

Cognitive repairs in decision-making by venture capitalists

by

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Author's declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

This paper examines cognitive repairs as they apply to the decision-making process used by venture capitalists, asking the question of “how could, or how do, cognitive repairs play a role in the decision-making process used by venture capitalists when evaluating a proposal for a new investment?” It begins by reviewing the well-documented concept of human decision-making biases and errors, and then shifts to an overview of the decision-making processes used by venture capitalists when evaluating a proposal for investment in a new venture. It then looks specifically at previous literature that identifies decision-making biases that venture capitalists fall prey to, and follows with reviewing the literature on cognitive repairs: organizational strategies that are used to compensate for or correct decision-making biases. Senior members of the venture capital industry were interviewed to empirically investigate this question, and it was found that while some strategies were in place to reduce human decision-making error, there was both room for and suggested evidence of a greater number of such errors. This leads to the suggestion that the increased use of cognitive repairs by venture capitalists could be beneficial, though this initial research is only of an exploratory format and warrants further investigation both more broadly and deeply.

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1.0 - Introduction and overview

This paper first begins by exploring an academic foundation for the research, looking at how common errors and biases can thwart human beings' attempts at acting as rational decision makers, using two typical errors - the representativeness and the "hot hands" phenomena - to illustrate the potential problems. Next, it shifts to the industry-focused foundation of this paper, outlining and providing basic background information on the world of venture capital and similar types of private equity investing. The background of the venture capital industry also addresses variations in the types of venture capital firms, as well as a description of decision-making process generally used by venture capitalists when considering potential new investments.

While the first two foundations of this paper may seem to have a conceptual chasm between them, the next area that we address begins to bridge the gap between the two fields, reviewing leading research that focuses on how venture capitalists (VCs) and similar investors make decisions. Drawing the two fields even closer, we then review research from the past few decades that has focused specifically on decision-making errors and biases, as they occur in the decisions of VCs and related investors. We also explore criticisms of the methodology used during the earlier works in this sub-set of research, and note ways that later researchers have attempted to correct the measurement problem.

Next, we turn to a relatively new segment of related research, known as "cognitive repairs." This area looks at ways that organizations can compensate for the problems caused by individual decision-making errors, thus correcting or preventing the any number of biases. This field lays the final piece of the framework that leads us to propose the research question, "how could, or how do, cognitive repairs play a role in the decision-making process used by venture capitalists when evaluating a proposal for a new investment?"

We then discuss a series of exploratory interviews carried out with venture capitalists and those in that industry in Canada, bringing out highlights and commonalities among their reports of the decision-making and decision-making errors. Essentially, we see that there are a number of tools in place that are

already used to reduce cognitive decision-making error, but there is also both room for and evidence to suggest the need for a more thorough application of cognitive repairs in this field.

2.0 - Biases in decision-making

A number of disciplines (economics, for example) tend to lean heavily on the assumption that human beings are rational decision-makers. However, there has been a substantial amount of literature that has shown that human beings, in fact, commit no small number of decision-making errors due to biases, fallacies and other complications (see, for example, Kahneman and Tversky, 1974). Over the last half a century, a great number of such biases have been studied by researchers at academic institutions around the world. To illustrate the concept of decision-making biases, consider the following two illustrative – and contradictory – examples.

First, we look at a phenomenon often referred to as the representativeness phenomenon. Those who fall prey to this fallacy believe that if part of a series of occurrences strays away from a result or average expected of the series, then another part of that series will stray from the expected result or average - in the *opposite* direction (Tversky and Kahneman, 1970).

This fallacy is often illuminated through the story of a series of simple coin tosses. A single coin toss is expected to have a 50/50 chance of turning up either a ‘heads’ or a ‘tails.’ However, if a coin were tossed repeatedly and continued to turn up an inordinate amount of ‘heads’ in the series, someone falling prey to the representativeness phenomenon would believe that there is a greater likelihood for a ‘tails’ to occur next. In other words, that there have been so many ‘heads’ that have turned up, that the result of a ‘tails’ is believed to be ‘due,’ when in reality the probability of the next coin toss remains the same as all the others: 50% chance of heads, 50% chance of tails.

As a second illustrative example of a decision-making bias, we consider what is popularly known as the ‘hot hands’ effect. This bias dictates that when part of a series of occurrences strays away from a result or average expected of the series, then another part of that series will stray from the expected result or average – in the *same* direction (Golovich, Vallone and Tversky, 1985).

This fallacy is often told through the example that gives it its popular name: the ‘hot hands’ in basketball. Were a basketball player able to successfully sink a series of baskets in a row, the bias would

dictate that he or she would be on a ‘hot streak’ and therefore more likely to continue to successfully score baskets without missing (Gilovich, Vallone and Tversky, 1985).

We can immediately see how these two decision-making biases contradict each other, yet both are common examples of errors that human beings regularly commit. In general, where many theories would dictate that rational decision-making would contribute towards reaching an optimal goal or outcome, errors in decision-making cause biases away from the optimal result.

The representativeness and the ‘hot hands’ phenomena are just two of a long list of such decision-making biases. The endowment effect occurs when people often demand much more to give up an object than they would be willing to pay to acquire it (Kahneman, Knetsch and Thaler, 1991). The status quo bias shows a preference by the decision-maker for his or her current state, as opposed to either buying or selling a good (Samuelson and Zeckhauser, 1988). The anchoring effect happens as decision-makers are systematically influenced by random and uninformative starting points (Chapman and Johnson, 1999). While we will break from this topic presently to consider the industry-focused base of this paper – venture capital – we will shortly return to see how decision-making biases come into play in this paper’s chosen industry.

3.0 - Venture capital

Typically, entrepreneurial firms that are in the early stages of their life cycle have a limited number of sources of funding available to them. Venture capital is one source of private equity funding that is typically provided to such early-stage entrepreneurial firms, particularly those that show potential for relatively high growth and financial returns.

Venture capital plays a key role in economic growth, and a great number of successful ventures that contribute considerably to economic growth have been encouraged by support from venture capital (Bygrave and Timmons, 1986). In addition to providing much-needed funding for firms in their early stages of life, venture capitalists can also help to raise additional funds for a start-up (in addition to the venture capital firm's own funding), provide strategic analyses for the new organization, and provide management recruiting services (Gorman and Salhman, 1989). In fact, some researchers have suggested that "capital" can play the smallest role in venture capital – with venture capitalists commonly playing key roles that address non-financial aspects of a new company, the expertise of these individuals can be a crucial factor in nurturing new firms into healthy, profitable companies (Bygrave and Timmons, 1986).

3.1 - Venture capitalists vs. business angels

One way to explore further details about venture capitalists is to compare and contrast them with a closely-related type of private equity investor known as “business angels” or as “angel investors.” The purpose of this exploration is to use the comparison as a tool to help the reader understand greater details about the venture capital industry, including: the source of investment funds, the size of investment funding available, the value placed on more than financial resources as part of a VC deal, and the use of due diligence by venture capitalists.

Venture capitalists are those who work for venture capital firms, organizations that use investors’ money to invest in new entrepreneurial start-ups in order to seek generous returns (often from 25% to 40% within 3-10 years) (MacMillan et al, 1985). Business angels, on the other hand, are private investors who invest their own funds in a start-up firm (Bachher and Guild, 1996), are more likely to have previous involvement in a successful venture than are venture capitalists (Van Osnabrugge and Robinson, 2000).

Typically, angel investors have fewer dollars available for funding when compared to venture capital firms. However, business angels have provided seed financing for some of the world’s most famous companies: Bell Telephone in 1874, Ford Motor Company in 1903, or Apple Computer in 1997 (Van Osnabrugge and Robinson, 2000). In some cases, business angels have been known to support a venture’s early growth to the point where further financing can be provided by larger venture capital players (Bachher and Guild, 1996). Like angels, venture capital firms have also provided seed funding for no small number of very successful organizations, and are capable of supporting a firm’s early growth in order to attract other investors at later stages.

Both venture capitalists and angel investors have been known to invest their time along with their money to work towards a venture’s success (Gorman and Salhman, 1989; Sudek 2007). Both have been known to fund ventures independently, or as part of formal or informal networks of similar investors (Franke et. al., 2006; Bachher and Guild, 1996).

However, there have been some differences noted between the two groups, differences that reach beyond simple role definition. Research has suggested that venture capitalists tend to perform more due diligence than business angels, while angels invest more opportunistically and do not tend to calculate internal rates of return (Sudek, 2007). The use of due diligence is very important to venture capitalists, as they use systematic methods to evaluate and review proposals for venture funding, and take this information into account when structuring potential deals.

For the purposes of this paper, we will focus on the activities of venture capitalists as opposed to any other entrepreneurship financing groups. Partly this is to provide a narrower scope for this research paper, and partly this is due to the fact that, because of their private and relatively fragmented nature, business angels have not traditionally been the easiest research subjects to locate. However, especially since the late 1990s, some business angels have started to form organizations that help co-ordinate their efforts, thus making them easier to locate and contact for the purposes of research (Sudek, 2007).

Simply focusing on a narrower scope of venture capitalists could belie the great amount of diversity that can exist in venture capital firms. These organizations can and will target their investment strategies on start-up firms of different sizes, stages, locations or any other number of discerning factors, as we will discuss in the next section.

3.2 - Variations among venture capital firms

There are a number of dimensions that venture capital firms can differ on, including but not limited to the following: industry target, geographic scope, stage(s) financed, size of firm, number of associates involved in the firm, number of investors, age of the firm, and amount of funding that can be allocated to a particular venture. We will explore each of these dimensions in greater detail here.

Industry target: venture capital firms may invest primarily in ventures from one industry or another. The majority of venture capital funding in recent years has been focused on either information and communications technology-based ventures, or biotechnology-based ventures (MacMillan et. al., 1987). In many cases, especially those of smaller venture capital firms, a narrower industry focus is believed to allow for a greater expertise in a given industry, which can assist decision-makers in these firms with making their decisions. However, some research has suggested that the preference of funding some industries over others, has inhibited venture capital firms from investing in newer fields, such as “clean” energy technologies, that could prove to be financially lucrative.

