, you need to understand something called cohort analysis. This is one of the most important tools of startup analytics. Although it sounds complex, it is based on a simple premise. Instead of looking at cumulative totals or gross numbers such as total revenue and total number of customers, one looks at the performance of each group of customers that comes into contact with the product independently. Each group is called a cohort.
- ❑ Lean Startups use it in product development, too. This technique is useful in many types of business, because every company depends for its survival on sequences of customer behavior called flows.

- ❑ This is the pattern: poor quantitative results force us to declare failure and create the motivation, context, and space for more qualitative research. These investigations produce new ideas—new hypotheses—to be tested, leading to a possible pivot. Each pivot unlocks new opportunities for further experimentation, and the cycle repeats. Each time we repeat this simple rhythm: establish the baseline, tune the engine, and make a decision to pivot or persevere.
- ❑ When good results are not forthcoming, business leaders assume that any discrepancy between what was planned and what was built is the cause and try to specify the next iteration in greater detail. As the specifications get more detailed, the planning process slows down, batch size increases, and feedback is delayed.
- ❑ Learning milestones prevent this negative spiral by emphasizing a more likely possibility: the company is executing—with discipline!—a plan that does not make sense. The innovation accounting framework makes it clear when the company is stuck and needs to change direction.
- ❑ Energy invested in success theater is energy that could have been used to help build a sustainable business.
- ❑ Following the lean manufacturing principle of kanban, or capacity constraint, Grockit changed the product prioritization process. Under the new system, user stories were not considered complete until they led to validated learning. Thus, stories could be cataloged as being in one of four states of development: in the product backlog, actively being built, done (feature complete from a technical point of view), or in the process of being validated. Validated was defined as “knowing whether the story was a good idea to have been done in the first place.” This validation usually would come in the form of a split test showing a change in customer behavior but also might include customer interviews or surveys.
- ❑ Most important, teams working in this system begin to measure their productivity according to validated learning, not in terms of the production of new features.
- ❑ When informed that their pet project is a failure, most of us are tempted to blame the messenger, the data, the manager, the gods, or anything else we can think of. That’s why the third A of good metrics, “auditable,” is so essential. We must ensure that the data is credible to employees.
- ❑ Three months later, David had built the functionality he had promised, based on those early letters of intent. But when he went back to companies to collect his checks, he discovered more problems. Company after company procrastinated, delayed, and ultimately passed up the opportunity. Although they had been excited enough to sign a letter of intent, closing a real sale was much more difficult. It turned out that those companies were not early adopters.
- ❑ A STARTUP’S RUNWAY IS THE NUMBER OF PIVOTS IT CAN STILL MAKE
- ❑ The true measure of runway is how many pivots a startup has left: the number of opportunities it has to make a fundamental change to its business strategy. Measuring runway through the lens of pivots rather than that of time suggests another way to extend that runway: get to each pivot faster. In other words, the startup has to find ways to achieve the same amount of validated learning at lower cost or in a shorter time.

