

4. See the authors quoted by Cunningham and Lischeron (1991) in the paragraph devoted to 'the Great Person School of Entrepreneurship', and the conclusions of Fayolle's recent research (Fayolle, 2000a).
5. This table uses information based on the works of Filion (1997), Landström (1998), and Tornikoski (1999).
6. Bruyat (1993), Sammut (1995), Fayolle (1996), de la Ville (1996), Verstrate (1997) and Marion (1999).
7. In this section, our main objective is to develop a comprehensive view of how we see possible direction and focus for research in entrepreneurship.
8. The term 'stable' means the organization has reached a level of functioning whereby things become regular. The organization can still be, at this stage, changing, due to a growth in activity and the projects behind this growth. Basically, the 'stable' entrepreneurial organization marks the end of the previous stage. Today, the problem is that it is difficult to know where, when and how an entrepreneurial emergence process ends.
9. The expression 'on the way' ('chemin faisant') is used by Avenier (1999).
10. See Baumard (1997) for much more on the construction of an epistemological positioning.
11. These correspond to the objectives or categories of objectives usually used in management research. See for example Wacheux (1996).
12. The title of a seminar organized in Lyon on the 8 December 1999 by the Pôle Lyonnais de Recherche en Gestion. Speakers included members of the Universities Lyon 2 and 3 and E.M. LYON.
13. These two theories (equilibrium and change) are presented by Stevenson and Harmeling (1990).
14. From our point of view, the entrepreneurial situation corresponds to a temporary phenomenon.
15. See Savall and Zardet (1995 and 1996).
16. See for example Lewin (1946), Argyris and Schon (1991), or Liu (1997) for the action research methodology; Hatchuel and Molet (1986) or Hatchuel (1994) for the 'intervention' research concept and Chanal, Lesca and Martinet (1997) or Claveau and Tannery (2000) for a very close concept which is the 'ingenierie' research.
17. Based on numerous research papers, notably, Piaget (1968; 1973 and 1979), Giddens (1987), Bouchikhi (1990), Thietard et al. (1999), Van de Ven (1999), Hlady-Rispal (2000).
18. Obviously, the above presentation only concerns research related to the entrepreneurial process and the focus of research as defined in this chapter.
19. Avenier (1989), p. 202.

4. Connecting levels of analysis in entrepreneurship research: a focus on information processing, asymmetric knowledge and networks¹

G. Page West III

INTRODUCTION

Though entrepreneurship research has grown dramatically over the last 20 years, the field of entrepreneurship continues to be viewed as a 'multidisciplinary jigsaw', characterized as a potpourri (Low, 2001) of accumulative fragmentation (Harrison and Leitch, 1996; Ucbasaran, Westhead and Wright, 2001). The effect of this view is significant difficulty for entrepreneurship researchers seeking the academic legitimacy afforded by publication of their work in mainstream journals, and by promotion and tenure in their institutions (Busenitz, West III, Shepherd, Nelson, Chandler and Zacharakis, forthcoming). In large part, the cause of this view is that research has sought to examine aspects of the phenomenon at various levels of analysis (e.g. individual, group, firm, industry), and does so using different theoretical perspectives imported from other fields. The field is often 'a meeting place for researchers from other fields' where they 'speak after one another, rather than to one another' (Bruyat and Julien, 2001, p. 166). Lacking a unified ontology, and epistemology of its own, it is thus difficult to examine cross-level relationships in entrepreneurship or generalize a finding at one level of analysis to other levels. Yet clearly this is needed if entrepreneurship theory seeks to achieve the sort of scope, parsimony, and generalizability (Bacharach, 1989) – and therefore the legitimacy (Pfeffer, 1993) – enjoyed by other fields through their base paradigms.

Thus a frame is still needed to both organize research across the domain of entrepreneurship and guide future efforts toward a more integrating perspective. The central agenda of this chapter is to propose such a frame. This chapter proposes that focus upon an information processing perspective can provide a foundation for integration and generalizability of research across the field. The information processing perspective builds on the intellectual roots of entre-

preneurship. As others have previously argued, entrepreneurship is rooted in uncertainty and the development of asymmetric knowledge that leads to entrepreneurial rents (Knight, 1921; Schumpeter, 1934; Mises, 1949; Kirzner, 1979; Rumelt, 1987). Information processing is central to dealing with both uncertainty and knowledge development, and thus responds to these distinguishing characteristics about entrepreneurship described earlier by scholars. Moreover, the information processing view provides an appealing perspective to examine the relationships between entrepreneurship phenomena at different levels of analysis because it emphasizes flows between elements in a system. It thus sheds light on how aspects of the phenomenon at one level of analysis can impact aspects of the phenomenon at another level.

This chapter argues that the information processing perspective can be applied across a broad scope of phenomena of interest in the field. Employing this perspective, the very same kinds of relationships exhibited and investigated at one level of analysis may also be exhibited and investigated at other levels. The perspective therefore provides a means to distinguish areas of relatedness and possible reconciliation between seemingly incommensurable paradigms that have been relied upon to examine aspects of the entrepreneurship phenomenon at different levels of analysis. It will be shown that information processing can at the same time accommodate other theoretical perspectives, and thus preserve the power of such perspectives to add insight about aspects of entrepreneurship. Thus the information processing perspective presents the possibility to achieve scope, parsimony and generalizability in the field.

The characteristics of scope, parsimony and generalizability described here resemble criteria proposed by Bacharach (1989) for evaluating theory. It must be explicitly acknowledged that information processing is a theoretical perspective that is deeply rooted in a variety of other disciplines (e.g. cognitive psychology, cybernetics, communication), in which exist other individualized and detailed understandings and applications than are suggested in this chapter. For example, communication theory tends to model characteristics of information systems (e.g. Shannon and Weaver, 1964) and to examine the effectiveness of specific media used or of overall communication within organizations (e.g. Rogers and Agarwala-Rogers, 1976; Daft, Bettenhausen and Tyler, 1993). Organizational communication theorists more recently focus on the relationship between information systems and firm structure or process (e.g. Jablin, 1987; Stinchcombe, 1990; Putnam, Phillips and Chapman, 1994), and the transaction cost or communication efficiency of firms (e.g. King and Cushman, 1994; Casson and Wadson, 1998). In this chapter the focus is upon how entrepreneurs deal with uncertainty and asymmetrically create new knowledge, and about how individual, firm, and population levels of entrepreneurship can be related via information processing. Herein an eclectic view of information processing is presented that draws on ideas from other fields, but which seeks

to understand, explain and predict entrepreneurship phenomena as its key 'dependent variable'.

