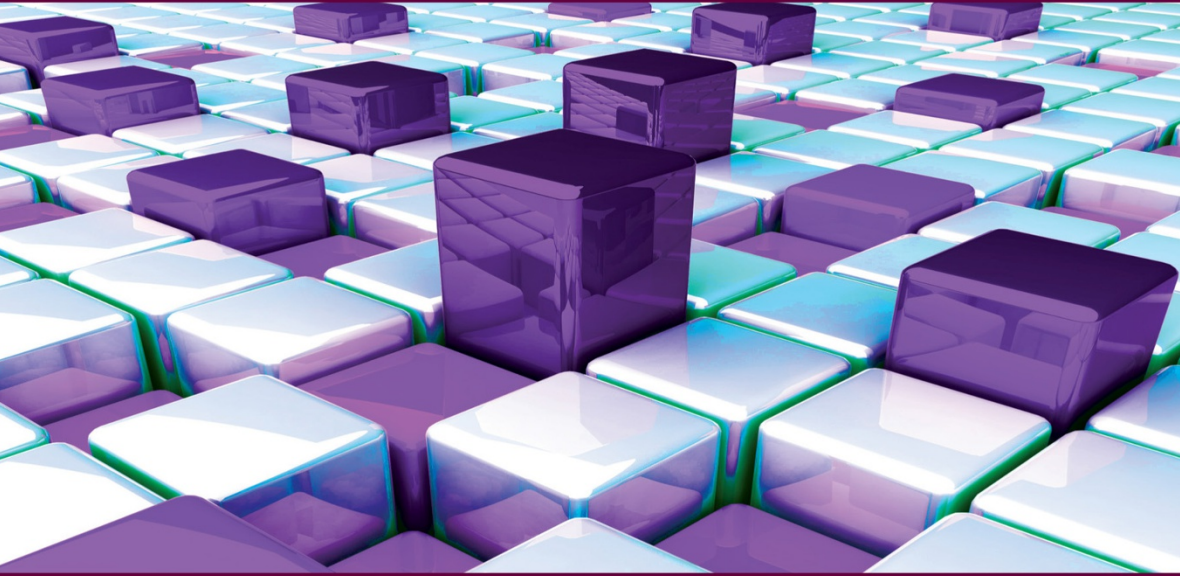


INNOVATION, ENTREPRENEURSHIP AND MANAGEMENT SERIES

INNOVATION BETWEEN RISK AND REWARD SET



Volume 6

**Venture Capital and
the Financing of Innovation**

Bernard Guilhon

ISTE

WILEY

Venture Capital and the Financing of Innovation

Innovation between Risk and Reward Set

coordinated by
Bernard Guilhon and Sandra Montchaud

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First published 2020 in Great Britain and the United States by ISTE Ltd and John Wiley & Sons, Inc.

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John Wiley & Sons, Inc.
111 River Street
Hoboken, NJ 07030
USA

www.wiley.com

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Library of Congress Control Number: 2019952874

British Library Cataloguing-in-Publication Data
A CIP record for this book is available from the British Library
ISBN 978-1-78630-069-0

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Acknowledgments

For Elizabeth. This book is dedicated to her, though it may have turned out to be the opposite of what her concerns were. She is all the more deserving of this dedication for having read and reread it, and in having suggested changes and improvements, in the form of simpler sentences and less sophisticated turns of phrase. The material does not exactly make for a page turner and is perhaps a bit arid, which is yet another reason for segments that sounded strange and possibly in need of a bit of fine tuning. A special thank you goes to her.

For Alice, always quick to make space for my insatiable urge to write and to provide me with all the means to achieve it. And once more, through SKEMA, she provided the logistical infrastructure and opened its doors wide to give me the warmest welcome.

For Stéphane, whose taste for reading does not go so far as to include economics, and who prefers real economic games to reflections on economic issues.

For Matilde, whose future choices remain to be seen, in hopes that this book will serve as an inspiration to her to reflect and research.

For Arseniy, who always seems to be out of balance, in hopes that he will put his very real abilities to use.

Introduction

“Really, what is analyzing, if not choosing and deferring?”

[ALA 10, p. 174]

The works carried out on the subject of venture capital analyze this financing mechanism in terms of the stages of intervention, the players involved, the actions and innovative practices they implement. They also focus on the institutional arrangements that govern them, as well as on the performance of innovation and growth of the company, the sector in which it operates, and the economy as a whole.

