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Entrepreneurs' Search for Sources of Knowledge

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Entrepreneurs' Search for Sources of Knowledge

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ABSTRACT

The primary purpose of this monograph is to explore the search process for knowledge used by entrepreneurs and entrepreneurial firms in pursuit of new opportunities, new product innovation opportunities in particular. Understanding the search for and the use of informational sources is important at both the behavioral level and at the policy level. At the behavioral level, such an understanding expands the existing literature and research scope of scholars related to research on innovative activity, and innovative activity is important because it is a fundamental source of economic growth. At the policy level, such an understanding about sources of knowledge enhances the use of public-sector innovation initiatives in pursuit of economic growth.

The second purpose of this monograph is to present empirical evidence about the sources of knowledge that entrepreneurs and entrepreneurial firms actually use (and actually do not use) in an effort to allow observed behavior to inform future economics and management theory about the search for and use of knowledge sources. The theoretical literature on this topic is limited and often uninformed by the actual behavior of entrepreneurs and the boundary constraints they

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face. The empirical evidence presented might begin to provide a foundation for additional theoretical advancements on the use of alternative sources and their economic and entrepreneurial implications for the firm. With such a foundation, working backwards to how a firm identified, searched for, and decided to use such sources might be possible.

And, the third purpose of this monograph is to generate new and more complete empirical efforts to construct databases and to conduct analyses—empirical analyses and case studies—related not only to entrepreneur's and entrepreneurial firm's search for and use of sources of knowledge but also to measure the trends in the impacts of their use.

1

Introduction

> Human life has always been lived on the edge of precipice. Human culture has always had to exist under the shadow of something infinitely more important than itself. If men had postponed the search for knowledge and beauty until they were secure, the search would have never begun. We are mistaken when we compare war with "normal life." Life has never been normal.
>
> — C.S. Lewis, *The Weight of Glory*

As the epigraph above suggests, the search for knowledge is profoundly important, and the implications from the epigraph are that one should strive to embrace an effort to understand and appreciate the process of searching for knowledge.

If one generalizes from the wisdom of C.S. Lewis to the behavior of entrepreneurs and entrepreneurial firms, it is perhaps not a big leap to seek to understand how their search for knowledge—new knowledge—has affected their behavior; how and why a search occurred and what and when have been the implications from that search.

However, the pages that follow do not provide definitive answers to these questions; rather what follows points a reader in a direction from

which he/she might begin to think about how to address these issues given that the related academic and policy literature (hereafter referred to as the extant literature) is limited not only in its volume but also in its focus on the antecedents and consequences of the search for sources of knowledge.

Regarding the pages that follow, the purpose of this monograph is three-fold, and these three purposes are intertwined.

The first and broader purpose of this monograph is to explore the search process for knowledge by entrepreneurs and entrepreneurial firms in pursuit of new opportunities, new product innovation opportunities in particular as explained in later sections.[1] Understanding the search for and the use of information sources is important at both the behavioral level and at the policy level. At the behavioral level, such an understanding expands the existing literature and research scope of scholars related to their research on innovative activity, and innovative activity is important because it is a fundamental source of economic growth. At the policy level, such an understanding enhances the use of innovation initiatives promulgated by policy makers in their pursuit of levers to pull to enhance economic growth.

Understanding the use of information sources at the policy level has contemporary relevance. As one example, consider university technology transfer. Much if not most of university research is funded by the public sector and the transfer of resulting technologies to the private as well as the public sector has social benefits as enumerated in and incentivized through the Bayh-Dole Act of 1980.[2]

Figure 1.1 illustrates a model of university technology transfer. The model has 12 steps or processes as summarized in Table 1.1.[3]

Figure 1.1, as well as the extant literature discusses in detail how technology is transferred from a university often through patents; however, conspicuously absent from the university technology transfer literature

[1] By intent, I am not restricting my arguments to the search for only new knowledge. Existing knowledge can be rediscovered, and it may complement new knowledge to enhance outcomes.

[2] A detailed discussion of the Bayh-Dole Act of 1980 as an example of public-sector entrepreneurship is in Hayter *et al.* (2018).

[3] For a discussion of alternative technology transfer classifications see Goel and Rich (2005).