The chapter will proceed as follows. In the next section is discussed a key problem confronting the field of entrepreneurship – that different theoretical perspectives are often used to examine the phenomenon at different levels of analysis, and that the incommensurability of these perspectives has led to claims of fragmentation and poor legitimacy for the field. Based on a broader view offered by Baumol (1993) of innovating entrepreneurship together with foundational theory in the entrepreneurship field, it is evident that asymmetries of information and knowledge are central to the phenomenon both practically and theoretically. The following section pragmatically describes how the creation of asymmetric knowledge about entrepreneurial opportunities and the acquisition of initial resource endowments to pursue opportunity are socially constructed using information processing dynamics. The final section discusses the implications of the information processing perspective to suggest that progress in the integration of entrepreneurship research can be accomplished by focusing on information flows and the networks within which such flows occur. Focusing on networks and flows provides the means to examine important new questions in the domain of the field (Busenitz et al, forthcoming; Shane and Venkataraman, 2000) and will enable researchers to better synthesize previous research by relating entrepreneurship phenomena occurring at different levels. The importance of information flows in networks presents entrepreneurship as unbounded in time and space (Johannisson, 2000), and reinforces the generalizability of the perspective for the field (Bacharach, 1989).

THE NATURE OF ENTREPRENEURSHIP

Fragmentation in Research

The field of entrepreneurship has been widely criticized for its lack of integration, and thus its lack of legitimacy. The field has made limited progress toward disciplinary status in a normal science framework (Aldrich and Baker, 1997), remains in an undeveloped theory-building stage (Wiseman and Skilton, 1999), and is a 'multidisciplinary jigsaw' characterized by accumulative fragmentation (Harrison and Leitch, 1996; Ucbasaran et al, 2001). This problem arises for a series of nested reasons.

First, the phenomenon of entrepreneurship has only recently begun attracting attention by academics interested in understanding it and teaching it (Finkle and Deeds, 2001). As Low (2001) points out, academics conducting research about entrepreneurship have their primary intellectual roots in other fields. In their research they tend to apply their base discipline perspectives and training

(Busenitz et al, forthcoming). Because different base disciplines harbour different philosophies, aims, central foci, methods of research and instruction, and relevant literature streams (Ogbor, 2000), consensus and coherence about the phenomenon of interest are difficult to achieve (Pfeffer, 1993). The inability to achieve coherence and create a distinct position for entrepreneurship in the context of existing academic disciplines compromises the perceived legitimacy of the field (Harrison and Leitch, 1996).

Relatedly, and central to the argument of the present chapter, is that entrepreneurship phenomena occur at multiple levels of analysis, e.g. individual, firm and population. Researchers tend to focus on an aspect of the phenomena at a level of analysis that is consistent with the base disciplines from which they have come (Davidsson and Wiklund, 2001). For example, research focusing on individual personal characteristics (demographic and psychological) of entrepreneurs or their behaviours (e.g. Bowen and Hisrich, 1986; Gartner, 1989; Shaver and Scott, 1991; Katz, Brockhaus, and Hills, 1993) draws on organizational behaviour and psychology for theoretical support. Research on firm-level characteristics (e.g. Sandberg and Hofer, 1987; Covin and Slevin, 1991; McDougall and Robinson, 1994; Lumpkin and Dess, 1996; West III and Meyer, 1998), which dominates published entrepreneurship research (Busenitz et al, forthcoming), tends to draw on strategic management perspectives. Research on entrepreneurial communities or economies tends to draw on population ecology (e.g. Aldrich and Wiedenmayer, 1991; Aldrich and Fiol, 1993) and industrial organizational economics (e.g. Acs and Audretsch, 1989; Dean, Meyer and DeCastro, 1993). Thus academics drawn to study entrepreneurship tend to focus on one level of analysis that is generally consistent with the orientation of their base discipline. Theoretical frameworks borrowed from base disciplines to examine entrepreneurship tend to focus within a single level of analysis. These varying ontological bases don't really 'speak' to each other (Low, 2001) and result in the use of varying epistemologies that lead to the fragmentation in evidence.

At the core, the varying ontologies and epistemologies brought to the study of entrepreneurship reflect different definitions of the phenomenon (Baumol, 1993; Davidsson and Wiklund, 2001). For example, economists tend to define entrepreneurship in the context of systematic optimization (Baumol, 1993) and the economic outcome it achieves, and thus much of the research in entrepreneurship conducted by strategic management scholars focuses on profitability and competitive market performance (Bruyat and Julien, 2001). Sociologists tend to define entrepreneurship by the evolution of new populations, focusing on density dependence and ecological selection and retention mechanisms. Behaviourists define entrepreneurship in terms of the actions and/or cognitions of persons trying to establish new organizations. Nearly 15 years ago, Low and MacMillan (1988) identified variance in definitions as a barrier to the devel-

opment of coherence in the field. Low reiterates this message by discussing the 'disproportionate and unproductive time we spend trying to define entrepreneurship ... [that is] symptomatic of the fundamental problem with our field' (2001, p. 18).

