

The Discovery of Opportunities: Extending the Economic Theory of the Entrepreneur

Mark Casson
Nigel Wadeson

ABSTRACT. Shane (2003) [A General Theory of Entrepreneurship: The Individual-Opportunity Nexus. Cheltenham: Edward Elgar] has shown convincingly that modern theories of entrepreneurship perform reasonably well in explaining the empirical results obtained in different areas of research upon the subject. His book also shows that the cognitive aspects of entrepreneurship in general—and opportunity recognition in particular—are important areas that warrant further research. This paper argues that the concept of opportunity is closely related to the concept of a project, as an opportunity is essentially a project that would prove beneficial if it were exploited. It is suggested that modelling individual search across potential projects, and the screening of projects by the use of symptoms, holds the key to the successful modelling of entrepreneurship in terms of opportunity.

KEYWORDS: opportunity, project, discovery

JEL CLASSIFICATIONS: L26, M13.

1. Introduction

This paper outlines a model which attempts to clarify the role of opportunity in the modern economic theory of the entrepreneur. The term ‘opportunity’ is widely used in the theory of entrepreneurship. Indeed, it appears in the titles of two influential books: Kirzner’s *Perception, Opportunity and Profit* (1979) and Shane’s *General Theory of Entrepreneurship: The Individual-Opportunity Nexus* (2003). The term also appears in economics in other contexts:

most notably ‘opportunity cost’—a concept that is fundamental to the theory of resource allocation. This is not a coincidence—the concept of opportunity arises naturally wherever choices have to be made. Microeconomic theory is a theory of choice under conditions of scarcity, and entrepreneurship studies the behaviour of individuals who specialise in making choices that require intensive use of judgment—i.e. choices that involve unprecedented situations in which different people are likely to make different decisions (Casson, 1982).

The term opportunity has been employed in different ways by different writers on entrepreneurship, and this has created some confusion. Kirzner (1973), for example, suggests that opportunities are like dollar bills blowing around on the side-walk, waiting for an alert individual to pick them up. Schumpeter (1934), by contrast, suggests that opportunities require large amounts of capital to exploit, and that the commitment to exploit them can be found only in minds of the highest order.

The difficulty is that—like many other concepts in economics, such as ‘market’ or ‘competition’—discussion of opportunity is rarely grounded in a manner which makes the application of the concept straightforward and obvious. When used in some contexts, the word seems to signify merely an idea about how to earn a profit. In the economic literature, it often relates to an unexploited ‘activity’, but it remains unclear what sort of ‘activity’ this would be. The purely metaphorical nature of Kirzner’s example, and the very unusual and extraordinary activity described by Schumpeter, reinforce this notion that the concept of opportunity is difficult to apply in practice. This paper argues that an opportunity is best

Final version accepted on November 2006.

Mark Casson and Nigel Wadeson
Centre for Institutional Performance
University of Reading
Whiteknights, Reading, RG6 6AA, UK
E-mail: m.c.casson@reading.ac.uk

conceived as a potentially profitable but hitherto unexploited *project*. There are specific qualities that distinguish projects from activities, and these qualities demonstrate how the concept of opportunity can be brought 'down to earth' in a relevant manner. The shift from activity to project does not require a radical rethinking of the subject; rather, it is an exercise in clarification.

There are relatively few opportunities that simply lie around for people to stumble across by chance. The discovery of an opportunity generally involves a commitment of scarce resources; in some cases this may be simply the time of the person involved, but in other cases physical resources, such as offices and IT systems, can be tied up as well. In a world of scarcity, these resources could have generated value if they had been deployed to an alternative use. The costs are sunk, e.g. the time an entrepreneur has spent in seeking out a project cannot be recovered if it is abandoned (although any unspent time can, of course, be saved).

Although the concept of opportunity is well known, many economists continue to have difficulty understanding why it plays such a central role in entrepreneurship. They tend to question why there is a stock of unexploited opportunities waiting to be discovered. If these opportunities exist, and could be exploited right away, why have they not already been exploited? This seems to point to an inefficiency in the economic system which is difficult to explain.

The short answer to this question is that the existence of unexploited opportunities does not imply any inefficiency at all. The misunderstanding arises because the costs of discovery have been ignored. More opportunities could be discovered if more resources were devoted to their discovery. But diminishing returns are liable to set in. The easiest opportunities to identify are likely to be discovered first, and so the costs of each additional discovery increase as more people join in the search and the stock of easily discovered opportunities is depleted. Secondly, duplication of effort becomes more likely as more people join in and make the same discoveries. Duplicated discoveries are not only socially wasteful: competition by rivals exploiting

similar projects dissipates rents and thereby, in the long-run, discourages entrepreneurial effort (Casson, 1994). Thus there is a margin at which the expected profit afforded by a further opportunity becomes equal to the expected cost of discovering the opportunity. Beyond this margin lie all the undiscovered opportunities that await discovery at a later date.

If there were a fixed stock of opportunities, then as new opportunities were discovered the stock of unexploited opportunities would decline until no new opportunities remained to be discovered. Such 'stagnationist' thinking was once quite common (Keynes, 1936), but it overlooks the implications of learning and volatility. Experience gained as a by-product from exploiting existing opportunities creates new opportunities by making additional projects viable. Changes in the environment can also make new projects worthwhile, whilst making others obsolete. As the economy adapts to changing conditions, new opportunities arise as fast as others are destroyed.

The exploitation of opportunities is a vital part of the economy's response to external shocks. When new scarcities arise, or existing scarcities tighten their grip, opportunities arise to economise on the scarcer resources and substitute other resources for them instead. Opportunity recognition, stimulated by the prospect of profit, encourages entrepreneurs to seek out the projects which help the economy to adapt to changing conditions. In Austrian theory, it is the prospect of profit from an opportunity that motivates the search that leads to discovery (Kirzner, 1973).

Opportunities, therefore, are a natural consequence of economic volatility. At any given time some opportunities will be recognised and exploited, and others will be overlooked. The set of potential projects from which opportunities are drawn is always very large, and so it is important for the entrepreneur to choose the right field in which to search. A set of possible search strategies is delineated below. The long-run success of the entrepreneur can then be explained by good judgment in the choice of search strategies. In summary, search strategy impacts significantly on the performance of the entrepreneur.

