

Real Options – Its Implications On Venture Capitalist' s Investment Decision-Making Behavior.

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This paper is prepare for the research workshop on recent topics in real options valuation, that will be conducted at 6th Annual International Conference on Real Options Theory Meets Practice – Coral Beach, Paphos, Cyprus July 4-6 2002

Key Words: Real options, investment decision-making behavior, dynamic strategic planning, technology management.

ABSTRACT

An overriding issue on the agenda of today's venture capitalists concerns their investment decision-making. Their fundamental concern is compounded by methodological difficulties: a) traditional net present value (discounted cash flow) evaluations are inadequate for many risky projects, and b) the available methods for valuing these projects are limited and often impractical.

Good investment decision-making has often been described as following: - an orderly and logical process from framing investment decision-making problem, searching and evaluating of alternatives, and choosing the best option to investment. Compressed decision time and increase complexity are disturbing the orderly flow of information and proper flow of investment decision-making authority structure. Managers are turning to new approaches, emphasizing on options thinking, managerial flexibility and resource flexibility.

This paper describes the implications of the presence of real options in investment decision-making situations and how the presence of real options changes the managers' investment decision-making behavior. Real options' reasoning is a logical for funding projects that maximizes learning and access to upside opportunities while containing costs and downside risk. Although it has considerable advantages over conventional approaches, the methodology to make some intelligent conjectures remains scarce. This paper describes and illustrates a methodology to understand the behavior change of investment decision-making with and without the presence of real options. The research exercise demonstrates the behavioral changes implications with and without the presence of real options.

This paper seeks to develop theory or compare patterns by looking at four main questions that will be answered through a series of exercises. The 4 questions are stated below: -

1. Given the choice to choose several investment decision-making options, will the investment practitioners change their investment decision-making behavior?
2. Given the choice to choose several investment decision-making options, how will the investment practitioners change their investment decision-making behavior?
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?
4. How sustainable and adaptable will the behavioral change in investment decision-making of the investment practitioners through the time?

This paper focuses on six aspects of the process that venture capitalist use to select and structure investments: investment strategy, deal flow generation, screening, due diligence, valuation, and investment structure. Decision-making regarding these processes of selecting and structuring investments also followed the standard model of decision-making: Investment practitioners make assessment on the current issues or situations, alternative decisions are listed and evaluated as to the managers objectives, risk and reward factors and so on often using traditional valuation methodology; a decision was made and implemented.

In this paper, I will describe a series of approach to evaluating investment decision-making through experimental economics. For example, controlled experiment will be use to ask respondents to score a series of statements to understand and investigate their investment decision-making behavioral changes.

Given the relentless development of investment field, complexity in investment decision-making can only be expected to increase. This promises lead to more intense and complex challenges for decision makers, but through the exercise and better understanding of their investment decision-making behavior, investment practitioners will have equip themselves with powerful understanding for addressing these complex and dynamic decisions.

THE BASIC ISSUES

This paper seeks to develop theory or compare patterns through answering four main questions that will be answered through an exercise. The 4 questions are stated below: -

1. Given the choice to choose several investment decision-making options, will the investment practitioners change their investment decision-making behavior?
2. Given the choice to choose several investment decision-making options, how will the investment practitioners change their investment decision-making behavior?
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?
4. How sustainable and adaptable will the behavioral change in investment decision-making of the investment practitioners through the time?

The author realized that by answering the four questions above could not predict 100% behavioral changes in investment decision-making of investment practitioners in venture capital firms. But at least, we can realize or make some intelligent conjectures about investment decision-making behavioral changes, informed by this research exercise and factor it towards better understanding of the affect of real options on behavioral changes in investment decision-making.

The research study will confine itself to taking a qualitative approach (rather than a quantitative approach) in exploring investment decision-making process of investment practitioners with real options in mind, through scoring a number of statements.

In this qualitative research, the findings could be subject to other interpretations and small sampling procedure decreases the generalizability of the findings. This study attempt not be generalizable to all areas of venture capital investment, only confine to emerging technology decision-making – in this research context – high technology firm investment.

This research study will contribute to the scholarly research and literature in the field because: -

- a. There is yet to have a good qualitative research on the real options which traditionally focusing on more mathematical or quantitative approach.
- b. This research will enable other more quantitative real options researchers to realize the innate reasons behind managerial decision-making behavior given the options to choose rather than sticking to a fixed budget or investment path.
- c. Through more qualitative research a test can be undertaken to confirm the theoretical real-option valuation and its implications for management's intuition and experience.

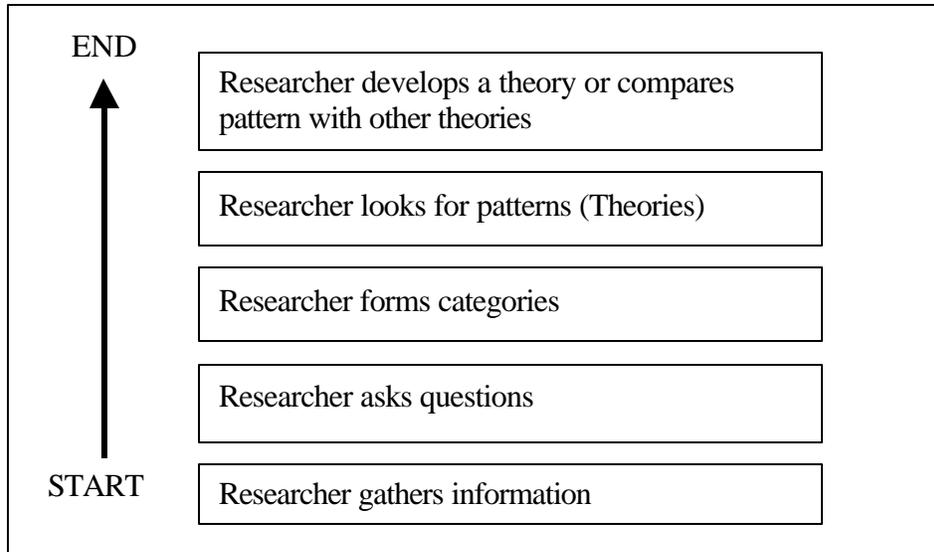
The research study will also contribute to the improvement of the real options practice in numerous ways such as: -