- ❑ First, vanity metrics can allow entrepreneurs to form false conclusions and live in their own private reality.
- ❑ Second, when an entrepreneur has an unclear hypothesis, it's almost impossible to experience complete failure, and without failure there is usually no impetus to embark on the radical change a pivot requires. As I mentioned earlier, the failure of the "launch it and see what happens" approach should now be evident: you will always succeed—in seeing what happens.
- ❑ A new startup in Silicon Valley called Path was started by experienced entrepreneurs: Dave Morin, who previously had overseen Facebook's platform initiative; Dustin Mierau, product designer and cocreator of Macster; and Shawn Fanning of Napster fame. They decided to release a minimum viable product in 2010. Because of the high-profile nature of its founders, the MVP attracted significant press attention, especially from technology and startup blogs. Unfortunately, their product was not targeted at technology early adopters, and as a result, the early blogger reaction was quite negative. (Many entrepreneurs fail to launch because they are afraid of this kind of reaction, worrying that it will harm the morale of the entire company. The allure of positive press, especially in our "home" industry, is quite strong.)
- ❑ Many people have had the experience of being overconnected on existing social networks, sharing with past coworkers, high school friends, relatives, and colleagues. Such broad groups make it hard to share intimate moments. Path took an unusual approach. For example, it limited the number of connections to fifty, based on brain research by the anthropologist Robin Dunbar at Oxford. His research suggests that fifty is roughly the number of personal relationships in any person's life at any given time.
- ❑ The decision to pivot is emotionally charged for any startup and has to be addressed in a structured way. One way to mitigate this challenge is to schedule the meeting in advance. I recommend that every startup have a regular "pivot or persevere" meeting. In my experience, less than a few weeks between meetings is too often and more than a few months is too infrequent. However, each startup needs to find its own pace.
- ❑ *Zoom-in Pivot*: In this case, what previously was considered a single feature in a product becomes the whole product.
- ❑ *Zoom-out Pivot*: In the reverse situation, sometimes a single feature is insufficient to...
- ❑ *Customer Segment Pivot*: In this pivot, the company realizes that the product it is building solves a real problem for real customers but that they are not the type of...
- ❑ *Customer Need Pivot*: As a result of getting to know customers extremely well, it sometimes becomes clear that the problem we're trying to solve for them is not very important. However, because of this customer intimacy, we often discover other related problems that are important and can be solved by our team. In many cases, these related problems may require little more than repositioning the existing product. In other cases, it may require a completely new product. Again, this is a case where the product...
- ❑ *Platform Pivot*: A platform pivot refers to a change from an application to a...

- ❑ *Business Architecture Pivot*: This pivot borrows a concept from Geoffrey Moore, who observed that companies generally follow one of two major business architectures: high margin, low volume (complex systems model) or low margin, high volume (volume operations model).⁶ The former commonly is associated with business to business (B2B) or enterprise sales cycles, and the latter with consumer products (there are notable exceptions). In a business architecture pivot, a startup switches architectures. Some companies change from high margin, low volume by going mass...
- ❑ *Value Capture Pivot*: There are many ways to capture the value a company creates. These methods are referred to commonly as monetization or revenue models. These terms are much too limiting. Implicit in the idea of monetization is that it is a separate “feature” of a product that can be added or removed at will. In reality, capturing value is an intrinsic part of the product hypothesis. Often, changes to the way a company...
- ❑ *Engine of Growth Pivot*: As we’ll see in Chapter 10, there are three primary engines of growth that power startups: the viral, sticky, and paid growth models. In this type of pivot, a company changes its growth strategy to seek faster or more profitable growth.
- ❑ *Channel Pivot*: In traditional sales terminology, the mechanism by which a company delivers its product to customers is called the sales channel or distribution channel. For example, consumer packaged goods are sold in a grocery store, cars are sold in dealerships, and much enterprise software is sold...
- ❑ *Technology Pivot*: Occasionally, a company discovers a way to achieve the same solution by using a completely different technology. Technology pivots are much more common in established businesses. In other words, they are a sustaining innovation, an incremental improvement designed to appeal to and retain an existing customer base...

Accelerate

- ❑ A pivot is not just an exhortation to change. Remember, it is a special kind of structured change designed to test a new fundamental hypothesis about the product, business model, and engine of growth. It is the heart of the Lean Startup method. It is what makes the companies that follow Lean Startup resilient in the face of mistakes: if we take a wrong turn, we have the tools we need to realize it and the agility to find another path.
- ❑ From the point of view of individual efficiency, working in large batches makes sense. It also has other benefits: it promotes skill building, makes it easier to hold individual contributors accountable, and, most important, allows experts to work without interruption. At least that’s the theory. Unfortunately, reality seldom works out that way.

