

The Informational Basis of Entrepreneurial Discovery

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Abstract. Scholars have identified four different roles played by entrepreneurs in the discovery of new venture opportunities. What each of these roles has in common is that the discovery process consists of the acquisition of specific, risk-reducing information. Uncertain returns from such investments deter some would-be entrepreneurs from making discoveries. This approach suggests that the vision to make entrepreneurial discoveries depends on making cost-effective informational investments, not on special talents possessed by only a few aspirants.

When entrepreneurs discover an opportunity to engage in a profitable venture that others have overlooked, is it because they have a special knack for doing such things? Do they succeed because they are smarter, more diligent, or more alert? An *entrepreneurial discovery* (or for brevity, simply a discovery) is *an unexpected, yet valuable economic opportunity, such as the founding of a new firm, the creation of a new product line, the development of an innovative technology, the satisfaction of an ephemeral market need through arbitrage, or the like*. For the purposes of this analysis, a discovery is *valuable if it is one that is monetarily rewarding*. Presumably, other aspiring entrepreneurs would judge the same discovery to be valuable but for some reason they do not notice it. Do those who overlook such opportunities fail to see them because they lack visionary talent? If their failure stems from not having the talent, it follows that only those who possess it should attempt to be entrepreneurs, unless of course they feel very lucky.

We do not as yet understand the discovery

process utilized by entrepreneurs to identify new venture opportunities, even though it has been the subject of considerable study. Our lack of understanding of how entrepreneurs make discoveries is unfortunate because it complicates the identification of a conceptual basis for investigating or teaching entrepreneurship. It also adds to the difficulty of even being able to define what we mean by the term, entrepreneurship. For example, does entrepreneurship include corporate venturing, expanding an existing business, replicating a successful concept in a second career, or operating a family business? While there are some elements of discovery in each of these activities, this analysis does not specifically treat any of them. Rather it focuses on the underlying process of identifying unexpected, yet valuable economic opportunities.

Discovery is fundamentally important to entrepreneurship. Without discovery, the actions of entrepreneurs could almost be reduced to managerial rules of thumb that could be easily imitated by competitors. In the long-run, imitation would reduce profits to average levels that would be inadequate to justify risk-taking activity (Jacobson, 1992; Rumelt, 1987). Indeed, any venture opportunity could work because it would have inherent potential that could be tapped by a talented, manager-like, entrepreneur. However, some ventures fail because of competitive disadvantages unrelated to the talent or convictions of the entrepreneur.

Scholars generally study what entrepreneurs do after discovering a venture opportunity. Taking this approach, the risk of the venture is associated with the uncertain success of implementing a business plan. However, risk also attends the choice of the type and means for acquiring information to make the initial discovery of the opportunity. Information can be purchased like any

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other commodity, but the acquisition expense can become a sunk cost. Purchasing the wrong information also takes time, which adds to the cost of making discoveries. This paper focuses on the *ex ante* process of discovery, rather than on the *ex post* process of implementing the business plan.

The central character in the discovery process is the "entrepreneur." Scholars have generally treated entrepreneurs as black boxes, acknowledging that what they do is critically important. However, there is no consensus on how to even define what we mean by the term. One of the contributions of this paper is suggest a view of them that highlights their role in the discovery process. Accordingly, an *entrepreneur is someone who optimizes the tradeoff between investing too much or too little in specific, risk-reducing signals*. The remainder of this paper applies this new perspective to the study of discovery as it develops an information-based model. Because the outcome of the discovery process is the creation of value, the next section of this paper examines the economics of discovery.

The economics of discovery

An exploration of the economics literature for references to entrepreneurial discovery leads one into the midst of an intradisciplinary conflict that generally pits *Austrian economists, who assume entrepreneurs have an important role to play in discovery*, against *Neoclassical economists, who do not make allowances for such a role* (Kirchhoff, 1991). Since Adam Smith (1776), economists have attempted to understand how entrepreneurs discover economic opportunities and distribute wealth. Toward the end of the nineteenth century, Neoclassical economists diminished the role of economic actors in entrepreneurial discovery. Their chief spokesman was Marshall (1961) who advocated a general equilibrium theory.