- a. The fundamental decision-making confronting managers in venture capital and will encourage the creation of certain patterns of activity. The knowledge gained concerning the domain consequences of such decision-making can serve as a impetus to other researchers/ managers to understand their decision making process as pertinence to venture capital and other areas.
- b. It will reveal the underlying logic of managerial decision-making process within the framework of real options.
- c. It analyzes qualitatively actual case applications, and tackles real-life implementation issues and problems in a more practical detail.

The research study will also improve the decision-making policy within the organization as such: -

- a. It is hoped that through the research, a generic option based user friendly methodology with simulation capabilities will add as an aid to investment practitioners.

In general, the research will follow the inductive mode of research in a qualitative study model (Creswell, 1994) as described below.



REAL OPTIONS CONCEPT

A real option is analogous to financial option contract; it is limited-commitment investment in an asset with an uncertain payoff that conveys the right, but not the obligation, to make further investments should the payoff look attractive. If you decide not to make further investments, options expire, but all that is lost is its price. Ironically, the ability to provide access to significant upside potential while containing downside losses makes options more valuable with greater volatility.

Real options differ from financial ones in several important respects: They cannot be valued the same way, they typically less liquid, and the real value of an investment to one firm may differ a lot from its value to another firm. This creates a substantial challenge to evaluating a real options implication. This paper approach is to use fuzzy, albeit carefully developed, measures to obtain behavior with the presence of real options.

The research case study will be based on managerial operating flexibility and strategic interactions known as corporate real options. Corporate value creation and competitive position are critically determined by corporate resource allocation and by the proper evaluation of investment alternatives.

In a constantly changing and uncertain world marketplace, managerial operating flexibility and strategic adaptability have become crucial to capitalizing successfully on favorable future investments or competitive moves. Corporate capabilities that enhance adaptability and strategic positioning provide the infrastructure for the creation, preservation, and exercise of corporate real options.

This research will take on a qualitative approach to describe the case as a general conceptual framework for viewing real investment opportunities as collections of options on real asset – in another words – corporate real options.

The real options approach gives managers a decision-making and valuation tool that reflect good project management, ensuring that these decisions lead to the highest market valuation of corporate strategy. The real options approach is a way of thinking a change that requires executives to create value through their management of strategic investments in an uncertain world.

The table below describes different real options (Trigeogris, 1997)

Types	Description
Option to defer	Management holds a lease on (for an option to buy) valuable land or resources. It can wait x years to see if output prices justify constructing a building or a plant or developing a field.
Time-to-build option (Staged investment)	Staging investment as a series of outlays creates the option to abandon the enterprise in midstream if new information is unfavorable. Each stage can be viewed as an option on the value of subsequent stages and valued as a compound option.
Option to alter operating scale (e.g. to expand; to contract; to shut down and restart)	If market conditions are more favorable than expected, the firm can expand the scale of production or accelerate resource utilization. Conversely, if conditions are less favorable than expected, it can reduce the scale of operations. In extreme cases, production may be halted and restarted.
Option to abandon	If market conditions decline severely, management can abandon current operations permanently and realize the resale value of capital equipment and other assets on second markets.

Option to switch (e.g. outputs or inputs)	If prices or demand change, management can change the output mix of the facility (product flexibility). Alternatively, the same output can be produced using different types of inputs (process flexibility)
Growth options	An early investment is a prerequisite or a link in a chain of interrelated projects, opening up future growth opportunities.
Multiple interacting options	Real-life projects often involve a collection of various options. Upward-potential-enhancing and downward-protection options are present in combination. Their combined value may differ from the sum of their separate values, i.e. they interact.

VENTURE CAPITAL

Jean Witter first used venture capital as a term in a public forum in his presidential address to the 1939 Investment Bankers Association of America convention (Reiner, 1989). Since then venture capital has evolved into a specialized form of finance supporting small privately owned companies judged to have the potential for fast growth.

In the context of this research exercise, this paper will focus on six aspects of the process that venture capitalists use to select and structure investments: investment strategy, deal flow generation, screening, due diligence, valuation, and investment structure.

Even though, the venture capital investment decision-making requires an extensive and long process of looking at management capability, financial health, market trends and its own investment strategy, sometime the venture capital firm must be flexible in its selection and structuring of investment.

THE RESEARCH EXERCISE STRUCTURE

Trying to apply complicated methodologies to uncertain situations is usually futile. The greater the uncertainty, the more you need to keep things simple; otherwise, you run the risk of having everyone blow a conceptual fuse trying to cope with both the uncertainty of the situation and the uncertainty introduced by the research exercise's insistence on using complicated methodologies. So a straightforward approach to gathering and analyzing the behavioral changes in investment decision-making will enable a better execution of the research exercise.

One way to start the research exercise is to have a team of investment practitioners to respond to the questions. It is crucial to this process that everyone feel comfortable articulating his or her point of view and underlying rationale. It always pays to establish ground rules in advance for making sure that the environment is right and that the participants are clear on the expectations for making it an effective research exercise.