2. The concept of opportunity

The key to the model set out in this paper is a view of the economy as a system of interdependent projects, linked by flows of information and material resources. Each project generates goods and services; a simple project may generate a single good or service whilst a more complex project may generate a mixture of them.

Both information and material resources are scarce. The economic problem for a society is to select the most appropriate portfolio of projects. In a free enterprise system this selection is generated by the interaction of numerous decisions made by different individuals, and aggregated through market institutions. All the individual decisions are subject to uncertainty. Given the state of the economic environment at any one time, there is a set of projects that would best meet the needs of society. This set cannot be identified, however, because of the scarcity of information. Some of the projects in the set may be already in operation, but others may not. An opportunity is a project which would form part of the optimal set but which is not in operation.

In this model, individuals are rational, but they incur information costs. They address the scarcity of information by economising on its use. This explains why they face uncertainty: collecting all the information required to guarantee a correct decision would not only be difficult, but hopelessly uneconomic. Thus the amount of uncertainty that a person faces is to some extent a consequence of their own decisions on how much information to collect. Gifford (1995) has made a similar point, but she follows Radner (1992) in assuming that individuals have fixed and finite computational capabilities. In the interests of simplicity, the model below assumes, on the contrary, that individuals can always process additional information if they are willing to incur the cost. The two approaches complement each other; they lead to similar conclusions, but the cost-based approach is simpler than the capacity-based approach for present purposes.

It is assumed that individuals are 'meta-rational' in the sense that they optimise the amount of information they collect. This implies

that they face a trade-off between the costs of collecting additional information and the benefit of reducing the risk of a mistake. There are two types of mistake: missing a profitable opportunity, and exploiting an unprofitable opportunity by confusing it with a profitable one. To effect the trade-off, an individual needs to know their information costs. They also need to have a theory that identifies the risks they face, and the instruments available to manage these risks. Meta-rational individuals are 'instrumental' and 'purposeful' in the sense that they pursue given ends (Mises, 1949), but they are only 'boundedly rational' rather than 'substantively rational', in the sense that they do not normally act upon full information (Simon, 1983).

The ends pursued by entrepreneurs may be non-materialistic; some choices may offer them emotional rewards, based on personal recognition and social status, as well as purely financial rewards. Whilst Austrian theory tends to emphasise material rewards, Schumpeter was very clear that emotional rewards based on status (the will to win) and the creation of a legacy (the desire to found a dynasty) are important to outstanding entrepreneurs.

It is not only information that is costly to acquire: theories too are costly to acquire as well. A rational individual may well select a theory that they know is highly simplified because a more complex theory would be too expensive to learn, and would be of little use if the information required to apply it was difficult to collect. Although a meta-rational individual may be aware of more sophisticated theories, therefore, they choose not to use them because of the cost involved.

Entrepreneurs are people who believe that they have lower information costs than other people. They may also believe that they have better theories, because they find theories easier to learn, and can therefore invest in more sophisticated ones. Entrepreneurs have a comparative advantage in collecting and processing information. Moreover some entrepreneurs have a comparative advantage in processing one type of information, such as marketing intelligence, whilst others have a comparative advantage in processing other types of information, such as technological information.

To undertake large projects, entrepreneurs need reputation, because they require access to resources they do not own—in particular, to other people's funds (Knight, 1921). Reputation means that other people accept their claims. An entrepreneur becomes a specialist decision-maker when other people place their resources under the entrepreneur's control by lending funds, e.g. by investing in his firm.

If an entrepreneur's claims are valid then his decisions will, on balance, be better than the decisions that other people would have made in the same circumstances, and therefore the value of the resources placed under his control will increase, e.g. his firm will be profitable and grow. Conversely, if the entrepreneur's claims are false then, in the long run, poor decision-making will lead to the failure of his firm and possibly the loss of his reputation too.

Overall, a good entrepreneur, with good judgment, will tend to select good projects, whilst a bad entrepreneur, with bad judgment, will select bad projects. Of course, given the prohibitive cost of collecting full information, there will always be residual uncertainty; good judgment shortens the odds, but does not guarantee success.

The new projects promoted by a good entrepreneur will tend to be true opportunities, whilst the projects promoted by a bad entrepreneur will be false opportunities—i.e. projects that appear promising to people who use over-simplified theories and poor information. Investing in false opportunities represents a waste of resources because the opportunities do not belong to the optimal project portfolio. The key to entrepreneurial success is to possess sufficient judgment to recognise true opportunities and screen out false ones.

3. Projects

A key aspect of the systems view set out in this paper is that resources are allocated between projects rather than activities. In conventional economics, resources are allocated between activities. An activity involves a continuous flow of inputs and outputs. When an activity is in a steady state, the rates of input and the rates of output are constant over time. The level of the

activity is variable; if conditions change then the scale of the activity can be either increased or decreased instantaneously with no cost of adjustment, so the system can easily move from one steady state to another. Hence operations are never 'locked in' to any particular scale of activity.

By contrast, a project involves a stock of resources which are committed to a particular use over a considerable period of time. These resources include land, labour, and physical capital such as office and factory buildings, plant and equipment. Setting up a project may incur substantial sunk costs: it involves a commitment of resources which cannot be recovered if the project is abandoned later. The scale of a project cannot be easily changed, although various real options may exist for reducing its scale (e.g. by not replacing worn out equipment) or expanding the scale (e.g. developing new projects as spin-offs of the existing one) (Dixit and Pindyck, 1994). The values of the various types of real options or, put another way, the value of flexibility, form part of the overall value of the project (McGrath, 1999).

The benefits generated by a project are usually realised only after many of the costs have been incurred. Projects therefore need financing: someone needs to pay the costs before the revenues come on stream. These costs and revenues are not necessarily monetary: the cost may be represented by unwaged voluntary effort, whilst the revenues may be payments in kind, such as the satisfaction that volunteers obtain from a job well done. In some cases financing may be provided by the project team as a whole, but in other cases it is supplied by a specialised group of shareholders.