Geographic scope: many firms invest primarily in ventures from one geographic region or another. The size of the geographic scope can vary considerably from firm to firm, with targets ranging from smaller geographic areas (e.g. Silicon Valley, Boston/Cambridge, Calgary, Toronto) to mid-sized ones (states, provinces) to entire nations or international regions. In some cases, limitations of a firm’s geographic scope are related to its target industry. For example, venture capital firms focusing on new ventures in Silicon Valley have traditionally been involved in high-technology ventures, while those focused on the Canadian province of Alberta in recent decades have focused more on oil- and energy-focused ventures, currently the dominant industry in that province. In addition, it should be noted that literature suggests that European venture capital firms tend to look more freely across national boundaries (notably, to other countries in Europe) than do their North American counterparts (Muzyka, Birley and Leleux, 1996).

Stage(s) of venture financed: research has shown that fledgling entrepreneurial firms will have different challenges at different stages in their evolution (Hanks et al, 1993). For example, the earliest stages of a venture traditionally have to do with developing a prototype or proof of concept for a new technology, where later stages focus more heavily on capitalizing on the market, securing customers, or growing the organization appropriately (Fried and Hisrich, 1994). Recognizing the different needs and challenges posed at different points in an entrepreneurial firm's existence, many venture capital forms focus specifically on funding a certain stage or set of stages of this life cycle. Typical categorizations of such stages, both by academic research into venture capital and by the venture capital industry itself, include:

- Seed stage: typically, this is the earliest stage of a firm's existence that is funded by venture capital. Financing at this stage is typically used to develop a prototype or prove a concept, helping to provide a solid foundation as the firm moves to the next stages of its growth.
- Start-up stage: venture funding provided at this stage targets companies who are working with initial product development or marketing efforts. The venture that is seeking funding at this stage may be new, or may have already existed for a short period of time, but has not yet sold their product commercially.
- First-stage financing: funding at this stage is directed towards companies that have expended their initial capital and have started to sell their product, but require additional funds in order to grow and/or develop
- Expansion: financing provided to firms that are already established, but that require additional funds to be able to capitalize on an opportunity that has presented itself either in the market, or with regards to a new technology.

Size of the venture capital firm: this dimension is most often measured by the total dollars that a venture capital firm has at its disposal that can be invested in new ventures.

Number of associates: this dimension addresses the number full-time staff (or full-time equivalents) in firms that are involved directly in making decisions relating to venture investment. In some firms this number can be quite large, whereas in other firms a larger number of support staff may work for the company but those who actually are involved firsthand in making decisions as to whether or not to fund a particular investment can be a much smaller number.

Number of investors: as noted earlier, a venture capital firm often involves investments from a number of different sources. Past research has identified this dimension on the basis of the number of investors typically involved per venture (for example, Fried and Hisrich, 1994).

Amount of funding provided by a firm to a particular venture: past research has shown that funding to a particular venture by a venture capital firm can vary widely, ranging from the tens of thousands of dollars to the tens of millions (Canadian Venture Capital Association, 2008). Different entrepreneurial start-ups may seek vastly different amounts of funding; in most venture capital firms, one of the earliest screening phases for a venture capital proposal looks at the amount of funding sought by the entrepreneurial team (Fried and Hisrich, 1994).

The age of the firm: this dimension is one that is often measured in research for the sake of distinguishing between firms on a cursory level (Tyebjee and Bruno, 1984; Fried and Hisrich, 1994), though a substantial amount of research has focused more heavily on the years of funding decision experience that the venture capitalists themselves may hold, as opposed to the age of the firm (for example, Tyebjee and Bruno, 1984; MacMillan et al, 1985)

Years of venture capital experience by decision-makers: venture capitalists may work for different firms over the course of their careers, so a newer firm may actually hold experience that extends vastly beyond the actual age of the firm, through the decision-makers that are involved in its activities (Fried and Hisrich, 1994). Interestingly (and as will be discussed in greater detail below) some research has suggested that the amount of venture capital experience that a decision-maker has, plotted against the success of the investment decisions, shows an inverted U-shape. That is, having more years of venture capital experience correlates to making better investment decisions, but only to a certain point (usually around 14 years) after which the accuracy of decision-making declines as years of experience increases (Shepherd, Zacharakis and Baron, 2002).

As we can see, the range of dimensions that a private venture capital firm can differ along can be considerable. Some researchers have noted that the variation in firms and difference in environments that

they operate in can be problematic for more general research into decision-making by venture capitalists (for example, Zacharakis, McMullen and Shepherd, 2003; Kollman and Kuckertz, 2004). One such piece of research compares and contrasts the decision-making environments of venture capital firms in China, Korea and the United States, attributing differences in decision-making by the firms to the differences in these countries' regulatory environments. (Zacharakis, McMullen and Shepherd, 2003)

However, a number of studies have worked across firm dimensions, and have been able to show general characteristics in decision-making by venture capitalists. Such studies have noted similarities in decision-making criteria categories (for example, Tyebjee and Bruno, 1984; Fried and Hisrich, 1994), or the extent that decision-makers in these firms make use of intuitive judgment (for example, Hisrich and Jankowicz, 1993; Hall and Hofer, 1993).

3.3 - The venture capital proposal evaluation process

As part of the industry-focused background for this paper, it would be helpful to briefly examine the general process by which investors make decisions whether or not to fund a particular venture. One of the earliest papers on decision-making by venture capitalists dates back more than three decades ago, which briefly outlines an evaluation process for proposed investments (Wells, 1974), and a similar model can be found in Tyebjee and Bruno's oft-cited paper on the subject a decade later (Tyebjee and Bruno, 1984). However, these earlier authors note the limitations of their own models, and that their brief outlines warrant further investigation. Thus, this paper makes use of a detailed description as compiled by Fried and Hisrich (1994).

A visual representation of this model can be found immediately below, in Figure 1.0. The researchers note that the average length of the evaluation process, as reported by the venture capitalists they interviewed, was 97 days. In exploring this model, we look at six areas: the origin of the investment proposal, the firm-specific screen, the generic screen, the first phase of the evaluation process, the second phase, and finally the deal structuring. It is important to note that the Fried and Hisrich model does not consider any post-deal activities in their model, notably activities that consider the involvement of the venture capitalist(s) in the start-up firm. This will also be discussed in greater detail below.

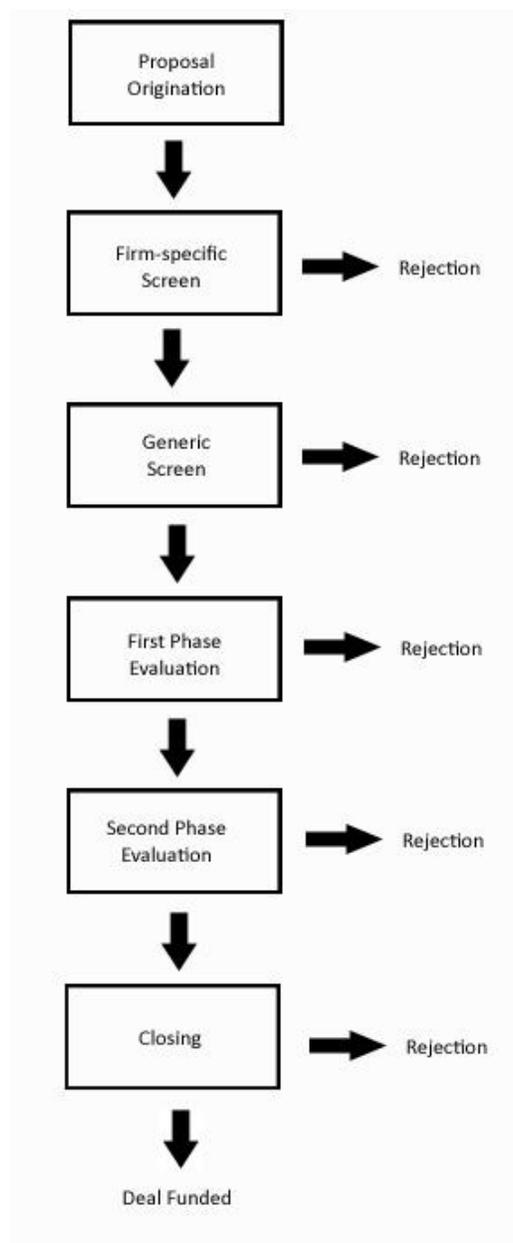


Figure 1.0 – Venture capital decision-making process

To begin our review of the proposal evaluation process, we start at a point that happens largely before the investment proposal is ever received by the venture capital firm: the origin of the deal. Research has shown that the source of referral can be important to the decision whether or not to fund a venture. In one foundational article in this field, only one quarter of the deals considered had come in as “cold calls” from entrepreneurs wanting the attention of venture capitalists without prior reference

(Tyebjee and Bruno, 1984). Another foundational research paper indicated that not one of the deals reviewed as part of their research with venture capitalists that had come in “cold” had been funded (Fried and Hisrich 1994). Supporting these claims, other studies have shown that having connections to venture capitalists have increased the chances of an entrepreneurial team’s success in securing venture capital funding (Shane and Stuart, 2002; Hsu, 2007). Thus, the source of the referral can be an important step in the decision-making process. It should also be noted here that a considerable number of referrals come from other venture capitalists, seeking co-investors for deals they are considering (Tyebjee and Bruno, 1984).

After the investment proposal has been received by the venture capital firm, the next step in the process is a firm-specific screen. Here, the venture capital firm briefly reviews the proposals and filters out any that do not fit their company’s investment strategy. As discussed earlier (3.3 – *Variations among venture capital firms*), venture capital firms can have specific geographic, industry, financing stage, financing size, or similar targets. In general, those proposed ventures that do not provide a good match with the firm’s strategy are filtered out of the process at this point (Tyebjee and Bruno, 1984; Hall and Hofer, 1993). However, research on European venture capital firms suggests that those firms may be more willing to look beyond their investment guidelines to consider proposals from categories that they do not usually fund (Muzyka, Birley and Leleux, 1996).

The following step of the process is a generic screen, where there is a brief analysis in terms of generic criteria set by the venture capital firm, other than those criteria already filtered out in the preceding step. This screening stage is largely based on both the reading of the proposed venture’s business plan, and by knowledge of the existing industry by the venture capitalist reviewing the proposal. Some research suggests that this screen will be less rigorously applied when the quality of the referral is high (Tyebjee and Bruno, 1984). However, most proposals are rejected during these two screening phases of the process, and together the two steps only involve a minimal time investment by the venture capital firm.