What economists refer to as innovation implies novelty, but it is not novelty in itself that constitutes innovation. A new product, service, or process concept may be filed away and never brought into use. What matters is how this concept is implemented in economic practice so that the new feature introduced changes previously established practices and, in turn, the ways in which certain types of problems are addressed. The idea of innovation therefore implicitly refers to methods of producing, consuming or financing, that is to an existing routine that is an accepted way of dealing with a recurring problem. We will use the definition proposed by Vanberg [VAN 92]: “An innovation can be considered as a routine that purports to be new and potentially superior with regard to the accepted way of dealing with a given problem”.

The phasing out of existing routines is a concept that comes directly from Schumpeterian analysis. In his book *Capitalism, Socialism and Democracy* [SCH 51], Schumpeter points out that capitalism is infinitely malleable,

whose capability is not to manage existing structures but, by applying “disjointed pushes”, to create new ones and then destroy them [SCH 51, pp. 122–123]. He refutes the thesis of the exhaustion of technological progress, because capitalism is inherently subjected to an evolutionary process whose fundamental impulse is innovation. The creative destruction process takes place over the long term and transforms the economic structure from within “by eliminating outdated elements and continually creating new ones” [SCH 51, p. 122]. This is the essential source of productivity gains. The appearance of a new product, more modern equipment, or a new type of organization is, above all else, an *internal* phenomenon *within* a company that has the effect of modifying the forms of competition on the market *through* the effect it has on quality and costs. This process should not be reduced to a simple phenomenon of competition through pricing, since creative destruction calls into question “the very foundations and existence... of existing firms” [SCH 51, p. 124].

However, the Schumpeterian dynamic can only be understood if both the real and financial dimensions of the act of innovation are taken into account. Entrepreneurs who create innovations are faced with the need to finance their projects in order to achieve new discoveries, which means giving a primary role to financing mechanisms in the desired level of economic activity. In his own historic period, Schumpeter favored financing through banks, which over time, came to be seen as very limited in its ability to support innovative projects.

I.1. Venture capital: an original mechanism for financing innovative projects

Over the past 40 years, the relationship between industrial structures and financing structures has changed profoundly. The forms of competition, including all institutions and organizations involved with competition in the markets, are the dominant institutional structure. Some institutional structures (deregulated labor markets, the mobility of skilled labor, more open and diversified financing, intellectual property rights, etc.) encourage the emergence of new companies capable of creating marketable technological knowledge. The emergence of venture capital is a by-product of the need to develop forms of innovation in financing, allowing new technological paths that have proliferated in many activities, particularly high-tech ones, to be explored. At the same time, the deregulation of

financial systems favors market-based systems and threatens the stability of bank-based systems. This has profound implications for how financing is provided to companies, as well as for the opportunities made available from private savings. Venture capital funds are multiplying: as professionally managed organizations, they constitute venture capital (VC) firms, they gather financing resources and they invest in companies that pass through a formative period for a limited period of time (5 to 8 years).

1.2. Analysis of the financing chain

In an earlier paper [GUI 08], we defined venture capital as a financing mechanism for the early stages of a company's life, and proposed to analyze it as a two-tiered structure of intermediation.

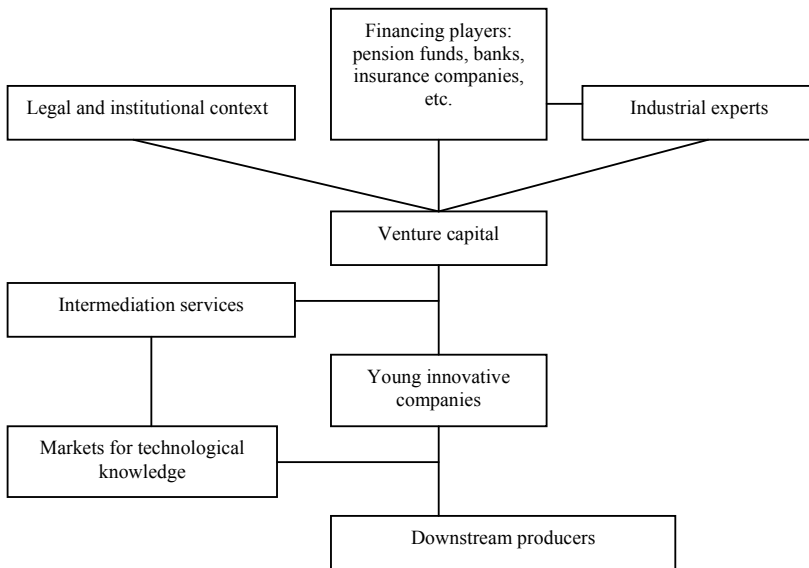


Figure 1.1. *The simplified intermediation structure (source: [GUI 08, p. 9])*

A venture capital fund is first and foremost an innovative project management structure, firmly rooted in a legal and institutional context that expresses the incentives and constraints defined by public authorities (taxation, legal rules, control mechanisms, etc.). Using this as a basis, the financing players, constituted mainly in Europe by banks and in the United States by pension funds, insurance companies, retirement funds, etc.,

become involved. In addition to these players, scientific, technological and industrial experts also take part, whose participation is often required to assess the market prospects of the projects that are presented.