The objective of this research exercise is to solicit alternative scenarios for why people responded as they did. Often, you will find that agreement on the basic facts does not lead people to the same conclusions. This is always interesting, and possibly useful to deduct further of behavioral changes.

This research exercise will use real options reasoning, rather than more conventional approaches to investment assessment, because it represents a robust and coherent way of thinking about highly uncertain situations. Using the statements as the basis of deducting behavioral changes also has the advantage of being fast, inexpensive and a great way to get involvement and open up communication from many critical people.

The overall research exercise consists of 2 phases. The crux of the proposed practical process for identifying is in the novel way it deals with the analysis of behavioral change in investment decision-making.

Set Up Phase: Definition of the Scope of Assessment.

Defining the nature of the scope of assessment of the research exercise, we should start with the 4 main questions as guidance. Herewith again, the 4 main questions: -

1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?
(Scope of assessment – The affect of real options on managers’ investment decision-making, will they change given a choice?)
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?
(Scope of assessment – The affect of real options on managers’ investment decision-making, how they change given a choice?)
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?
(Scope of assessment – The affect of real options on managers’ investment decision-making, the learning effect of manager once they were given the flexibility advantage with the presence of real options. We can deduct the learning effect through deducting the scoring of behavior changes with and without the presence of real options)
4. How sustainable and adaptable will the behavioral change in investment Decision-making of the managers through the time?
(Scope of assessment – The affect of real options on managers’ investment decision-making, how sustainable is their behavioral change?)

There are three assumptions for the research exercise are as stated below: -

1. With the presence of real options, investment practitioners will have the managerial, operation and financial flexibility/ options to change your investment decision-making.
2. Without the presence of real options, investment practitioners will not have managerial, operation and financial flexibility/ options to change your investment decision-making. In another words, you will probably face the top management questioning of your investment decision-making changes.
3. All the 6 sections of the research exercise, the research will assumed a positive note of the overall economic sentiment in the investee company and the investment to the company have not been invested.

The research exercise is conducted with a selected pool of 25 investment practitioners from various venture capital companies in Malaysia.

Analysis Phase: Data collection and Analysis

The data collection procedure will be: -

1. Deducing the behavior changes through looking at the scoring by the managers.
2. Gather observational notes by conducting an observation as a participant.
3. Keep a journal during the research study.

Researcher will engage in multiple observations during the course of a qualitative study. The research data collection protocol or form for recording information is needed to note observations in the field. The research will design an observational protocol as a single page with a dividing line down the middle to separate descriptive note – portraits of the informants, a reconstruction of dialogue, a description of the physical setting, accounts of particular events, and activities – from reflective notes – an opportunity for the researcher to record personal thought such as “speculation, feelings, problems, ideas, hunches”.

There will be inclusion of the demographic information such as the time, place, and date that describe the field setting where the observation takes place.

Besides evaluating on the scoring of the managers and keeping notes on observation, the data analysis activity will also be conducted as an activity simultaneously with data collection, data interpretation, and narrative reporting writing. In qualitative analysis several simultaneous activities engage the attention of the researcher: collecting information for the field, sorting the information into categories, formatting the information into a story or picture, and actually, writing the qualitative text.

THE RESEARCH EXERCISE

During the exercise, a) The difference between the percentage change between the presence of real options and without the presence of real options will show whether the managers really change their investment decision-making behavior through changing the six aspect of process that venture capitalists use to select and structure investment. (Answering Question 1),

b) The higher the magnitude of behavioral changes in one of the 7 real options listed in the table will show how managers change their investment decision-making through changing investment strategy (and others selection and structuring of investment processes) such as pursuing a growth options strategy and so on. For example, scanning through the table 1, that if the time-to-build options (staged investment) has the greatest magnitude among the rest of the real options on other investment strategies, we can deduct how managers change their investment decision-making behavior, that is, most of them opt for time-to-build options as their main investment decision-making with the presence of real options (Answering Question 2);

c) Given the presence of real options and without the presence of real options, we can deduct whether managers – given the flexibility of real options - will change their investment decision-making behavior through learning. This can be deducted from

looking at the significant of behavioral change in total of magnitude change. For example, we can deduct that, through learning of the real options advantages in terms of managerial flexibility and resource flexibility, what is the significant difference in total behavior change – given the presence and without presence of real options (Answering Question 3) and;

d) The higher the magnitude of change, the higher of sustainability of behavioral change in investment decision-making. For example, if the managers score the highest point, in term of magnitude of behavior change, for option to switch their investment strategy, maybe from high risk to low risk, we can deduct that the option to switch will be the highest sustainable behavioral change. (Answering Question 4)

*** DENOTES that the statement/ paragraph is taken from Gardella, L.A. Edison Venture Fund, , CFA Reading 2000, Selecting and Structuring Investments: The Venture Capitalist's Perspective.

Investment Strategy

*** The investment strategy is at the heart of the venture capital firm. The strategy defines the focus of the investment activities with the respect to industry, stage of development, financing size, and geographical region. And although it needs to be focused, an investment strategy should be flexible enough to take advantage of opportunities created by market changes.

*** There is considerable evidence that when it comes to successfully tackling highly uncertain investment decision-making, investment strategy counts and can help to lower investment risks. The key issue here is to know whether with the presence of real options will managers change their investment strategy, and ultimately affecting their investment decision-making behavior.

Table 1 Real options and investment strategy

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, option to defer/ delay an investment outlay in the first year of operation.							
2.Time-to-build (Staged investment) For example, option to staged investment rather than putting significant outlay of investment in period of investment.							
3.Option to alter operating scale. For example, option to alter operating scale from high investment to lower investment strategy.							
4.Option to abandon. For example, option to abandon the entire company investment in company A if the is significant drop customer retention.							
5.Option to switch. For example, option to switch to another alternative company if the original company cannot meet the agreed terms and conditions of investment outlay.							
6.Growth option. For example, growth option will be opted if that company shows significant increase in profitability, thus more investment outlay for the company.							