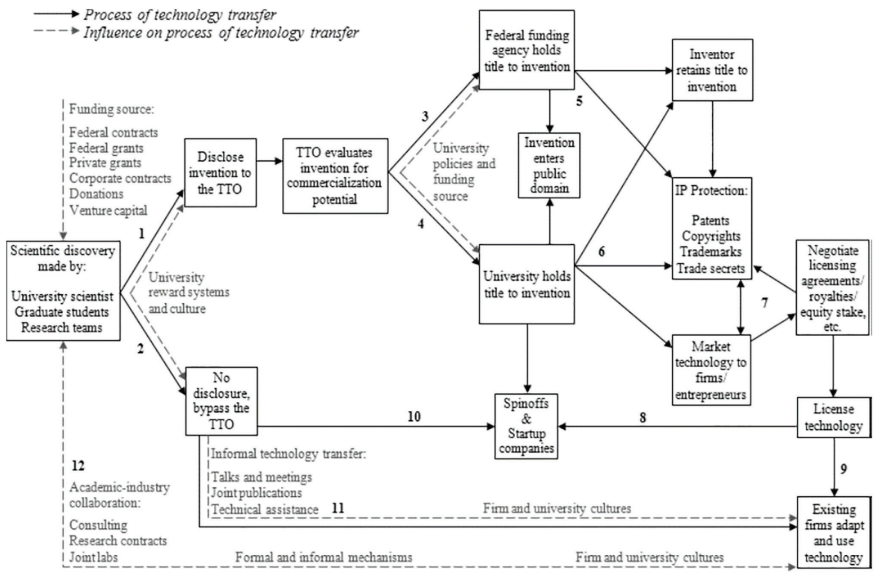

Figure 1.1: A model of university technology transfer.

Source: Bradley *et al.* (2013, p. 621).

is a discussion of how technology-related ideas or technology-related knowledge enters a university. What sources of knowledge do faculty rely on to enhance their ideas? My point is that there are knowledge flows into and out of a university, and the same is true for federal research laboratories and entrepreneurial firms. Understanding both knowledge flows is, I believe, paramount to a complete understanding of the two-way technology transfer process which is critical to understanding the search for knowledge and the net benefits from alternative sources of that knowledge.

One should not interpret this first purpose statement to imply that there is a void of scholarship that focuses on the search for and use of knowledge. On the contrary, there is such a literature but it is limited in volume as well as in scope, and it is only on occasion motivated by a theoretical model or by theoretically constructed hypotheses. And, only on occasion, does this literature go beyond the simple identification of knowledge sources to explore what entrepreneurial characteristics drive

Table 1.1: Annotated processes associated with university technology transfer as illustrated in Figure 1.1

Process 1	The inventor can choose to disclose his/her invention to the university's technology transfer office (TTO).
Process 2	The inventor can choose not to disclose his/her invention, bypassing the TTO.
Process 3	The university can decline to retain title to the invention; the federal funding agency can then request title to the invention.
Process 4	The university can retain title to the invention.
Process 5	The university requests the title to the invention and lets it enter the public domain, effectively ending the technology transfer process; it allows the inventor to retain title to the invention, as long as the university approves; the inventor is then free to file his/her own application for IP protection; he/she requests the title to the invention and files an application for IP protection, typically a patent.
Process 6	In some cases, it is decided early on that a spinoff or startup is the best way to develop the invention; in other cases, the university markets the technology to firms or entrepreneurs that can develop the technology; the university may also begin the process of acquiring IP protection in the form of patents, copyrights, trademarks, trade secrets, etc.; the university may, with the funding agency's approval, allow the inventor to retain title to the invention; if the invention is not federally funded, it may be allowed to enter the public domain; this outcome typically occurs when the invention is unlikely to have significant commercial value, or there is no market interest or need for the invention.
Process 7	The invention can be marketed before IP protection is acquired, that is, if the university wants to gauge market interest before investing significant time and resources to protecting the invention; or, if the invention seems especially promising, the university might choose to apply for patents, copyrights, etc. before or even as they are marketing it to potential investors; the university could successfully market the invention, lock in an interested firm or entrepreneur, and begin licensing negotiations before the IP protection process is completed; if the federal funding agency holds title to the invention, its next step is to file patent applications; similarly, if the inventor is permitted to retain title, he/she will likely seek IP protection before taking steps to commercialize and develop his/her invention.

Continued.

Table 1.1: Continued.

Process 8	If the technology has been licensed to an entrepreneur, such as the inventing faculty member or an outside party, a spinoff or startup company is established around the invention.
Process 9	If the technology has been licensed to an existing firm, the firm then adapts and uses the typically embryonic technology.
Process 10	A spinoff or a startup company being established that utilizes the knowledge passed on from the university scientist.
Process 11	The scientist's discovery, idea, or knowledge being adapted and used by an existing firm.
Process 12	The university scientist and the firm developing the invention often maintain a continued working relationship by means of academic–industry collaboration; the firm and university cultures must be favorable toward maintaining a partnership and engaging in technology transfer activities in order for collaborations to be successful; academic–industry collaboration can involve consulting, research contracts, the establishment of joint labs, and other partnerships between the university and the firm.

Source: Bradley *et al.* (2013, pp. 620–625).

the search for the knowledge and what the entrepreneurial implications are that consequently result from the search.