There are many different types of project, and even projects of the same type are different, although some of the differences may be small. Thus all retail projects have important characteristics in common, but there is still heterogeneity: shops differ in their location, the date they were established, and the range of products that they stock.

In principle, all projects compete for resources. Land, labour and finance are all scarce. However, because of interdependencies, many projects also complement each other. The

outputs generated by one type of project are the inputs required by some other types of project. It is therefore more accurate to say that clusters of complementary projects compete for resources.

Projects need to be managed. The implementation of a project normally requires that some processes are carried out before others: it is difficult, for example, to put up a building by painting it first and digging the foundations later. Someone has to plan the activities in the correct sequence and supervise the implementation of the plan. Internal coordination therefore requires project management. Volatility can disrupt schedules, and so it is inconvenient to adhere to a completely rigid sequence. Risks associated with absenteeism, bad weather, and shortages of materials all favour flexibility, as does learning that takes place as part of the project (Wadeson, 2005). A manager therefore needs to be in constant attendance, and in a large and complex project, management becomes a specialised role.

Choices between projects can be made either within firms—e.g. where different divisions compete for internal funds (Chandler, 1962; Williamson, 1975)—or between firms, as when different firms compete for venture capital to undertake the projects they have decided to promote. Whilst the distinction between internal and external project selection is of considerable significance for the theory of entrepreneurship as a whole, it is of only secondary relevance to the theory of opportunity, and so the distinction will not be pursued further here.

4. Project possibility sets

In an activity-based view of the economy (e.g. Koopmans, 1951), there is a set of *possible* activities and, within this, a subset of *feasible* activities. The set of possible activities which are not necessarily feasible comprises all the available inputs combined in every conceivable proportion. The set of feasible activities is determined by the state of technology at the time. The set of production activities, for example, is specified by the activities which enter into the production functions in various industries.

In a project-based view of the economy, the corresponding notion is that of project sets. When analysing entrepreneurship it is tempting to reject the notion of a given set of possible projects and to argue that the entrepreneur creates new possibilities through the exercise of his imagination. The difficulty with this approach is that, without a well-defined set of possibilities, it is impossible to apply the theory of meta-rational choice, as set out above. The approach therefore retains the notion of a given set of possibilities—i.e. a set of possibilities which is exogenous to any decision made by the entrepreneur. Whilst it is recognised that other approaches can be taken, it is claimed that this is the simplest and most direct way to construct a rigorous theory of entrepreneurship.

There are three stages involved in implementing a project: discovery, investment, and operation. Entrepreneurial judgment is involved in all three stages, though the level of judgment typically diminishes with successive stages. The same entrepreneur does not have to undertake all three stages, but we will assume, unless otherwise stated, that he or she does. If there were markets in ideas ready for investment, and investments ready for operation, then an entrepreneur could sell a partially completed project to another entrepreneur. This would allow different entrepreneurs with different skills to specialise in different stages of project innovation. In practice, however, selling projects is usually difficult, as rights to unexploited projects are difficult to defend (Casson, 1982, Chapter 11).

It is assumed that each project competing for resources is championed by a single entrepreneur. Entrepreneurship is defined as a role rather than a person, which means that the entrepreneur, as a person, may fulfil other roles as well. An entrepreneur may promote several projects rather than just a single one.

An entrepreneur does not know in advance whether a possible project is feasible. Moreover, even if a project is believed to be feasible in a technological sense, it may not be viable in an economic sense, because the benefits conferred by the project do not outweigh its costs. Although activity-based models typically assume that the feasibility of activities is common knowledge throughout the economy, the assumption in a

model of entrepreneurship must be that neither the feasibility nor the viability of a project is common knowledge. Indeed, there is no agreement between people on either of these questions. People who take an optimistic view may believe that a project should be undertaken, whilst pessimists believe that it should not. In a free market economy, the optimists can go ahead despite the reservations of the pessimists provided that they can mobilise sufficient resources to carry out the project at their own risk.

The basic notion of a trade-off, encapsulated in conventional activity-based models of the economy, remains valid because all projects compete for the same resources and are drawn from the same possibility set. However, the project set is much more heterogeneous and diverse than in the activity-based view of the economy, and hence the trade-offs are far more subtle.

When modelling entrepreneurship, it is easier to focus on the set of projects, which is objective and exogenous, rather than the set of opportunities, which is subjective and endogenous. The set of opportunities is subjective because it reflects individual entrepreneurs' perceptions of prospective profits. It is endogenous because some of the unexploited projects that form the basis for the opportunity set only exist because entrepreneurs decided not to exploit them previously. Much of the confusion over opportunity has arisen because of the failure to distinguish properly between the project set and the opportunity set, and to recognise that it is the project set that holds the key to modelling entrepreneurial behaviour in a rigorous way. Whilst the notion of an opportunity set has intuitive appeal, it lacks the objectivity and exogeneity that is required to make it really useful for analytical purposes.

5. Coordination in a project-based economy

Coordination of the economy hinges crucially on selecting the most appropriate portfolio of projects. In a volatile economy, the project portfolio needs to be continually updated. Because projects are long-lived, this is not a matter of instantaneously changing the entire portfolio, as would occur in a conventional

activity-based economy. Neither is it simply a matter of adjusting the scale of existing projects. With the scale of existing projects largely fixed, adjustment tends to occur by starting up entirely new projects. As already noted, at any one time there is a large number of projects which are not in operation, and hence there is a wide range of new options to choose from.

To undertake these new projects it is necessary to find supplies of land, labour and finance. There may be spare supplies because of 'frictions' in the market process: e.g. 'brownfield' land which became idle in a previous period and has not yet found an alternative use; unemployed labour, and workers returning to employment after maternity leave; idle cash balances waiting for an investment opportunity, and so on. Some resources may be liberated by reducing the scale of existing projects. When start-up projects are small, contractions in larger long-established projects are a natural way of liberating resources. In some cases, however, large projects may have reached the end of their life, through depreciation or obsolescence, or both, and may therefore be ready to be shut down altogether.