7. Multiple interacting options For example, the manager might opt for a multiple interacting options to their investment strategy if he/she is highly uncertain about the future state of that company.							
(Part B) Without the presence of real options							
1. Option to defer.							
2. Time-to-build (Staged investment)							
3. Option to alter operating scale.							
4. Option to abandon.							
5. Option to switch.							
6. Growth option.							
7. Multiple interacting options.							

Deal Flow Generation

*** Deal flow refers to the investment opportunities generated by the venture capital firm. In general, deal flow is an underrated aspect of the investment process, but it differentiates one venture capital firm from another.

A venture capital firm's marketing efforts to generate deal flow must provide the firm with a wide selection of investment opportunities. The deal generation process should ensure that the firm gets the first look at deals, particularly those in its focus areas. Finding good deals is like trying to find a needle in a haystack – looking for that one exceptional deal out of hundreds available.

Table below presents a sets of real options that managers might or might not use to maximize deal flows in their investment.

Table 2 Real options and deal flow generation

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
<p>1.Option to defer.</p> <p>For example, the venture capital firm might defer their marketing effort during the downturn of the industry that they are investing.</p>							
<p>2.Time-to-build (Staged investment).</p> <p>For example, the venture capital firm might make staged investment in their marketing effort to look for more deal flow in the new industry that they are looking.</p>							
<p>3.Option to alter operating scale.</p> <p>For example, the venture capital firm might alter their marketing operating scale to suit the current economic and technology dynamic situation.</p>							
<p>4.Option to abandon.</p> <p>For example, the venture capital firm might totally abandon their marketing effort if the industry outlook that there are invested in is bad for a foreseeable time period.</p>							
<p>5.Option to switch.</p> <p>For example, the venture capital firm might opt for another different kind of marketing effort if the current marketing efforts do not create high deal flow.</p>							
<p>6.Growth option.</p> <p>For example, in order for the venture capital firm to growth to their preset objectives, they might opt for a greater marketing drive to generate greater deal flow for the firm.</p>							

7. Multiple interacting options. For example, the venture capital firm might use multiple marketing efforts to boost up deal flow generation.							
(Part B) Without the presence of real options							
1. Option to defer.							
2. Time-to-build (Staged investment)							
3. Option to alter operating scale.							
4. Option to abandon.							
5. Option to switch.							
6. Growth option.							
7. Multiple interacting options.							

Screening

*** The objective of screening deals is to efficiently focus the resources of the venture capitalist so that he or she can identify opportunities quickly, understand the risk factors of the investment prospect, and assess the return potential.

Screening is typically centered on how the deal fits the overall strategy, the perceived potential for the deal, and the source of the deal. All deals should receive attention, but particular attention should be paid to sources that have referred high-quality deals in the past.

The table below might suggest to managers real options to leverage on different screening strategy.

Table 3 Real options and screening

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
<p>1.Option to defer.</p> <p>For example, the manager might opt for option to defer their screening process until certain material information are gain from the company A.</p>							
<p>2.Time-to-build (Staged investment)</p> <p>For example, the manager might perform screening in a staged manner as information and knowledge about company A continually increase over time.</p>							
<p>3.Option to alter operating scale.</p> <p>For example, the manager might opt to place a more stringent screening process for the new industry that they are in.</p>							
<p>4.Option to abandon.</p> <p>For example, the venture capital firm might opt to abandon certain screening criteria, if the outlook of the overall industry is very bright and low in risk of default.</p>							
<p>5.Option to switch.</p> <p>For example, the venture capital firm might switch their screening criteria in view of the current industry positive/ negative outlook.</p>							
<p>6.Growth option.</p> <p>For example, the venture capital firm might opt to enlarge their screen criteria to cover more ground on the companies that they will invest.</p>							
<p>7.Multiple interacting options.</p> <p>For example, the venture capital firm might opt for multiple screening processes to ensure proper</p>							

screening of companies.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

Due Diligence

*** The due diligence process provides a clear understanding of the business model and the major risk factors involved. But, more importantly, due diligence is the start of a relationship with the company’s management team. The due diligence process is complex which involved management interviews, customer references, third party analysis, personal references, vendor references, industry trade shows, customer visits, financial analysis, and legal issues.

The statements of due diligence’s real options this paper use to assess different real options are listed in the table below.

Table 4 Real options and due diligence

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the manager might opt to defer his/ her due diligence on company A, if there is							

significantly lack of information about customer reference.							
2.Time-to-build (Staged investment) For example, the manager might develop a due diligence program in a staged manner, with increasing depth of due diligence exercise over time.							
3.Option to alter operating scale. For example, the manager might opt to alter his/her due diligence depth in accordance to the company that he/she investing.							
4.Option to abandon. For example, the manager might opt to abandon totally the due diligence activity if the overall industry outlook of the company is unhealthy							
5.Option to switch. For example, the manager might switch to other his/her due diligence focus from placing high focus on management capability towards financial health.							
6.Growth option. For example, the venture capital firm might opt for a more relax due diligence criteria to ensure more company able to meet the criteria for investment.							
7.Multiple interacting options For example, the venture capital firm might opt for multiple due diligence criteria to ensure more diligent screening.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							

3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

Valuation

*** Throughout the due diligence process, valuation is a topic of consideration and discussion. Other issues that affect valuation are: -

- a. The development stage of the company – whether it is an early or an expansion-stage investment, for example;
- b. The valuation of industry comparables;
- c. The financial history of the company, its growth rate, and profitability;
- d. The amount of influence that can be exercised by the venture capitalist.