The Neoclassical view

Essential to Neoclassical economics is the notion that economic actors are rational and operate independently in markets that are in equilibrium. *At equilibrium, prices are co-determined by rational suppliers and rational buyers and everyone earns the same level of profits that is just*

sufficient to maintain capital investment. It is an elegant view that is mathematically powerful, but it provides no incentive for entrepreneurs to bear the risk of creating new products and processes (Jacobson, 1992). This paper utilizes general equilibrium theory to demonstrate the need to provide incentives to entrepreneurs in exchange for bearing risk.

The Austrian view

According to Austrian economics, markets are in disequilibrium and profits are a disequilibrium phenomenon (Jacobson, 1992). Disequilibrium enables entrepreneurs to discover market imbalances that offer ways to earn above average returns. If they can protect their discoveries from imitation by others, they can preserve a competitive advantage that will ensure their economic survival (Barney, 1986a).

The most often cited explanation of entrepreneurial discovery from Austrian economics is the carrying out of new combinations (Schumpeter, 1971). The individuals who carry out the combinations are entrepreneurs. However, the carrying out of new combinations is only part of the story. While it is an indicator of the intentions of entrepreneurs (Bird, 1992), it does not provide us with any insight regarding how they discover a venture opportunity.

Toward an information-based model of entrepreneurial discovery

This study proposes as a starting point that we consider a model of entrepreneurial discovery that is grounded in the acquisition of information. (Refer to Figure 1.) A central premise of this model is that entrepreneurs are *profit maximizers who purchase information about prospective ventures that they can utilize to improve their risk-adjusted return on investment*. Some readers may prefer to think of them as *utility maximizers, or individuals who maximize their personal psychic well-being, rather than their profit*. The difficulty with conceptualizing them as utility maximizers, however, is in selecting a metric to measure the dependent variable, entrepreneurial discovery. The utility maximization alternative also would introduce a variety of unknown, and probably unknow-

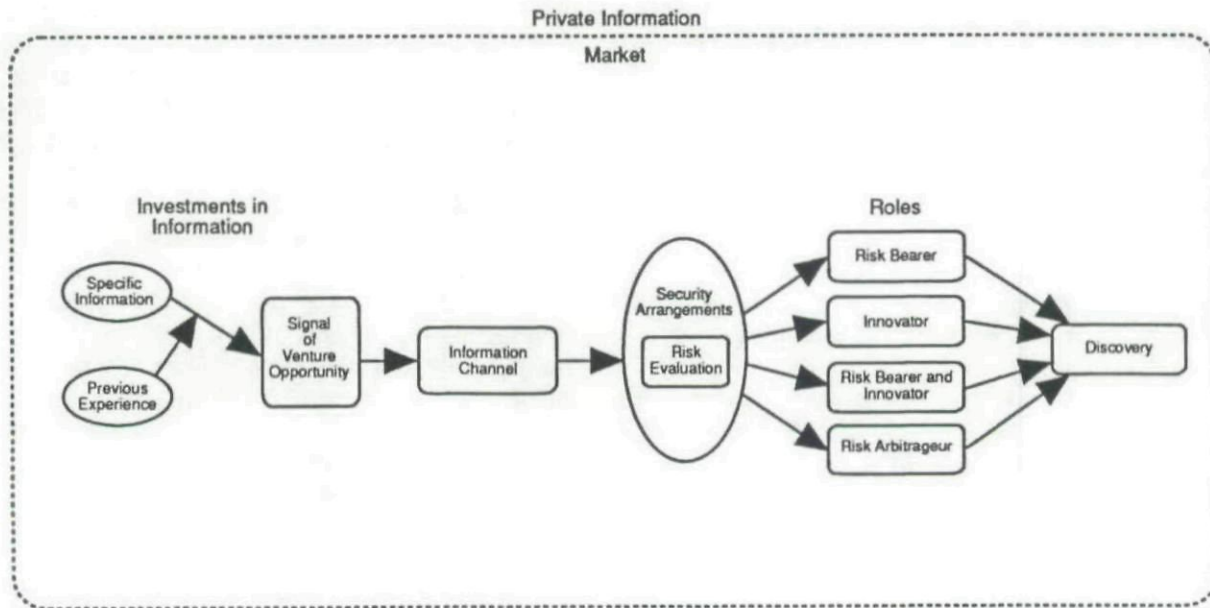


Fig. 1. An information-based model of entrepreneurial discovery.

able, personal preferences as moderating effects, which would shroud any relationships that could be found in unnecessary complexity.