After the deal origin and initial screening phases, the first real phase of the evaluation process begins. Here, the venture capital firm starts to review the proposal in greater depth. Meeting with the entrepreneurial team that has made the proposal is common during this phase, assessing in some depth the behaviours, thought processes and backgrounds of the team. Any number of methodologies can be used for this investigation, and it can involve both quantitative, statistical analyses as well as more qualitative, informal reviews. Two interesting examples of the latter methodology come from the Fried and Hisrich (1994) paper. The first example comes from an anecdote relayed by one of the venture capitalists they interviewed for that paper:

I like to go out and meet the spouse and the kids and try to see if their home is in chaos or if it's pretty orderly. Rather than me passing judgment on how they live, what I want to understand is what kind of environment that entrepreneur's coming out of.

The second illustrative quote also comes from one of their venture capitalist interviewees, this time addressing the need to see how the entrepreneurial management team reacts under pressure:

We subject management to a number of sessions where we might lean on them a little bit to see what kind of pressure points they have ... We see how they interact with their management team, and we ask questions where we know there's going to be some controversy to see how they handle it.

In addition to the informal, interpersonal examination that takes place at the first full stage of the evaluation process, the venture capitalists will also check references during this stage. This includes both the references that are provided by the entrepreneurial team, as well as other references that the venture capital firm is able to locate. As we will discuss below, research has suggested that the evaluation of the entrepreneurial team is one of the most important factors considered by venture capitalists when reviewing funding criteria (see, for example, MacMillan et al, 1985; Bachher and Guild, 1996), so it would follow that an in-depth review of those potential leaders of a new firm would be a top priority during the evaluation phase.

Addressing the more statistical or quantitative aspects of a new firm also occurs during the first phase of evaluation. Different types of such reviews can come into play here, especially depending on the venture capital firm's target dimensions for potential investments. For example, accountants tend to be

brought into the review process if the venture capital firm focuses on financing of later-stage ventures, since more financial data will be available from those ventures seeking funding that may already have accrued considerable revenues and/or expenditures during their lifespan. Or, as a contrasting example, those venture capital firms which invest primarily in early-stage ventures would be more likely to take on in-depth technical studies of a product, since the core technology of the proposed venture may not yet be fully proven. For such reviews, venture capital firms can make use of “technology partners” (consultants or others with field-specific expertise) to help with the analysis. Also through such reviews during the first-stage evaluation, the venture capital firm will increase their overall knowledge of the industry that the new venture proposes to operate in.

The first-phase evaluation is followed by a second phase, still aimed at reviewing the investment proposal along the previously mentioned dimensions, but which sees the venture capitalist invest considerably more time and energy in reviewing the proposal. Advancing to this stage represents that the entrepreneurial team, product and market, have passed through initial analyses, and the venture capitalist can even be seen to display an “emotional investment” (Fried and Hisrich, 1994) in the venture. This shows an escalation of commitment, a potential source of decision-making error, where people increase their commitment in response to previous investments (sunk costs – in this case, the time and resources put into the initial review) (Heath, 1995), and can also leave room for a confirmation bias, looking for information that confirms pre-existing interpretations and avoids searching for contradictory information (Klayman and Ha, 1987; Jones and Sugden, 2001). This second review shifts to a focus aimed at any remaining obstacles that would prevent current the financing, and considering ways to overcome these obstacles. Because the time and energy put towards proposal evaluation dramatically increases during this phase, most venture capitalists like to have an idea of the deal price before it begins, so that their time investment would not be wasted on a deal that does not end up with a good fit for amount of financing requested.

After the two phases of evaluation, the final key step is the closing phase, where the details of the deal are negotiated and the legal documents are reviewed and finalized. Assuming that all is well, this phase ends with the venture capital firm providing the actual financing to the entrepreneurial team. However, even though the closing phase takes place after the aforementioned considerable review, making it to this phase does not guarantee that a venture will be funded. According to Fried and Hisrich's study (1994), as many as 20 percent of deals that make it to the closing phase are still rejected.

In reviewing the proposal evaluation process as outlined by Fried and Hisrich (1994), those authors note the stages involved are not always as distinct as they are described here. Boundaries between the different stages can be blurred, and stages can be returned to if need be. For example, if any final problems come up in the closing stage, the venture capital firm may choose not to fund the venture, but more likely they will return to a review where they can figure out how to overcome the remaining obstacles. That the stages are not necessarily as distinct as described by Fried and Hisrich is one that finds support; the earlier study by Tyebjee and Bruno (1984) grouped both the two initial screening phases and the two evaluation phases together, resulting in a model that moves from deal origination to screening to evaluation to the closing phase.

4.0 - Decision-making by venture capitalists

Having begun by examining background information on both the research-oriented foundation of this paper (decision-making) and the industry-oriented foundation of the paper (venture capital), we now move on to examine areas that have more explicitly connected the two fields. There has been a growing body of literature over the past few decades that focuses on the intersection of these two areas of study (Wells, 1974; Tyebjee and Bruno, 1984; MacMillan et al, 1987; Fried and Hisrich, 1994; Bachher and Guild, 1999; Teppo, 2004). Note that this is distinct from decision-making by the entrepreneurs or the entrepreneurial team, of which there is also a considerable amount (see, for example, Forbes, 1999; Simon and Houghton, 2002; Keh, Foo and Lim, 2002).

4.1 – Rankings of decision criteria and categories

Earlier pieces of such decision-making research focus on categorizing and ranking the key criteria used by venture capitalists when evaluating investment decisions. The choice of focus should come as no surprise; research has indicated that success of firms backed by venture capital is greater than those without such backing (Davis and Stetson, 1984). Thus, understanding what criteria are used by a venture capitalist to evaluate a new venture could be important to both would-be entrepreneurs seeking venture financing, and to those wanting to understand characteristics of successful start-ups.

However, later research focuses more specifically on decision-making errors and biases as displayed by venture capitalists. They note the venture capitalists are subject to the same decision-making biases as any other human beings are, and specifically begin to probe a number of such biases evident by this group.

First we begin by looking at the earlier work, which focuses on categorizing and ranking key criteria used by venture capitalists when evaluating investment decisions. In one of the earliest such studies, Tyebjee and Bruno (1984) reported five underlying categories for decision-making:

- Market attractiveness: the size of the market that the new venture proposes to operate in, the potential for market growth, and the new firm's access to customers
- Product differentiation: uniqueness of the core technology, patents or opportunity for patents held by the entrepreneurial team, technical edge of the product in a competitive marketplace, and profit margin that the product offers
- Managerial capabilities of the entrepreneurial team: the start-up team's skills in marketing, management, and finances; and the references of the entrepreneur(s)
- Environmental threat resistance: the core technology's life cycle, barriers to entry from potential competitors, and risk protection
- Cash-out potential: future opportunities to realize capital gains from the venture investment.

In their research, Tyebjee and Bruno also provided one of the earliest models describing the process that occurs from the time that a potential deal originates until the venture capitalist firm decides to fund a new venture, again with the intention of illuminating the decision-making process. The key process

stages are identified as: deal origination, screening processes, evaluation of proposal, and deal structuring (Tyebjee and Bruno, 1984). However, though it provided some early insight into the venture capital process, the authors did note that their description was “admittedly simplistic.” As such, this paper made use of a later, more detailed study (Fried and Hisrich, 1994) was used for the description provided above.

MacMillan, Siegel, Subbanarahamsima (1985) were the next to investigate the criteria used for decision-making by venture capitalists, intended as a follow-up that was based on the Tyebjee and Bruno (1984) research. The key contribution of this paper was one that would be replicated, to a certain extent, in future research. Notably, they found that characteristics of the entrepreneur were five of the ten highest ranked criteria by venture capitalists when making a decision whether or not to fund a venture. Specifically, these criteria were (in descending order of importance): the entrepreneur’s capability for sustained intense effort; that the entrepreneur is thoroughly familiar with the market targeted by the venture; the entrepreneur’s demonstrated leadership ability in the past; the entrepreneur’s ability to evaluate and react to risk well; and the entrepreneur’s track record relevant to the venture.

The other five criteria also fit into categories that roughly correlated with Tyebjee and Bruno’s earlier model: that the venture offered at least ten times return in five to ten years (cash-out potential); the investment can be made liquid (cash-out potential); that the product’s market could enjoy a significant growth rate (market attractiveness); that proprietary protection was possible or secured for the product (product differentiation) (MacMillan et al, 1985).

Characteristics of the entrepreneur were also suggested as critical to the decision to fund a new venture through a list of deal-rejection criteria compiled by the researchers. Venture capitalists were asked to indicate which pairings of criteria, if lacking, would cause them to immediately reject a proposed deal. For example, the top-ranked pairing reported was the absence of: “returns of ten times within five to ten years” from the time of investment, and entrepreneurs with the “capability for sustained intense effort.” 84 percent of the venture capitalists indicated that the lack of these two criteria alone would cause them to reject a deal. Out of the top ten such pairings, characteristics of the entrepreneur

represented fifteen of the twenty criteria (75%), and eight of the top ten criteria (80%) in the top five pairings (MacMillan et al, 1985).

Later research by MacMillan, Zemann and Subbanarahamsima (1987) expanded on previous research and attempted to discern criteria that made a potential venture successful or unsuccessful. Once again, similar categories were shown as important: characteristics of the entrepreneur, of the market, and of the product, as well as competitive threats from the environment, and financial potential for the venture capital firm. Unsuccessful ventures were seen as those with weak or absent characteristics in these categories, such as a venture with: a weak entrepreneurial team, a product with no prototype, and no clear market demand for the product. Successful ventures contained positive criteria in each of these categories, such as a venture with: a highly qualified team, one that demonstrates the presence of a market for the product, and has protection for the product (MacMillan et al, 1987). This research also attempted to track a relationship between the criteria listed as important and as the success of ventures, but ended up introducing a considerable opening for bias through their methodology, which they commented on when reporting their discussing.

Other research has focused not on determining or ranking the decision-making criteria by venture capitalists, but on suggesting models that could improve that decision-making. In one such paper, Khan (1987) suggested that actuarial models could be useful if applied by venture capitalists, suggesting that a “decision support system” would be beneficial (Khan, 1987, P 203).

In his research, Khan reviews both the disjunctive and conjunctive decision processes. The former (disjunctive) was described as when one or two key criteria were focused on heavily by the venture capitalist, while the latter (conjunctive) would involve a series of minimal-threshold decision criteria that, if they are not all met, would result in rejection of the deal. Both models were seen as non-compensatory; that is, a low score on a given category or categories would cause deal rejection, and could not be offset by a higher score in another category (Khan, 1987).