The statements of valuation’s real options this paper use to assess different real options are listed in the table below.

Table 5 Real options and valuation

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the manager might opt to defer his/her valuation process if there is lack of information regarding the industry comparables.							
2.Time-to-build (Staged investment) For example, the manager might opt to build his/her firm greater influence on the company A over a certain period of time).							

3.Option to alter operating scale. For example, the manager might opt to exercise different valuation scale over certain period of time.							
4.Option to abandon. For example, the manager might opt to abandon totally his/her valuation on a company based on certain criteria that do not match his/ her investment objectives.							
5.Option to switch. For example, the manager might opt to switch his/her valuation from one criterion to another criteria.							
6.Growth option. For example, the manager might opt for a higher valuation growth in terms of profitability over a certain period of time.							
7.Multiple interacting options. For example, the manager might opt to form a few valuation criteria.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

Investment Structure

*** The investment structure creates a framework for addressing the objectives of both the venture capitalist and the entrepreneur. The lack of uniformity among investment structures is one of the reasons the venture capital industry is not as institutionalized as other asset classes.

The investment structure should create a balance between the expected return and the risk assumed through the valuation, investment security, covenants, and relationship. Many venture firms have a general philosophy on structuring investments: The structure should be flexible so that the company is free to grow, and it should create the framework for productive relationship between the investor and the company's management. The investment structure should allow investor maximum upside potential, minimal downside risks, and the opportunity for increased investment in the company and eventually control in the sale of the company.

The statements of investment structure's real options this paper use to assess different real options are listed in the table below.

Table 6 Real options and investment structure

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the venture capital firm might opt to defer structuring their investment for the maximum gain to them, but rather waited for more suitable timing.							
2.Time-to-build (Staged investment). For example, the venture capital firm might opt to							

structure the investment in a staged investment style.							
3.Option to alter operating scale. For example, the venture capital firm might opt to alter their investment structure to suit the special nature of the company that they invested in.							
4.Option to abandon. For example, the might opt to abandon the current stringent investment structure practice due to the positive outlook of the current industry and economic.							
5.Option to switch. For example, the manager might opt to switch from one investment structure to another investment structure practice.							
6.Growth option. For example, the venture capital firm might opt to be more risk taker in their investment structure in order to grow bigger.							
7.Multiple interacting options For example, the venture capital firm might opt for a multiple investment structure for different industry.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							

7. Multiple interacting options.							
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ANALYSIS OF THE RESEARCH EXERCISE

This research begins with the premise that investment decision-making behavior will change with the presence of real options. Real options’ reasoning is a logical for funding projects that maximizes learning and access to upside opportunities while containing costs and downside risk

This paper describes the implications of the presence of real options in investment decision-making situations and how the presence of real options changes the managers’ investment decision-making behavior through asking investment practitioners 4 questions, as stated below: -

1. Given the choice to choose several investment decision-making options, will the investment practitioners change their investment decision-making behavior?
2. Given the choice to choose several investment decision-making options, how will the investment practitioners change their investment decision-making behavior?
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?
4. How sustainable and adaptable will the behavioral change in investment decision-making of the investment practitioner through the time?

This paper focuses on six aspects of the process that venture capitalist use to select and structure investments: investment strategy, deal flow generation, screening, due diligence, valuation, and investment structure. We shall in turn focus on the six aspects of venture capital process and then analyzing the 4 main questions that had been answered by a pool of selected 25 investment practitioners from various venture capital companies in Malaysia.

1. Investment strategy

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioners will willingly alter their investment strategy if given the presence of real options. Tapping further into this section, multiple interacting options scores highest consistently, provide a strong indication that investment practitioner proactively change their investment decision-making in the their investment strategy.

Looking at (Part B – Without the presence of real options) even without the presence of real options, investment practitioners still proactively change their investment decision-making in the area of investment strategy.

Questions	Summary Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	A resounding yes.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Multiple interacting options and time-to-build options scores the highest point, thus indicating the investment practitioners prefer the two options. It provides hints that with the presence of real options investment practitioner will choose for the two options.
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	No significant changes in investment decision-making behavior given with or without the presence of real options.
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Multiple interacting options score the highest point for sustainability and adaptability.

1. Deal flow generation

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioner will willingly alter their deal flow generation style if given the presence of real options. Looking further, time-to-build options and option to alter operating scale score consistently the highest point. Such responses provide insight into

the way deal flow generation usually take longer process to alter their deal flow style, but rather conduct the changes in the deal flow style in a staged manner or alter the scale of the deal flow operating.

In contrast with the investment strategy, deal flow generation will remain as it planned given the situation where real options do not presence.

Questions	Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	Yes, but not significant.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Time-to-build (Stage investment) and option to alter operating scale are the preferred options for investment practitioner given the presence of real options.
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	Not significant.
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Less significant but more sustainable and adaptable for time-to-build options.

2. Screening

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioner will willingly alter their screening if given the presence of real options. High scores for option to switch suggest that given the presence of real options, investment practitioner most likely to switch their screening criteria in view of the current industry positive/ negative outlook.

Without the presence of real options, investment practitioner will remains as of the original screening criteria. This can be noted through looking at Question 3, in which most investment practitioners rated “less significant/ less likely”.

Questions	Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	Yes, but less significant.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Given a choice, investment practitioner will choose option to switch as their preferred way to change their investment decision-making behavior.
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	Not significant.
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Less likely to be sustainable as most of the investment practitioners score low in all options presented.

