

# DESIGN THINKING AND LEAN STARTUP: A PROCESS TO DESIGN, TEST, AND LAUNCH YOUR STARTUP

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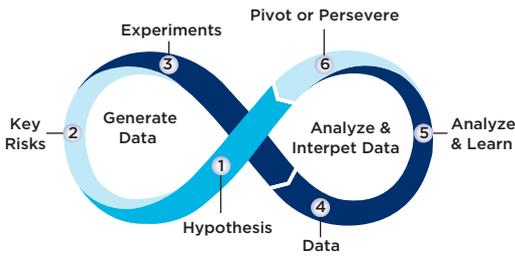
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Startup Garage is an experiential entrepreneurship course I teach at the Stanford University Graduate School of Business. Each year, about 50 teams go through that course and between 5 and 10 teams end up launching a venture based on the work they completed in the course. Companies such as ePocrates, Trulia, SoFi, DoorDash, and BipSync came from the course. Importantly, numerous other aspiring entrepreneurs launched their careers using the process and tools they learned in the course. In this short chapter, I want to share with you the key elements of the process—we call it the Startup Garage process—we teach in that course. This chapter begins with a description of the two key methodologies that provide the building blocks for the Startup Garage process: Lean Startup and Design Thinking. It then provides a description of the integrated Startup Garage process that combines these two building blocks and concludes with a description of the role of the team in the process.

## LEAN STARTUP

Lean Startup<sup>1,2,3</sup> begins with the premise that a startup is a set of hypotheses about the startup's business model. The entrepreneur's goal is to prove or disprove these hypotheses using experimental data. The methodology proceeds in a cycle as follows (see Figure 1): Formulate the key business hypothesis, identify the key risks in your business hypothesis (i.e., critical assumptions on which the viability of the business rests), design an experiment to collect data to assess these risks, collect the data, analyze and determine whether they prove or disprove the key business hypothesis, and then decide whether you will persevere (continue on the same path), pivot (make a critical change in the business hypothesis), or abandon the project.

The key principle behind this methodology is that it is impossible to know whether your hypothesis about the business is correct unless you test it and collect real data. The methodology is an antidote to a common form of bias that plagues entrepreneurs, unbridled optimism that disregards any data that contradict the

**FIGURE 1** The Lean Startup Innovation Cycle

entrepreneur's hypothesis until it is too late. The methodology aims to balance that optimism with rigor and data that can guide the entrepreneur and his or her team through the process of starting a business.

The key elements of this methodology are first, the business hypothesis, which is typically framed using a versatile tool called the Business Model Canvas<sup>4</sup> (see Figure 2). This tool provides a common language for summarizing how the business will create and capture value, and it divides the business model into its key elements. Second is the minimal viable product: a minimal version of the product that gains customer traction. The goal of the entrepreneur is to discover this minimal viable product through a series of experiments. Third is the pivot or persevere decision, a decision to either stay the course or make a radical change, informed by the data gathered through the experiment.

*Wealthfront: A lean startup case study.* Wealthfront was cofounded by Andy Ratchleff in 2008, and it initially operated as an investment manager marketplace in which clients would find outstanding managers to manage the U.S. public equities portion of their portfolio. In early 2011, Wealthfront's managers outperformed the U.S. market by 4%. However, this was not impressing its customers and Wealthfront was not gaining adequate traction. Andy picked up the phone and spoke to some of its customers to find out what was going on. He learned that they did not want someone to manage part of their portfolio exceptionally well but rather someone to manage their complete portfolio adequately and inexpensively. Andy and his team developed a paper prototype of an automated

financial advice service that would do exactly that. They shared the paper prototype with roughly 40 potential customers and walked them through the specific advice the tool would provide to them using paper and pencil (this is referred to as the concierge minimal viable product). They received consistent and enthusiastic feedback. With that information at hand, Andy refocused the team on the development of an online financial advisor that was launched in December 2011<sup>5</sup>. The product was exceptionally well received, and the startup is now growing and thriving.