The proposed model provides a basis for building upon the perspectives of previous researchers, particularly those from the Austrian School (*cf.* Camerer, 1985). It also permits the examination of actions by an entrepreneur that can lead either to the discovery or rejection a prospective venture opportunity. Focusing only on those deals that are carried out may cause scholars to overlook a large number of venture possibilities that were seriously considered by an entrepreneur, but that were eventually rejected. Finally, to demonstrate its relevance, the model must be capable of generating propositions that identify possibilities for future research.

An unreasonable expectation for the model would be to require that it generate propositions that have implications that are as rich as the experiences of actual entrepreneurs. All theory depicts a view that is a simplification of real experience. The model in Figure 1 constrains and simplifies the variables that may impact discovery, which also limits the generalizability of any propositions that can be generated. Although entrepreneurs would probably never utilize such an approach to decide whether to pursue a venture

opportunity, this paper uses it to illustrate how different ways of optimizing investments in specific information lead to different entrepreneurial roles in discovery.

Public or private markets

Received theory assumes that markets are accessible by the general public and are both informationally and allocationally efficient. Markets are *informationally efficient* when all buyers and sellers have the same information. Markets are *allocationally efficient* when prices are set so that they equate "the marginal rates of return (adjusted for risk) for all [buyers and sellers]". In an allocationally efficient market, scarce savings are optimally allocated to productive investments in a way that benefits everyone" (Copeland and Weston, 1988, p. 330; *cf.* Fiet, 1993, pp. 4–6). When markets are informationally and allocationally efficient, a state of *perfect competition* exists that requires that all economic actors earn the same average levels of profit. Entrepreneurs are unwilling to bear the required above normal levels of risk in return for average levels of profit. Above normal risk is a level of risk that exceeds that which allows entrepreneurs to earn enough to keep their dedicated assets productively employed in

their ventures. Thus, given perfect competition, all discovery would cease. There would no incentive for entrepreneurs to bear above normal levels of risk in return for average levels of profit. When we see entrepreneurs "betting the store", it is unlikely that it is because they expect to divide their future earnings equally with their competitors. This reasoning yields the first proposition.

Proposition 1: Entrepreneurial discovery can only occur where imperfect competition exists.

Entrepreneurs take on risk because they believe that they can manage it using *private information*, or *information with very limited distribution*, that gives them a competitive advantage (Fiet and Hellriegel, 1993). Their hubris contrasts with the findings of Fama's (1970) study of equity markets.

Fama (1970) reported that public equity markets are *informationally efficient in a semi-strong sense*. By this, he meant that *no investor could earn above normal returns by trading on publicly available information*. If information regarding ventures that could generate above average returns were publicly available, potential competitors would have an incentive to expropriate any returns that were in excess of average. Subsequent investigations of the informational efficiency of *public* equity markets have provided substantial empirical support for Fama's (1970) findings (cf. Copeland and Weston, 1988). These subsequent investigations, however, were not intended to uncover how entrepreneurs use *private* information known only to themselves.

Private information markets are those that disseminate information that is not available to the general public. This kind of information is important to entrepreneurs because a discovery cannot generate sustainable above normal returns unless its circumstances are private (cf. Barney, 1986a, 1986b). If its circumstances were not private, rational, profit-maximizing competitors would have already entered the market until everyone was earning normal returns. Although it is probably true that earning above normal returns is a temporary phenomenon for most entrepreneurs, given our assumption of rationality, they would only be available in private information markets.

Many entrepreneurs utilize personal contacts to

acquire private information (Lorenzoni and Ornati, 1988; cf. Granovetter, 1978). While using personal contacts is more time consuming than consulting public information sources, entrepreneurs have few alternatives because private markets are less well organized than public markets, primarily as a result of their lack of *intermediaries*, like stock brokers, *who can guarantee the value of information exchange* (Poindexter, 1976). Although the rationale for the existence of these markets is compelling (cf. Casson, 1990), we know comparatively little about them as a result of our recent historical preoccupation with the Neoclassical paradigm.

Not only is private information distributed less widely than *public information*, it is unavailable to the general public. The latter is *information that is normally accessible through the print media*. It is a *public good*, meaning that *no one can take custody of it and limit its distribution*. Examples of this information are corporate annual reports, investments advisory newsletters, or stock quote data. It is information that is available to anyone who seeks it.