A simple way of viewing this process is to say that each period all the possible projects in the economy are placed in competition with each other for scarce resources (Witt, 1998, 169–70). The focus is on competition in the factor markets for land, labour and finance. Although rival projects will ultimately compete with each other in product markets too, this competition will only occur once the projects have successfully completed the initial investment stage. To complete this stage they need to obtain resources. Their claims on resources will, of course, be assessed on the basis of how well they are expected to compete with rival projects in the future, but this is competition based on expectations regarding product market competition rather than the reality of the competition itself (Shackle, 1979).

From this perspective, existing projects are competing with new projects to retain the resources already under their control. Thus entrepreneurs in charge of established projects are fighting to retain the allegiance of key employees who might be tempted away to join

new projects, or existing projects which plan to expand. Established projects have an advantage over new projects because their costs are already sunk, whereas those of the new projects are not. On the other hand, some existing projects—particularly those which have only recently started—may have failed to fulfil their expectations regarding product market performance, and so may be ripe for killing off.

An entrepreneur has to assess the probable value of the future benefits generated by his project—whether or not the project is already in operation (Sarasvathy, 2001). He then has to assess how much he is prepared to pay for the resources that he requires to control. How much will he offer to key workers, either to retain their allegiance or to bid them away from rival firms? How much is he prepared to pay in rent for factories and offices, and is he prepared to take up or renew a mortgage for the outright purchase of a property? On what terms is he prepared to sell equity in his venture, or to borrow on loan?

6. Complements and substitutes

If all the projects considered at any given time are substitutes for each other, then it is relatively straightforward for the factor markets to allocate resources to the most promising projects. These are the projects that are most highly valued by the optimistic entrepreneurs that promote them, relative to the costs of the resources they use. As rival entrepreneurs bid up the wages of labour, the price of land, and the interest rates on loans, so the values of projects (as reflected in their share prices, for example) falls. Once the share price becomes negative, a project is eliminated from the bidding. Eventually there are just sufficient projects remaining to use up the available resources.

If entrepreneurs' expectations are correct then, provided certain other conditions also hold, this process will generate an optimal portfolio of projects. But if some of the entrepreneurs have mistaken expectations, then the outcome may be sub-optimal. However, if each entrepreneur was meta-rational then the portfolio will be subjectively optimal, conditional upon the information available at the time

decisions were taken, and the distribution of that information amongst the entrepreneurs (as suggested by Hayek, 1959).

Projects are not necessarily substitutes, however; e.g. different projects may relate to adjacent stages of the same production process. More subtle interactions are also possible: thus two firms may independently set up in the same district, and only later realise that their by-products are useful to each other.

Conflicts can also arise. Negative externalities occur when one project damages the performance of another: this is the reverse of the complementarities discussed above. For example, the by-products from one plant may pollute the environment of the other, as when a textile mill discharges effluent that pollutes the river water used by a brewery downstream. Conflicts can also arise through wasteful replication; e.g. two similar projects are promoted when there is only room for one. Conflicts are particularly likely if the legislative framework is poor (Baumol, 2002).

The most direct way to address complementarities is to group complementary projects together and evaluate them as a whole. The most direct way to address conflicting projects is to place the projects into separate groups with the provision that only one group can be undertaken. The difficulty with this approach is that, in practice, almost every project is complementary to, or in conflict with, some other project to some degree. As a result, the portfolio selection problem becomes extremely complex. It may involve a choice between different economy-wide sets of complementary projects, with numerous rival sets of projects. It becomes, in effect, a problem for a central planner. The problem is unlikely to be solved effectively by a central planner, however, because the planner will not have all the information he requires at his disposal, and has little incentive to apply the practical judgment that is characteristic of the successful entrepreneur.

In a free market economy these problems are addressed pragmatically. Local planning is often used to address complementarities and negative spill-overs, and to avoid wasteful duplication of facilities. This reflects a view that distant

projects are more likely to be independent of each other than projects in the same locality. When entrepreneurs need to get planning permission before they can go to factor markets, their discussions with the planners help to coordinate project selection at the local level.

A free market also allows entrepreneurs to merge the ownership of interdependent projects. Complementarities can be managed through vertical integration, which brings interdependent activities under common ownership and control. Replication can be addressed by rival entrepreneurs merging their interests through joint ownership of a single project (Richardson, 1960).

7. Infrastructure and knowledge

There is a special form of complementarity which has particular significance for entrepreneurship, because it affects the sequencing of investment decisions. It arises when one type of project needs to be completed before another type of project can commence.

Infrastructure is an obvious example. It has long been recognised that transport infrastructure—in particular roads, bridges, railways, ports and airports—needs to be in place before mass production and heavy manufacturing can get underway, for otherwise there is no affordable means of importing materials or exporting the products. It follows that knowledge of where appropriate infrastructure exists is essential to the manufacturing entrepreneur.

This leads to the second point, which is that other forms of knowledge are also a pre-requisite for certain types of project. Knowledge of the problems encountered with the existing technology in an industry is a useful guide to projects that can improve upon it. Knowledge spill-overs occur not only within industries but between industries: spill-overs between textiles and engineering, for example, have exerted a strong influence of the development path pursued by newly industrialising countries (Audretsch and Keilbach, 2006). Understanding the implications of the knowledge gained in one project for the performance of another project can be crucial in optimising the sequencing of project investments.

Spill-overs are also important in the commercialisation of the economy. The establishment of markets can boost production by making it easier to realise profit from output. Quite small investments in market-making can often have quite remarkable effects. The establishment of a general store near a cross-roads may attract artisans to use the store as a retail outlet. As the local population increases, additional services are provided. Entrepreneurs with new ideas are attracted to the area once it has become an established market place. Innovative practices stimulate competition and give the emerging market town a good reputation, which expands its geographical catchment area.

In principle, spill-overs could be taken into account in a central plan. The planner would devise an inter-temporal development plan for the entire economy. This would specify a sequence of project investments that adjusted the project portfolio each period so that it followed an optimal path. In practice, of course, the information requirements of such an exercise are quite prohibitive, being even greater than the requirements of the other planning exercises described above. As a result, the responsibility for exploiting spill-overs devolves to individual entrepreneurs.

8. Evaluating new projects

The project-centred approach to the economy highlights the importance of the process by which projects are evaluated by individual entrepreneurs. Because of the heterogeneity caused by the proliferation of project varieties, there is an enormous number of projects for entrepreneurs to investigate. The projects already in operation are a tiny proportion of the projects that need to be considered. Although some projects not in operation may have been previously tried and subsequently shut down, they too are small in proportion to the number of wholly untried projects.