This short case demonstrates how Andy tried to understand why the first generation of its service was not gaining traction. He used the data to propose a new service and value proposition which he tested using low-resolution concierge minimal viable product. Armed with that information, Andy led the company through a successful pivot.

This methodology brings a much needed rigor into the process of starting a new venture, but it is not without its limitations. First, it is unclear how the original hypothesis is to be generated. And second, there is a lot of ambiguity in how the pivot-or-persevere decision is to be made. Design thinking, the second methodology we will introduce, provides a process for generating the original hypothesis and also a high-level vision that can guide the pivot or persevere decision.

## Design Thinking

Design thinking is a process developed by the design firm IDEO<sup>6,7</sup> and taught extensively at the Stanford design school (affectionately referred to as "d.school"<sup>8</sup>). It focuses on understanding the customer deeply through meaningful empathetic interactions and using low-resolution, rapid prototyping to develop and test solutions. The visual representation of the process in Figure 3 (and description below) outlines its key steps<sup>9</sup>.

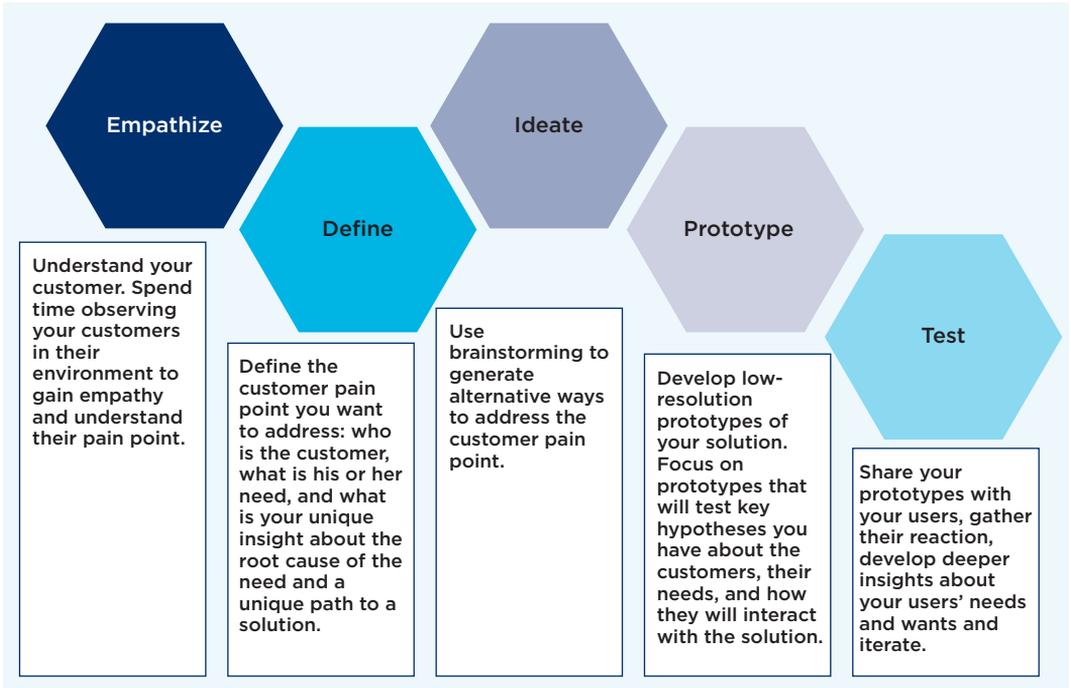
This process relies on the following principles:

1. Do not solve your own problems—solve someone else's problems. To be able to do that,

FIGURE 2 The Business Model Canvas

Designed for:		Designed by:		On: Day <input style="width: 50px;" type="text"/>	Month <input style="width: 50px;" type="text"/>	Year <input style="width: 50px;" type="text"/>		
Iteration: No. <input style="width: 100px;" type="text"/>								
<b>Key Partners</b> <p>Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?</p> <p><b>MOTIVATIONS FOR PARTNERSHIPS:</b> <i>Optimization and economy Reduction of risk and uncertainty Acquisition of particular resources and activities</i></p>	<b>Key Activities</b> <p>What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p> <p><b>CATEGORIES</b> <i>Production Problem Solving Platform/Network</i></p>	<b>Value Propositions</b> <p>What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each customer segment? Which customer needs are we satisfying?</p> <p><b>CHARACTERISTICS</b> <i>Newness Performance Customization "Getting the Job Done" Design Brand/Status Price Cost Reduction Risk Reduction Accessibility Convenience/Usability</i></p>	<b>Customer Relationships</b> <p>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?</p> <p><b>EXAMPLES</b> <i>Personal assistance Dedicated Personal Assistance Self-Service Automated Services Communities Co-creation</i></p>	<b>Customer Segments</b> <p>For whom are we creating value? Who are our most important customers?</p> <p><i>Mass Market Niche Market Segmented Diversified Multi-sided Platform</i></p>	<b>Key Resources</b> <p>What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p> <p><b>Types of resources</b> <i>Physical Intellectual (brand patents, copyrights, data) Human Financial</i></p>	<b>Channels</b> <p>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines?</p> <p><b>CHANNEL PHASES:</b> <i>1. Awareness How do we raise awareness about our company's products and services? 2. Evaluation How do we help customers evaluate our organization's Value Proposition? 3. Purchase How do we allow customers to purchase specific products and services? 4. Delivery How do we deliver a Value Proposition to customers? 5. After sales How do we provide post-purchase customer support?</i></p>		
<b>Cost Structure</b> <p>What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?</p> <p><b>Is your business more:</b> <i>Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing) Value Driven (focused on value creation, premium value proposition)</i></p> <p><b>Sample characteristics:</b> <i>Fixed Costs (salaries, rents, utilities) Variable costs Economies of scale Economies of scope</i></p>			<b>Revenue Streams</b> <p>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> <b>TYPES:</b> <i>Asset sale Usage fee Subscription Fees Lending/Renting/Leasing Licensing Brokerage fees Advertising</i> </td> <td style="width: 33%; vertical-align: top;"> <b>FIXED PRICING</b> <i>List Price Product feature dependent Customer segment dependent Volume dependent</i> </td> <td style="width: 33%; vertical-align: top;"> <b>DYNAMIC PRICING</b> <i>Negotiation (bargaining) Yield Management Real-time-Market</i> </td> </tr> </table>			<b>TYPES:</b> <i>Asset sale Usage fee Subscription Fees Lending/Renting/Leasing Licensing Brokerage fees Advertising</i>	<b>FIXED PRICING</b> <i>List Price Product feature dependent Customer segment dependent Volume dependent</i>	<b>DYNAMIC PRICING</b> <i>Negotiation (bargaining) Yield Management Real-time-Market</i>
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FIGURE 3 The Design Thinking Process



you need to spend time with your potential customers and understand their day and their workflow and their experience from their perspective, not yours.

2. Do not jump into solutions before you can define the problem. Be clear what is the problem you want to address and maniacally focus on solving it.
3. Do not let the perfect be the enemy of good enough. At early stages of the development of a new solution, you do not know enough about the problem you are trying to solve. Low-resolution prototypes can help you quickly discover the problem and the solution.
4. Bias for action. You want to maximize your learning by accelerating the time to a prototype and testing multiple prototypes rapidly.
5. Divergent thinking—encourage wild, even crazy, solutions to open up the space of possible solutions and thus create unique and unpredictable approaches to the problem.

This process can be viewed simultaneously as a problem-definition/problem-solving methodology and a toolbox for stimulating creativity. Specifically, the empathize and define steps in the process focus on problem definition and the ideate and prototyping steps focus on problem solving. And the test step simply tests to see whether the solution solves the problem. In this last step, you can discover that the solution works but needs changes or it doesn't. The testing stage may highlight the need to change the solution completely, but oftentimes it leads to rethinking the problem statement. As a toolbox for stimulating creativity, design thinking relies on an approach that considers multiple alternatives in both defining the problem statement and generating solutions. This is known as divergent thinking and is central to the design thinking process.