Through Khan's framework, the previously mentioned research (Tyebjee and Bruno, 1984; MacMillan et al, 1985; MacMillan et al, 1987) aligns most closely with the disjunctive model, since they place a strong importance of a few criteria (notably the characteristics of the entrepreneur), with of course the notable exception of the conjunctive-oriented rejection pairings from MacMillan et al (1985), as discussed above. Khan's own research, which also interviewed a series of venture capitalists, investigated both styles of decision-making. Disjunctive-based decisions once again showed an importance placed by the venture capitalists on the characteristics of the entrepreneur. It also showed, however, that the product itself was a key category in their decision-making. As the author noted, "product then appeared to be an intuitive filter, given much more credence by venture capitalists than they themselves appear to realize" (Khan, 1987). Both intuitive decision-making and venture capitalists' difficulties with retrospectively understanding their decision processes will be discussed below.

Khan (1987) also compared the expected results of the decision-making by venture capitalists to the actual success of the investments. He found that the judgments of venture capitalists were "surprisingly poor predictors of actual outcomes," and hence suggested the use of actuarial decision models to help improve such judgments.

One of the major works that we examine that focuses on categorization and ranking of decision criteria used by venture capitalists is that of Fried and Hisrich (1994). Much like the other such research pieces, Fried and Hisrich use a post-hoc methodology, interviewing venture capitalists on past decisions where they were the lead decision-maker. Through this work, they analyze their findings according to the previous models, where they noted some validation of those models but also "some major exceptions." To account for both previous models, the authors put forward their own new model of categorization, building partly on previously published work by one of the lead authors (Hisrich and Jankowicz, 1990).

This new categorization divides decision-making criteria into three main categories: "concept," dealing with the core technology and product itself; "management," dealing with aspects relevant to the entrepreneurial team; and "returns," addressing the financial aspects of the deal. Criteria dealing with

competitive threats are considered in the “concept” category, and notably absent are criteria that deal explicitly with factors related to the product’s market. More details of this model can be found in Figure 2.0.

Figure 2.0 – Fried and Hisrich model of decision-making categories

Concept	Management	Returns
Investment must involve an idea that either already works, or can be brought to market in a short time frame (i.e. 2-3 years).	Must demonstrate that they can make reasonable decisions, identify risks, are hardworking and flexible.	Must provide an exit for the investors, most often within a 3 to 10 year time period.
The concept must offer a substantial “comparative advantage” over competitors.	Past experience: must have general management experience, and done well at prior jobs.	Must offer potential for a high <i>rate</i> of return.
Business concept must show significant earnings potential.	Personal integrity of the members of the management team.	Must offer potential for a high <i>absolute</i> return.
The concept must have reasonable overall capital requirements.	Must be able to exhibit leadership, especially under extreme pressure.	

However, some notes must be made about the categories that are outlined in the Fried and Hirsch model. For example, under the “management” category the authors recognize that while venture capitalists place value on when would-be entrepreneurs have done well at past jobs, association with a venture that has previously failed does not necessarily disqualify them from the selection process. This finding is supported by other research (for example, Cope, Cave and Eccles, 2004), that suggests that venture capitalists may consider involvement with past failures as part of a learning process that could contribute positively to the experiences of the entrepreneur.

As well, the same category notes that the entrepreneurial team needs to have sufficient management experience. However, as noted earlier, venture capital firms can participate in the management of the start-ups that they fund, helping to bring business expertise to the team. Indeed,

research has even cited examples where the entrepreneur has a limited knowledge of management or even of the venture's core technology, but the venture capital firm worked with the entrepreneur to help them increase their knowledge of the business.

As we can see through this research on categorization and ranking of decision criteria, the characteristics of the entrepreneur seem to play a key role in the decision process, at least as reported by the interviewees. Other research has also echoed this importance (see, for example, Hisrich and Jankowicz, 1990; Bachher and Guild, 1996), which in general has led to such statements as the following by MacMillan, Siegel and Subbanarahamsima in their 1985 paper:

There is no question that irrespective of the horse (product), horse race (market) or odds (financial criteria), it is the jockey (entrepreneur) who fundamentally determines whether the venture capitalists will place a bet at all.

Even recent literature looking into the decision-making processes of angel investors (distinguished from venture capitalists, as outlined above) has found that the characteristics of the entrepreneur or team were of high importance in that field as well. Notably, four of the six decision criteria reported as most important to business angels were: trustworthiness and honesty of the entrepreneur(s), the skills of the management team, enthusiasm/commitment of the entrepreneurs, and the domain expertise of the entrepreneurs (Sudek, 2007).

However, such claims - that characteristics of the entrepreneur or team are those held as most valuable by venture capitalists - do not go unchallenged. Hall and Hofer (1993), when investigating decision categories similar to those in the previously mentioned papers, noted a lack of importance reportedly placed on the entrepreneur or management team. A number of the research papers discussed below take this anomalous finding into account, with some citing it as an impetus for a more critical look at decision-making by venture capitalists, as the body of research diverges away from the categorize-and-rank format we have examined so far.

4.2 – Venture capitalists and decision-making error

Nearly a decade ago, the relevant literature began to shift away from determining which categories and criteria were considered as important in the venture capitalist decision process. Decision-making by venture capitalists was still a topic of leading research, but the newer body of literature focused on two key areas: issues with the venture capitalists' reporting of their own decision-making, and potential errors in the decision-making itself.

4.2.1 – Venture capitalists’ reporting of their own decisions

To look at the first area - issues with venture capitalists’ reporting of their own decision-making - we need to start by examining the role of intuition, which has been cited as playing a key role in the venture capitalists’ decision-making processes. One of the earliest pieces to focus specifically on intuition’s role in this field is that of Hisrich and Jankowicz (1990) who, through interviews, asked venture capitalists to focus aspects of their decision-making that did not involve straightforward technical or numeric projections. The authors cite numerous references to “gut decisions” or decisions that relied on “personal chemistry” in previously published, venture capital-oriented literature, but noted that it was an area that had “been little researched by workers in the field” (Hisrich and Jankowicz, 1990).

The investment decision constructs reported as intuitively directed were those relating to the entrepreneurial team, unique opportunity (based on a protectable product), and appropriate return, respectively. Once again, we find echoes of the earlier categorization, as these dimensions could easily be related to the aforementioned categories of characteristics of the entrepreneur, product/market, and cash-out potential, respectively. And once again, we find that the first category – entrepreneurial team – is shown as the most important dimension, particularly the areas relating to the experience of the principal, the personality and background of the principal, and the characteristics of the management team (Hisrich and Jankowicz, 1990).

Zacharakis and Meyer (1998) build on the focus on intuition, but take a critical look at this issue, particularly addressing the role it plays in the *research* on decision-making by venture capitalists. These authors review past literature in the field (including, among others, Wells, 1974; Tyebjee and Bruno, 1984; MacMillan et al, 1985; Khan, 1987; Fried and Hisrich, 1994) and note that almost without exception, previous research in the field made use of post-hoc, interview-based methodologies. That is, researchers would contact venture capitalists and ask them to recollect a past decision or decisions that they had made involving funding a venture. Through series of such interviews, researcher would gather

data that would be used in an attempt to shed light onto the decision-making criteria that are important to such funding decisions.

However, in taking this critical look, Zacharakis and Meyer (1998) also cite psychological literature that experts who rely on intuition more than non-experts are poor at introspection (Simon and Chase, 1973; Fischhoff, 1988). As venture capitalists are seen as intuitive decision-makers who are later asked, by researchers, to be introspective about the reasons for their decisions, we could then expect the possibility for errors in the related research that uses post-hoc interview methodology. In other words, all the previous literature could be held as suspect to considerable methodological errors, since they had all used a similar – and potentially flawed – methodology.

To further explore this question, Zacharakis and Meyer developed a study (aptly titled, “A Lack of Insight: Do Venture Capitalists Really Understand Their Own Decision Processes?”) to probe the issue. To this end, they used a research methodology called “policy capturing” that was intended to discern between “actual” and “espoused” theories (Hitt and Meyer, 1991). Their findings were consistent with their hypothesis: venture capitalists are not good about introspecting about their own decision processes (Zacharakis and Meyer, 1998). While the authors note that their findings provides support for a need for venture capitalists to use decision-making aides (as previously noted by Khan, 1987 and is a point which we will return to later in this paper), they also note that past research on decision-making by venture capitalists needs to be “reevaluated” in light of the new findings. To support the latter point, they cite the divergent findings by Hall and Hofer (1993) that suggest that characteristics of an entrepreneur are not necessarily important in venture capitalists’ decision processes, as noted above.

Such findings present a problem to those researching venture capitalists, and this paper is no exception. If post-hoc interview methodologies are seen as prone to error, then that presents a reliability problem for those attempting to accurately research the decision-making of venture capitalists through such methods. Different authors have utilized research methodologies that have attempted to overcome this reliability problem, often using complex methodologies, such as conjoint decision-making tools

(Shepherd, Zacharakis and Baron, 2002; Franke et al, 2006) or repeated case-study format decision making tasks (Zacharakis and Meyer, 1998). Such methodologies are beyond the scope of resources available for this research paper. However, in order to minimize a reliability problem, an interview format was used that focuses on the tangible processes administered by venture capitalists in their decision-making, not on their ability to recall their own internal decision-making criteria. That is, we focus on empirical evidence that lies outside the 'black box' of a venture capitalist's internal decision-making, as will be discussed further in the methodology paper.

However, it should be noted that despite the findings of Zacharakis and Meyer (which were published in the widely read *Journal of Business Venturing*), a number of authors continued to work in a post-hoc interview format when determining decision criteria for venture capitalists (see, for example, Teppo, 2004; Ulu, 2008), continuing to rely on venture capitalists' recall of their own internal decision processes.

4.2.2 – Decision-making biases demonstrated by venture capitalists

Research into problems with venture capitalists' ability to understand their own decision processes seemed to open the door for the next area of literature that we will explore: decision-making errors and biases by venture capitalists. This paper opened with a look at human decision-making errors, touching on a few popular examples out of many well-researched phenomena. While fields such as economics would assume that human beings act rationally, there have been no small number of well-documented empirical findings that argue against this assumption. In a follow-up study to the work that questioned the insight of venture capitalists, Zacharakis and Shepherd (2001) looked at the same group with an eye towards two potential issues: the overconfidence bias and information availability.