If every project in the set of all possible projects were promoted every period by some entrepreneur, then the number of entrepreneurs required would be enormous. Indeed, expenditure on the evaluation of projects and the selection of successful bids would probably

exhaust the entire resources of the economy. It is therefore vitally important to find a strategy for economising on the costs of entrepreneurial discovery.

The following sections set out in detail a model of how opportunities are discovered. Discovery is analysed as a two-stage process. In the first stage the entrepreneur identifies one or more fields in which he intends to focus his search. In the second stage the entrepreneur examines in detail a set of potential projects within the chosen field, appraising their prospects in terms of a number of observable characteristics.

These characteristics are regarded as symptoms of the project's underlying profitability, which cannot be directly observed. For example, a symptom that customers would value the introduction of a premium quality product in some industry is that a high proportion of existing goods are returned by customers as defective items. While this does not directly demonstrate the existence of demand for quality, it is likely to be correlated with it.

The selection of symptoms is guided by an underlying theory. In determining the fields of search in which to specialise, the entrepreneur considers the kinds of symptoms that will be available in each field, and the way in which he will combine them to arrive at a final decision. In the first stage, where he selects the field, the entrepreneur eliminates entire classes of projects, whilst in the second stage he only eliminates individual projects, whilst accepting others.

The sequential approach to observing project symptoms allows the entrepreneur to decide, at each successive step, whether the investigation of symptoms is worth continuing, given the information collected at previous stages. It also has the advantage that each observation that is made helps to inform the choice of which symptom to observe next (Wadeson, 2004).

9. Choosing the field of search: an inward-looking approach

Consider to begin with a single representative entrepreneur who seeks to identify new project opportunities. It is assumed that the set of all possible projects, though large, is finite. It is also

assumed that the set has been classified in such a way that an entrepreneur can easily select a particular field in which to search. For example, if the entrepreneur is interested only in book-selling projects in English country towns, then he does not need to scan opportunities for mechanical engineering projects in the US as well. This is because information on certain characteristics of projects, such as type of output and location of facilities, is freely available. Other information, which would enable the entrepreneur to assess the profitability of a project, is not freely available, however, as explained above. The entrepreneur needs to consider the implications of this when he chooses his field of search.

There are three main criteria by which the entrepreneur can select a promising field of search. One of them is 'inward-looking', and the other two are 'outward-looking': one looks outward to the economic environment, whilst the other looks simply at the projects already in operation, and how their performance can be improved.

The inward-looking approach focuses on the preferences and capabilities of the entrepreneur. The entrepreneur is in a good position to know these already.

- If the entrepreneur plans to manage the projects in which he invests, then it will pay him to screen out projects for which he lacks the relevant management skills.
- If he needs to manage on the spot, then he may confine himself to projects located near his place of residence.
- If the entrepreneur needs to borrow funds to undertake large projects, it will pay him to screen out large projects for which funding will be difficult to procure.
- There is no point in the entrepreneur selecting a field in which he lacks the knowledge or expertise to screen projects properly: e.g. a field like oil and gas exploration, which involves large and complex projects, is inappropriate for an entrepreneur who lacks the mathematical skills to undertake difficult scientific and financial calculations.
- A life-style entrepreneur may only consider fields which are interesting or amusing to him,

or provide him with the status to which he aspires.

- An entrepreneur may reject areas to which he has a moral objection, and even decide to concentrate only on areas which he considers particularly worthy from a social perspective.

The weakness of this approach is the obverse of its strength, however. It makes no use of information about the state of the economy. Instead of looking inward, to his own capabilities, it may be said, the entrepreneur should be looking outwards at the current state of the economy.

10. An outward-looking approach: examining the economic environment

There are two main ways in which the entrepreneur can base his choice of field on observations of the economy. One is to examine the environment of the economy, and the other is to examine projects already underway. We consider these two approaches in turn.

If the entrepreneur thinks like a conventional economist then his natural approach will be to work with a model of the economy. A conventional economic model will tend to suggest that the portfolio of projects currently in existence is reasonably well adapted to the needs of the economy. The entrepreneur will therefore infer that new projects are warranted only by a change in conditions. He will assume that change is driven by exogenous shocks to the business environment. Given that projects are long-lived, he will focus on long-run trends, such as demographic changes, changing lifestyles, and the depletion of natural resources. These trends require adaptation of the project portfolio to be implemented through the introduction of new projects.

The entrepreneur, considered as a practical economist, may have access to a formal model. This model will identify the sort of trends described above, and demonstrate their probable impact on prices, wages, interest rates and other factors affecting the relative profitability of different projects.

In practice, the entrepreneur is likely to use more informal methods as well. He may simply

extrapolate recent trends that he has noticed. Using his general knowledge, he may draw upon historical analogies to infer what is likely to happen in the future if these trends persist, in the light of what happened in similar situations in the past. He may also draw upon his own personal experience of more recent situations.

While the economic model may succeed in identifying the demand for new projects, it is not so well equipped to identify the supply of feasible projects. The supply of new feasible projects is strongly influenced by technological change. The entrepreneur may adopt a purely passive role, taking the pace of technological progress as a datum, and waiting for appropriate projects to become feasible. Alternatively, he may become more pro-active, initiating R&D projects with the specific aim of developing new goods and services which will meet the emerging demands identified by the model.

The decision to undertake an R&D project is, in principle, no different from the decision to undertake any other kind of project. However, R&D projects are not simple stand-alone projects, but are complementary to the production and marketing projects that produce and sell the new goods and services created by the technology. In this sense, R&D projects cannot be evaluated independently, but need to be evaluated as part of a set of projects which involves the exploitation of the research output too. The R&D project will be undertaken before the production and marketing projects, in case the R&D should be unsuccessful. This is a special case of the spill-over lag discussed above. The institutional response to this complementarity involves vertical integration between production, marketing and R&D: the firm that undertakes the R&D undertakes the production and marketing too.