In summary, entrepreneurial discovery can only occur when individuals have access to private information about the circumstances of a venture. If the information about a venture were public, potential imitators would copy the discovery until they depleted any capacity to earn above average returns. Because this private information is not available through published sources, entrepreneurial discovery can only occur in private information markets. Refer to private information markets in Figure 1. The above arguments generate the following proposition.

Proposition 2: Entrepreneurial discovery can only occur in private markets for information.

The role of signaling

When entrepreneurs position themselves so that they have access to information about potential new venture opportunities, they are using an information channel.¹ An *information channel* is a *frequent source of signals*. A *signal* is *current information that changes our ideas about a future state*. Specifically, a signal can inform us about how a discovery will affect an entrepreneur's

future profit. One of the most useful types of signals is one that reduces an entrepreneur's risk, thereby increasing his or her profit. Signals become more valuable when they are unique or at least rare. When they are unique or rare they may be combined with previously acquired specific information to provide an aspiring entrepreneur with a competitive advantage in moving forward with the discovery.

Entrepreneurs are often pictured as achieving mastery over their fate by being independent, rugged, dynamic, innovational, and making their way, largely by their own efforts. Closer inspection of their enterprises leads us to a somewhat different conclusion. They thrive not by bucking the odds, but by selecting an environment that they view as having an appropriate set of security arrangements, which probably includes being in close proximity to an information channel. *Security arrangements are circumstances that limit the risk of entrepreneurial discovery.* Easterbrook (1949) suggests that the presence of these security arrangements may be an historical accident as much as anything. Nevertheless, entrepreneurs who survive are more than lucky. They are alert to the types of signals that have previously been informative and they remain vigilant to any need for a course correction. Figure 1 illustrates how risk evaluation in the discovery process is dependent upon receiving signals, often from information channels. The arguments of this section give rise to the following proposition:

Proposition 3: Entrepreneurs secure their ventures from the risks associated with discovery by tapping into an information channel from which they obtain risk-reducing signals.

Positioning would-be entrepreneurs in close proximity to an information channel reduces their access cost. Nevertheless, acquiring signals to reduce risk is still not costless. Nor are there any guarantees that their purchase will have the expected risk-reducing value. Thus, aspiring entrepreneurs may view the acquisition of risk-reducing signals as an investment of sorts.

The role of risk evaluation in entrepreneurial discovery

Entrepreneurs chose the types of signals in which they most prefer to invest. Acquiring the wrong signals poses a risk because their cost cannot be recovered if it does not provide more accurate information about the prospects for the discovery. Whereas the acquisition of a signal can be expensive and must be purchased in the present, its true value cannot be determined until the outcome of the discovery is known in the future. The intertemporal nature of investing in signals poses a risk for aspiring entrepreneurs.

Risk assumes the probability distribution of future events is known. Recently, it has come to be increasingly a concept referring not to the probability of outcomes but to their costs (Fischhoff, Watson and Hope, 1984; March and Shapira, 1987). The main focus has been on "defining tradeoffs between specific 'risk' and other costs" (March and Shapira, 1987, pp. 1411, 1412). This means that entrepreneurs might be willing to select an alternative with a very high probability of a loss as long as the loss was small. However, they would prefer to avoid any choice where the loss could be devastating, even if its probability were low.

Projects that have an unknown future are uncertain. *Uncertainty assumes the probability distribution of future events is unknown* (Knight, 1933). Arrow (1989) argues,

There is a state of the world which, if we only knew it, would tell us what the consequences of every action are. But since we don't know it we can speak of uncertainty as being an uncertainty about the state of the world. Whereas what will actually happen will depend on the action we take but also depend on factors which we don't know (p. 41).

Entrepreneurs would be interested in a prospective venture if their evaluation of it suggested that it would be profitable. However, they could be expected to reject it if they could not assess its risk.

Some researchers have suggested that entrepreneurs may be moderate risk takers (Brockhaus, 1980; Mancuso, 1975; McClelland, 1961), however their studies used recent small business founders as proxies for entrepreneurs, regardless of whether or not they (1) had innovated to enter

an existing market, or (2) had grown by creating new demand, or (3) had taken customers away from existing competitors (cf. Carland, Hoy, Boulton and Carland, 1984, p. 357). If they would have required these more risk-laden criteria from their subjects, it is very possible that they would have found that characterizing them as moderate risk takers is an over simplification. As noted earlier, there is evidence to suggest that they believe that the normally expected probabilities of failure do not apply to them.