The overconfidence bias proposes that people are more confident in their judgments than is warranted by the facts (Griffin and Tversky, 1992; Newby-Clark et al, 2001). They make probability judgments that are more extreme than they should, given the evidence and their knowledge. With regards to the current research, this may show up as a tendency for venture capitalists to rely on existing knowledge rather than seeking new information, preventing them from accurately perceiving potential opportunities and pitfalls (Zacharakis and Shepherd, 2001). The Zacharakis and Shepherd (2001) paper probed this exact question, and found that venture capitalists indeed do tend towards overconfidence, with their results showing that 96 percent of those studied demonstrated "significant" overconfidence. Furthermore, they reported that their research showed a strongly correlated (0.70) inverse relationship between overconfidence and accuracy. That is, the more overconfident a venture capitalist is, pertaining to potential investments, the more inaccurate their decision(s) tended to be. Determining factors for the overconfidence were cited as the amount of information, type of information, and belief by the venture capitalist as to whether the venture would succeed or fail (Zacharakis and Shepherd, 2001).

Aside from overconfidence, another decision-making bias shown in venture capitalists involves an escalation of commitment for failing ventures. During the venture capital process, there are a number of

opportunities for investors to continue or increase their funding commitments to an entrepreneurial venture they are supporting. Birmingham, Busenitz and Arthurs (2002) examined whether venture capitalists were likely to escalate their commitments to ventures, even if those ventures showed clear signs that they were on a failing course. Their research found that this was indeed the case, with escalation of commitment evident occurring more prevalently in ventures that would eventually go out of business (or remain in stasis), as compared to those that are acquired or move to an Initial Public Offering (IPO), even when signs for such failures were evident before the escalation of commitment.

Decision biases due to increases in a venture capitalists' experience is a third area that has been investigated in recent years. A paper by Shepherd, Zacharakis and Baron (2002) attempted to probe the question: does more experience at venture capital decision-making lead to better decisions? This field has been explored briefly; a later paper in the field showed that venture capitalists with less experience tended to place a higher value on the characteristics of the entrepreneur, while those with greater experience tended to focus on team cohesion (Franke et al, 2008). In determining whether increases in experience led to better decisions, Shepherd, Zacharakis and Baron (2002) found that an experienced venture capitalist tended to make better decisions about funding new ventures than did inexperienced venture capitalists – to a point.

Increased experience could improve a venture capitalist's understanding of the relationship between various factors and new venture success (Shepherd, Zacharakis and Baron, 2002), leading to better decision-making. However, this research also suggested that decision curves of venture capitalists demonstrated inverted U-shapes, where years of experience are plotted against reliability and performance of decisions. That is, after a certain amount of experience (the paper suggests approximately 14 years' worth), the decision-making capabilities of the venture capitalists *decreased* with regards to reliability performance.

In the discussion section of their paper, the authors note that further investigation into this phenomenon is warranted. However, they do guess that this issue could be explained by venture

capitalists' increased likelihood to use automatic processing, as opposed to a more systematic method, as their years of experience cross a certain threshold (Shepherd, Zacharakis and Baron, 2002). That is, with sufficient years of experience, venture capitalists may become *more* prone to any number of heuristics and biases as they use an increasing number of decision-making "shortcuts."

The fourth and final area we will review from the existing literature on venture capitalist decision-making errors is that of the similarity bias. It has been observed that people tend to rate others more positively if those being rated are more similar to those doing the rating (Bryne 1971). Franke et al (2006) probed whether or not problems that would have come as a result of similarities between the venture capitalists and the entrepreneurial team seeking venture funding. The similarity bias would suggest that venture capitalists would be more likely to view entrepreneurs or their teams more favourably, if those seeking the funding had characteristics that were similar to those of the decision-maker.

Investigating this question, Franke et al (2006) found that the similarity bias did come into play, in certain cases. In one dimension where their hypothesis did find support, the researchers noted that those venture capitalists who came from backgrounds at larger firms were likely to rank more favourably the would-be entrepreneurs who also came from backgrounds at larger firms. The corollary to this was also supported, namely that those entrepreneurs with experience in smaller firms were more likely to be viewed favourably by venture capitalists from similar backgrounds.

Another dimension of the similarity bias that did seem to be valid stemmed from a field-specific bias. In this issue, venture capitalists from engineering or managerial backgrounds tended to rate entrepreneurs from similar educational backgrounds more highly when evaluating the entrepreneurial team. However, a number of dimensions in Franke et al's (2006) research did not find support for a similarity bias between the venture capitalists and the entrepreneurs. These factors were age, the level of education obtained (e.g. MBA, PhD), or a similarity in amount of experience in leading teams.

5.0 - Cognitive repairs

Looking back, we have already reviewed a diverse range - and considerable amount - of previous research as part of the foundation for this paper. We started by taking the briefest of looks at the concept of human decision-making errors, and then shifted to a focus on the venture capital industry and the decision processes involved in funding new ventures. We then turned to look at recent research that examined decision-making by venture capitalists, both earlier works that focused on categorization and ranking of criteria used in decision-making, as well as later works that specifically probed human decision-making errors demonstrated by venture capitalists.

What did not show up in considerable supply during the review of published literature, however, were prescriptive suggestions on how to deal with the all-too-human decision-making errors that venture capitalists could fall prey to. Recent research suggests that such investors are not only aware that they are subject to their own biases and heuristics, but also could view these errors as inevitable (Levie and Gimmon, 2008). However, with numerous authors noting the damage that decision-making biases could cause in the world of venture capital, we look to draw on one last realm of academic work for the final piece of foundation for this paper. Specifically, we turn to a pioneering paper focused on what its authors termed “cognitive repairs.”

In the paper that first describes cognitive repairs, Heath, Larrick and Klayman (1998) recount the following, very telling story:

Cognitive psychologists have spent 30 years examining the actual processes that people use when they collect information, combine it, and draw inferences about their world ... However, outsiders have not always accepted the pessimistic description of human faculties and reason that is found in the research literature. As one skeptic put it, “If we are so stupid, how did we get to the moon?” ... We resolve the apparent discrepancy between evidence of individual shortcomings and the empirical fact of moonwalks by observing that *individuals* did not make it to the moon, *NASA did*.

That is, while it remains an intensively researched fact that human beings are prone to no small number of decision-making errors (some of which have already been noted in this paper), organizations

are able to put systems in place that can prevent, address, or mitigate the effects of individual-level decision-making biases. These organizational-driven systems are known as “organizational repairs.”

Heath, Larrick and Klayman (1998) cite two main categories which make up these organizational repairs. The first is that of *motivational repairs*, which sees an “increase [in] the energy and intensity with which individuals pursue a task.” Indeed, motivation within an organization is a research area that has been the subject of considerable study over the years, noting that individual motivation can be essential to the healthy functioning of any organization. The second category of organizational repairs is that encompassing *cognitive repairs*, a name that reflects “the fact that they correct some cognitive process that was initially flawed and in need of repair.” It is this second category, addressing what organizations can do to prevent or remedy individually-based decision-making errors, which we look into in some detail here.

In their paper, Heath, Larrick and Klayman (1998) focus on three main areas through which lend potential cognitive repairs. These areas centre around the three separate stages of the learning process:

1. Generation of hypotheses to explain external events;
2. Collection of information to support or refute the hypotheses; and
3. Drawing conclusions based on the hypotheses and information.

The authors list both a number of potential causes for individual decision-making biases for each stage, as well as potential cognitive repairs that can help to prevent or reduce harm caused by those biases. We will briefly review each of these suggested stages, biases and repairs in turn.

5.1 – Cognitive repairs: generation of hypotheses

When looking at the first stage, generation of hypotheses to explain external events, the authors cite potential for decision-making biases from a number of different areas, including the following:

- Individuals search for explanations that make themselves look good: often, decision-makers will perform shallow searches that demonstrate a self-serving bias. This can surface as a belief that successes result from stable, internal factors (e.g. ability) and that failures result from uncontrollable, external factors (e.g. bad luck). As a potential cognitive repair, organizations could mandate that individuals get take part in processes that force them to consider alternative factors for success.
- Individuals focus on people rather than situations: psychology’s ‘fundamental attribution error’ (also known as the ‘correspondence bias’) dictates that we tend to explain behaviours more due to personality-based factors, and less due to situational factors (Jones and Harris, 1967; Ross, 1977). As a potential cognitive repair, organizations could put systems in place that encourage decision-makers to consider other attributes than people.
- Individuals will stop searching as soon as they generate one hypothesis: or, if they work to develop multiple hypotheses, their “alternative” hypotheses tend to differ only slightly from one another. As a potential cognitive repair, organizations could establish practices that involve “relentless drilling” of proposed hypotheses by those removed from the decision-making task, or by involving outside experts who can help to provide novel viewpoints and hypotheses.

5.2 - Cognitive repairs: data collection

The next stage addressed in the cognitive repairs literature is that of collection of information. Such errors could include both information that is collected from either the decision-maker's memory (relying on experience, knowledge, or internalized activity), or from the decision-maker's external environment.

Both can be minimized by rigorous data collection, for example the noting the following issues and possible solutions:

- Individuals often collect small samples of information: this bias is often seen as resulting from limited time or attention by the decision-makers. In some cases, the greater amount of information that is available, the lower a percentage of information that decision-makers will consider. To deal with this, organizational systems could be put in place that encourage or require individuals to collect larger samples.
- Individuals collect biased samples of information: one key reason for this is that individuals draw on available information only, which can be subject to any number of biases, such as the availability bias (Tversky, 1972) or the recency effect (Deese and Kaufman, 1957). To deal with this, organizational systems could be effected that force systematic information collection, especially the consideration of unusual events.
- Individuals collect information based on pre-existing theories: often do so without verifying these theories through empirical research. To deal with this, organizational systems could be established that require empirical data collection, sending decision-makers to the actual place, people or resources that can provide accurate information.