Design thinking relies on intuition, insights, and small scale qualitative interactions between the “designers” and their “customers” to uncover

unmet customer needs and explore new ways to solve them. It allows rapid progress and provides the basis for gaining deep customer insights. However, it also has its limitations: it does not provide clear guidance to determine when a solution is good enough, and it does not provide tools to consider the business aspects of the solution. Questions like what is the business model, or is the solution economically viable, cannot be addressed effectively with design thinking.

### The Startup Garage Innovation Process: Integrating Design Thinking and Lean Startup

At Startup Garage, the course I teach at Stanford, we have merged the two processes into an integrated process, called the Startup Garage Innovation Process, in which the students begin with design thinking to identify an unmet customer need and develop low-resolution prototypes and then progress into lean startup, in which they translate those needs and prototypes into business model canvases, minimal viable products, and experiments that supplement qualitative responses to few prototype tests followed by quantitative responses in more extensive tests. Our intention is to use the best of both worlds and develop an approach that leverages the strengths of the two foundational processes (design thinking, lean startup) and use each one to address the limitations of the other.

A visual representation of the process is provided below in Figure 4.

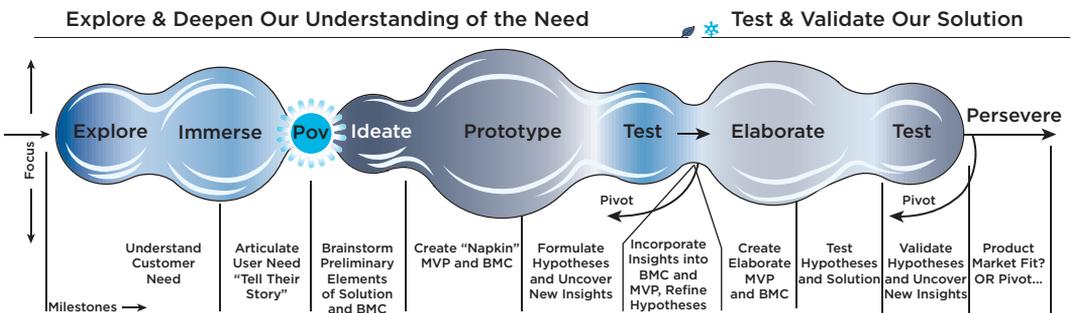
We will now provide more details about the steps of this integrated process.

### EXPLORE AND DEEPEN OUR UNDERSTANDING OF THE NEED

The purpose of this stage in the process is to develop an understanding of the customer, his or her needs, and develop a range of possible solutions with associated business models. The entrepreneur and his or her team spends the first month learning about the customer through direct observations, interviews, and immersion in the customer’s environment. Teams spend time with customers at their place of business or at their homes, they ask questions, make observations, gather data. At the end they summarize the information they have gathered into a list of pain points and a description of customers and their behaviors. This culminates in multiple points of view describing the customer’s problems. These points of view include a description of the customer, his or her pain point, and why this pain point is compelling. An example of a point of view is as follows:

George, a conscientious knowledge worker with average computing skills, **needs** an easy and seamless way to share electronic documents with his coworkers, **because** existing methods are becoming increasingly cumbersome and frustrating in accommodating the proliferation of computing platforms and are making him feel inadequate.

FIGURE 4 The Startup Garage Innovation Process



This point of view represents the customer problem solved by cloud-based document sharing and storage solutions such as DropBox and Box. It can serve as the starting point for understanding the underlying customer pain and generate possible solutions.

Teams usually generate multiple points of view, and then they focus on one based on their subjective assessment of how actionable the point of view is and how big the pain point is. No consideration for market size is made at this point.

The teams then use brainstorming to generate tens of different ways to address the selected pain point and then select one or two approaches based on team excitement, how well the approach fits the need, and team ability to develop a solution. Low-resolution prototypes of the solution are then developed in the form of storyboards, mock-ups, or videos. The team also develops a business model for each of the two solutions using the business model canvas and then performs a very rudimentary market size calculation using a top down market size formula:

$$\text{Total \# of Customers} \times \text{Market Penetration} \times \text{Revenue per Customer per Year}$$

This calculation helps the team determine the magnitude of the opportunity.

