

# Knowing what unknowns to know in entrepreneurship <sup>1</sup>

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Working paper — rev. 3, October 2016

How much should a start-up invest in a distribution plan before it knows whether its technology will work? How much should a start-up invest in a product before it knows whether the market need is real? The answer to these and many similar questions is “not much, possibly nothing.”

Both parts of this answer are revealing. The “possibly nothing” part of the answer reflects the fact that there are many activities that are simply premature in the early stages of a new venture. Building sophisticated systems and processes before there is any business is an exercise in hubris or self-delusion. So why isn’t the answer to the questions posed at the outset, and countless similar questions, always “nothing”? The questions imply a precedence of some questions over others, and logic would seem to dictate that we address first things first. However, the world is not so simple. Questions of market, technology, customer acquisition, partnerships, etc. are often intertwined. Moreover, we must often reach across these functional boundaries to reach convincing answers. Questions about market need or the possibility of partnerships may depend for their resolution on a step forward on technology; questions of technical feasibility may depend on greater clarity about customer and context.

The issues posed by these questions go to the heart of entrepreneurship. A team of entrepreneurs has a good idea for a new venture. What should they do and when should they do it? We know successful entrepreneurship involves an iterative process of testing ideas and revising plans — entrepreneurship involves hypotheses and experiments. But what are the hypotheses that should be tested, when should they be tested, and what is a good experiment?

Success in entrepreneurial ventures is, to a large extent, based on systematically managing uncertainty. For a venture to be successful, many assumptions have to be true, assumptions about the market, technology, etc. Testing these assumptions in a logical order gives the team the best chance of making course corrections early and not wasting too much time and money on a venture that is ultimately not going to be successful. In this essay, I will outline an approach that is the *lowest cost resolution*

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<sup>1</sup> I thank my colleagues in the Strategy area at The Fuqua School of Business at Duke University, in particular Wes Cohen, Ronnie Chatterji, and Victor Bennett for their many helpful comments.

*of uncertainty.* This method involves 1) identifying the assumptions or unknowns; and 2) creating an order of resolving these unknowns based on three parameters: severity, probability, and cost of resolution. Following this method will give the entrepreneurial team the greatest chance of success, avoiding unnecessary waste of time and money.

### **Brief history of an important idea**

Frank Knight<sup>2</sup> was the first to assert that uncertainty was the core idea in understanding entrepreneurship. Knight distinguished uncertainty from risk. In the case of risk, as he defines it, a future state is unknown but there is an objective basis for assigning a probability to various outcomes, for example, the life expectancy of a person or the roll of a pair of sixes in a game of dice. Uncertainty is the case where there is no objective basis for assigning probabilities. The entrepreneur is the person who is willing to undertake economic activity in the face of uncertainty. Knight suggests that entrepreneurs have special insight that allows them to operate effectively in an environment of uncertainty and capitalize on opportunities. Knight's view seems to have stood the test of time — uncertainty lies at the core of entrepreneurship.<sup>3</sup> Decades later, Peter Drucker proposed that the uncertainty of a new venture could be addressed with a discipline that involves market focus and a willingness continually to revise assumptions and plan.<sup>4</sup> Clayton Christensen makes a similar point when he emphasizes “planning to learn” rather than “planning to execute.”<sup>5</sup> Both Drucker and Christensen were concerned primarily with innovation and recognized the importance of focusing on the uncertainty of the market. These insights are also embodied in the advice given to entrepreneurs by experienced investors to focus on value-changing milestones and the efficient use of capital.

In the past few years, these insights have been developed further in the “Lean Start-up” methodology. This method emphasizes early engagement with customers. It recommends customer development over product development and hypothesis testing over detailed planning.<sup>6</sup> Hypothesis testing allows earlier verification of critical assumptions and changes of directions (“pivots”) based on the results of experiments. The Lean methodology identifies the “minimum viable product” as the primary vehicle for experiments. It is, therefore, ideally suited for environments, such as the current “tech” industry, where products can be produced rapidly and modified at low cost. (This is not surprising given the methodology's roots in the discipline of “agile” programming). This methodology does not apply as neatly in areas such as healthcare and space travel. The Lean methodology represents a special case of the more general method advocated here, which is a discipline of

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<sup>2</sup> Knight 1921.

<sup>3</sup> For an extensive discussion of entrepreneurial judgment and uncertainty, see Foss & Klein 2012, especially c. 4.

<sup>4</sup> Drucker 1985, especially pp. 188-196.