5.3 – Cognitive repairs: drawing conclusions

The final category addressed deals with how conclusions are drawn, once the hypotheses have been generated and data have been collected:

- Individuals weigh vivid evidence more heavily when making decisions: although statistical data may be available, this information may be under-emphasized in consideration for less statistically accurate – but more compelling - personal stories. To deal with this, an organization could require individuals to classifying exceptions to the data as major or minor, thus helping to reduce the effects of outside stories that would hopefully be classified as minor.
- Individuals use pre-existing theories to evaluate evidence: one way this shows up results in those unexpected examples or data points to be considered as failures, or outliers to be ignored. To deal with this, organizations could intentionally conduct “deviant searches” to identify and critically examine such outliers; or, organizations could require individuals to interact with others (such as outside experts) who may judge the information differently.
- Individuals can demonstrate overconfidence: being overly optimistic in the probability of an unlikely event, or underestimating the amount of time and energy required to complete a project. Organizations can help to deal with this by having systems that allow for overconfident decisions, and allowing individuals to later adjust accordingly.

5.4 – Cognitive repairs: dimensions for adoption

In addition to reviewing the a number of different categories, individual problems, and general suggestions for cognitive repairs, Heath, Larrick and Klayman (1998) also outline a number of dimensions that could affect whether or not a cognitive repair is successful, particularly as might affect the cognitive repair's adoption by an organization:

- Simple vs complex: many of the repairs suggested in their paper were very simple (such as short, multi-step decision models) but it was noted that many exist (e.g. formal statistical analyses) that are much more complex
- Domain-specific vs domain-general: repairs that can only be applied to specific tasks or environments, or ones that are applicable across a great number of situations, regardless of environment
- Corrective vs. preventative: repairs that come “after the fact” of a decision-making bias to reduce or counter its effects, or those that come before the error with an aim at preventing bias
- Familiar vs. novel: repairs that are familiar to those implementing them, or ones that are new and those implementing must spend time learning new processes or systems imposed by the repair
- Social vs. individual: repairs that are applied socially, through relationships with others, or repairs that are applied by the individual to their own thought processes
- Top-down vs. bottom-up: repairs that are implemented by upper-level managers or outside experts, or repairs that come from the lower levels of an organization (e.g. self-implemented)

5.5 - Potential issues with cognitive repairs

While cognitive repairs could assist with improving decision-making processes, this is not to suggest that there are not potential limitations of this theory. First, any such repairs would need to be adopted successfully by an organization, and the adoption process in some cases could be a long and difficult one.

Next, as the authors note in their paper, the implementation of cognitive repairs may actually address one problem but at the same time exacerbate others (Heath, Larrick and Klayman, 1998). For example, institutionalizing a decision-making framework aimed at improving data collection may result in a decrease in new hypotheses that are explored when new problems arise. That is, if a company puts a new decision framework in place, members of that organization may feel that they have the “right” model for data collection, and thus resist the generation of new hypotheses or new models that would address any unanticipated data that comes into play.

Finally, some organizations may choose not to correct their decision-making biases. Implementation costs, lack of understanding by those who would decide to implement such changes, and a host of other factors could cause organizations to reject the adoption of such potential improvements.

6.0 - Cognitive repairs and decision-making by venture capitalists

We have now reviewed a substantial amount of research on foundational topics: decision-making biases, venture capital, how these two fields merge, and cognitive repairs. However, as noted previously, very little has been suggested in terms of prescriptive methods that can address decision-making biases displayed by venture capitalists. While it is not this paper's intention to be prescriptive per se, a proposed synthesis of the literature on venture capital decision-making and on cognitive repairs may shed light on improved decision-making processes.

To structure this proposal, we will follow the same categories used in the cognitive repairs literature: generating hypotheses, collecting data, and drawing conclusions. In each area, we will both examine decision-making biases suggested in published literature, and suggest other points for weakness that could warrant further investigation. Basic suggestions for cognitive repairs will also be provided in each case.

6.1 - Generating hypotheses

First, we look at the tendency for individuals to search for explanations that make themselves look good. This could be seen as related to the self-serving bias, where individuals attribute their *successes* to internal, personal factors but attribute their *failures* to external, situational factors (Miller and Ross, 1975). Or, some research suggests that those making “inside” decisions (with knowledge of plans and scenarios) tend to be overly optimistic in their predictions (Kahneman and Lovallo, 1993). With regards to venture capitalists, we noted earlier the similarity effect that took place when venture capitalists showed favourability for investing in entrepreneurs who can from the same firm-size (large vs. small) or educational (e.g. MBA, PhD) background as themselves (Franke et al, 2006). Venture capitalists may view entrepreneurs from similar backgrounds as being more capable of handling the challenges of entrepreneurship, more competent in dealing with the threats from competition, or possessing other qualities that could lead to their success.

We may find also support for this tendency – searching for explanations that make themselves look good - through the aforementioned phenomenon whereby venture capitalists tend to escalate commitment to failing ventures (Birmingham et al, 2002). It is possible that venture capitalists will choose to “chase bad money with good” (i.e., continue to fund a deal even though it shows signs of failure) in this fashion because of their own prior support of the now-failing ventures. Beliefs that their original investments – and decisions to fund those investments – were good ones could drive venture capitalists to continue to fund failing ventures, ignoring external data pointing to the likelihood of the venture’s failure. This can be seen as evidence of escalation of commitment, where people increase their commitment in response to previous investments or sunk costs (Heath, 1995).

In both of these cases, involving outside reviewers in the decision process may serve as a sufficient cognitive repair. Reviewers who come from diverse backgrounds, dissimilar to the venture capitalist’s own, could help to question the similarity bias since no one background (firm size, educational level) would find support that goes unchallenged by at least one other reviewer. Outside reviewers would

also help to prevent “chasing bad money with good,” on the assumption that those not previously involved in funding the venture would thus not fall prey to the endowment effect.

Next, we review the possibility for the fundamental attribution error, the tendency to over-emphasize personality-based behaviours and under-emphasize situational factors. While we saw it repeatedly suggested in earlier research that venture capitalists place high importance on the entrepreneur or entrepreneurial team (for example, Tyebjee and Bruno, 1984; MacMillan et al, 1985) we also saw that venture capitalists may not even recognize the priority they place on the product itself, when evaluating potential investments (Khan, 1987). Other research has suggested that the emphasis on personality-based activities (such as the characteristics of the entrepreneur) when evaluating investments may be due to a post-hoc reporting bias that could ignore the situational factors that actually come into play during the decision process (Zacharakis and Mayer, 1998).

Any organizational repairs suggested to address this problem would need to focus on restoring the balance by re-emphasizing situational factors. This could be done through both simple and complex ways. Simply, by developing strategies as easy as a rule of thumb that requires decision-makers to look at situational factors whenever a personality-based attribution is on the table. Complexly, statistical analyses could be required as part of the process that forces the decision-maker to review situational factors. As we noted earlier, one study showed an under-representation of such external analyses (market research, technical reviews of the product, etc.) in favour of more personality-based factors (Fried and Hisrich, 1994). Making such external analyses mandatory in the venture evaluation process may help to restore this balance.

The third and final sub-category to review, when addressing problems with generating hypotheses, examines the tendency of individuals to formulate only a single hypothesis, or to only generate alternative hypotheses that are similar to the original thought. One example of this from the venture capital world is the tendency for less-experienced venture capitalists to place a higher emphasis on the individual entrepreneur, where more-experienced decision-makers in this role looked more

strongly at cohesion between members of the entrepreneurial team (Levie and Gimmon, 2008). Limited hypothesis generation could also contribute to the previously discussed phenomenon where, after a certain threshold, an increase in decision-making experience by venture capitalists actually led to a decrease in decision-making performance (after approximately 14 years of experience). This could result from an increased use of automatic processing by the venture capitalists, as opposed to their thoroughly considering the decision-making situation through careful analysis (Shepherd, Zacharakis and Baron, 2002).

One potential organizational repair could address both of these problems. More experienced members of the venture capital community could serve as mentors or on committees that are involved whenever newer venture capitalists are in lead decision-making roles, and vice-versa. This would allow the person with a greater amount of expertise to challenge the limited hypotheses of the novice decision-maker, providing a screen for any “rookie mistakes.” This organizational repair could also serve as a safeguard against automatic processing by experienced decision-makers. Newer decision-makers involved in the process would need to ask probing questions due to their lack of experience, which would help to both increase their own expert knowledge by learning from experienced venture capitalists and also to challenge any unquestioned assumptions that might be held by the veterans.

Another way we see limited hypothesis generation occur in the venture capital world takes place at the earliest parts of the evaluation process: the firm-specific and generic screens, as discussed earlier. North American venture capital firms have tended to stick more rigorously to industry- and geography-specific screens, where comparative research on European-based firms show that the latter tend to more regularly consider proposals from outside their designated screening criteria (Muzyka, Birley and Leleux, 1996). It may be possible that such screens help to reduce the front-end load of venture capitalists’ decision-making processes, but they may also screen out potential “winners” in the form of new ventures that lie just outside the screening criteria. A very simple organizational repair would be to take more time reviewing proposals in the screening process (since it was noted that this usually only takes a very brief

period of time). A more complex repair would be to track over time the successful ventures funded by other firms, deals that were just outside the principal firm's screening criteria, and taking this information into account when regularly updating or reviewing the principal firm's criteria.

6.2 – Data collection

The next main category we review looks at the collection of information. Particularly, the problems included: how samples of information collected are often smaller than necessary to make a good decision, how there was a tendency to ignore real data in favour of hypothesized data, and how only part of the real data would be collected.

With regards to small samples of information collected, one key area to investigate would be that research repeatedly found a strong reliance on referrals in the origination of proposals for venture capital funding (Tyebjee and Bruno, 1984; Fried and Hisrich, 1994). Those proposals not coming from trusted sources were not looked at as highly as those that came from referrals – if the former group were even considered at all. However, this is striking for two key reasons.

First, literature has shown that there is no particular advantage of serial entrepreneurs (those who are repeatedly starting and nurturing new ventures) where potential success of a new firm is concerned (Birley and Westhead 1993; Wright, Robbie and Ennew 1997; Westhead, Ucbasaran, and Wright 2005). That is, it has been shown that there is no correlation between previous entrepreneurial success and future entrepreneurial success. Drawing this connection, we can suggest that venture capitalists, too, fall prey to the ‘hot hands in basketball’ effect: their actions suggest a belief that previous success is an indicator of future success, despite both instances (entrepreneurial success) deviating in the same direction away from the expected average. While it is possible that previous success involves learning that can be valuable to the entrepreneurial process, and that venture capitalists see this learning as valuable and as a criteria that should be looked on favourably when choosing to invest, sharing the knowledge with venture capitalists that there is no distinct correlation between serial entrepreneurs and success may help them to re-evaluate this bias, serving as a basic cognitive repair.