The second purpose of this monograph is to present empirical evidence about the sources of knowledge that entrepreneurs and entrepreneurial firms actually use (and actually do not use) in an effort to allow observed behavior to inform economics and management theory about the search for and use of knowledge. The theoretical literature on this topic is limited and often uninformed by the actual behavior of entrepreneurs and the boundary constraints they face. The empirical evidence presented in the following sections might begin to provide a foundation for additional theoretical advancements on the use of alternative sources and their economic and entrepreneurial implications for the firm. With such a foundation, working backwards to how a firm identified and searched for and decided to use such sources might be possible.

The third purpose of this monograph is to generate new and more complete empirical efforts to construct databases and to conduct analyses—empirical analyses and case studies—related not only to entrepreneur's and entrepreneurial firm's search for and use of sources of knowledge but also to measure the trends in the impacts of their use. It is my hope that the exploratory analyses presented in the sections that follow motivate scholars in these directions.

The remainder of this monograph is organized as follows. In Section 2, I suggest the bones of a model of entrepreneurial behavior—an individual entrepreneur or an entrepreneurial firm—that is sufficiently broad so that others might use it to study new dimensions of innovative behavior that go beyond the exploratory empirical analyses that I am able to offer in this monograph. The model that is offered relies on selected insights and arguments within the extant literature; the entire body of literature that is broadly defined to be related to sources of knowledge is not the focus of this monograph and is thus not reviewed herein.[4]

[4]This monograph departs from the traditional literature review published in *Foundations and Trends in Entrepreneurship* in the sense that it uses aspects of the existing literature to motivate new research on theoretical models about the search for and use of alternative sources of knowledge and to motivate new research and empirical analyses of the consequences of the use of adopted knowledge.

In Section 3, I describe the AEGIS database from which the data that are used herein to explore the model are presented in Section 2. The AEGIS database is arguably the most complete database dedicated exclusively to European entrepreneurial firms; knowledge-intensive innovative entrepreneurial (KIE) firms in particular. The units of observation in the database are KIE firms and their founders. As defined by Malerba and McKelvey (2019, p. 558):

> . . . knowledge-intensive innovative entrepreneurship, shortened as KIE . . . provides a modern view of entrepreneurship that links the intense use of knowledge by the new ventures with a high innovative activity related to the economy and markets . . . KIE firms are defined as new learning organizations that use and transform existing knowledge and generate new knowledge in order to innovate within innovation systems.

The KIE firm data described in this section provide some behavioral information related to the use of alternative sources of knowledge. To acknowledge the cultural aspects of the search for knowledge, I describe alternative measures of entrepreneurial experience on a country by country basis, on an industrial sector by industrial sector basis, and on a technology sector by technology sector basis.

In Section 4, I rely on information in the AEGIS database to describe alternative sources of knowledge and a KIE firm's expressed value of usefulness of each source of knowledge in pursuit of new product innovation opportunities.

In Section 5, I rely on information in the AEGIS database to construct a measure of the experience base that resides in a KIE firm's founders.

In Section 6, I rely on information in the AEGIS database to describe alternative measures of a KIE firm's pursuit of product innovation opportunities.

In Section 7, I explore the relationship between a KIE firm's experience base (Section 4) and the *ex post* valuation of the alternative sources of knowledge that have already been used (Section 4). The behavioral model in Section 2 suggests that an entrepreneur's experience,

or the overall level of experience embodied in an entrepreneurial firm, will determine the order of search in alternative knowledge-embedded areas. Unfortunately, the information in the AEGIS database (or in any database about which I know) does not describe the order of search but rather it describes a KIE firm's *ex post* assessment of the knowledge sources that have already been searched.

Section 8 is the first of two sections that explores new product innovation opportunities in terms of a KIE firm's use of alternative sources of knowledge and the professional experience embodied in a KIE firm. These relationships are explored descriptively in this section. In Section 9, these relationships are explored in a multivariate manner. Neither of these sections is to be viewed as a complete presentation of econometric-based analysis of covariates of new product innovation. Rather, these sections represent only the tip of a theoretical and empirical iceberg which is intended to point researcher on ways to motivate the expansion of theoretical scholarship on the antecedents of the use of alternative sources of knowledge as well as to motivate additional empirical analyses related to the consequences of the use of alternative sources of knowledge.

Section 10 expands on the multivariate analyses in Section 9 through the introduction of a so-called nature variable related to the gender of a KIE firm's founders in contrast to the so-called nurture variable about the professional experience embodied in a KIE firm's founders as previously considered in Sections 8 and 9.

Section 11 concludes the monograph with a survey of the conclusions from the empirical analyses in the previous sections. My hope is that these conclusions will serve as both a salvo and a roadmap for future research related to entrepreneurs' search for sources of knowledge and use of that knowledge.

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