The second level of intermediation involves projects that are more specifically technology-intensive. In recent years, institutions specializing in technological intermediation have emerged as agents acting as interfaces between venture capital and new technological developments. Particularly in the United States, many of these intermediaries have taken the form of Internet service providers that provide information on the quality of technology projects and growth opportunities. In addition, many technology companies in the start-up phase, initially financed on an individual basis, are knowledge producers seeking complementary financing from venture capital funds and targeted information on downstream opportunities (licensing). In this perspective, technological intermediation supports the development of technological knowledge markets in many activities: software, biotechnology, artificial intelligence, 3D, etc.

This intermediation mechanism creates specific constraints from the point of view of information [RIN 16]:

- the existence of an agency relationship between the principal (venture capital) and the agent (entrepreneur), which is absent in bank financing;

- the limited duration of these vehicles requires VC firms to disclose the real value of their investments to be recovered at the closing date of the venture capital fund;

- “At this point, institutional investors will be able to know the ‘true’ return to their investment, and can make an informed decision whether to participate in the VC’s future funds or not. This structure, based on sequential fund-raising through closed-end fund vehicles that allow revelation of information about true investment returns, is central to the VC industry” [RIN 16, pp. 3–4].

Today, the financing chain for innovative projects has been extended, and the number of stages of the intermediation has increased [EKE 16, p. 2]:

Step 1. Incubation

In the first stage of development, when the company does not yet exist and its business model is not established, financing is

mainly based on *love money* (*Family, Friends and Fools*), public assistance (competitions, loans of honor), or assistance provided by incubators or accelerators.

Step 2. Seed

This is the first capital contribution made to the company. Funds can come from *business angels*, public authorities (grants), private savings mechanisms such as *crowd-funding* or specialized funds (priming funds).

Step 3. Start-up

Generally, it is at this stage that venture capital in the strict sense of the term becomes involved, mainly through the activity of specialized funds, but also *through* public aid at this point as well.

Step 4. Growth

During the growth phase, growth capital funds are also involved, which allow the company to expand its business volume and enter new markets.

Step 5. Exit

The last potential step is the exit: the resale of the company (usually to large companies wishing to take ownership of its assets, ideas, and/or the technologies it developed) or an initial public offering.

These five stages follow the path of a logistic curve from incubation to exit, with venture capital considered by these authors to include the start-up and growth phases.

Another slightly different definition has been proposed by the OECD [OEC 18a, p. 102] which is based on the definition proposed by EVCA:

“Venture capital is a subset of private equity (i.e. equity capital provided to enterprises not quoted on a stock market) and refers to equity investments made to support the pre-launch, launch,

and early stage development phases of a business. *Venture capital-backed companies* [...] are new created or young enterprises that are (partially or totally) financed by venture capital”.

The seed phase is included as part of venture capital. The same is true in a more recent publication [OEC 18b] in which the OECD includes the following four steps in its definition of venture capital: seed/start-up/early stage/late stage venture.

In our opinion, these different definitions refer to constraints on the information available to work on long series. They are also explained by the confusion that often occurs between the company’s development stages and the investment stages:

Development of the company	Concept/ Start-up	Development	Growth	Maturity
Investment stages	Seed Angels	Early stage VC	Late stage VC	Exit

Table I.1. *Progression of development and investment of companies (source: [NVC 18, p. 7])*

The start-up and early stage phase includes the production of the concept, the business model, and the operational deployment. These three stages are situations in which the cash flow is negative. The so-called late stage phase corresponds to the company’s growth phase. During this phase, the viability of the product is made certain, the company begins to grow, and its marketing and sales operations play an increasingly important role. In most cases, and based on the data available to us, venture capital will be identified in our work during the start-up, early stage, and late stage phases¹.

¹ Very often, venture capitalists are involved at the seed stage, which is the responsibility of business angels. The question arises as to whether venture capitalists and business angels are complementary or may be substituted [HEL 17]. In fact, venture capitalists invest money from third parties while *business angels* invest their own money. This distinction is far from insignificant: if they are complementary, the financial ecosystem is integrated; if they are able to be substituted, the financial ecosystems are disjointed. The authors suggest that there are two separate paths in the start-up ecosystem and that this can be explained by the diverse range of companies’ needs.