<sup>5</sup> Christensen 1997, pp. 160-162.

<sup>6</sup> Blank & Dorf 2012, Blank 2013.

organizing and testing the assumptions underlying the new venture.<sup>7</sup> These various insights and forms of advice are all variations of the same core idea —managing uncertainty lies at the heart of entrepreneurship.

### Managing uncertainty

Uncertainty is due to the very large number of unknowns, primarily about the future. As Knight noted, we have scant evidence to make reliable predictions about these unknowns. However, the entrepreneur, at least implicitly, operates with a preliminary assignment of probabilities to the important unknowns. Furthermore, it is not true to say that this assignment of probabilities is based on no information. The evidence may be flimsy, but the foundation of entrepreneurship includes seeing opportunities that others do not. Whether it was Estee Lauder (and a few other daughters of Russian immigrants) seeing the latent desire for beauty products as women of their generation claimed a more prominent position in society, Howard Schultz seeing the opportunity in a changing America to embrace a version of the café culture of Milan and Italy, or Mark Zuckerberg seeing a latent need for self expression and connection afforded by an on-line version of the college facebook, these entrepreneurs intuited or analogized the existence of an untapped market need. This initial insight is the starting point. If the rest of entrepreneurial action were just a matter of executing well on the initial idea and hoping that you are right, we would have no need for a principle of managing uncertainty. In fact, however, the entrepreneur’s initial idea is almost certainly wrong. The question is not whether the entrepreneur is right or wrong. The question for the entrepreneur is: How close are you to a good idea and how can you get there from where you started? This insight will cause the thoughtful entrepreneur to search for a path, albeit probably a somewhat crooked one, to a viable business idea that can be traveled with the very limited resources available to him or her. This is the lesson of entrepreneurs such as Estee Lauder and Howard Schultz.<sup>8</sup>

Therefore, resolving these unknowns, i.e., learning, and adapting are hallmarks of good entrepreneurial execution. Of course, the entrepreneur is not the only agent who faces uncertainty. Uncertainty is a dominant feature of innovation generally and many other human endeavors. However, what distinguishes entrepreneurship, at least in the business context, is complete flexibility (lack of strategic constraints) coupled with very limited resources. The challenge for entrepreneurs is to define the right experiments and map out a sequence that uses capital and other resources as efficiently as possible. The entrepreneur must find a viable path forward before human and financial capital are exhausted. We can say that the overriding objective of forming a new venture is finding the lowest cost resolution of uncertainty. This much is now widely accepted. But how does the entrepreneur go about achieving

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<sup>7</sup> I am grateful to Wes Cohen for this insight and the clarification that the entrepreneur’s “unit of analysis” is the assumption rather than the product.

<sup>8</sup> See Lauder 1985, especially pp. 28-31 and 80-85 and Schultz & Yang 1997, especially pp. 65-69.

the lowest cost resolution of uncertainty? Is there a single recipe that applies to all start-ups? Or is each case completely idiosyncratic so that a unique path has to be found for each? The enthusiasm surrounding the lean model has created a mindset that entrepreneurs should just launch — fail early and fail often. But failure by itself does not teach us anything. If there are an infinite number of bad ideas, eliminating one of them gets us no closer to a good idea. Firing at and missing the target in the dark gives us no information about where the target is. In this essay, I will outline the principle of the lowest cost resolution of uncertainty. A few examples will illustrate these principles in practice.

### Align technology

Align Technology was a company founded in 1997 in Santa Clara, CA and initially funded by Kleiner Perkins.<sup>9</sup> The company was created to develop a new device for correcting malocclusion (crooked teeth). The product, Invisalign, was introduced in 1999. The product concept was a series of custom-made, clear plastic retainers that would have the ability to move teeth. The premise for the company was that the application of computer modeling and custom manufacturing technologies could turn this concept into a scalable and profitable enterprise. Over the first six years of its existence, Align burned through \$270 million of capital raised from venture capitalists and through an IPO and almost came to an ignominious end before new leadership righted the ship. Almost out of cash and with its stock price at one tenth of the IPO price, the company turned the corner and became cash flow positive. One could argue that, had the company not had the good fortune of a truly compelling value proposition and a product that was significantly superior to the conventional approach in every relevant respect, the company would have ceased to exist. Now, Align is growing rapidly posting 2015 revenue of \$845M and has become the dominant supplier to the orthodontic market. Was the near death experience necessary?