Because it identifies new long-term trends, this approach to new project selection may well lead to radical innovation. There is no guarantee that a purely incremental adaptation of existing types of project will meet the challenges. A new R&D project may be required to address the issues possibly involving a combination of public and private funding. The emergence of a nuclear power industry in the 1950s, in response to a per-

ceived decline in stocks of fossil fuels, is a case in point.

11. An outward looking approach: examining the performance of current projects

The second approach to project selection is for the entrepreneur to base his decision upon an examination of the projects already underway in the economy. The entrepreneur foregoes the deductive process embodied in the economic model and moves straight to the issue of which types of project are currently performing best in the economy. There are two ways in which such information can be used.

The first is simply to measure variations in the current performance of existing projects and to infer that more projects of the best performing types are required. Investment in these projects can be financed by scaling back, or closing down completely, the worst performing types of project. At its crudest, this is an example of extrapolative expectations. It assumes both that existing levels of performance will persist, and that projects similar to those already in operation will generate similar levels of performance. The approach is exemplified by many management consulting reports, which identify high-performance projects, examine the ways that they are managed, and then promote the management techniques they employ as examples of best practice that can be applied elsewhere.

The advantage of this approach is that it eliminates the risk of mis-interpreting the long-term changes and their implications for the economy. Its disadvantage is that it focuses on the issue of whether more or less of existing types of project are required, rather than whether new types of project are required altogether. In contrast to the previous approach, therefore, it is conservative and incremental: new types of project are not considered, and so radical innovation cannot occur. The principal disadvantage is that extrapolation is an unreliable technique; in particular, it fails to recognise that cloning projects may result in excess capacity which depresses returns.

The second way of using information about existing projects exploits the notion of concealed

complementarities mentioned earlier. It is based on the notion that there are many complementarities between existing projects, only some of which will have been recognised at the time that investments in existing projects took place. To realise fully the complementarities between existing projects, it may be necessary to invest in yet another project, whose significance was not appreciated at the time that the previous investments took place. On this view, new investments are complementary to existing investments, rather than just substitutes for them (Young, 1993). For example, the innovation of the personal computer exploited a concealed complementarity between existing office-based computer systems and the growing demand for home working, driven by the growth of dual-career families. Considered as projects, office computer systems exemplified a technology-driven project, whilst home-working exemplified a socially-driven project, and the connection between them was initially unclear. The personal computer adapted the office-based computer system to personal use and so realised the concealed complementarity between computer technology and home-working. Although the personal computer competed with office computer systems, its success did not derive solely from its superiority in an office environment. Although it diverted resources away from other projects—including conventional office-based computer systems—by taking labour and finance away from them, its success was mainly due to its complementarity with other projects that were already underway.

A similar point applies to hidden conflicts. Two seemingly unrelated investments may have been made in the past which turn out to have been in conflict with each other. Given that some of the costs of the projects are already sunk, it may be uneconomic to shut one of them down. A better approach may be to introduce a third project which will ameliorate the conflict between the two. Referring back to an earlier example, if a textile mill pollutes river water used by a brewery, a new environmental technology for the treatment of effluent may be the answer to the problem. In this way, unforeseen problems created by an existing set of projects generate an opportunity for new projects.

12. Sampling

Whilst selecting a field of search narrows down the choice of projects considerably, it may not narrow it down sufficiently, because of the large initial size of the project possibility set. Even within a chosen field, screening every possible project is likely to be a major undertaking. A natural way to economise on the cost of screening is to select just a sample of possible projects within the field.

It has already been noted that the set of all possible projects presents itself to the entrepreneur, not as an undifferentiated mass of projects, but as a classified list. The entrepreneur can therefore sample from this list in a systematic way. Sampling can be implemented using a table of random numbers or by picking, say, every tenth project on the list. In practice, of course, this is not the way that sampling is done, but for the purposes of this analysis it is not the mechanism itself that counts, but rather the implications that can be deduced from the analysis. So far as the outcome of the sampling process is concerned, the assumption of random sampling is compatible with the general opinion that it is very difficult to predict which particular opportunities will be examined by any given entrepreneur.

13. Sequential screening

While the field to which a project belongs can be freely determined, other information about a project can only be determined at a cost. The entrepreneur cannot gather information which determines with certainty whether a project will be successful or not. The profitability of a project cannot be directly observed in advance. The entrepreneur can, however, observe certain characteristics of a project which he believes are correlated with its future profitability. The key characteristics are identified by a theory to which the entrepreneur subscribes. Different theories suggest that different characteristics are important. Different entrepreneurs may subscribe to different theories, and therefore seek information on different characteristics.

Because information is costly, the entrepreneur will not normally collect information on all

the relevant characteristics. He will focus on the characteristics that he considers most decisive, i.e. characteristics which predict success or failure independently of other characteristics. A characteristic which is hard to observe, and can only be interpreted in the light of other observations, may not be worth the cost of investigation.

In principle, the entrepreneur could determine in advance the set of project characteristics that he will investigate, before any observations at all have been made. In practice, this is not normally efficient, however (Lippman and McCall, 1976). It is better to wait to see whether the information already collected on an initial set of project characteristics is reasonably decisive before incurring additional costs by observing other characteristics. Each time a new characteristic is observed, the entrepreneur considers whether to continue his investigation or to terminate it. He may terminate the investigation by either accepting or rejecting the project, according to its prospects for success.

We consider a situation in which an entrepreneur can investigate only one project at a time. The entrepreneur must terminate the investigation of one project before he can proceed to investigate another. If he accepts a project, and becomes involved in its implementation, then he will have no time to search out other projects until either the project has come to the end of its life or he has delegated its implementation to someone else. An entrepreneur who does not delegate is liable to get 'stuck in a rut' with a single project. A versatile and imaginative entrepreneur will delegate the implementation of a project as soon as possible so that he can proceed to investigate others.

To implement a screening programme the entrepreneur requires a criterion by which to accept or reject a project. The criterion cannot be expressed directly in terms of profitability because profit is not directly observable at the evaluation stage. The criterion must be expressed in terms of the observable characteristics which are the symptoms of the underlying profitability.

A simple decision criterion will refer only to the most recent observation to determine whether search should continue or whether it should

terminate. The criterion also determines which observation should be made next if the search continues, and whether the project should be accepted or rejected if search is terminated.