Thus, the company's development is based on types of interventions made by the players by means of a technical, social, and cultural process that leads to the emergence of a technological variety, in other words, an innovation.

I.3. Analysis of the intermediation structure

This structure can be identified by three elements:

– as an incentive structure that defines division of powers and compensation schemes: venture capital receives two forms of compensation: an annual percentage on the amount invested plus 20 to 25% of the earnings at the exit time. The compensation of entrepreneurs varies, depending in part on balance each of them strike between an entrepreneurial career and the status of employee in a large company, and on the amount of assets they personally own (see Chapter 1);

– as an allegiance structure. Financing with venture capital makes it possible to modify the distribution of rights between the contracting parties. These are voting rights, the rights to sit on the board of directors, settlement rights and cash flow rights. In addition, the most critical resource of a company is its organizational capital [ZIN 00], which is a property that emerges from its employees' specific investments. Contributions in equity only become legitimate because the structure of specific investments can be considered consolidated enough to grant power to investors:

“In this context, venture capitalists will tend to professionalize the firm's management so as not to make it too dependent on the entrepreneur or a specific professional manager. The financing of innovation, driven by venture capital, tends to erase the role of the entrepreneur in some cases *once the firm is incorporated*, which facilitates the external financing of the firm during various ‘rounds of financing’” [GUI 08, pp. 71–72].

However, this allegiance structure remains flexible. There are situations regarding which the level of performance strengthens the power of venture capitalists, and there are situations of conflict in which decision-making power and control rights will be exercised by the entrepreneur;

– as a structure of interrelated rules: those defined by national laws and which form the legal, fiscal, and operational environment (a situation of

heteronomy) and those defined by the elements of the contracts negotiated by the participants (a situation of autonomy).

I.4. Justification of venture capital

In addition to representing an original mechanism for financing innovative projects, many studies have highlighted certain unique features of venture capital. Here are some of the most important aspects:

First, it appears that venture capital (public programs and the private financial sector) has enabled dynamic entrepreneurs to create companies whose emergence and growth have revolutionized high-tech industries such as IT, digital technology, biotechnology, medicine, etc., as well as services such as insurance, e-commerce, etc.

Second, venture capital represents only a small fraction of total R&D expenditures. Venture capital-backed firms accounted for about 3% of R&D spending in the United States between 1983 and 1992, while accounting for 8% of total patents filed during this period [KOR 00]. It was during the 1970s that venture capital became an important component of the new innovation system in the United States [KEN 11]². In total, venture capital investment has accounted for about 10.2% of innovation flows in 15 European countries since the early 1990s.

² “The first and most important of the new economic areas might be termed the networked, distributed computing model that was made possible by the advances in semiconductors. This includes both the personal computer (Apple, and then in the 1980s, Osborne, Compaq, and others) and work stations (Apollo Computers, to be followed in the early 1980s by Sun Microsystems, Silicon Graphics, and many more), components for small computers (Seagate, Shugart Associates, Tandon Corporation, Zilog and many more), software (Microsoft to be followed in the early 1980s by Ashton-Tate, Borland, Lotus, to name a few) and even computer retailers such as Computerland. The computer data networking sector also began its explosive growth with companies such as Rolm (founded in 1969), Ungermann-Bass, 3Com, and in the 1980s many more. Additionally, there were continuing opportunities in classes of larger computers leading to firms, such as Amdahl, and providing components and software for them, e.g. Oracle. One change for the most successful ICT start-ups of the 1970s and into the 1980s is that the government market was significant, but no longer critical” [KEN 11, p. 1708]. (pp. 14–15).

Third, venture capital rarely funds fundamental research, with start-ups devoting a large part of their R&D expenditures to product development and marketing.

Fourth, venture capitalists are currently facing a new concept, one that they have looked on with uncertainty, regarding the entrepreneurial skills of the management team, markets, and technology. Betting on enlightened investors and decision-makers is not a sustainable proposition in this area. With regard to markets and technology, there is little or no data, making the future difficult to predict from existing benchmarks – though not impossible to imagine. From this point of view, venture capital works as a mechanism for selection and screening, that must involve experts, people with scientific, economic, and marketing knowledge, in order to define the scope of the new concept by carrying out testing and experimentation phases to establish highly uncertain ideas on solid foundations, particularly in high-tech sectors. In addition, venture capital funds accumulate knowledge and experience that support and assist entrepreneurs. In this way, the barriers to entry into entrepreneurship are not simply financial or informational, but social and psychological, and their extent also depends on the acceptability of innovation. Indeed, the start-ups invested in are not primarily producers of goods or services, they permeate the field of science and innovation and offer new methods for producing, consuming, knowing, and communicating. From this perspective, venture capital is an *essential facility*, by its nature, that is, it is an essential service infrastructure from which innovative ideas can be carried out and move forward to business start-ups³.