In its early years, Align pursued the conventional strategy of driving for very high growth. In addition, the company recognized that mass customization capabilities would be a source of long-term competitive advantage. Therefore, the company invested heavily in developing and implementing the necessary technology internally rather than developing partnerships to manufacture its product. Finally, the company's original strategy was to target the consumer as its customer, assuming that a motivated consumer would request and receive orthodontic treatment based on Align's Invisalign system from a certified orthodontist. The net result of these three strategic decisions was a very high and ineffective cash burn.

In keeping with the premise that it could create an automated, technology driven manufacturing platform that could deliver the Invisalign product at a fraction of the

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<sup>9</sup> The observations and analysis offered here are from the author's personal experience as vice president of engineering from 2000 till 2004, but the interested reader can get a perspective on the company and its challenges from Bowen and Groberg 2002.

market's willingness to pay, the company projected 60—70% gross margins as the technology matured. This goal has, in fact been achieved, but it took many generations of technology and much trial and error. While the company was working to establish a stable, cost effective manufacturing platform, it was also driving for high growth, with negative gross margins and costly quality issues. Exacerbating the company's problems was a single-minded focus on marketing programs targeting the consumer despite signs that these programs were much less effective than anticipated. This focus resulted in large and relatively ineffective marketing expenditures and an investment in capacity that was significantly misaligned with the demand generated.

Was all this necessary? A more rational approach to building this company would have been to identify and decouple the assumptions that were the basic premises of the company. Put differently, we can think of the original venture as a theory comprising a number of different assumptions. Some of these assumptions involve customers and what they will value, some involve technology and other aspects of production, and some are about the long-term competitive position of the company. An analysis might have suggested testing the market first, validating the assumptions about willingness to adopt among both constituencies served — consumers and orthodontists. The relevant assumptions could have been tested in a few regional markets. Once the basic market need had been established, the company could have tested hypotheses about size of the market, obstacles to adoption, pace of adoption, and, critically, the effectiveness of various approaches to demand creation. On the last point, the company would have discovered early on that it was not patient demand, but rather a combination of patients' awareness and orthodontists' acceptance that was required to drive demand. Of course, testing the market would have involved creating a manufacturing system capable of producing the Invisalign product, but this could have been on a smaller and more controlled scale than the company's actual operations. Such a production facility would have allowed the company to test some aspects of the process that involved interaction with the orthodontist. However, most elements of the system could have been developed and optimized independently of the production system instead of what actually occurred, namely that relatively small advances were put into production and scaled up only to be replaced at great expense by the next relatively small advance. It is worth noting that the Align manufacturing system is very complex, consisting of six discrete and very different process steps (such as 3D scanning, stereolithography, etc.) and a very complex data management and control system. These could easily have been decoupled and optimized separately. Finally, the company would have made its investments in intellectual property protection in parallel but these were naturally separate from the other activities of the firm. Such an approach probably could have created the same company possibly for half the capital and without the trauma of a near death experience.

## Rent the Runway

Another but very different example is Rent the Runway.<sup>10</sup> Rent the Runway has been a terrific success, and has built a base of more than five million clients since its launch in 2009. Contrary to mythology surrounding entrepreneurship, the two founders, Hyman and Fleiss, pursued a very methodical and controlled approach to building their business. To simplify somewhat, the success of their business model rested on the dual pillars of consumer behavior and partnership with designers. They identified the key assumptions in both areas, and tested and revised those assumptions as appropriate. Not until they had built a solid foundation of validated assumptions in these two critical areas did they launch the service. On the side of consumer behavior, they began with the simple thesis that young women would rent dresses. They conducted two market trials at Harvard, which satisfied them that there was a significant willingness to rent. The next step was to determine whether women would rent dresses without trying them on. In a trial at Yale, they found that 75% of the participants rented. Next, they proceeded to the critical thesis that women would be willing to rent dresses on a website. They conducted a trial with a random sample of one thousand women who had expressed interest. However, rather than building a website for the trial, they simply emailed pictures of the dresses as PDFs. Once again, their thesis was validated. Similarly with the designers, they proceeded in a systematic, open-minded way. Here again, they arrived at a conclusion that was satisfactory but this process involved more learning and revision. The discipline that these founders employed rather intuitively involved identifying discrete assumptions and then testing them as economically as possible and in a logical order. If there were any adverse outcomes of these tests, they made revisions and tested again. In contrast to Align Technology, Rent-the-Runway embodies the lowest cost resolution of uncertainty.