Yet it is clear that, in the domain of entrepreneurship, aspects at one level of the phenomena have an impact and a bearing on aspects at other levels. The efforts of individual entrepreneurs result in firm foundations, the performance of new firms may affect the genesis of entrepreneurial communities, and the development of vibrant entrepreneurial communities may impact the behaviours and success of intending entrepreneurs (Saxenian, 1994; Malecki, 1997; West III and Landry, 2001) or the resources available to them in their start-up efforts (Aldrich, 1999). Research that focuses within one level of analysis will not capture these important cross-level interactions (West III, 1997; Davidsson and Wiklund, 2001) or begin to address the true richness of the phenomenon. Moreover, the reliance on within-level theoretical frameworks from other base disciplines does not easily allow for the relationships and findings discovered at one level to be generalized to other levels. Complicated by contradictory recommendations for the use of different research methods to deduce theory (Low and MacMillan, 1988; Vesper, 1988; Bygrave, 1989; Aldrich and Martinez, 2001), variation in the unit of analysis in many studies (Gartner, 1989), and incomparable case selection (Van der Werf and Brush, 1989), individual studies expose different facets of entrepreneurship in a non-cumulative fashion. Then often urged to do so by journal reviewers and editors, researchers are careful to circumscribe their research at one level but not another, such as considering entrepreneurship at only the firm level and not the individual level (Lumpkin and Dess, 1996). It is thus difficult to identify and discuss cross-level relationships in entrepreneurship or to generalize a finding at one level of analysis to other levels.

A Synthetic View – Innovating Entrepreneurship

Consistent with the goal of developing a more generalizable perspective, this chapter builds upon a view that transcends the definitionally directed foci of the various disciplines used to examine entrepreneurship. Herein, entrepreneurship is referred to in the context described by Baumol as 'innovating entrepreneurship' (1993, p. 199). This is Schumpeterian entrepreneurship that manifests itself in an arena where achievement relies on constant discovery, where transformation of ideas into economically viable entities, revolutionizing, and exploiting the untried, are its hallmarks. In Baumol's description, innovating entrepreneurship can be apparent by either creating or operating a firm, and innovating entrepreneurship contributes to economic growth and progress in productivity.

The innovating entrepreneurship view offers advantages for building a more generalizable approach. First, the perspective has a great deal of face validity for what is commonly thought of when describing entrepreneurship. As Baumol (1993) notes innovating entrepreneurship is a far cry different from 'firm-organizer' entrepreneurship, where in the latter arena new firms may be launched whether or not anything innovative is actually involved and where everything about such a launch can be analysed and calculated. Amazon.com represents innovative entrepreneurship, for example, while traditional publishers' or book retailers' efforts to establish Internet sales channels fall closer to firm-organizer or reproducer organizations (Aldrich and Martinez, 2001). Second, the innovating entrepreneurship perspective allows for entrepreneurial activity at either the individual or firm level. Discovery, transformation, revolutionizing, and exploiting are qualities that can be used to describe innovating firms that start new businesses (e.g. Burgelman, 1983) as easily as innovating individuals who start new firms.² Third, the perspective inherently recognizes the potential impact of such activity at an economic or societal level. Economic viability, economic growth and progress in productivity are all outcomes that affect competitors and the creation and distribution of wealth in society (Venkataraman, 1997). Thus it appears that the innovating entrepreneurship view offers a sufficiently broad foundation for entrepreneurship to overcome the limits of other discipline-based definitions applied to the phenomenon.

The Centrality of Asymmetric Information

Because Baumol's innovating entrepreneurship concept is based on Austrian economics ideas about innovation (Schumpeter, 1934) and alertness (Kirzner, 1985), it suggests that the dynamic of market disequilibrium resulting from imperfect information is central to the phenomenon. Entrepreneurs both create disequilibrium in markets (Schumpeter, 1934) and take advantage of existing market disequilibrium (Mises, 1949; Kirzner, 1973). Disequilibrium reflects the existence of informational asymmetry about new sources of profit potential. Knight holds that new sources of profit are possible 'only in so far as the changes and their consequences are unpredictable in character' (1921, p. 37) while Mises claims such profit opportunities arise from 'changes unforeseen by the majority' (1949, p. 297). Thus market disequilibrium is characterized by widespread uncertainty and widespread – but not complete – ignorance of economic actors (Kirzner, 1973).³ To confront and act in the face of uncertainty, entrepreneurs must sense that there is gain that more than offsets the potential downside from venturing activity (Venkataraman, 1997). Entrepreneurs are thus uniquely alert to profit from opportunities presented by

uncertainty (Mises, 1949; Kirzner, 1979). Alertness and the ability to identify opportunities amidst uncertainty rests with the knowledge that entrepreneurs develop and that others do not (Kirzner, 1979; Venkataraman, 1997). It is the asymmetry in such knowledge that leads to entrepreneurial rents (Kirzner, 1979; Rumelt, 1987).

Valuable, asymmetric knowledge for innovating entrepreneurs is based upon specific information in which they make deliberate investments (Hayek, 1945; Fiet, 1996). The fragmentation of knowledge in society (Hayek, 1945) makes it possible for some to acquire and possess knowledge that others cannot. Such knowledge can be developed either through deliberate search or spontaneously (Kirzner, 1979). Spontaneously-acquired information might be available to others and would therefore not present asymmetric opportunities, while it is more likely that deliberately-acquired information would be different from that possessed by others.

These ideas about deliberate, prospective information acquisition stand in marked contrast to competing views about the role of information in the entrepreneurial process. The neoclassical economics view does not allow for the possibility of information asymmetry at the microeconomic level. Of all that is or could be known, everything is known instantaneously by all economic actors; therefore enterprising individuals or firms are absent from standard analytical models, and the theory of the firm is largely concerned with optimization (Baumol, 1993). More recently, Shane (2000) proposes that the unequal distribution of *prior* knowledge influences the recognition of opportunity, and examines efforts of individuals to commercialize technology that had already been invented and patented. Different stocks of knowledge accrue as a result of people's past idiosyncratic life experiences, and these stocks contribute to different abilities to recognize an opportunity that presumably already exists (Shane, 2000). These findings lead to speculation that opportunities somehow exist objectively in the economic environment (e.g. Shane and Venkataraman, 2000), potentially reducing the role of the entrepreneur to one who merely recognizes but does not in fact create. The argument of this chapter, in contrast, is that entrepreneurs who make deliberate and prospective investments in information can develop asymmetric knowledge about opportunities that can be economically viable in the future. The process of deliberate information acquisition is not necessarily a 'search' process with a defined goal (Shane, 2000), but instead may be regarded as exploration of Knightian uncertainty that yields suggestive non-objective data about opportunity. As will be shown, asymmetric entrepreneurial knowledge takes the form of 'justified true belief' (Nonaka, 1994) about opportunity and allows for the possibility that entrepreneurs can not only recognize but also shape opportunity (Gartner, Carter and Hills, Chapter 7, this volume).