Finally, venture capital does not produce developments in isolation, rather, this type of financing is influenced by macroeconomic (GDP, interest rates, etc.), institutional, and organizational developments, without one single reading being applicable. For example, the relationship between venture capital investment and growth can be interpreted as directly one-to-one: venture capital is a growth factor and, in turn, growth has a positive and significant impact on the development of this industry in countries where it has reached a certain degree of maturity. Moreover, institutional changes are

³ This makes it possible to give context to the approach, defining a venture capital fund solely as a portfolio of start-ups whose risk frontier is to be adjusted by distributing it using strictly financial techniques.

inextricably linked to the development of this industry⁴. Finally, the very significant role played by new players such as *business angels* has made it possible to have a more detailed division within the organization of the financing chain and to encourage the implementation of supervision and selection processes that have reduced the uncertainty surrounding the new concepts. Not to mention *serial entrepreneurs* and investors who are able to invest large sums in start-ups, either directly or through fund structures, and who have built a reputation for skills, qualifications, and integration into effective networks.

I.5. Problem addressed by the book

The fundamental issue addressed in this work is organized around the following four proposals:

1) the players involved take decisions by mobilizing different knowledge sets in relation to the innovative project. More specifically, venture capital activities use two types of knowledge:

“Instrumental knowledge represents the means of production used within a process of activity. They include scientific and technological knowledge, knowledge relating to management or organizational principles, etc. The second type refers to *interpretative* knowledge that helps to define situations, to develop representations of reality, and to give meaning to a productive activity. Interpretative knowledge is developed during a filtering phase that seeks to identify the contributions

4 In the United States, if we look exclusively at companies created after 1974, “the idea here is to see what portion of the companies that could have received VC financing, choose to use VC financing. To get at the companies who could have used VC financing, we limit our sample to those companies that came of age after the Prudent Man Rule. By excluding firms like Ford Motor Company and General Electric, we can better estimate the importance of VC to young companies. Approximately 1,339 currently public US companies were founded after 1974. Of those, 556 (42%) are VC-backed. Focusing on these companies dramatically increases our measures of VC impact. VC-backed companies comprise 63% of the market cap of these “new” public companies, versus 21% for the full sample. Employment share increases similarly, from 11% to 38%. The most impressive figure is arguably R&D spending, with VC-backed firms making up an overwhelming 85% of the total R&D of the post-1974 public companies. Given that the VC industry has been in large part spurred by the relaxation of the Prudent Man Rule, these results provide an illustration of the importance of government regulation” [GOR 15, p. 5].

of new knowledge in relation to existing solutions and to evaluate technological projects in terms of their effectiveness and utility...” [GUI 08, p. 63].

Instrumental knowledge is held by entrepreneurs, and its purpose is to delimit all possible activities. The purpose of interpretative knowledge is to delimit all conceivable activities, they are held by venture capitalists (assisted by experts). Of course, there are overlaps: entrepreneurs also develop representations that are supposed to correspond to productive and market opportunities, venture capitalists hold instrumental knowledge they have obtained from areas such as their previous experience as entrepreneurs. The intersection between these two sets of knowledge represents the achievable activities;

2) the attention span of the players is limited [SIM 83]. No single player can control all the elements included in an innovative project. It is recognized that cognitive limitations depend on the distance of the players from the content of the project [FLE 01]. If instrumental knowledge is close to the knowledge bases held by entrepreneurs (for example, the project consists of the recombination of a known set of components), the behavior adopted is described as exploitation. In contrast, while interpretative knowledge is knowledge that is distant from what is normally found in the field of venture capital intervention, it is exploratory in nature and needs to be supported and expanded on by the use of scientific and industrial experts. In this context, the “attention network” must operate in such a way that links are created between the entrepreneur who directs attention to salient points of the project, and the network members who receive this attention [LAZ 11]. This allows for the exchange of information;

3) from these two proposals, it follows that the financing of innovative projects with venture capital is fundamentally ambiguous. Points of ambiguity may be generated by the difficulty of distinguishing between more and less worthwhile projects. Similarly, technological knowledge can lead to divergent assessments of the contribution of a technology. In this case, the productive and commercial aspects of the project must be rethought and reassessed;

4) ambiguity can be reduced by mechanisms for consolidation and valuation, known as syndication, staged financing, improvement of intangible assets, assistance provided by the entrepreneurial support