A more sophisticated decision rule will make use of memory. Use of memory is a major factor distinguishing sophisticated decision rules from simple ones. A sophisticated decision rule would relate the decision at each stage of an investigation to the entire set of observations already made, rather than just to the last observation.

An even more sophisticated approach to the evaluation of the set of projects would allow the further consideration of a project to be postponed until other projects had been considered. In this case the entrepreneur would have the additional option of temporarily terminating the search by placing a project 'on hold' until other projects had been investigated. The results of the investigation would be memorised for future use.

In determining the criterion of success, the entrepreneur has to decide how high to set the target level of profitability to which he aspires. If he aspires to a very high level of profitability when evaluating projects from an unpromising population then he must expect to spend a good deal of time searching before he finds an acceptable project; conversely, if he demands only a moderate level of profitability then he can expect the search to be shorter. The entrepreneur must optimise this trade off between small profits sooner or larger profits later when determining his project acceptance criterion (Casson and Wadeson, 1998).

The more uncertain the entrepreneur is about the overall characteristics of the population of projects in the field from which he is sampling, the more likely it is that projects will be placed on hold. To optimise the trade-off described above, the entrepreneur must take a view about the underlying profitability in the population as a whole. As he samples from the population, he may come to regard his initial beliefs about the population as wrong. If he is aware of this risk before he starts then he may decide to place 'on hold' some of the first projects that he examines, so that he can return to them later. In particular, if the entrepreneur believes that he may be too optimistic about the population at the start then

he can plan to re-visit early projects placed on hold, with a view to accepting some of them later on. It will pay the entrepreneur to remember not only which projects were placed on hold, but also the observations made upon them, so that, if necessary, observation of these projects can be taken up again at the point at which it was stopped before.

14. Competition between entrepreneurs

The analysis of entrepreneurial decision-making has so far focused upon a single entrepreneur. In practice, of course, there are many entrepreneurs in the economy, and no analysis of entrepreneurship would be complete without an examination of the relationships between them.

In principle, entrepreneurs could be allocated to sub-fields by a central planner, who delegates the discovery of opportunities in each particular field to a particular entrepreneur. This would require the planner to have a very precise and comprehensive classification of fields, in order to resolve territorial conflicts between entrepreneurs in neighbouring fields, and to ensure that no promising fields were overlooked. The failure to achieve such precision may explain why this approach has not been widely used in government. However, it is quite commonly applied within conglomerate firms, where the fields are narrower; in these circumstances, each manager of a product division is typically treated as an internal entrepreneur (Penrose, 1959).

Under central planning, the planner determines the number of entrepreneurs in each field. To avoid wasteful duplication of effort, the fields may be sub-divided to the point where there is only one entrepreneur in each field. Market economies operate on a different principle, however, in which there is no control over the number of entrepreneurs in a given field. As a result, in choosing their fields of specialisation, entrepreneurs must take account of the choices of field made by other entrepreneurs.

There is little point in choosing a crowded field, unless it is highly profitable. Sunk costs are incurred in entering a field, and so entrepreneurs will tend to stay in a field once they have entered it. This makes it easier for other entrepreneurs to assess how many people there are in the field,

and how 'crowded' it is relative to other fields. Over-crowding is most likely in fields that involve low sunk costs: not only are these easier to enter, but people can enter and leave so quickly that the number of people in the field at any given time is difficult to assess. Over-crowding is a particular risk when there is highly publicised discovery, and people act on extrapolative expectations—the 'gold rushes' of the nineteenth century are a case in point.

With 'free for all' discovery, entrepreneurs may gain an advantage over others simply by being better at estimating the number of people already in a field. Even if they cannot observe the number directly, they may be able to infer it from a general knowledge of social networks—e.g. they may be able to assess how quickly news of a new discovery will spread. In other words, they become experts at 'second-guessing' the behaviour of other entrepreneurs.

Sophisticated entrepreneurs may be able to gain further advantage through the strategic exploitation of these social processes. An entrepreneur may start a rumour that a new discovery is false, to discourage competitors from entering the field. Alternatively, an entrepreneur may fabricate a new discovery so that he can lure people into buying up resources which he already owns. A classic case of social manipulation concerns the profit made by the Rothschild family from the spreading of misinformation in the financial markets regarding the outcome of the Battle of Waterloo.

15. Summary and conclusions

This paper has presented a simple model of entrepreneurship which explores the cognitive issues involved in the discovery of opportunities. An opportunity is defined as an unexploited project which is perceived by an individual to afford potential benefit. A discovery is the identification of an opportunity by an individual who scans the set of possible projects. A discovery involves screening a sample of potential projects from a selected sub-field of the project possibility set. An opportunity is discovered when a project meets the criteria established by the individual for a potentially successful project.

When modelling entrepreneurship in a formal way, the concept of a 'project set' is actually more useful than the more familiar notion of an 'opportunity set'. Whilst the concept of an opportunity set has intuitive appeal, most propositions about opportunities can be expressed more rigorously as propositions about projects instead.

The model invokes the principle of rational action. It is suggested that an effective application of the concept of rational action calls for the existence of a given set of possible projects. The set is large but finite, and is organised into a number of specific fields on which entrepreneurs can focus their efforts.

An entrepreneur is someone who specialises in exercising judgment regarding investing scarce resources in projects. Entrepreneurship involves three main functions: discovery of an opportunity, procurement of resources for a project, and the realisation of benefits through project implementation. Competition with other entrepreneurs is liable to emerge at each of these three stages.

Writers on entrepreneurship who stress imagination and creativity sometimes suggest that the field of entrepreneurial endeavour cannot be mapped out—there are no coordinates by which one entrepreneur can position themselves relative to another (Shackle, 1979). This is not the view taken here. It is argued, instead, that opportunities are related to unexploited projects in a well-defined set of possible projects. Since this set is well-defined, it can be classified according to various characteristics, such as type of output, location of facilities, the sorts of tasks involved, and so on. This classification is certainly known to the modeller, and it is quite reasonable to suppose that it is also known to entrepreneurs, who are perfectly capable of defining the sub-field in which they plan to operate.