DEVELOPING ASYMMETRIC KNOWLEDGE

This section more carefully articulates how asymmetric knowledge about entrepreneurial opportunity is constructed and initial resource endowments to pursue opportunity are acquired. We begin by discussing the relationship between fundamental concepts of uncertainty and information, identified above. The discussion then differentiates between information, meaning and knowledge, and shows how these are sequentially and progressively developed relying on information processing dynamics (see Figure 4.1). The concept of 'justified true belief', as asymmetric knowledge about opportunity, is that which results from the process of selecting, communicating, refining and reshaping information, and gaining agreement on the view of opportunity within a network of interested parties.

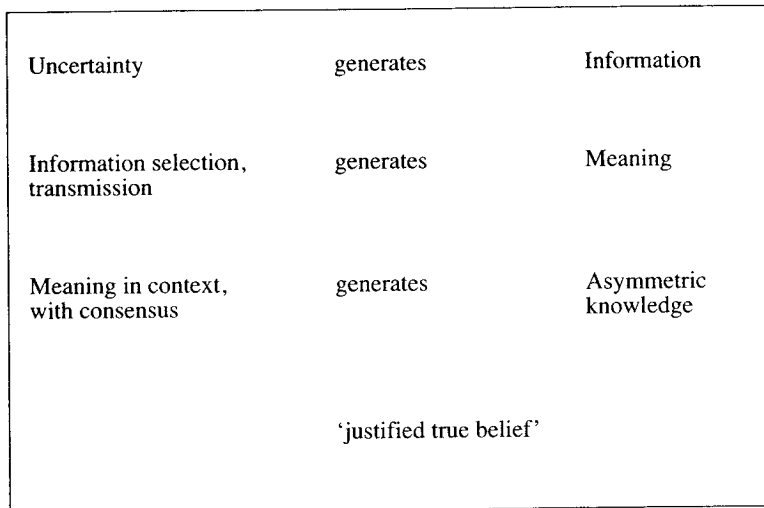


Figure 4.1 Progression from uncertainty to asymmetric knowledge

Transitioning from Information

Alertness and the deliberate acquisition of information orients us to two key questions. Since emergent conditions and opportunities are those yet to be experienced, it begs the question of what is meant by the concept of information. How can innovating entrepreneurs develop information about that which does not exist? And since other individuals and incumbent firms in an industry will likely have similar access to public information, it also begs the question of

what it is that innovating entrepreneurs do with information that enables them to asymmetrically identify and pursue opportunity in order to earn entrepreneurial rents. As a result, attention paid to the nature of information and how available information is gathered and processed may be particularly appropriate in understanding the sources and effects of innovating entrepreneurship. A blend of ideas from communications theory, information theory and organizational information processing systems, demonstrate how information processing is at the core of entrepreneurship.⁴

Communication theory has been instrumental in helping to define characteristics of information and its flow, and these may be useful in understanding its role in entrepreneurship. Foundational work in the field holds that information refers to freedom and the range of choice when one selects a message to send, and in this sense can be said to represent the *uncertainty* of a situation (Shannon and Weaver, 1964). For example, in a situation characterized by great uncertainty, many possible choices of messages about the situation exist; therefore a wide range of information possibilities is available to describe the situation. On the other hand, in a situation where less uncertainty exists, the number of possible message choices about the situation is limited and thus a more restricted range of information exists. Thus 'information in communication theory relates not so much to what you *do* say, as to what you *could* say' (Shannon and Weaver, 1964, p. 8).

That early communication theorists equate *more* information with *greater* uncertainty contradicts the usual prescriptions about how information serves to *reduce* uncertainty (e.g. Fiet, 1996). However, this equation is precisely the situation confronted by innovating entrepreneurs who face the uncertainty described by Knight (1921). Where true uncertainty reigns and it is not possible to distill down all alternatives into tractable analysis, innovating entrepreneurs are presented with many choices. Rather than focusing on one possibility and gathering information to bracket that choice, innovating entrepreneurs gather information to expand their repertoire of possible opportunistic actions. By embracing uncertainty and the prospective gathering of information reflecting its many possibilities, the ability to discover innovative and commercially viable opportunity is enhanced. This is the hallmark of the innovating entrepreneur, and below will be described how this entrepreneur's use of networks and bridging of 'structural holes' serves to embrace uncertainty.

Having considered the broad range of possibilities presented by uncertainty, then the entrepreneur's choice of information to use is critical. Out of all the possible choices of what could be said about a particular situation, what in fact is said begins to direct and shape the perception and understanding of the situation. The classic case of Fred Smith and Federal Express illustrates this point. What Smith first said and how he said it (in a college paper to his professor) earned him a C grade and the admonition that his idea for an

overnight delivery service would never work out. Later on what he said, to whom he said it, and how he said it helped to raise substantial capital for what became a very successful venture. More generally, entrepreneurs seeking venture capital often do not receive investments following their first presentations because they have not been convincing enough. Instead, they tend to learn more about the kind of information desired by this type of investor and make revisions to their pitches in subsequent meetings. As a result, the process of selecting and transmitting information becomes of paramount importance.