With regards to small samples of information collected, we also find the strong reliance on referrals striking since research has shown repeatedly that venture capitalists can be just as flawed in their decision-making as any other non-experts (Zacharakis and Meyer, 1988; Zacharakis, Shepherd and

Baron, 2003). Remember, a large number of referrals that lead to deal acceptance come from other venture capitalists, especially those seeking co-investment opportunities for ventures they are considering (Tyebjee and Bruno, 1984; Shane and Stuart, 2002). Thus, one would assume that venture capitalists expect each other to be reliable referrals – and thus, able to make good decisions in referring a venture - though we know that they fall prey to errors just as any other experts do. Time pressures on venture capitalists can lead to such heuristics (Kunze, 1990), and it is likely that any number of previously explored biases (availability heuristic, self-serving bias) could be at play here.

Once again, a cognitive repair as simple as informing venture capitalists that their peers may not be the most reliable references might suffice. However, it has also been previously mentioned that venture capitalists tend to seek not only those references that are provided by the entrepreneur, but also seek out and check their own new references (MacMillan et al, 1985). Ensuring that venture capitalists do seek out these additional references, even when the initial references were others in the venture capital community, might serve as a reinforcement for good decision-making in this case.

We look at the next two areas pertaining to data collection simultaneously, as they could be closely related, as far as venture capitalists are concerned. Specifically, these two areas are: that individuals collect data that are biased, and individuals collect data based on pre-existing theories. That is, data that are biased, or that is believed to exist, are favoured over data that are empirically gathered. This ‘confirmation bias’ sees decision-makers seek out information that is known to be favourable to their intended outcome, rather than those expected or known to lead away from that outcome (Klayman and Ha, 1987).

Throughout the research on venture capital decision-making, we find repeated mention of intuitive or “gut-driven” decisions, prime examples of situations where empirical data are ignored in preference for internal data. In Fried and Hisrich’s (1994) study of the evaluation process, the researchers compiled a list of behaviours undertaken by venture capitalists reviewing investment proposals. Each behaviour was ranked based on the percentage of times that venture capitalists carried out this behaviour

during the review process (e.g. 100% of the time interview all members of the management team; 86% of the time investigate the market value of comparable companies). The list of highly-ranked behaviours displayed an overwhelming majority of actions that showed intuition-driven decision-making (e.g. meeting with the management team to get a “feel” for the persons involved, touring the facilities of the proposed venture, contacting current and potential customers for the venture, etc.) Similarly, the list of rarely-exercised behaviours showed that systematic data collection ranked much lower on the list. Interviewees reported that less than 40 percent of the time, they: conducted formal market research studies, carried out formal technical studies of the product, or performed in-depth library research. One would expect that such research be carried out routinely in the venture capital decision-making process, especially considering how it has been previously noted that both the product’s market and the product itself are important categories for decision-making criteria by VCs (MacMillan et al, 1985; Fried and Hisrich, 1994).

Once again, we can suspect that the availability bias is at play here. Venture capitalists have limited time and energy resources, and it is relatively easy to conduct sit-down meetings with entrepreneurial teams, or tour facilities belonging to potential investees (especially considering the number of technical firms that anecdotally start in the entrepreneurs’ garages or basements – how long would it take to tour these facilities?). Full-scale market research can be a much more time intensive process, as could full technical reviews of a product. However, while time and energy resources would appear to be in short supply, financial resources might be less of a constraint, considering that a “small” venture capital firm can control hundreds of millions of dollars for potential investments. One organizational repair would involve seeing venture capital firms more routinely use their financial resources to contract out the market research and technical inquiries. Given the high costs of venture failure, and high ratings of importance on understanding the market and product for a venture’s success, it is likely that making such studies more routine would serve as a beneficial organizational repair.

Once again addressing the tendency to favour hypothetical data over empirical data collection, we may find that the limited scope of target ventures considered in the early screening processes could serve as a potential area for cognitive repairs. The research we examined showed that most venture capital organizations applied filters when receiving new proposals for investment, looking at such dimensions as geographic scope, venture industry, or venture size.

Another reason to ensure that data collection uses empirical methods comes from the findings from one article reviewed, namely that entrepreneurs tend to misrepresent themselves and the capabilities of their team members to the venture capitalists during the decision-making process. This is admittedly somewhat understandable, though not necessarily excusable. Venture capital can be a high-stakes game, with anywhere from tens of thousands to tens of millions of dollars in initial funding alone riding on the decision to fund or not fund a new venture (Fried and Hisrich, 1994), not to mention any financial gains that would come from a successful venture or even from an Initial Public Offering (IPO) (remembering that venture capital funding has been cited as the single strongest determinant of success for an IPO (REF)). Having would-be entrepreneurs “put their best foot forward” during the evaluation process, then, might be understandable, whether or not it is an actual reflection of their capabilities to execute their business plan under pressure.

When suggesting a cognitive repair for this issue, we might begin by suggesting a more rigorous, empirically-driven review of the entrepreneur and their team. Evaluating based on a “gut feeling” can provide some valuable insight into a decision, but the due diligence should be exercised more fully when reviewing the leadership and management aspects of a potential enterprise. It is no surprise, then, that some venture capitalists do indeed take extra precautions when evaluating the entrepreneur and their team. Another potential cognitive repair would be to take such misleading representation into account, and later adjust accordingly. Here we can again draw on the analogy of a contractor promising to deliver home renovations both “on time” and “on budget,” while the actual home owners would add both expected costs and anticipated buffer time for project completion to their own estimations of the project.

When the project does indeed exceed cost and time expectations (as many such projects do, anecdotally), the homeowners will still be prepared.

6.3 – Drawing conclusions

The final category that we address looks at how decisions are actually made once hypotheses have been generated and data have been collected. Notably, this includes the tendency for individuals to weigh vivid evidence more heavily than statistical data when making decisions, use pre-existing theories to evaluate evidence (that is, not to search for or use theories that may be more appropriate to the context or nature of the decision being made), and display the use of the overconfidence bias.

First we look at how individuals tend to weigh vivid evidence more heavily when making decisions, even when more accurate statistical data may be available. Once again we find ourselves, when considering the behaviours of venture capitalists, to consider their intuitive decision-making habits. Personal stories from would-be entrepreneurs (or their customers, suppliers, or other references) have the potential to play a role in a vividness effect or availability bias, causing the stories to stand out amongst the other data regarding the investment decision.

Next, we look at the use of pre-existing theories to evaluate evidence, which can (among other difficulties) cause those making decisions to miss important data that do not fit with the models or theories they are using to evaluate a decision circumstance. This seems to correlate with the status quo bias, where new alternatives or methods are ignored in favour of the currently used ones, a bias that has tended to be prevalent in a majority of individuals (Samuelson and Zeckhauser, 1988).

Decision-making errors of this nature are somewhat understandable: for some organizations, to be continually revising the models that they use to evaluate their environment can be a costly and time-consuming activity. However, this sort of activity is crucial to the sustained activity of organizations in certain fields, and venture capitalists likely fall into this later category.

From the perspective of a venture capital firm, revisiting decision-making models would help to ensure that potential opportunities for investments are not missed. Organizations known generally as future technology search firms do exist, specializing in searching out and providing information about up-and-coming technologies that are forecasted to hold sway in the marketplace. A number of these

organizations offer services that specifically include a search for outliers – those new technologies or innovations that lie beyond the expected areas of growth activity, particularly technologies that have the potential to be widely disruptive to the system and serve as the first-of-their-kind innovations in new fields. To a venture capitalist, finding such new technologies yet unanticipated by the market (if they encompassed such factors as high potential for return, protectable technology, and other dimensions discussed earlier) could have the potential to be very successful investments for the firm.

Finally we look at the overconfidence bias, where decision-makers are more confident in their decisions than they should be. As was discussed previously, venture capitalists have been shown to fall prey to this bias when reviewing their investment decisions, with a full 96 percent of subjects in one study demonstrating a significant presence of this bias (Zacharakis and Shepherd, 2001). Venture capitalists not only demonstrated that they were subject to this bias, but that it negatively affected their decision-making.

In the paper that reviews overconfidence by venture capitalists, the authors go as far as to suggest their own corrections that would, if implemented, serve as cognitive repairs. These suggestions include a “counterfactual reasoning” exercise that essentially requires any venture capitalists currently considering investment decisions to justify their thoughts to a group, which forces counterfactual thoughts to be raised and addressed. They also suggested the use of a “scorecard” to track investment decisions, with the venture capitalists recording what they perceive as the rationale for decision-making *at the time the decision is made*, so that accurate records can be tracked and compared when later data come in on the success or failure of a particular investment. Finally, they note that actuarial decision aides – tools that decompose decisions into their various components and then optimally combine independent analyses to form a decision – may play a useful role in reducing the effects of the overconfidence bias (Zacharakis and Shepherd, 2001).

7.0 – Methodology

When deciding how to empirically investigate the issue of decision-making by venture capitalists, we return to the research question of “how could, or how do, cognitive repairs play a role in the decision-making process used by venture capitalists when evaluating a proposal for a new investment?” Thus, we would need to probe two key areas: first, where are places for potential decision-making errors by venture capitalists, and second, what (if any) mechanisms are already used that facilitate cognitive repairs by this group?

To empirically investigate these issues, a number of one-on-one interviews were carried out with both those working in venture capital firms and those working in companies that are closely related to venture capital firms in an advisory capacity. The companies in the latter category were those that helped entrepreneurs seeking funding to prepare for their ‘pitch’ to venture capital firms. Such firms primarily serve two purposes: to help the entrepreneurs be as prepared as possible before actually approaching a venture capital firm for funding, and to help the venture capital firms filter out funding proposals that were not appropriate or were inadequately prepared. As noted in section 3.3, the source of referral can be a major factor in a venture capitalists’ decision process, and such advisory firms derive their value from helping to increase the quality of such referrals for both those seeking and those providing the funding.

In all cases, the interviewees were senior-level decision-makers for their companies, being senior managing partners or higher in their firms. Interviews were carried out either over the telephone or, where time and resources permitted, in person. Open ended question formats were used throughout the interview process. A total of six interviews were carried out, and the primary source of interview referral was the Canadian Venture Capital Association. Interviewees were involved in firms that operated primarily in Canada, and operated on a variety of scopes of funding (different geographic targets, different venture stage targets, and different amounts of funding available).

