

**TOWARD AN EXPERT ASSESSMENT OF INTANGIBLES IN  
TECHNOLOGY-BASED NEW VENTURES**

by

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## **Abstract**

This dissertation documents three initial phases of an investigation into intangible aspects of new ventures. The assessment of intangibles, which are often present in start-ups, is a topic of recent interest (Stewart 1997, Clement, Hammerer and Schwarz 1998, Shepherd and Douglas 1999, Sullivan 1999, Smart 1999, Boulton et al 2000), particularly during the early-stage investment-decision process of technology-based ventures. On one hand, investors are challenged to properly assess new opportunities. At the same time, entrepreneurs or innovators face the formidable task of communicating what is, sometimes, nothing more than just an “extraordinary” idea. In such situations, the decision to continue with the due diligence process, and finally to invest, is based frequently on those aspects that are intangible.

Phase I of the research was a pilot study to elicit vocabulary from investors and determine their need to assess intangibles. A group of twelve investment-decision experts were interviewed. The interviews were content analysed. The results of the content analysis suggest that there is a need on the part of both investors and entrepreneurs to improve their assessment of intangibles when making an investment decision.

Phase II used Repertory Grid, a technique based on personal construct psychology, to identify intangibles used by experts when assessing or communicating new venture opportunities. Five venture capitalists and five entrepreneurs were interviewed. The results reveal a total of 149 constructs. Principal component analyses

indicate that each interviewee identified only a few major areas of emphasis in his or her thinking. Furthermore, a cluster analysis revealed that each investor had his or her own way of conceiving the intangibles in a given proposal. Next, an extremity analysis identified each person's most meaningful constructs. As a result of these analyses, the operation of intangibles during the investment-decision process is evident. From this phase, what is remarkable is the contribution of Repertory Grid technique to identify intangibles assessed by investors and communicated by entrepreneurs.

Phase III involved the development of a fuzzy expert system as a diagnostic tool to assess intangibles in new technology-based ventures. The system was validated with five experts in investment-decision making. The results show a promising future of this tool when used for assisting entrepreneurs and investors to assess venture viability. Finally, the results of this research could also open the door for this technique to be applied in other areas such as: scientific proposals, requisition of grants, and assessment of employment candidates.

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## **Dedication**

Con todo mi amor para Geral, Maria, Ana Lucía, Andrea de Jesús, y Amalia.



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**“We know more than we can tell and we can know nothing without relying upon those things which we may not be able to tell.”**

**-Michael Polanyi**

## **Chapter 1**

### **Introduction**

The objective of this research is to articulate additional assessment criteria for technology-based ventures. As a result, this study is aimed to help not only investors to assess some of the new demands but also entrepreneurs to describe such new exigencies.

We are living in a new economy. Nowadays, technology-based new ventures are urged to survive in an economy largely dependent on sophisticated technology, sparking innovation and a constantly changing environment. In this new setting, information from new ventures is difficult to obtain and interpret. As suggested by Beck (1992), the core of this new economy is formed by small technology-based ventures whose key assets are intangible.

Small businesses are making a significant contribution to the global new economy. In Canada, for example, small businesses (firms with fewer than 50 employees) account for 97 per cent of all businesses and in the United States, 94 per cent of all technology-based ventures are small businesses (Pohlmann, 1998). The US Office of Economic Research reported that small businesses contribute 47 per cent of all sales, are

responsible for 51 per cent of the private gross domestic product, produce 55 per cent of all innovations, and obtain more patents per sales dollar than large US firms (SBA, 1997).

Stewart (1995), elaborated some of the factors for the increase in number of technology-based new ventures:

1. The way in which businesses operate and function has been changed by the information age.
2. Geographic location and firm size is not longer a limitation due to computers and telecommunications.
3. Globalisation is breaking down barriers to doing business across borders.
4. Technology is driving the creation of new products and services.
5. The Internet and its commercial acceptance have created a new platform for communications and a medium for transacting business through electronic commerce.

As reported by Groupe Secor (1998), knowledge-based ventures, a subset of small businesses, are considered as being major wealth creators in the new economy. In these ventures, the development, possession and application of knowledge are central to the production of particular goods and services. These ventures depend largely on knowledge derived from innovative science and technology for their core products, and most important, they offer high growth potential. These small knowledge-based businesses, generally referred to as technology-based ventures, are the focus of this research. In this

study, technology-based ventures are considered to be a subset of knowledge-based businesses.

Abernathy and Clark (1985), refer to the causal chain of innovation as the process, which moves from the development of ideas, to the creation of entrepreneurial technology-based ventures, to the commercialisation of products or services in new industries. Moreover, the commercialisation of ideas is the key to the management of technological innovation, which is the author's area of research. This thesis focuses on part of the causal chain of innovation: the appraisal of worthiness in new technology-based ventures during their early stages of financing.