Communication theory has also been helpful in understanding how information channels impact others who are potentially interested in a new venture. Just as the choice of information about a situation begins to define the situation, so too does the conveyance of that information through communication channels (Shannon and Weaver, 1964). Because of the means through which possible information about a situation is communicated, the message received by interested members may differ from the information itself. Shannon and Weaver (1964) mathematically model received messages as a function of the impact on transmitted information of technical factors such as communication channel capacity, message coding, noise in the channel and signal continuity. For example, reflecting message coding and channel noise characteristics, a business plan submitted to a venture capital firm blindly through the mail will be received less favourably and be given less attention than one that is forwarded to the venture capital firm through an individual trusted by the firm. In this circumstance, while the textual content of the transmitted information remains unchanged, the effect of the communication channel on the meaning of that information is substantial and consequential. More recently, organizational communication theorists (e.g. Huber and Daft, 1987; Jablin, Putnam, Roberts and Porter, 1987; Downs, Clampitt and Pfeiffer, 1988; Daft et al, 1993) have specifically linked the combination of communication processes (scanning, probing, message routing, message summarizing) and channel characteristics (symbolic interactionism, media richness) to the degree to which people in organizations understand the environment and then act upon such understanding.

These views make an important distinction between information and meaning for innovating entrepreneurs. Information is *not* meaning (Shannon and Weaver, 1964). Information is a characteristic of the environment that the entrepreneur faces (this could include both the external environment and the internal environment of a new venture organization). Information about the environment is selected, and it is then transformed by communication channels and processes employed by the innovating entrepreneur. As a result, the meaning of information received is different from the nature of the environment that precipitated the message to begin with. Information is thus transformed into meaning through its selection and through the communication process.

The choice of communication channel or process may, in fact, serve to select the kind of information gathered about a situation out of all the kinds of information possible. Incumbent companies institutionalize methods of gathering and communicating information, and as a result these methods subsequently direct them toward types of information (Stinchcombe, 1990) that reinforces the ways they are organized (Weick, 1969). This is essentially Penrose's (1959) argument about entrepreneurial management's ability to identify 'interstices' in markets that institutionalized administrative management cannot. For example, Hamel and Prahalad (1994) point out that the auto industry in the 1980s relied heavily on studies of historical trends in the industry in order to better understand developing consumer needs and direct R&D investment. This reliance by Ford led to the rejection of the development of a minivan concept, while Chrysler did pursue the minivan opportunity at that time after having gathered consumer data in a unique and very different fashion. For innovating entrepreneurs the preference by venture capital firms to evaluate new venture ideas in traditional business plan format and to focus on specific decision criteria (Zacharakis and Meyer, 2000) tends to direct the gathering of certain information and its presentation in a certain way. It becomes very clear, then, that communication and information processes play a substantive role in how the innovating entrepreneurs help interested others perceive the environment and opportunity. These processes serve both to select kinds of information gathered about the environment, and to transform this information into meaning about the intended entrepreneurial venture.

More importantly, the transformation processes enable the extension and refinement of incipient meaning. Where incipient meaning is created through initial information selection and communication, others may then add to, enhance and improve on it. During the start-up of the Staples office supply retail business, for example, the founders' discussions of the practical organizational needs of the business resulted in a progressively modified and more insightful view of the innovative type of company they were in fact creating (Hart, 2000). Thus someone may recognize that the situational context communicated is similar to a previously experienced situation and offer an additional perspective on action possibilities. This is precisely the reason why researchers have discovered that previous industry experience among top managers is important for new technology ventures (e.g. Eisenhardt, 1989). Or someone may 'tag' a certain aspect of communicated information with an additional nuance, and by doing so open the door for a modified meaning with greater adoption potential for the revised perspective among other interested individuals. The subsequent exchange of information, ideas and meanings following the initial communication about an opportunity, describes how entrepreneurs move from recognition of an opportunity toward resolve to pursue it in a particular fashion. Innovating entrepreneurs 'bounce their ideas' off trusted

others, and later on more formally negotiate meanings and understandings about a new venture with prospective employees, financial providers and other stakeholders. In short, the subsequent communication of knowledge allows for the progressive modification of insight and meaning about an opportunity, or conversely for the rejection and discarding of insights or perceived meanings that others find inappropriate.

Transitioning to Asymmetric Knowledge

Through progressive, iterative and reciprocal communication about the incipient meaning, interested parties tend to converge on a shared perspective and an area of mutual understanding (Rogers and Kincaid, 1981; Rogers, 1986). In this manner, the information and ideas developed initially by an individual may ultimately become an organization-wide asset of a new venture, through validation among other members. It is in the sense of validation by other members that Nonaka refers to organizational knowledge as '*justified true belief*' (1994, p. 15, emphasis added) that is created and organized by the content (semantic) and process (syntactic) aspects of information transmission. 'In terms of creating knowledge, the semantic aspect of information ... focuses on conveyed meaning' (Nonaka, 1994, p. 16). Here the semantic aspect stresses the nature of information in context, while the conveyed meaning aspect stresses its transformed properties through communication processes. Knowledge is thus a shared framework for the organization of information and its meaning, creating understanding and insight. Such insight is akin to the alertness about means-ends relationships ascribed to entrepreneurs (Mises, 1949), relationships that motivate a particular responsive action. In this regard, Stonier writes that knowledge characterizes a human system that puts transformed information into a context and is able to 'respond in a manner that enhances its chances of survival' (1991, p. 261). This describes very accurately the dynamic process through which innovating entrepreneurs orchestrate a view of opportunity that convinces top managers to join their fledgling firms, and enables them to strike deals with various sources of financing, new suppliers and customers. Roszak argues that the fundamentally great ideas that motivate organizations are those that are the result of generalizing across many participants a 'sensible, connecting pattern' when confronted with a 'vast, shapeless welter of facts' (1986, p. 88). The parallel with the generally accepted view of entrepreneurs as those who detect patterns in a complex context (Simon, 1984; Ropo and Hunt, 1995; Gardner and Martinko, 1996) is striking.