It is important to note that, when interviewing subjects for this paper, the earlier warnings (as outlined in section 4.2.1) were taken into account, noting venture capitalists’ difficulties with post-hoc

reporting on their own internal decision processes. To help counter this problem, questions and discussion were steered towards decision-making mechanisms and processes that were tangible and verifiable. That is, questions or discussion that would answer such queries as “what are the important criteria that you use when evaluating a venture proposal?” were steered away from, in favour of discussion that followed along the lines of “Please tell me what happens next in the process: how is the next stage of the decision made? Who is involved in the process? Who oversees the decision-making results?” A more detailed list of such questions is included in Appendix A. However, a certain amount of post-hoc decision-making data were also presented by the interviewees, which will be discussed in the Findings section.

8.0 – Findings

One key finding was the repeated priority placed on the members of the entrepreneurial team as important to the decision-making processes. In all cases, meetings between the venture capital firm and the entrepreneurial team were seen as necessary and integral parts to the process. These meetings ranged from informal meetings to much longer processes involving rigorous due diligence processes. Interviewees consistently reported that the evaluation of the entrepreneurial team was a multi-faceted process: formal background and reference checks would be carried out as part of a due diligence process, and investigations as to the level of equity that the entrepreneurs had put into the venture themselves would also be evaluated. (The initial self-funding of a venture was seen as an important point by many venture capitalists. As one interviewee put it, “if there’s no skin in the game, there’s no deal.”) However, in addition to externally verifiable team evaluation criteria, the venture capitalists’ reviews also consistently relied on less-tangible qualities, such as “team chemistry” and “personal relationship skills.” A number of venture capitalists noted that the funding approval process was both more demanding and more difficult than many entrepreneurs had originally envisioned, and that as a result they got to experience firsthand how the entrepreneurial team reacted to both unpleasant surprises and increased demands on their time. Such ‘soft’ evaluations were consistently reported as playing a key role in the decision-making process. Another interviewee reported this as the desire to “be proud to tell other people that you’re working together” with the entrepreneur, relying on estimated beliefs about external perceptions of the deal members.

However, less ‘soft’ evaluations also appeared to play an important role. Both market and technological research were carried out in some instances, though by no means were these consistently reported by interviewees as a necessary part of every process. Due diligence was reported by all interviewees, though in some cases the primary due diligence seemed to centre around deal structuring – that is, the venture capitalists’ due diligence that any deal they enter into is structured in such a way that prevents the entrepreneur from abusing their funds or power, for example – rather than around due

diligence around investigating the background checks or core technology of the proposal itself. It was interesting to note that venture capitalists' perceptions of their peers' evaluation processes seemed to contain a marked degree of skepticism: a number of different interviewees complained that their peers' systematic evaluation processes were lacking – that is, that their peers would not take the time to rigorously carry out market research, do background checks, or use similar empirical tools -

It is important to note that deception – whether intentional or otherwise – was also reported to occasionally play a role in the venture capital process. This deception could come from both sides: either those seeking or those providing funding could engage in behaviours led to mislead the others. Primarily, this was reported as the entrepreneurs presenting information in such a way as to hopefully increase the likelihood of their being funded, or improving the situations by which they were funded. In one exemplary instance, an entrepreneur was reported to have requested a certain deadline for funding that would have led the venture capital firm to evaluate the prospect in a light that was uncharacteristically advantageous to the entrepreneur (evaluating their need for financing at an anticipated low point in their cash flow cycle, showing a greater than normal need for financial support). It is important to note that venture capitalists consistently reported that ethical behaviour by the entrepreneurs was held as important; in this particular case the venture capitalist firm broke off any further talks with the would-be funding recipient because of this behaviour. “We only found that because of one of our young bright analysts who came across the issue; as a result, all the other work was cast in a different light. Would we now have to spend how much time going through every other little detail of their proposal to look for other issues?”

However, deception was also admitted to play a role in the behaviours of some venture capitalists. The key issue focused around venture capitalists who mis-represented their experience and ability. As one interviewee put it, “the most overworked statement” coming from venture capitalists to would-be funding recipients is that “we are value-added investors.” Venture capital firms are often seen as providing more than financial value to the entrepreneurs, providing invaluable management experience

and wisdom to the growth of a venture. However, as was noted by a number of interviewees, the Canadian venture capital industry is widely populated with those who come from financial (investment, banking) backgrounds rather than entrepreneurial (leadership, operations or management) backgrounds. “Unless these venture capital firms have populated their teams with serial entrepreneurs,” one interviewee noted, the actual non-financial value that the VC firm brought to the deal would be limited. Some interviewees went as far as to note that the Canadian venture capital industry’s performance was meagre compared to the American industry, citing primarily this lack of entrepreneurial experience on the part of the VCs when evaluating proposals.

Aside from deceptions, numerous interviewees reported that decision-making errors can and would happen in the evaluation process. These appeared to be divided into two key types of errors: those that came about as a result of difficulties with forecasting or understanding external factors, and those that came about from judgment errors involving the evaluation of the proposal. The former centred around markets that tended to shift in ways that were unexpected at the time of the proposal evaluation: the “bursting of the tech bubble” or the situations involved in the current economic downturn were both commonly cited examples of such decision-frustrating factors. The latter type of errors (those involving poor judgments of the evaluation process) tended to be more diverse. In one case, a “honeymoon period” effect was reported, where both the entrepreneurial team and the venture capital firm were excited about the prospect of a successful venture in the early days of the relationship between the two groups, with “everybody wanting to put their best face forward and see everyone else in a positive light.” In others, the lack of in-depth analyses were cited: “we didn’t do enough in-depth technical research on the product, and it didn’t perform as well as we had expected that it would.”

9.0 – Analysis and Discussion

The above-listed findings are but a brief overview of representative comments and issues that were raised repeatedly in the interviews with those in the venture capital world. While a certain amount of systematic research and due diligence was reported by those evaluating proposals, it is important to note that there was also a sufficient quantity of ‘soft’ decision-making, as noted in the example of the evaluation of team characteristics. Most interviewees noted that intuitive decision-making did play a key role in such decisions, relying on the expertise embedded in those members of the venture capital firm evaluating the proposals. Such ‘soft’ decision-making could be seen as an area that leaves much room for decision-making error, warranting further investigation into the decision-making issues that can and do arise from such evaluations. As well, the current decline and poor performance of the Canadian venture capital industry was consistently reported, which could lead one to consider that the decision-making processes of those in the industry would want considerable improvement. Thus, there may be a case for an investigation into the implementation of cognitive repairs by Canadian venture capital firms, though it would prove a challenge to find ways that such

10.0 - Limitations of this paper

While a certain amount of ground has been covered in synthesizing a number of diverse fields of research, this paper is not without its limitations. We look at the relatively small amount of empirical investigation as one key limitation (with only six interviewees taking part in the initial research), and also consider problems caused by the complexity of human decision-making, and potential barriers to the actual adoption of such suggestions contained herein.

Primarily, one limitation of this paper is the relatively small number of interviewees involved in the empirical research. However, these initial interviews showed that the question of decision-making by venture capitalists needed to be carried out both more broadly and more deeply, with many interviewees also noting the importance of such research. In a number of examples, the interviewees invited the researcher to discussions that were in considerably greater depth than these initial interviews, and provided other contacts for potential interviewees in order to expand the scope and size of the research. However, further challenges would present themselves in attempting this research, as discussed in the section immediately below, “Suggestions for Further Research.”

Another key limitation arises from the sheer complexity of decision-making problems that human beings can encounter. As suggested by one body of this research, a category of primary importance to the decision-making process involves the characteristics of the entrepreneurial team. Fields as diverse as psychology, sociology and economics have worked for centuries in an attempt to shed light on human behaviour and decision-making, and creating cognitive repairs that appropriately probe not only the specific decision-making biases but also suggest proper remedies would certainly be a complex issue. For example, one cited work notes that cognitive repairs, while attempting to improve one part of the decision-making process, runs in danger of frustrating other parts of that same process (Heath, Larrick and Klayman, 1998).

Next, as mentioned earlier, quite often there are many competitive demands for venture capitalists' time (Kunze, 1990). In dealing with this time crunch, decision-making heuristics can be seen

not only as a necessary evil, but as ones that are necessary though not necessarily evil. That is, venture capitalists seem to be aware not only that they use decision-making shortcuts, but also that those shortcuts can pose potential limitations on their decision-making, and these limitations are seen as inevitable by some venture capitalists (Levie and Gimmon, 2008). To adopt any such cognitive repairs, venture capitalists would likely have to be convinced that they result in a positive net benefit in the trade-off of time versus decision-making improvement, a claim would be difficult to provide empirical support without substantial research backing it.

11.0 - Suggestions for further research

However, it is possible that such research could be partly expedited by a method that focuses not on post-hoc interviews that probe venture capitalists' recollections of their internal, previously-used decision-making criteria, but rather through an interview format that focuses primarily on decision-making processes and tools that are externally-verifiable. Such processes and tools could include evaluation review protocol used by the venture capital firm, the presence of meetings where decision-makers must defend their thinking to others, or the use of outside experts for review processes. In other words, looking at such externally-verifiable pieces would address, in part, the difficulties that arise from trying to peer into the 'black box' that is venture capitalists' recollections of their own decision criteria.

Should such work on cognitive repairs prove fruitful, it is likely that it could be replicated in other similar fields. For example, we noted earlier a number of distinctions between business angels and venture capitalists, with the former being a group that could be studied in light of the suggestions in this paper. Publicly-funded venture capital sources could also be investigated, as has been distinguished in some previous research (Bachher and Guild, 1996).

As well, the research could be expanded to cover the decision-making by groups such as philanthropic bodies, which contribute billions of dollars annually to the economy in North America through funding both for-profit or not-for-profit organizations. As with venture capital, philanthropic organizations have processes in place for evaluating proposals from ventures that seek from thousands to tens of millions of dollars, though there are marked differences between the two fields (notably, that venture capitalists expect financial returns on their investment – sizeable ones, at that – while philanthropic organizations do not usually subject their grantees to providing financial returns, but rather expect demonstrations of social returns that are in line with the grantees' missions.)

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