- ❑ These problems inevitably turn into interruptions for the designer, and now those interruptions are interfering with the next large batch the designer is supposed to be working on. If the drawings need to be redone, the engineers may become idle while they wait for the rework to be completed. If the designer is not available, the engineers may have to redo the designs themselves. This is why so few products are actually built the way they are designed.
- ❑ Large batches tend to grow over time. Because moving the batch forward often results in additional work, rework, delays, and interruptions, everyone has an incentive to do work in ever-larger batches, trying to minimize this overhead. This is called the large-batch death spiral because, unlike in manufacturing, there are no physical limits on the maximum size of a batch.
- ❑ I worked at a company that entered this death spiral. We had been working for months on a new version of a really cool product. The original version had been years in the making, and expectations for the next release were incredibly high. But the longer we worked, the more afraid we became of how customers would react when they finally saw the new version. As our plans became more ambitious, so too did the number of bugs, conflicts, and problems we had to deal with. Pretty soon we got into a situation in which we could not ship anything. Our launch date seemed to recede into the distance. The more work we got done, the more work we had to do. The lack of ability to ship eventually precipitated a crisis and a change of management, all because of the trap of large batches.
- ❑ Sustainable growth is characterized by one simple rule: New customers come from the actions of past customers.
- ❑ In a great market—a market with lots of real potential customers—the market pulls product out of the startup. This is the story of search keyword advertising, Internet auctions, and TCP/IP routers. Conversely, in a terrible market, you can have the best product in the world and an absolutely killer team, and it doesn't matter—you're going to fail.³
- ❑ Chapter 6 emphasized the importance of building the minimum viable product in such a way that it contains no additional features beyond what is required by early adopters. Following that strategy successfully will unlock an engine of growth that can reach that target audience. However, making the transition to mainstream customers will require tremendous additional work.⁴ Once we have a product that is growing among early adopters, we could in theory stop work in product development entirely. The product would continue to grow until it reached the limits of that early market. Then growth would level off or even stop completely. The challenge comes from the fact that this slowdown might take months or even years to take place. Recall from Chapter 8 that IMVU failed this test—at first—for precisely this reason.
- ❑ We saw an example of speed regulation in Chapter 9 with the use of the andon cord in systems such as continuous deployment. It is epitomized in the paradoxical Toyota proverb, "Stop production so that production never has to stop." The key to the andon cord is that it brings work to a stop as soon as an uncorrectable quality problem surfaces—which forces it to be investigated. This is one of the most important discoveries of the lean manufacturing movement: you cannot trade quality for time. If you are causing (or missing) quality problems now, the resulting defects

will slow you down later. Defects cause a lot of rework, low morale, and customer complaints, all of which slow progress and eat away at valuable resources.

- ❑ When I teach the Lean Startup approach to entrepreneurs with an engineering background, this is one of the hardest concepts to grasp. On the one hand, the logic of validated learning and the minimum viable product says that we should get a product into customers' hands as soon as possible and that any extra work we do beyond what is required to learn from customers is waste. On the other hand, the Build-Measure-Learn feedback loop is a continuous process. We don't stop after one minimum viable product but use what we have learned to get to work immediately on the next iteration.
- ❑ Having a low-quality product can inhibit learning when the defects prevent customers from experiencing (and giving feedback on) the product's benefits.
- ❑ The alternative is to use a system called the Five Whys to make incremental investments and evolve a startup's processes gradually. The core idea of Five Whys is to tie investments directly to the prevention of the most problematic symptoms. The system takes its name from the investigative method of asking the question "Why?" five times to understand what has happened (the root cause). If you've ever had to answer a precocious child who wants to know "Why is the sky blue?" and keeps asking "Why?" after each answer, you're familiar with it. This technique was developed as a systematic problem-solving tool by Taiichi Ohno, the father of the Toyota Production System. I have adapted it for use in the Lean Startup model with a few changes designed specifically for startups.
- ❑ Five Whys provides an opportunity to discover what that human problem might be. Taiichi Ohno gives the following example: When confronted with a problem, have you ever stopped and asked why five times? It is difficult to do even though it sounds easy. For example, suppose a machine stopped functioning: 1. Why did the machine stop? (There was an overload and the fuse blew.) 2. Why was there an overload? (The bearing was not sufficiently lubricated.) 3. Why was it not lubricated sufficiently? (The lubrication pump was not pumping sufficiently.) 4. Why was it not pumping sufficiently? (The shaft of the pump was worn and rattling.) 5. Why was the shaft worn out? (There was no strainer attached and metal scrap got in.) Repeating "why" five times, like this, can help uncover the root problem and correct it. If this procedure were not carried through, one might simply replace the fuse or the pump shaft. In that case, the problem would recur within a few months. The Toyota production system has been built on the practice and evolution of this scientific approach. By asking and answering "why" five times, we can get to the real cause of the problem, which is often hidden behind more obvious symptoms.