## CrowdTunes

To explore the structure of this approach, we will take a more detailed look at a simple example, a recent graduate from the entrepreneurship program at Duke University. CrowdTunes,<sup>11</sup> a tech start-up, has a familiar structure — it is a smartphone app with a server backend. The initial idea was to replace the jukebox with a social experience — allow bar patrons to bid for their chosen music. As with many such businesses, the impetus was the young founders' own experience. The idea seemed appealing to them so they extrapolated that the idea might appeal to people like them. Moreover, if it was appealing to bar patrons, it would probably be attractive to bar owners. How should they proceed? We begin by identifying the important unknowns.

1. Will the activity itself resonate with the intended audience enough that it might become a regular part of going out to bars (i.e., is the need real)?

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<sup>10</sup> See Eisenmann and Winig 2012.

<sup>11</sup> The author worked closely with the company's founders as their primary advisor at Duke during their time in the entrepreneurship program at Duke and then in the first couple of years of operation.

2. Will bar owners find it an attractive complement to their business or a nuisance?
3. Can rights to play music be secured economically?
4. Is there enough of a market to be interesting (number of patrons participating and amount of money bid)?
5. Can customers be acquired economically?
6. If they demonstrate an interesting business opportunity, will an established player simply take it away?

Notice that there is nothing on the initial list about technical feasibility. It may be that there is some issue lurking in the technical details; but this is highly unlikely. The system that needs to be developed involves pieces that are sufficiently well understood that the question of technical feasibility should not be on the initial list. Moreover, the investment required to build such a system can be well enough bounded that not even this question needs to be considered at the outset. Recognize that focusing on these questions does not require a fully functioning company. Recognize further that a positive answer to all of these questions would provide a dramatic step up in our confidence that the venture can succeed, and indeed may give us the confidence to start building out the company. So where to begin? We begin, as all ventures should, with the need.

Question 1 is the foundation for the venture. However, the bar owners are the gatekeepers. If they are not interested, then it will be difficult to get very far. So one reasonable path for these entrepreneurs could be as follows. First, explore the needs and interests of bar owners with the goal of finding a way in so that they can test their idea with bar patrons (question 2). The founders took this step and discovered sufficient interest to proceed. They also discovered that managing music is actually a pain point for bar owners, which constitutes an additional opportunity. The next step was to create a prototype to use as a test vehicle (question 1). Because of the assumption that there are no issues with technical feasibility, a simple system with the minimum necessary function would be sufficient. They could assume that they did not have to worry about the architecture of the system since they could plan to throw the entire prototype away. They managed to find a bright undergraduate engineering student who was able to build a prototype (iPhone only). They tested the idea in a few evenings in a few bars. Initial results were encouraging.

Now things become more complicated. They were able to establish the initial appeal of bidding for songs, but what kind of market did this really represent (question 4)? Would the novelty wear off and usage dwindle? Would this only be interesting on Friday and Saturday nights, or were other days also revenue potential? Are there other sources of revenue open to them? The testing now needs to be more sophisticated. On the positive side, they have discovered that relieving the bars of the music management problem is valuable enough that they may be able to get bars to pay them, instead of having to share revenue with the bars which was their original assumption. They have also discovered additional revenue potential. On the

other hand, revenue from bidding activity has been unpredictable. So they are making adjustments in product and other areas to find the right formula.

After some initial traction is gained, the question of obtaining legal rights becomes more relevant (question 3). Although the team had done a very cursory investigation early on, it became time to investigate more seriously. It was time to invest in reliable legal work to determine what the terms of a license would be for this venture. With more confidence in the revenue model, the team will need to execute those agreements. Similarly, the question of customer acquisition costs (question 5) had been on the table since the outset, but no serious work was done until they had some level of validation of the idea. But now, the team is spending significant effort exploring and testing a variety of distribution alternatives. Finally, the question of competitive threat (question 6) lies in the background. Why won't a company already in the music distribution business simply add a feature that crushes CrowdTunes' chances? This question remains unanswered, but the answer will lie in their ability to create value and a compelling experience for both patrons and employees (primarily bartenders), and to do it in a way that is difficult to imitate. To the extent that CrowdTunes can create a system that is not easy to copy, in its elements or combinations, it will make itself more viable as a standalone entity or an acquisition. To the extent that its solution is obvious, it probably will not have a future.

### Lowest cost resolution of uncertainty

The point of this essay is that finding path of lowest cost resolution of uncertainty gives an entrepreneurial team the greatest chance of succeeding. To help entrepreneurs (and innovators generally) put this principle into action, I offer, first, a stylized process that illustrates the underlying reasoning and, second, some considerations for the practical application of this process.