3. Due diligence

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioner will willingly alter their due diligence if given the presence of real options. Option to defer and option to switch scores the highest indicating that due diligence process will not change in the short-term as the due diligence is complex which involved management interviews, customer references, third party analysis, personal references and so on.

Without the presence of real options, investment practitioner will remain as per their original due diligence processes.

Questions	Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	Yes, but less significant than investment strategy area.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Given a choice, investment practitioners will choose option to defer and option to switch.
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	Insignificant.
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Insignificant.

4. Valuation

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioner will willingly alter their valuation process if given the presence of real options. Option to defer, option to switch and multiple operating options scores the high point in this area.

Questions	Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	Yes and significant.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Option to defer, option to switch and multiple operating options.
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	Yes and significant.

4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Quite sustainable.
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6. Investment structure

High scores in the section (Part A – With the presence of real options) provide a hint as to which investment practitioner will willingly alter their investment structure if given the presence of real options.

Questions	Remarks
1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?	Yes and very significant.
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?	Option to defer, time-to-build, option to abandon, growth option and multiple interacting options
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?	Very significant.
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?	Very sustainable.

CONCLUSION & FUTURE RESEARCH

Based on the research exercise there are a few behavioral pattern that we can deduct. First, investment practitioners are more willing to change their investment decision-making with or without the presence of real options framework in 3 main areas. They are investment strategy, valuation and investment structure. From this behavior, we can deduct that investment practitioners are more concern about their investment health (Direct impact) of the investee company rather than the rest of the venture capital processes (Indirect impact)– which are due diligence, screening and deal flow generations.

Second, multiple interacting option, time-to-build options and options to switch have the highest score ranking in the 6 areas of venture capital processes. It provide hint to us that investment practitioners are learner and adaptor in which they will place a small investment to have an options for the future to either switch, perform a stage investment or using multiple interacting options.

Third, in view of the question 1 and 3, in which answered by the investment practitioners, we can noticed two distinctive area of difference. The first area - Investment Structure, Valuation and Investment Structure, the ranking for the first question is from yes and significant to yes and very significant. The ranking for the question 3 is from not significant to very significant.

The second area – Deal Flow Generation, Due Diligence and Screening, the ranking for the first question is from yes and less significant to not significant. The ranking for question 3, not significant for all three areas.

This provide us with the hint that direct impact on the investment health do change investment practitioners' investment decision-making behavior through making them more inclined to change either with or without the presence of real options.

Taking over the concluding remarks above, intuition suggest that that we can differentiate the areas of venture capital processes into six boxes of investment decision-making behavior.

Investment Strategy

The investment strategy defines the focus of the investment activities with the respect to industry, stage of development, financing size, and geographical region. From the research exercise, investment practitioners perceived that investment strategy should be flexible enough (even without the presence of real options) to take advantage of opportunities created by market changes.

Real options influence: High.

Deal Flow

A venture capital firm's marketing efforts to generate deal flow must provide the firm with a wide selection of investment opportunities. From the research exercise, investment practitioner perceived that their deal flow strategy would change less frequent. Even with the presence of real options, investment practitioner perceived that their decision on deal flow strategy would follow the present deal flow strategy without much change.

Real options influence: Low

Screening

Screening is typically centered on how the deal fits the overall strategy, the perceived potential for the deal, and the source of the deal. From the research exercise, investment practitioners responded with less inclination to change their screening process except for options to switch a few screening criteria.

For example, the venture capital firm might switch their screening criteria in view of the current industry positive/negative outlook.

Real options influence: Low & Not Significant

Due Diligence

The due diligence process provides a clear understanding of the business model and the major risk factors involved. From the research exercise, investment practitioners responded with less inclination to change there due diligence process except for options to defer and options to switch.

For example, the investment practitioner might opt to defer his/her due diligence on company A, if there is significantly lack of information about customer reference and the investment practitioner might switch to other his/her due diligence focus from placing high focus on management capability towards financial health.

Real options influence: Low & Insignificant

Valuation

Issues that affect valuation are the development stage of the company – whether it is an early or an expansion-stage investment, the valuation of industry comparables and so on.

From the research exercise, the investment practitioners perceived real options have significant influence on their practice of valuation. They also perceived that they are adaptable and be able to learn with the presence of real options.

Real options influence: Highly significant in changing investment decision making and significantly influence the adaptive and learning behavior of the investment practitioners.

Investment Structure

The investment structure should be flexible so that the company is free to grow, and it should create the framework for productive relationship between the investor and the company's management.

From the research exercise, the investment practitioners score real options very high in terms of changing their investment decision-making and more significantly on the adaptive and learning behavior.

Real options influence: Very significant.

Hopefully, this research exercise on the behavior side of real options will act as a stepping-stone towards more future research deliverables. I propose a summarize version of the potential future research as described below

Future Research Deliverables	Importance to venture capital investment decision-making	Approach
Strategic Opportunities Landscape	The recognizing of venture capital companies in relative to where a company competes and which business models that company uses.	ROV, case study and stimulation approach.
Scenario Building and Options Weighing Chart	The ability to recognize differing options available for investment & how different investment options produces differing value creation.	ROV, case study and stimulation approach

<p>Creation of value creation ecosystem for 3G roll out</p>	<p>To cater for interrelated stakeholder requirements through development of different stakeholder preference and linking them towards a win-win venture capital ecosystem</p>	<p>ROV & Scenario building</p>
<p>Recommendation of Best Options</p>	<p>To discover the optimum case for the venture capital selection and structuring process through weighing on investment cost and value created.</p>	<p>ROV & case study</p>

APPENDIX

RESEARCH EXERCISE REAL OPTIONS IMPACT ON INVESTMENT DECISION-MAKING

Thank you for taking time to complete this exercise

This paper seeks to develop theory or compare patterns of investment decision-making behavior by looking at four main questions that will be answered through a series of exercises. The 4 main questions are stated below: -

1. Given the choice to choose several investment decision-making options, will the manager change their investment decision-making behavior?
2. Given the choice to choose several investment decision-making options, how will the manager change their investment decision-making behavior?
3. How does the behavioral change evolved through proper learning of real options flexibility, such as managerial flexibility and flexible resource allocations?
4. How sustainable and adaptable will the behavioral change in investment decision-making of the managers through the time?