Characterizing their risk-taking propensity as moderate presupposes that entrepreneurs consider risk to be an exogenous factor over which they have no control. Their confidence in their ability to manage risk may come from a belief that they can reduce it by comparing relevant risk-reducing signals with what they believe are the discovery's prospects. (Even the most aggressive entrepreneurs do not attempt some discoveries because their prospects are uncertain.)

One way to reduce the cost of risk evaluation is to specialize in the acquisition of information about particular types of risk, as suggested by Fiet (1991b). Specialization allows entrepreneurs to leverage their previous investments in specific information. They might focus their activities on a particular industry or they might choose to limit their dealings to a selected group of suppliers and distributors with whom they have had personal experience. Proposition 4 suggests how entrepreneurs evaluate the factors affecting a prospective discovery's market risk and agency risk to determine the returns that can be expected from it. Figure 1 illustrates the role of risk evaluation in the discovery process.

Proposition 4: Entrepreneurs improve their chances of generating rewards from their discoveries by specializing in the acquisition of information about particular types of risk.

Investments in specific information

Figure 1 indicates that risk-reducing signals consist of specific information. *Specific information has little or no value for assessing the risk associated with more than one prospective discovery* (Casson, 1990, Fiet, 1991b; Klein, Crawford and Alchian, 1978). For example, it is

not possible to invest in background investigations of, or spend personal time with, providers of critical resources to assess their character and intentions and to use this same information to assess unforeseen competitive conditions. To assess competitive conditions, it would be necessary to invest in different specific information, such as conducting market research concerning customer or competitor reactions, and evaluating competitor cost structures.

Hayek (1945) observed that the most valuable information to entrepreneurs is that which relates to the special circumstances of the time and place of a particular deal. By a *deal*, he meant a *decision with monetary consequences related to a prospective new venture*. The model in Figure 1 suggests that it is the type of information entrepreneurs utilize for discovery. Because a risk-reducing signal is specific information, and in this sense is not a public good, one entrepreneur can acquire control of it and keep it secret. Because specific information is ephemeral, it may only be valuable to the entrepreneur who discovers it. Others may not be as well positioned to take advantage of it with regard to the time, location, or special circumstances of the deal. Thus, specific information, as long as it can be kept private, can be a source of temporary competitive advantage. The crucial role of specific information in the discovery process is delineated in the next proposition.

Proposition 5: The most valuable type of information to entrepreneurs in making a discovery is specific information about the circumstances of a prospective deal.

Some entrepreneurs are better suited by their previous experience to recognize the criticality of a signal. Previous experience consisting of specific information is not the same as having a reservoir of general information, such as a diploma from a graduate school. Presumably, many aspiring entrepreneurs are similarly qualified. These arguments lead to the next two propositions.

Proposition 6: Entrepreneurs reduce their risk of discovery through the assessment of specific, risk-reducing signals.

Proposition 7: Some entrepreneurs are better

suited to assess the criticality of signals as a result of having previously acquired relevant, specific information.

The role of previous experience

The signaling capacity of an entrepreneur's previous experience depends on its specificity. However, not all specific information is a signal capable of changing our view of future events. *Signals consist of current information, whereas specific information, such as some forms of previous experience, is not restricted to the present time frame.* Relevant, previous experience can be expected to be specific information that can influence an entrepreneur's perception of a discovery's prospects. Entrepreneurs are presumed to make deposits of specific information into their memory for future recall.

Previous experience is useful for setting the context within which entrepreneurs can decide whether to invest in specific, risk-reducing signals. It can be conceptualized as a cue that alerts entrepreneurs to a promising opportunity to invest in specific information (Refer to Figure 1). Because other aspirants are likely to have had similar previous experience, entrepreneurs cannot expect to earn above normal profits from it. Above average profits can only result if an entrepreneur invests in, and then, acts upon private, specific information. It is possible that an entrepreneur's previous experience could by itself act as an effective signal. However, if the signal is not valuable, rare, and imperfectly imitable by others, the entrepreneur cannot expect to maintain a sustainable competitive advantage (Barney, 1986a). The above arguments lead to the eighth proposition.