The team then shares prototypes and basic pricing information with potential customers. Engaging in open-ended discussions, the team aims to understand whether the proposed solution resonates with the customer. At the first iteration, the most likely outcome is that the team discovers that it did not fully understand the customer need. This can send the team back to the drawing board to refine its points of view. Two or three iterations are typically needed until the team starts receiving consistent responses from the users that the need they are addressing is compelling and the solution is promising. Positive customer response takes the form of consistent willingness from the customer to engage in meaningful value exchanges with

the team: sign up to be a beta tester, commit to codevelop the product, pay a small fee to reserve a fully developed product, or join a customer waiting list. In the absence of evidence of strong positive response, the team keeps iterating but is encouraged to stop after the third iteration and pivot to a different opportunity identified in the early interviews.

When a positive response is obtained, the team now moves to the **Test and Validate the Solution** phase. The first step is to develop a more elaborate model of the business unit economics: the lifetime value of each customer minus the customer acquisition costs. By comparing this calculation to comparable metrics in the industry and customer segments the team is targeting, the team is able to determine key assumptions that would lead into attractive and positive unit economics, and they then design experiments to gather data to support these assumptions. Common assumptions have to do with attrition rates in the customer funnel, customer repeat purchase decisions, etc. The team's goal is to identify the two to three tipping point assumptions, assumptions that can tip the profitability equation with the least change in the underlying assumption. And then the team runs experiments to test these assumptions. These experiments usually take the form of engaging in meaningful value exchanges with customers using a more elaborate prototype, now referred to as the minimal viable product.

As an example, one of our teams wished to develop a turnkey forecasting tool, powered by artificial intelligence tools, to help container transportation companies better match supply and demand. Their minimal viable product took the form of consulting engagement: identify a client and work closely to analyze the client's data and provide a manual solution that demonstrates the potential financial benefits in the context of the client's operations for a given month. The team managed to secure such a client and demonstrated the potential benefits before engaging into the development of the actual tool. This enabled them to launch their sales effort to other potential customers.

Teams are also encouraged to be clear ahead of time what response will be considered affirmative for their assumptions and support that target response using a statement that “if we get X positive responses we know this will lead to a profitable business because it would support the following unit economics.” One of our teams that ended up launching as the company Doordash used a spreadsheet to model their profitability, and they then designed experiments to test assumptions in the spreadsheet. Their target was getting responses that were compatible with the assumptions in their profitability spreadsheet.

*The pivot decision:* Nothing illustrates the process more succinctly than the pivot decision. Once data from experiments are collected, the team meets to decide whether it is time to change directions—make a pivot. The team summarizes all the data supporting the current hypothesis as well as risks to the business model identified either previously or as a result of new data gathered. The team then also considers one or more pivots: changes in key elements of the Business Model Canvas that would address the risks uncovered so far and possibly open up opportunities for more rapid growth. The pivot decision also highlights the iterative nature of the process; the gray arrows in the process diagram in Figure 4 are points where the process can move back to earlier steps. It is common to see 10 teams that started at the same point to be at very different steps of the process 2 months later, based on the data they have collected and pivots they have made.

*The team:* Building a venture and running the Startup Garage process is a team sport. As part of the process we are encouraging our teams to spend time on basic team activities: discussing and deciding on team norms and processes, spending time to understand each other’s values and beliefs and what motivates each team member, and revisiting team norms and processes and their relationships to each other in periodic intervals. Failure to make progress in the process is sometimes due to the opportunity that

the team explores but other times is the result of team dysfunction. Teams should be mindful of the process but also of their team dynamics and pay attention to both.

## CONCLUSION

It is becoming increasingly recognized that startups that succeed follow a systematic, rigorous process of customer need identification, business model hypothesis generation, testing, learning, and iteration. This short chapter has summarized the key steps of the process as used at Stanford’s Startup Garage and as practiced by several startups that were successfully launched from that program.

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