The completion of the research exercise and analysis of the research will be submitted during the conduct of the '6th Annual International Conference on Real Options Theory Meets Practice'.

I hope to have great exchange of ideas during the workshop and in the end I hope to provide some knowledge back to your organization. The next step after this research exercise – 1. Conducting a more quantitative exercise on real options. 2. The next research exercise will be conducted to the AIMR society members in Malaysia.

How the survey is organized

The exercise is organized into 6 sections. Each of the sections assesses your views of the investment decision-making behavior that will be adopted by you.

The last section provides space for additional commentary.

How to complete the survey

The exercise should take about 30 minutes to complete. Please note that there are no right or wrong answers to any of these statements. Please read the instructions for each part carefully, and answer EACH question by selecting the statement that best express your opinion.

On completion, please pass this exercise back to me. I shall make arrangement for collection.

Your confidentiality

The information you provide will remain strictly confidential. The results will be based on the collective answers of all participants and shared in aggregated and summarized form only.

If you have any question

If you have any technical questions about the exercise or encounter any difficulties please contact Andrew Wong Lip Soon on +012-3262345 or email me at lipsoon@hotmail.com.

The Research Exercise

The assumption of the research exercise

1. **With** the presence of real options, **YOU will have** the managerial, operation and financial flexibility/ options to change your investment decision-making.
2. **Without** the presence of real options, **YOU will not have** managerial, operation and financial flexibility/ options to change your investment decision-making. In another words, you will probably face the top management questioning of your investment decision-making changes.
3. All the 6 sections of the research exercise, the research **will assumed a positive note of the overall economic sentiment in the investee company and the investment to the company have not been invested.**

DENOTES that the statement/ paragraph is taken from Gardella, L.A. Edison Venture Fund, , CFA Reading 2000, Selecting and Structuring Investments: The Venture Capitalist's Perspective.

Investment Strategy

*** The investment strategy is at the heart of the venture capital firm. The strategy defines the focus of the investment activities with the respect to industry, stage of development, financing size, and geographical region. And although it needs to be focused, an investment strategy should be flexible enough to take advantage of opportunities created by market changes.

Deal Flow Generation

*** Deal flow refers to the investment opportunities generated by the venture capital firm. In general, deal flow is an underrated aspect of the investment process, but it differentiates one venture capital firm from another.

A venture capital firm's marketing efforts to generate deal flow must provide the firm with a wide selection of investment opportunities. The deal generation process should ensure that the firm gets the first look at deals, particularly those in its focus areas. Finding good deals is like trying to find a needle in a haystack – looking for that one exceptional deal out of hundreds available.

Table below presents a sets of real options that managers might or might not use to maximize deal flows in their investment.

Screening

*** The objective of screening deals is to efficiently focus the resources of the venture capitalist so that he or she can identify opportunities quickly, understand the risk factors of the investment prospect, and assess the return potential.

Screening is typically centered on how the deal fits the overall strategy, the perceived potential for the deal, and the source of the deal. All deals should receive attention, but particular attention should be paid to sources that have referred high-quality deals in the past.

The table below might suggest to managers real options to leverage on different screening strategy.

Due Diligence

*** The due diligence process provides a clear understanding of the business model and the major risk factors involved. But, more importantly, due diligence is the start of a relationship with the company's management team. The due diligence process is complex which involved management interviews, customer references, third party analysis, personal references, vendor references, industry trade shows, customer visits, financial analysis, and legal issues.

The statements of due diligence's real options this paper use to assess different real options are listed in the table below.

Valuation

*** Throughout the due diligence process, valuation is a topic of consideration and discussion. Other issues that affect valuation are: -

- e. The development stage of the company – whether it is an early or an expansion-stage investment, for example;
- f. The valuation of industry comparables;
- g. The financial history of the company, its growth rate, and profitability;
- h. The amount of influence that can be exercised by the venture capitalist.

The statements of valuation's real options this paper use to assess different real options are listed in the table below.

Investment Structure

*** The investment structure creates a framework for addressing the objectives of both the venture capitalist and the entrepreneur. The lack of uniformity among investment structures is one of the reasons the venture capital industry is not as institutionalized as other asset classes.

The investment structure should create a balance between the expected return and the risk assumed through the valuation, investment security, covenants, and relationship. Many venture firms have a general philosophy on structuring investments: The structure should be flexible so that the company is free to grow, and it should create the framework for productive relationship between the investor and the company's management. The investment structure should allow investor maximum upside potential, minimal downside risks, and the opportunity for increased investment in the company and eventually control in the sale of the company.

The statements of investment structure's real options this paper use to assess different real options are listed in the table below.