The process that yields the lowest cost resolution of uncertainty has two steps:

1. Choosing the assumptions (or hypotheses),
2. Choosing the order of testing.

The first step is to identify the discrete assumptions that underlie the entrepreneur's business idea. These are the things that have to be true, or made to be true, in order for the venture to succeed — the hypotheses that need to be tested. We can think of all of these assumptions together constituting the entrepreneur's "theory." First, and most obviously, this theory must be complete or comprehensive. That is, it cannot be missing any assumptions that are necessary for success (within the planning horizon of the venture). Although there is no detailed checklist, the theory should cover the three pillars of any venture:

- Customers — needs, obstacles to adoption, other relevant characteristics.
- Solution — technology and other aspects of production and distribution including partnerships.



- Sustainable competitive advantage — critical resources such as expertise, intellectual property, relationships, etc.

These three pillars are not necessarily independent of each other. For example, the key piece of the production system that Rent the Runway needed to establish at the outset was the cost of acquiring dresses. Partnerships with designers allowed them to buy dresses at wholesale. This was a necessary condition for the viability of their business model. At the same time, these partnerships conferred powerful and long-term competitive advantage, assuming that designers would not be interested in additional relationships of this kind.

So it is important to think comprehensively about the factors necessary for success, but this is not enough. There are many ways of expressing or articulating the same entrepreneurial theory — many sets of assumptions that are equivalent, but not equally useful as a guide to action. For example, a venture may be thought to rest on the assumption that many people will buy the company's product for the asking price. If this is true, then the venture is successful. But it would take a full launch to validate the assumption. On the other hand, it is possible to create such a large set of narrow and detailed assumptions that the process of testing would be wasteful and inefficient. The goal is to articulate the underlying assumptions at a level of granularity that allows for meaningful experiments and efficient learning.

To return to Align Technology, what was not done was to decompose the theory into discrete elements and critically examine the relationships and interdependencies between these elements. On the other hand, part of the brilliance of Rent the Runway was the care with which the critical assumptions were broken down into the smallest reasonable discrete pieces. This gave the team very fine-grained control over the development of the company. Their learning process was targeted and produced specific, actionable results. As a result, the development of the company was efficient and not wasteful (ignoring the challenges they had with the development of the website). The set of assumptions, or theory, should be comprehensive in that it covers all the factors necessary for the success of the venture and it should be broken down or decomposed into discrete elements to permit efficient learning.

Every well-run new venture will exhibit a pattern of economical tests of the critical unknowns or hypotheses. Coming up with the comprehensive list of discrete assumptions is the first step. The second step is to determine a sequence, a series of steps that the new venture should take. Each step will resolve a critical unknown. This resolution will cause the entrepreneur to continue, to change direction ("pivot"), or, in the worst case, to abandon the enterprise. A change in direction will often cause the entrepreneur to revise the list of unknowns and revise the plan.

The second step is to prioritize the assumptions according to three factors: **severity, probability, and cost of resolution.**

**Severity** is the negative impact on the venture of a negative outcome. In the extreme case, the first question is “Is there a need at all?” If the answer is “No,” then the entrepreneur should simply stop. This is the unknown with the highest severity of impact. We can also take a positive perspective of the idea of severity. Rather than thinking of it as the unknown with the potential for the greatest negative impact, we can think of it as the unknown whose resolution may engender the most dramatic change of direction. In any case, the notion of impact may be difficult to quantify or make precise, but the intuition behind it is reasonably clear. The simple rule is that if A has higher severity than B, then test A before B.

Also a matter of judgment is the **probability** of an assumption being true. We have already seen Knight’s idea that the very essence of entrepreneurship is uncertainty where there is no objective basis for assigning probabilities. Nonetheless, this is exactly what the entrepreneur does — assign probabilities to various unknowns based on inadequate and incomplete information and then act based on those assessments. However, I resist calling this probability assignment a guess or a purely subjective matter. There are real cognitive processes at work — reasoning by analogy, recognizing patterns, extrapolating from experience, etc. Moreover, the more open entrepreneurs are to divergent opinions and different perspectives and the better they are synthesizing these various inputs into a considered judgment, the greater the chance that their assignment of probabilities will reflect reality.

What is counterintuitive to many entrepreneurs is that lower probability assumptions should be addressed first. It seems natural to many people to try to validate the more likely assumptions. Positive feedback always feels good. But this is the opposite of the right approach. If the goal is to minimize the time and money expended before strategy is adapted to reality or, possibly, the venture is abandoned, then the assumptions least likely to be true should be addressed first: if all else is equal and assumption A is less probable than B, then attempt to validate A before B.