To sum up thus far, information processing is at the core of innovating entrepreneurship. In the face of true uncertainty innovating entrepreneurs are better able to identify opportunity by seeking *more* information that expands their range of possibilities. This has implications for expanding potential sources of

information and the ways in which entrepreneurs gather that information. Entrepreneurs then select some information about opportunity out of the broad range uncovered, and through subsequent communications and exchanges develop refined meaning about it. Knowledge represents belief about the opportunity (and the means of pursuing it) that is shared by interested parties, and is developed through further iterative and reciprocal communication exchanges. This process of information diffusion and then convergence leads to the innovating entrepreneur's development of *unique* knowledge about the opportunity. Individuals and firms might develop knowledge similar to that which others also develop, purely as a function of the nature of the information symmetrically available from the environment. But the idiosyncratic selection, direction, focus, transformation and refinement of information and meaning by the entrepreneur and through the entrepreneur's networks leads to the creation of unique knowledge that cannot be developed by others. Entrepreneur-specific communication patterns and processes lead to the development of asymmetric knowledge about opportunity. This information processing perspective thus demonstrates how entrepreneurs are able to move in the direction of true uncertainty while reducing the risk of actions taken to embrace such uncertainty.

Asymmetric Knowledge as a Continuing Entrepreneurship Challenge

While the previous discussion has generally been couched in the context of new venture start-up, developing asymmetric knowledge is a continuing challenge for entrepreneurs. Building on the ideas and background offered here, the ability of innovating entrepreneurial firms to grow by continuing to identify new opportunities over time resides in the propensity of its members to develop, share and articulate new information and knowledge. This brief section further elaborates on this dimension in the context of articulating and sharing developed knowledge in the new venture organization.

Rapidly changing competitive environments dictate that new ventures continue to reshape themselves. Under such conditions the interface between the entrepreneurial firm and the competitive context is rapidly changing. The possibility that existing direction and existing products will be obsoleted is enhanced, so that modifications will be necessary in order to sustain advantage and superior performance. For example, West III and Meyer (1998) find that new technology ventures experience enhanced performance to the extent that they create uncertainty by challenging the status quo with new ideas and alternatives about strategic direction. This can be accomplished by ensuring a sufficient flow of new ideas into the new venture about future possibilities and by developing new information and communication flows among the networks of individuals within the new venture (West III and Meyer, 1997). In addition, the ability of new ventures to transition successfully from one life cycle stage

to the next also depends on breaking out of customary information processing routines and seeking new information about the venture's position in the life cycle and in its competitive environment (West III and Wilson, 1995).

Information and knowledge about new opportunities for entrepreneurial ventures may also arise from sources within the firm. For example, Winter (1994) discusses how competitive advantage may be enhanced through quality improvement, which involves layering tacit knowledge that already exists within the firm into articulated, explicit components. By articulating tacit components of a quality programme, for example, critical leverage points may be identified and focused upon to determine potential for further improvement. Expanding on the need to better understand tacit elements, Nonaka argues that 'realizing the practical benefits of (tacit) knowledge centers on its externalization and amplification through dynamic interactions' (1994, p. 20) among the new venture's managers.

In addition, the communication or refinement of objective knowledge may lead to enhanced opportunity identification. The sharing of knowledge throughout a new venture may enhance the skills and understanding of its key employees. Such communication may serve, for example, to show how others may employ new or expanded information search routines or how to deal better with new customers or suppliers. Thus a better understanding of practice can be routinized throughout the new venture, particularly in departments where it had not previously existed. In this way communication may transform objective knowledge back into tacit knowledge and help sustain a new venture's performance.

NETWORK IMPLICATIONS AND DISCUSSION

This chapter describes innovating entrepreneurship in terms of information flows. Innovating entrepreneurs embrace Knightian uncertainty by widening their information-gathering activities and increasing the flow of information; this increases the probability of identifying opportunity or increases the number of opportunities identified. They then reduce risk by creating information flows in exchange with others in order to develop justified true belief about a specific opportunity. Idiosyncratic selection, communication, refinement and validation in these information flows results in the development of asymmetric knowledge about opportunity. Thus information flows, and the characteristics of channels that affect such flows, can describe the entrepreneurial process for innovating individuals and innovating firms.

The importance placed on flows of information, informational channel characteristics, and the exchanges that occur through these, casts entrepreneurship as a network-based phenomenon (Aldrich and Zimmer, 1986;

Johannisson, 2000). Network theory is concerned with the relationships between elements in a social system (e.g. Rogers and Kincaid, 1981; Richards, 1985; Monge and Contractor, 1988). Similarly, viewing entrepreneurship as a network-based phenomenon focuses attention less on the entrepreneurs, firms, or populations and more on the flows of information moving between such nodes in an entrepreneurial network. Information flows in an entrepreneurial network depend on structural network characteristics such as the size and types of connections in the network, and of properties such as density and centralization (Scott, 1991). Network theory also places particular importance on the importance of connections between different social groups as particularly salient in the diffusion of new information and innovations (Granovetter, 1973; Rogers and Kincaid, 1981; Rogers, 1983). Reflecting this view, Burt (1997) finds that the information benefits to individuals who bridge 'structural holes' between different network clusters (i.e. who have strong relations with other network clusters possessing very different information) are especially valuable.

Viewing entrepreneurship in terms of networks provides the opportunity to use the same ontology and epistemology at each level of the phenomenon. For example, much research in entrepreneurship and innovation has devoted itself to examining the relationship between characteristics or traits of individuals and entrepreneurial performance (Gartner, 1988; Bantel and Jackson, 1989; Shaver and Scott, 1991). A network analysis approach would argue that networks are an intervening construct between individuals and entrepreneurial performance; characteristics of individuals affect or contribute to their network behaviour, which in turn impacts entrepreneurial performance. Research finds that the use of personal and extended networks of individual entrepreneurs is important in the start-up process (Birley, 1985; Dubini and Aldrich, 1991), and Hara and Kanai (1994) report that successful international efforts for entrepreneurs depend on networks they develop.