PLEASE BEAR IN MIND THE RESEARCH ASSUMPTION

Table 1 Real options and investment strategy

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, option to defer/ delay an investment outlay in the first year of operation.							
2.Time-to-build (Staged investment) For example, option to staged investment rather than putting significant outlay of investment in period of investment.							
3.Option to alter operating scale. For example, option to alter operating scale from high investment to lower investment strategy.							
4.Option to abandon. For example, option to abandon the entire company investment in company A if the is significant drop customer retention.							
5.Option to switch. For example, option to switch to another alternative company if the original company cannot meet the agreed terms and conditions of investment outlay.							
6.Growth option. For example, growth option will be opted if that company shows significant increase in profitability, thus more investment outlay for the company.							
7.Multiple interacting options. For example, the manager might opt for a multiple interacting options to their investment strategy if he/she is highly uncertain about the future state of that company.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

PLEASE BEAR IN MIND THE RESEARCH ASSUMPTION

Table 2 Real options and deal flow generation

(Score 7 if you strongly agree that an option might change your investment decision- making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the venture capital firm might defer their marketing effort during the downturn of the industry that they are investing.							
2.Time-to-build (Staged investment). For example, the venture capital firm might make staged investment in their marketing effort to look for more deal flow in the new industry that they are looking.							
3.Option to alter operating scale. For example, the venture capital firm might alter their marketing operating scale to suit the current economic and technology dynamic situation.							
4.Option to abandon. For example, the venture capital firm might totally abandon their marketing effort if the industry outlook that there are invested in is bad for a foreseeable time period.							
5.Option to switch. For example, the venture capital firm might opt for another different kind of marketing effort if the current marketing efforts do not create high deal flow.							
6.Growth option. For example, in order for the venture capital firm to growth to their preset objectives, they might opt for a greater marketing drive to generate greater deal flow for the firm.							
7.Multiple interacting options. For example, the venture capital firm might use multiple marketing efforts to boost up deal flow generation.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

PLEASE BEAR IN MIND THE RESEARCH ASSUMPTION

Table 3 Real options and screening process

(Score 7 if you strongly agree that an option might change your investment decision- making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the manager might opt for option to defer their screening process until certain material information are gain from the company A.							
2.Time-to-build (Staged investment) For example, the manager might perform screening in a staged manner as information and knowledge about company A continually increase over time.							
3.Option to alter operating scale. For example, the manager might opt to place a more stringent screening process for the new industry that they are in.							
4.Option to abandon. For example, the venture capital firm might opt to abandon certain screening criteria, if the outlook of the overall industry is very bright and low in risk of default.							
5.Option to switch. For example, the venture capital firm might switch their screening criteria in view of the current industry positive/ negative outlook.							
6.Growth option. For example, the venture capital firm might opt to enlarge their screen criteria to cover more ground on the companies that they will invest.							
7.Multiple interacting options. For example, the venture capital firm might opt for multiple screening processes to ensure proper screening of companies.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

Table 4 Real options and due diligence

(Score 7 if you strongly agree that an option might change your investment decision- making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the manager might opt to defer his/ her due diligence on company A, if there is significantly lack of information about customer reference.							
2.Time-to-build (Staged investment). For example, the manager might develop a due diligence program in a staged manner, with increasing depth of due diligence exercise over time.							
3.Option to alter operating scale. For example, the manager might opt to alter his/her due diligence depth in accordance to the company that he/she investing.							
4.Option to abandon. For example, the manager might opt to abandon totally the due diligence activity if the overall industry outlook of the company is unhealthy							
5.Option to switch. For example, the manager might switch to other his/her due diligence focus from placing high focus on management capability towards financial health.							
6.Growth option. For example, the venture capital firm might opt for a more relax due diligence criteria to ensure more company able to meet the criteria for investment.							
7.Multiple interacting options. For example, the venture capital firm might opt for multiple due diligence criteria to ensure more diligent screening.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

PLEASE BEAR IN MIND THE RESEARCH ASSUMPTION

Table 5 Real options and valuation

(Score 7 if you strongly agree that an option might change your investment decision-making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the manager might opt to defer his/her valuation process if there is lack of information regarding the industry comparables.							
2.Time-to-build (Staged investment) For example, the manager might opt to build his/ her firm greater influence on the company A over a certain period of time).							
3.Option to alter operating scale. For example, the manager might opt to exercise different valuation scale over certain period of time.							
4.Option to abandon. For example, the manager might opt to abandon totally his/her valuation on a company based on certain criteria that do not match his/ her investment objectives.							
5.Option to switch. For example, the manager might opt to switch his/her valuation from one criterion to another criteria.							
6.Growth option. For example, the manager might opt for a higher valuation growth in terms of profitability over a certain period of time.							
7.Multiple interacting options. For example, the manager might opt to form a few valuation criteria.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

PLEASE BEAR IN MIND THE RESEARCH ASSUMPTION

Table 6 Real options and investment structure

(Score 7 if you strongly agree that an option might change your investment decision- making, and 1 if you strongly disagree)

(Part A) With the presence of real options	1	2	3	4	5	6	7
1.Option to defer. For example, the venture capital firm might opt to defer structuring their investment for the maximum gain to them, but rather waited for more suitable timing.							
2.Time-to-build (Staged investment). For example, the venture capital firm might opt to structure the investment in a staged investment style.							
3.Option to alter operating scale. For example, the venture capital firm might opt to alter their investment structure to suit the special nature of the company that they invested in.							
4.Option to abandon. For example, the might opt to abandon the current stringent investment structure practice due to the positive outlook of the current industry and economic.							
5.Option to switch. For example, the manager might opt to switch from one investment structure to another investment structure practice.							
6.Growth option. For example, the venture capital firm might opt to be more risk taker in their investment structure in order to grow bigger.							
7.Multiple interacting options. For example, the venture capital firm might opt for a multiple investment structure for different industry.							
(Part B) Without the presence of real options							
1.Option to defer.							
2.Time-to-build (Staged investment)							
3.Option to alter operating scale.							
4.Option to abandon.							
5.Option to switch.							
6.Growth option.							
7.Multiple interacting options.							

THANK YOU FOR YOUR TIME

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