Proposition 8: Previous experience can serve as a cue to inform entrepreneurs about when to invest in signals related to a prospective discovery.

The following section illustrates how entrepreneurs may play different informational roles in discovery. Historically, the discussion of these different roles has been quite confused because we have generally not differentiated among them. The model in Figure 1 clarifies these different roles. Proposition 9 explicitly distinguished among them.

Proposition 9: Entrepreneurs evaluate signals in different ways which lead them to play different roles in the discovery process.

Table I summarizes the propositions generated by the proposed information-based model of entrepreneurial discovery.

TABLE I
Summary of propositions

1. Entrepreneurial discovery can only occur where imperfect competition exists.
2. Entrepreneurial discovery can only occur in private markets for information.
3. Entrepreneurs secure their ventures from the risks associated with discovery by tapping into an information channel from which they obtain risk-reducing signals.
4. Entrepreneurs improve their chances of generating rewards from their discoveries by evaluating limiting factors, such as those related to market risk and agency risk.
5. The most valuable type of information to entrepreneurs in making a discovery is specific information about the circumstances of a prospective deal.
6. Entrepreneurs reduce their risk of discovery through the assessment of specific, risk-reducing signals.
7. Some entrepreneurs are better suited to assess the criticality of signals as a result of having previously acquired relevant, specific information.
8. Previous experience can serve as a cue to inform entrepreneurs about when to invest in signals related to a prospective discovery.
9. Entrepreneurs evaluate signals in different ways which leads them to play different roles in the discovery process.

Entrepreneurial roles in discovery

In a comprehensive review of Austrian theories, Hebert and Link (1982) identified four roles played by entrepreneurs in the discovery process. The first type is a risk bearer (Cantillon, 1755; Knight, 1933; Mises, 1939; Shackle, 1955). *A risk bearer is an entrepreneur who assumes the risk associated with the uncertainty of earning above normal returns.* The second type is an innovator (Schumpeter, 1936, 1939, 1947, 1961, 1971). *An innovator is an entrepreneur who obsolesces established business routines using innovations.* The third type is a risk bearer and innovator (Baudeau, 1767; Bentham, 1952; Mangoldt, 1855; Cole, 1946). *A risk bearer and innovator is an entrepreneur who uses innovation to reduce costs and increase profits.* The fourth type is a risk arbi-

trageur (Kirzner, 1973, 1979a, 1979b). A *risk arbitrageur is an entrepreneur who avoids risk by contracting for factors at one price and simultaneously selling to another party at a higher price*. Table II summarizes the investment role played by each of these entrepreneurial types, the chief proponent of the role, and significance of specific information to the role. The next section interprets these roles as different approaches to investing in specific, risk-reducing signals.

TABLE II
Entrepreneurs as investors in specific information

Investment role of entrepreneur	Chief proponent of role	Significance of specific information to the role
Risk bearer	Cantillon	Uses it to reduce risk while uncertainty is irreducible.
Innovator	Schumpeter	Uses it to creatively combine factors of production.
Risk bearer and innovator	Baudeau	Its uses are similar whether for competitive circumstances or for innovation.
Risk arbitrageur	Kirzner	Uses it to identify opportunities for risk arbitrage.

Entrepreneurs as investors in specific signals

A major implication of the model in Figure 1 is that entrepreneurs can be viewed as investors in specific information. The view of entrepreneurs introduced at the beginning of this paper can now be seen in the context of an information-based model of entrepreneurial discovery. That is, an *entrepreneur is a person who optimizes the tradeoff between investing too much or too little in specific, risk-reducing signals*. Specific signals can reduce risk, however they are costly. Otherwise, we would expect to find entrepreneurs acquiring unlimited amounts of them. Because they are not costless, entrepreneurs evaluate and take responsibility for their cost. This approach suggests that when entrepreneurs discover new venture opportunities, it is not because they have unusual perceptive ability. It is because they are

able to react to similarities between current signals and specific information garnered from previous experience.

Continued investments in information can increasingly become sunk costs. However, making investments in information may also result in reducing risk through the amalgamation of signals that narrow the expected range of probabilities of future events. Predicting the future more accurately can become a competitive advantage when it is utilized to deploy more efficiently specific production factors.