Behaviour within entrepreneurial networks may also affect the extent to which new opportunities are first identified by entrepreneurs and then successfully pursued. Much has been written about entrepreneurial alertness (Kirzner, 1979) leading to opportunity recognition (de Koning, 1999; Singh, Hills, Lumpkin and Hynels, 1999). Individuals who are more comfortable in and have a propensity for bridging structural holes may be more successful at identifying new opportunities by generating flows of unique information through their networking and other information-gathering behaviour. Such individuals may then be more successful in attracting human and capital resources for their firm start-up by successfully 'brokering' their unique information and knowledge to appropriate parties (Hilmy, 1992).

A similar approach may be used to examine innovating entrepreneurship at the firm level. West III and Meyer (1997) examine information flows within new ventures to understand how new ideas are surfaced by individuals and

translated into new firm-level strategic initiatives (see Figure 4.2). They find that changes in the direction pursued by new ventures are strongly associated with enhanced communication between subgroups of managers with differing informational orientations (future-oriented managers and present-oriented managers). Future-oriented new venture managers engage in more prospective information-gathering activities and thus bridge more intensively between the organization information environment and the external information environment. But in addition, the information bridging between this subgroup and present-oriented managers is important in ensuring that the pursuit of new opportunities is effectively grafted into existing activities. Other research has highlighted the controlling and detrimental influence of founder CEOs and powerful others on information sharing and communication in new ventures (Eisenhardt, 1989; Meyer and Dean, 1990). Franchising represents a major source of entrepreneurial activity, but franchisors confront adverse selection and moral hazard issues related to the franchise versus company-own decision (Shane, 1998; Spinelli and Birley, 1998). Both issues essentially deal with the information flows that build confidence in the choice of and operation by the franchisee, and an information flow approach could provide both theoretical and practical guidance on this important question.

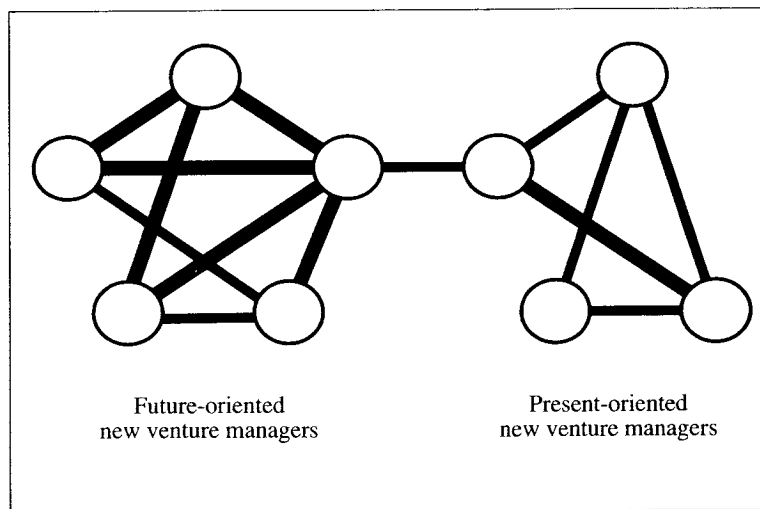


Figure 4.2 Networks within entrepreneurial firms

The information network view may also be extended to the macro-economic level. Here information networks can help explain how entrepreneurial com-

munities and clusters come into being, such as Silicon Valley (US), Cambridge (UK) or Lund (Sweden). In these areas the information linkages and flows between entrepreneurs are shorter, highly refined, and share a common language, making such networks highly efficient. The informational proximity of supportive resources (such as venture capital and law firms) makes the creation of new firms less onerous (Saxenian, 1994). In contrast, the creation of an entrepreneurial community in Watsonville, CA, or Winston-Salem, NC – while physically close to Silicon Valley or the North Carolina Research Triangle – is exceedingly difficult because of poorly developed information networks and the need to bridge many structural holes with important geographically-local stakeholders. What kinds of networks are important and how they evolve in such ‘sparse’ communities is an important area to explore in future research (West III and Landry, 2001).

An information theory-derived network model thus offers insight on the level of analysis issue in entrepreneurship research. The difference between innovating entrepreneur as individual versus innovating entrepreneur as firm (Lumpkin and Dess, 1996; West III, 1997) becomes less distinct. For both concepts of the entrepreneur there are networks involved. Both types of entrepreneur have external networks comprised of financial, legal, supplier, customer, personal and other contacts. Entrepreneurs defined as firms also have internal networks comprised of managers and employees, and thus may be viewed as simply larger and more complex networks with differing kinds of network properties and dynamics. Networks are also fundamental to the development and economic growth of entrepreneurial communities. While all three levels have different outcome variables, structural network properties and information flows are central and the independent variables associated with networks at one level are identical to important independent network variables at another level.

An information network perspective can also be used to examine cross-level effects. As has been described above, the networking efforts of innovating individual entrepreneurs serve not only to source new information and identify possible opportunities, but also to coalesce other interested parties in justified true belief around asymmetric knowledge about an opportunity. Examining flows of information to the entrepreneur, and between the entrepreneur and others, can help explain and predict how entrepreneurial firms result from individual efforts. The network perspective also affords the chance to examine cross-level effects that occur between populations and firms. For example, recent research has identified genealogical networks of firms in local communities (Neck, Meyer, Cohen and Corbett, 1999; Castilla, Hwang, Granovetter and Granovetter, 2000), where the business or markets of new firms is related to that of the firms from which the founder has just departed. An information flow view of this phenomenon reveals, instead, that each new firm is actually imbued with significant information and knowledge resource inputs via the set

of founding top management team members who come from other firms (see Figure 4.3). Such a perspective might argue against the 'liability of newness' (Stinchcombe, 1965) issue typically associated with new ventures.