The third factor in this stylized process is the **cost of resolving uncertainty**. This immediately begs the question: What constitutes resolution? What evidence should the entrepreneur take as sufficient to declare the assumption validated? For example, the Rent the Runway founders mailed PDFs to their prospective customers and took the response as validating the assumption that their customers would rent dresses from a website. Estimating the cost of resolution for an assumption involves a) thinking critically about what evidence will constitute resolution, and b) thinking creatively about the simplest, lowest cost way of gathering that evidence. Once this thinking is done, we can formulate a third simple rule that goes into our process: if all else is equal and resolving assumption A costs less than resolving B, then address A before B.

Having now considered each of these three factors individually, we can put them together. If we are able to judge both the potential severity of various unknowns as

well as their probability, we can construct a rank ordering of the various unknowns. We can imagine a quantity or index that is the product of severity and probability of the assumption not being true, that is, “severity of potential impact times probability of the negative occurrence.” This quantity is what we mean by “risk” in the colloquial sense — risks are things we worry about, and the greater the risk the greater the worry. For example, when we take a walk in the city, the risk of getting hitting by a car is greater than the risk of getting struck by an asteroid (higher severity, but dramatically lower probability) and also than the risk of wearing a hole in our shoe (higher probability, but much lower severity).

Yogi Berra is alleged to have said that in theory there is no difference between theory and practice but in practice there is a big difference. While acknowledging this insight, we can press on and say that theoretically our exercise produces a rank ordering of the risks facing a new venture. If we now add an estimate of the cost in money and time to resolve the unknown and thereby remove that item of risk, we can conceptually construct a measure that is risk divided by cost of resolution.<sup>12</sup> This measure will create a rank ordering of the assumptions or unknowns. Addressing the unknowns according to this order will be the path of removing the greatest risk for the lowest cost. Applying this principle produces a sequence of execution for a new venture.

Some practical realities will influence how we put this principle into action. Investors may differ with the entrepreneurs and influence their order of execution if they are to supply capital. The process as I have laid it out yields a sequential path of execution, and the issue of time to market may require more parallelism in execution. The entrepreneur must trade off the risk of being late against the risk of wasted effort. Finally there is the perhaps obvious factor of prerequisite. For example, if an actual implementation of the technology in some form is required to test consumers’ reactions or to interest potential partners, then building a prototype will have to precede resolving the unknown regarding customer response or partner interest.

Experienced investors and mentors have long advised entrepreneurs to focus on “value changing milestones.” The thoughts outlined here put structure onto this advice and also explains its importance. For a milestone that changes the value of a venture is precisely the resolution of an unknown that removes a significant risk factor. Most entrepreneurs envision ventures that will be highly valuable if successful. What makes the value of the venture so low in the early stages is that the probability of success is so low. The probability of success is low precisely because there are so many large risk factors. As these risk factors are removed, the probability of success goes up. As the probability of success goes up, so too does the value of the venture. Risk and value are inversely related. As value increases, the cost of capital decreases. Therefore, a well thought-out path through the

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<sup>12</sup> Strictly speaking we would have: Severity times Probability of being false divided by Cost of resolution.

entrepreneurial search space leads to the most efficient use of capital. It minimizes the use of very expensive resources — the time and effort of the founding team and any capital raised.

According to common lore, entrepreneurs are risk takers. I am still not sure what this means. Good entrepreneurs are certainly not risk takers in the sense of someone who climbs into a barrel and goes over Niagara Falls. Perhaps they are risk takers in the sense of an expert poker player who tries to beat the house in Las Vegas. But perhaps the discussion here can give some concrete meaning to this perspective. Entrepreneurs deal in an environment where the unknowns are truly uncertain in Knight's sense. There is not sufficient information to assign probabilities to various outcomes. However, entrepreneurs are willing to make judgments about probable outcomes and then act on those judgments. Entrepreneurs, at least implicitly, make judgments about probabilities based on incomplete and imperfect information. If the essence of entrepreneurship is dealing with uncertainty, then I hope to have offered a practical theory of managing uncertainty. This theory is not new. It can be gleaned from the actions of many entrepreneurs and has found a number of expressions over the decades. The essence is to find the lowest cost resolution of uncertainty — make no investment before its time. This principle provides powerful guidance for the entrepreneur.

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