Both the expected returns and risks from investing in specific information are dependent upon the quantity and specificity of the information that is acquired. There is an optimal combination of the level of investment in information with the degree of information specificity. That is, investing in information that is too specific would be excessively costly or, alternatively, it would not be sufficiently specific to be relevant to future discoveries. At the same time, investing in less specific information would generate a sub-optimal reduction in risk, while investing in more specific information would be excessively costly.

According to Cantillon (1755), at least one of the functions of entrepreneurs in the discovery process is to be a risk bearer. However, he did not differentiate between risk and uncertainty (Refer to Table II). When the probabilities of future events are known, the cost of an insurance contract can be included in the deal as a cost of business. To narrow the range of Cantillon's probability of future events, entrepreneurs invest in specific, risk-reducing information. When this probability cannot be calculated, it is more accurate to say that they bear uncertainty by avoiding it. Thus, investments in specific information enable an entrepreneur to differentiate between profitable opportunities with known risk factors from those whose probabilities are unknown, and thus unmanageable. However, even if a venture has a known risk with a positive net present value, it may still be rejected because the potential loss could be devastating (*cf.* March and Shapira, 1987).

One way to reduce the risk of discovery is to follow Schumpeter's (1961) dictum to be an innovator. His innovator may be no more than an information specialist who has made inferences from previous experience about how to creatively

combine factors of production. (Refer to Table II) The innovator's information comes through devising alternative hypotheses, constructing a crucial experiment, carrying it out so as to obtain a clean result, and recycling the whole mental process (Platt, 1964). Initially, specialized knowledge can be acquired either by obtaining a professional education or occupational experience. The more specialized the information, the more useful it may be in viewing new possibilities for combining factors of production. What seems to be important for innovation is to systematically gather and interpret information.

However, entrepreneurial discovery is often not intentionally directed innovation. Some of it occurs as a result of exogenous factors, such, as weather (i.e., the anecdotal account of Newton's discovery of gravity when the apple fell off the tree striking him on the head), governmental action (i.e., changes in the tax code, environmental regulations, or industrial policy), or competitive initiatives (i.e., actions to link data bases to an information highway, or the creation of a system of airline hubs that leaves openings for competitors that provide direct connection between smaller cities) that are outside the control of the entrepreneur. When discovery occurs as a result of exogenous factors acting upon the entrepreneur, instead of the converse, we may argue that the entrepreneur is not innovative, but lucky. In the case of lucky discoveries, entrepreneurs succeed, as Kirzner (1973, 1979a, 1979b) noted, by being alert to opportunities and quickly acting upon them.

Baudeau's (1767) risk bearers and innovators invest in information to reduce risk and uncertainty. They also invest in technical information related to how they can reduce costs or increase profits. Nevertheless, the processes are very similar. Although avoiding uncertainty and managing risk may involve acquiring information about the circumstances of the time and place of the deal, investing in technical information is the same process in a different area. (Refer to Table II.) In both circumstances, specific information is acquired and interpreted one detail at a time.

From an informational perspective, an entrepreneur's size or wealth does not necessarily translate into an advantage for Baudeau's entrepreneurs as they attempt to reduce costs and increase

profits. Specific, risk-reducing information is not likely to be generalizable from prior experience. It must be gathered sequentially, often through one information channel, one detail at a time. Recognizing the sequential nature of information acquisition should allay the fears of those such as Schumpeter (1942) who foresaw the day when large firms would be the only ones who could afford to be entrepreneurial.

Kirzner's (1973) arbitrageurs could be misinterpreted as possessing unusual perceptive ability, or as Kirzner, himself, describes them, as entrepreneurs who were alert. Unfortunately, the admonition to stay alert has little pedagogical value because it provides no guidelines about what should attract the attention of our alertness. In contrast, the approach that is suggested here focuses the attention of entrepreneurs, not upon some general conceptual horizon, but upon issues related to what they already have experienced in investing in specific information. For each entrepreneur these issues are unique and provide a potential competitive advantage.

Research implications

In order to derive and test hypotheses from these nine propositions, two natural limitations of information must be addressed. These were identified by Arrow (1989) who noted that (1) it does not have obvious units and (2) it may not be cumulative. That is, doubling the amount of it does not necessarily double its signaling capacity. Because the present analysis postulates that entrepreneurs utilize investments in specific information to identify new venture opportunities, hypotheses derived from these propositions cannot be tested unless these limitations can be controlled in the analysis.