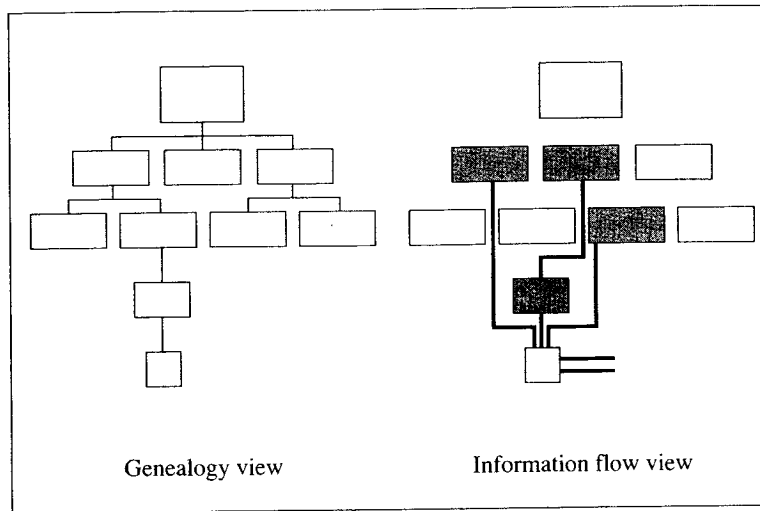


Figure 4.3 Networks within entrepreneurial communities

Finally, the information processing and network perspective offers promise to explore important questions that remain for entrepreneurship research. Four questions are mentioned here to suggest the scope that the information processing perspective can provide, recognizing that full treatment of each area is beyond the agenda of this chapter. One critical question that has only recently begun to attract interest is how entrepreneurs develop resources to begin with (Brush, Greene and Hart, 2001; Lichtenstein and Brush, 2001). Lacking tradeable assets to use in acquiring the specific resources needed to start a new venture, the information processing perspective holds that entrepreneurs exchange unique knowledge that is highly specific for types of resources that are more fungible (e.g. capital, human, physical).

Another critical question has to do with institutionalism and the differences between innovator and reproducer ventures (Zander and Kogut, 1995; Aldrich and Martinez, 2001). As they grow, most new ventures tend to rely increasingly on learned routines rather than develop new methods. Both new ventures seeking to grow and established firms seeking to become more entrepreneurial must find ways to be proactive in the face of the uncertainty presented by rapidly evolving competitive contexts. For both, the key challenge is breaking

the usual type of information flow created by increasing formalization and institutionalization of organizational routines. Relatedly, Venkataraman (1997) proposes that entrepreneurship research must seek to distinguish entrepreneurs from non-entrepreneurs. The information processing and network perspective offers unique insight here. Individuals or firms are innovating entrepreneurs to the extent that they increasingly utilize networks to embrace true uncertainty and create many informational possibilities, and to the extent that they bridge structural holes to embrace new information possibilities. Reproducer ventures (Aldrich and Martinez, 2001), firm-organizing entrepreneurs (Baumol, 1993), and non-entrepreneurs are behaviourally quite different in this respect.

A third question focuses on selection and retention mechanisms, usually discussed in the evolutionary approaches to entrepreneurship. Aldrich and Martinez (2001) argue that research must somehow integrate the strategic choice perspective and environmental selection process. The information flow perspective may accomplish this integration, in the sense that the competitive environment will select innovating entrepreneurs based upon the effectiveness (and perhaps efficiency) of their information processing behaviours that determine their strategy. A fourth question concerns the growth of new ventures started by women and 'ethnic minorities', two of the fastest growing segments of new venture formation in recent years. Women are found to be more socially-oriented than men and are better able to detect patterns amidst complexity, and thus it is no surprise that network relationships are an important component of start-ups by women (Brush, 1992). Similarly, 'ethnic minorities' involved in start-ups often do so within their related ethnic communities, where social capital is found to have an important influence on success (Greene, 1997). Future efforts to understand how to enhance successful entrepreneurship development in inner cities and less-developed countries might then concentrate on infrastructure that delivers information flow benefits associated with networks and social capital (Johannisson, 2000).

These points return us to the problem outlined at the outset of this chapter about the future of entrepreneurship research and theory development. That entrepreneurship often manifests itself in multilevel phenomena ordinarily presents problems to researchers (Klein, Dansereau and Hall, 1994). Academics – particularly newly-minted PhDs – are not often trained in multilevel theory or research methods, nor are reviewers accustomed to reviewing work that crosses levels of analysis (sometimes resulting in critiques about 'mixing levels of analysis'). A focus on information network flows avoids issues associated with comparing data about entities at different levels. Characteristics of networks and information flows can be ascertained independent of level, involve variables that are similarly-defined at each level, and in fact can reveal how dimensions at one level relate to dimensions at another level. Examples cited in the above discussion demonstrate how this perspective can be applied to a

range of problems and issues previously examined using fragmented and non-cumulative theoretical frames and research methods. Thus we must recognize the need to move beyond comfortable research methods and to embrace sophisticated and powerful methods such as network analysis. This has implications for the research methods content of doctoral programmes, efforts of professional academic interest groups in providing 'continuous education' for members trained years ago and/or in other disciplines, and effectively communicating to journal editors and reviewers a new ontology and epistemology for entrepreneurship research.

NOTES

1. The author is especially grateful for helpful comments on earlier drafts of this chapter provided by Frédéric Delmar, Alain Fayolle, Daniel Hjorth, Carin Holmquist, Chris Steyaert and the participants in the 2001 Movements of Entrepreneurship Workshop in Stockholm.
2. Henceforth, any reference to innovating entrepreneurs can be construed at either the individual or firm level.
3. Knight (1921) differentiated uncertainty into either 'risk' or 'true uncertainty'. Risk is uncertainty that can be measured probabilistically or statistically, while true uncertainty is unmeasurable. True uncertainty is not measurable because historical analysis can provide no relevant insight and present circumstances lack sufficient predictive information. In the discussion that follows uncertainty refers to Knight's 'true uncertainty' concept, where discovery, insight and exploiting the untried are central.
4. The ensuing discussion may easily apply to either individual entrepreneurs or entrepreneurial firms. Where the discussion mentions 'organizations' or 'organizational members', for individual entrepreneurs we might consider these to be members of their advisor and/or mentor networks.

PART TWO

Moving concepts

New Movements in Entrepreneurship

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