The key to modelling cognitive processes using a rational action approach is to recognise that decision-making is costly. There are two aspects to this: information is costly, and the formulation of theories that interpret information is costly too. Some types of information are more costly to collect and communicate than others. Simple models are cheaper to specify and learn than more complex models. Entrepreneurs

have a comparative advantage in decision-making because they have lower personal information costs than other people. They therefore specialise in taking judgmental decisions on behalf of other people. Other people loan them their resources, and employ them to manage these resources on their behalf.

Entrepreneurs therefore become the owners and managers of firms in which other people invest. Although entrepreneurs may invest in firms themselves, it is the fact that they control resources owned by other people that makes them specialists in their field.

To economise on information, entrepreneurs use a sequential approach to information gathering. A rational entrepreneur may commit to a project before he has examined it thoroughly because it is more efficient to invest in a good prospect at an early stage, and fine-tune it later, with further investment, once feedback from operation of the project has been obtained. However, the entrepreneur who makes the original investment is not always the best person to recognise subsequent opportunities to refine the project. In particular, other entrepreneurs may be better placed than the original entrepreneur to recognise concealed complementarities between the project and other projects, or to address problems which have arisen with the project in its original form.

The advantages of sequential investment mean that entrepreneurship is a path-dependent process. This does not mean that it is an inefficient process. Although path-dependence can result in lock-in, the expected costs of lock-in may be less than the savings in information costs effected by the sequential process. Because information costs are lower for entrepreneurs, entrepreneurs are well equipped to minimise the problems of lock in at the outset, and to ameliorate the problems at a later stage. In an entrepreneurial economy, the degree of lock-in is optimised in response to information costs.

The model set out in this paper has many implications. It addresses big questions concerning the evolution of economic systems. Further development of this analysis should allow the modelling of many different types of evolutionary phenomena using a rational action approach based on information costs.

References

- Audretsch, D. B. and M. Keilbach, 2006, 'Entrepreneurship, Growth and Restructuring', in M. Casson, B. Yeung, A. Basu and N. Wadeson (eds.), *Oxford Handbook of Entrepreneurship*, Oxford: Oxford University Press.
- Baumol, W. J., 2002, *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*, Princeton, NJ: Princeton University Press.
- Casson, M. C., 1982, *The Entrepreneur: An Economic Theory*, Oxford: Martin Robertson.
- Casson, M. C., 1994, 'Cultural Factors in Innovation', in Y. Shionoya and M. Perlman (eds.), *Innovation, Technology, Industries and Institutions: Studies in Schumpeterian Perspectives*, Ann Arbor: University of Michigan Press, 271–296.
- Casson, M. C., 1995, *Entrepreneurship and Business Culture*, Cheltenham: Edward Elgar.
- Casson, M. C. and N. S. Wadeson, 1998, 'Communication Costs and the Boundaries of the Firm', *International Journal of the Economics of Business* 3(3), 307–330.
- Chandler, A. D., Jr., 1962, *Strategy and Structure*, Cambridge, Mass: MIT Press.
- Dixit, A. and R. S. Pindyck, 1994, *Investments under Uncertainty*, Princeton, NJ: Princeton University Press.
- Gifford, S., 1995, 'A Model of Project Evaluation with Limited Attention', *Economic Theory* 5(1), 67–78.
- Hayek, F. A., 1959, *Individualism and Economic Order*, London: Routledge & Kegan Paul.
- Keynes, J. M., 1936, *The General Theory of Employment Interest and Money*, London: Macmillan.
- Kirzner, I. M., 1973, *Competition and Entrepreneurship*, Chicago: University of Chicago Press.
- Kirzner, I. M., 1979, *Perception, Opportunity and Profit*, Chicago: University of Chicago Press.
- Knight, F. H., 1921, *Risk, Uncertainty and Profit*, Boston: Houghton Mifflin.
- T. C. Koopmans, 1951, *Activity Analysis of Production and Allocation*, New York: Wiley.
- Lippman, S. A. and J. J. McCall, 1976, 'The Economics of Job Search: A Survey', *Economic Inquiry* 14, 155–189.
- McGrath, R., 1999, 'Falling Forward: Real Options Reasoning and Entrepreneurial Failure', *Academy of Management Review* 24(1), 13–30.
- Mises, L., 1949, *Human Action*, London: William Hodge.
- Penrose, E. T., 1959, *The Theory of the Growth of the Firm*, Oxford: Blackwell.
- Radner, R., 1992, 'Hierarchy: The Economics of Managing', *Journal of Economic Literature* 30(3), 1382–1415.
- Richardson, G. B., 1960, *Information and Investment*, Oxford: Oxford University Press.
- Sarasvathy, S. D., 2001, 'Causation and Effectuation: Towards a Theoretical Shift from Economic Instability to Entrepreneurial Contingency', *Academy of Management Review* 26(2), 243–263.
- Schumpeter, J. A., 1934, *The Theory of Economic Development (trans. R. Opie)*, Cambridge, MA: Harvard University Press.
- Shackle, G. L. S., 1979, *Imagination and the Nature of Choice*, Edinburgh: Edinburgh University Press.

- Shane, S., 2003, *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*, Cheltenham: Edward Elgar.
- Simon, H. A., 1983, *Reason in Human Affairs*, Oxford: Blackwell.
- Wadeson, N. S., 2004, 'Multi-dimensional Search: Choosing the Right Path', *International Journal of the Economics of Business* **11**(3), 287–301.
- Wadeson, N. S., 2005, 'Projects as Search Processes', *International Journal of Project Management* **23**(6), 421–427.
- Williamson, O. E., 1975, *Markets and Hierarchies: Analysis and Anti-Trust Implications*, New York: Free Press.
- Witt, U., 1998, 'Imagination and Leadership: The Neglected Dimension of an Evolutionary Theory of the Firm', *Journal of Economic Behaviour and Organization* **35**, 161–177.
- Young, A., 1993, 'Substitution and Complementarity in Endogenous Innovation', *Quarterly Journal of Economics* **108**(3), 775–807.

Copyright of *Small Business Economics* is the property of Springer Science & Business Media B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

Copyright of *Small Business Economics* is the property of Springer Science & Business Media B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.