Unfortunately, information does not come to us in neatly packaged units that can be added together. One way to begin to address Arrow's limitations is to consider information along narrowly defined dimensions, such as market risk and agency risk, as suggested by Fiet (1991a). *Market risk is due to unforeseen competitive conditions*, whereas *agency risk refers to the entrepreneur's risk that those upon whom he depends for resources may pursue their own interests*. In order to cumulate information about risk dimensions, we must determine how to measure them.

The problem of measuring information is similar to the problem of measuring invisible assets that has been discussed in the literatures of marketing (Bonoma, 1985), strategy (Fiet and Kosnik, 1995; Itami and Roehl, 1987) and organization theory (Barney, 1986b). These invisible assets are often "key success factors" that we have typically been unable to measure because we have commonly limited ourselves the use of econometric techniques (Jacobson, 1992, p. 795). Econometric techniques rely upon independent variables that are measurable. Jacobson (1992) suggested the use of a serial correlation model that approximates the way in which observed outcomes are correlated with invisible "key success factors" could overcome the measurement problem. A similar approach would assist researchers investigating entrepreneurial discovery.

Fiet and Kosnik (1995) suggested an effective way to address the measurement problem is to collect data on potential indicators. We could measure a particular dimension of information, such as agency risk by collecting information about incidents of dishonesty or not performing agreed to responsibilities. We could measure market risk by collecting information about the number of current competitors, the number of buyers, or the degree of technical obsolescence. These indicators could then be used to measure each of these constructs in a confirmatory factor analysis application of structural equation modeling (*cf.* Bollen, 1989, Loehlin, 1987). The advantage of this approach is that it could simultaneously be utilized to isolate measurement error and to compare the relationships among the constructs.

An important area for future inquiry will be to measure and compare the informational investments of entrepreneurs who commit resources to develop a discovery with those of entrepreneurs who judge that a venture opportunity will not be sufficiently profitable. Such a comparison could be useful for insights into the discovery process, for effective teaching and future study.

Finally, the speed with which investments must be made and how their rapidity affects the eventual performance and the type of investor role in discovery could be investigated by future researchers. As these investigations proceed, they will enable us to eliminate some of the misspecification that probably exists in the model.

Conclusion

This paper has suggested that the focus of any consideration of entrepreneurial discovery should be upon information that is specifically related to a deal. This informational perspective is then utilized to reconsider the actions of aspirants as they have been viewed in economic history. It builds on this perspective by looking at the acquisition of information as an investment decision that is motivated at least in part by pecuniary self-interest seeking.

Although some readers are likely to be disappointed that the model in Figure 1 cannot account for the behavior of all aspiring entrepreneurs, this is not its function, nor is it necessary that it do so in order to be useful. Its primary function is to generate propositions about the average tendencies of would-be discoverers.

This paper has proposed a new view of entrepreneurial discovery wherein entrepreneurs can most efficiently identify discoveries by optimizing their investment in specific, risk-reducing signals. This implies that signals can be purchased at a price. If an entrepreneur cannot see a market opportunity, this does not necessarily mean that no opportunity exists. It may be that he or she has not invested sufficiently to recognize it. Nor does lack of entrepreneurial insight suggest that one lacks what it takes, namely, some as yet undescribed talent. It certainly does not suggest that one is not smart enough. Where no investments in specific signals have been made, there are no insights to be discovered.

It may mean that one has not been sufficiently diligent. Diligence can be expected to vary depending upon what attracts the gaze of entrepreneurs, and once again, that depends on their previous specific investments in signals.

The primary implication of this approach is that discovery depends on actions by those who aspire to be entrepreneurs, many of which are within their control. Unlike the approach taken by Neoclassical economists, the present model recognizes the preeminent role of the entrepreneur in the discovery process. Moreover, it goes beyond the position advocated by Austrian economists by identifying a micro level mechanism for making discoveries, namely the optimization of investments in specific information. The advantage of

this approach is that it makes explicit provision for the efficacy of initiative by individual actors. Their success depends upon proactively combining current signals with specific information from previous experience. This should be a hopeful message for aspiring entrepreneurs.

Note

¹ There is an extensive literature describing how entrepreneurs utilize networks. The use of networks may be viewed as a way of tapping into an information channel to obtain risk-reducing signals about a venture opportunity.

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