### **1.1 Working definitions**

In this thesis, when the term "venture" is used as the unit of analysis, it will refer to companies, which are new and small, as opposed to established and large. This study is focused on technology-based ventures as a subset of small companies. As defined by Guild and Bachher (1996), technology-based ventures are "those companies intending to commercialise a technology for the first time and thereby expecting to derive a significant source of sustainable competitive advantage from the technology." What is considered an intangible aspect of such a venture is one that cannot be readily perceived or is not easily appraised at an actual or approximate value. Examples of intangible aspects are knowledge, intellectual capital, skills, abilities, beliefs, and ideas, among others (Bachher, Díaz de León, and Guild, 2000).

Professional venture capital is defined as funding provided by firms of full-time professionals, known as venture capitalist, who invest alongside management in young, rapidly growing or changing ventures that may have the potential to develop into significant competitors in large, rapidly growing markets (NVCA, 1999). The invested capital, or equity, includes the cash invested by founders plus any retained earnings generated by the venture. It is often the intent of the investors to develop the venture to the point where they can exit their investment; an example of an exit strategy is through an initial public offering (IPO). As described by Fenn, Liang and Prowse (1995), professionally managed venture capital firms generally are private partnerships or closely held corporations funded by limited partners that includes private and public pension funds, endowment funds, foundations, corporations, wealthy individuals, foreign investors and the venture capitalists themselves.

Entrepreneurs who are just starting out typically have very different needs from those who are already established and ready to expand their ventures. Many investors have found that their own skills are better suited to helping one type of venture than another. The early stages include seed, research and development, start-up and first stage financing (Pratt's Guide to Venture Capital Sources, 1995). At these stages, the technology-based ventures thought to have a high proportion of intangible or knowledge-based assets (Stewart, 1995). As a result, venture capitalists find it challenging to make investment decisions and estimate the potential return and risk. This lack of concrete data



or assets may help to explain the difficulty faced by early-stage technology-based ventures in obtaining financing from investors (Groupe Secor, 1998).

It is a working assumption of this study that, while there may be no shortage of ideas or capital, there is a shortage of people (entrepreneurs and investors) with the know-how to articulate hidden strengths and thereby build technology-based new ventures into successful companies (Bygrave and Timmons, 1992).

## **1.2 Research rationale**

When potential investors assess a business plan, they often attempt to focus on its financial attributes such as the proposed balance sheet and predicted cash flows. However, these financial indicators only approximate and do not reflect accurately all the possibilities for success that technology-based ventures frequently offer. Therefore, analyses based on traditional assessment often lead to the rejection of viable technology-based ventures (false negatives from the appraisal process).

Technology-based new ventures often start out with little more than a skeleton staff and personal computer. As described by Roberts (1990), many more begin with only the entrepreneur's knowledge and passion as inventory. Stewart (1995) describes this more succinctly as "the intangible assets in technology-based ventures may literally walk out at the end of the day." These ventures have little or no history or track record, and no tangible assets ("bricks and mortar," real property, plant and machinery). Consequently,

competitive advantage relies on the skills and experience of employees, knowledge bases, and the expertise of others such as suppliers, distributors, lawyers, accountants, and advertising agents (Hall, 1992).

This research is aimed to answer the following question: How might the traditional assessment be augmented to include “soft” estimates of venture viability? In other words, how best to assess and communicate intangibles when evaluating investment proposals? Recently, some authors have argued that companies should strive to achieve success through the development of skills and expertise for the creation of knowledge (Nonaka and Konno, 1998). This knowledge factor is difficult to estimate through a typical business plan, and it is further challenging to describe within a new technology-based venture. In order to contribute in this domain of expertise, this research shows an innovative approach to expert knowledge elicitation, one that can yield emerging investment criteria useful for assessing new ventures.

### **1.3 Research method**

This research describes a method to respond to some of the current demands placed on business plans for new technology-based ventures. The study consisted of four main steps:

- 1) To elicit from expert investors their articulation of how they assess business plans for new technology-based ventures.

2) To identify additional intrinsic characteristics of new technology-based ventures and hopefully enhance the current investment decision-making process.

3) To explore a suitable method such as fuzzy logic to incorporate intangibles and thereby facilitate the investment decision-making process for new technology-based ventures.

4) To validate the results obtained from previous stages.

#### **1.4 Research objectives**

The study presented in this thesis consists of the following objectives:

First, to investigate the current need of assessing and communicating intangibles of investment opportunities. The author explored this question through a set of 12 interviews with investors and entrepreneurs in Canada.

Second, to extract some implicit aspects of decision-making criteria used by two different experts:

- Expert investors, who specialise in assessing business plans for new technology-based ventures,

- Expert entrepreneurs, who have been successful at communicating an idea through a business plan.

To this end, personal construct theory (Kelly, 1955) was applied through a set of ten in-depth interviews following the Repertory Grid technique.

Finally, a third research objective is to explore the application of fuzzy logic (Zadeh, 1965) as a tool for assisting the evaluation of intangibles in new technology-based ventures. A concept demonstration system was developed and validated with five venture capitalists.

The application of fuzzy set theory proved to be a suitable approach when dealing with approximate or uncertain information. This method, also known as fuzzy logic, offers some useful insight for incorporating expert opinion into decisions through representations of linguistic logic. For a more detailed explanation on fuzzy set theory, please refer to Appendix A.

## **1.5 Thesis organisation**

This thesis is organised to describe the research carried out in this study. Chapter two summarises important literature in areas such as investment decision-making, technology-based ventures, elicitation of knowledge and expertise, and fuzzy set theory. It also includes a summary of previous studies in these areas of research. Chapter three

describes the methods and analytic techniques used to obtain results from the three stages of this study. The results obtained in each of the stages are summarised in Chapter four. Chapter five concludes the thesis with a discussion of the results. Chapter six includes some ideas for future research.

**“Teaching and the imparting of knowledge makes sense in an unchanging environment. But if there is one truth about modern man it is that he lives in an environment that is continually changing. The only man who is educated is the man who has learned how to learn... How to adapt and change... Who has learned that no knowledge is secure, that only the process of seeking knowledge gives a basis for security.”**

**--Carl Rogers**

## **Chapter 2**

### **Literature review**

Investment decision-making in the venture capital arena has been researched for more than 25 years. During this time, many studies have been carried out with the main focus of understanding how investors assess investment opportunities. For example, some researchers have aimed to describe the decision-making process used by investors (Wells, 1974; Tyebjee and Bruno, 1984; Silver, 1985; Hall, 1989; Fried and Hisrich, 1994). Other researchers have focused in identifying the decision-making criteria used by investors (Poindexter, 1976; MacMillan, Siegel, and SubbaNarasimha, 1985; MacMillan, Zemann, SubbaNarasimha, 1987; Robinson. 1987; Timmons et al., 1987; Hall and Hofer, 1993; Bachher, 1994; Knight, 1994; Zacharakis and Meyer, 1998; Bachher, 2000).

The decision to invest in a technology-based new venture, however, continues to be a challenging task due to the intangible nature of some of the assets of these ventures.

It is not surprising then that the assessment of intangibles is an important factor of recent interest. In fact, as suggested by Stewart (1997), Shepherd and Douglas (1999), Sullivan (1999), and Smart (1999), traditional approaches to financial assessment based on concrete aspects are perceived as less and less reliable and relevant. Correspondingly, there is an increasing interest in the proper assessment and communication of intangible aspects. This occurs largely because of the evolution towards a knowledge-based economy, one in which intangible factors play a greater role. Stewart (1997), for example, highlighted the importance of intellectual capital. He argued that “knowledge has become the primary ingredient of what we make, do, buy, and sell.” As a result, he pointed out, “managing it – finding and growing intellectual capital, storing it, selling it, sharing it – has become the most important economic task of individuals, businesses, and nations.” Beyond a national perspective, Pope John Paul II affirmed the increasing significance of “know-how, technology, and skill” in his 1991 encyclical *Centesimus Annus*, writing, “Whereas at one time the decisive factor of production was the land, and later capital... today the decisive factor is increasingly man himself, that is, his knowledge.”

When potential investors assess a business plan, they usually would like to focus on such concrete attributes as the proposed balance sheet and predicted cash flows. However, these financial indicators do not accurately reflect all the possibilities for success that technology-based ventures frequently offer. The results of such traditional assessments often lead to the rejection of potentially viable technology-based ventures. However, when evaluating these investment opportunities, expert analysts frequently face

approximate or soft data, often presented using linguistic terms. For instance, a business plan for a state-of-the-art technology could mention a “very attractive market opportunity” with the remaining, almost impossible, task of communicating the size of such market. In fact, entrepreneurs often present only subjective and qualitative evaluations through their business plan, estimates that lie at the heart of the decision to be made. This is particularly the case for new technology-based ventures in their early stages. In many such ventures, the investment opportunity consists of an idea presented by a team of energetic innovators who are convinced implicitly of its value. There is no convincing explicit balance sheet or predicted cash flow.

Assessing intangibles is thus a challenging task for investors. Although no prior research exists to suggest venture capital “accuracy rates” when assessing intangibles, anecdotal evidence confirms that this is a most troublesome factor to assess accurately (Dubini 1989, Harvey and Lusch 1995). Kozmetsky et al. (1985: 5) described this problem succinctly: “The talent criteria [intangibles], perhaps the most important quality a venture capitalist looks for in a portfolio company, is also one of the most difficult areas to assess.” David Gladstone (1988: 30), when president of a public venture capital firm, reported: “The problem with the venture capital business is that when we analyse people, our perceptions of others are usually wrong.” Smart (1999) corroborated this finding with the results of his study. He found that venture capitalists fail to achieve an accurate human capital valuation in 57 per cent of the deals. That is, investors experience significant surprises in their assessment of intangibles over half of the time. There is definitely a need for an accurate method to elicit and measure some of the intangibles in



business plans. Indeed, one of the industrial sponsors of this research offered a statement at the outset: “Knowledge-based companies represent this country’s best chance to create high-wage jobs, build exports and add wealth...yet they often have difficulty getting funding because their assets are intangible, consisting of people’s ideas and innovations” Holger Kluge, CIBC President, 1995.

## **2.1 Repertory Grid**

A review of the literature suggests that Repertory Grid might be a valuable tool for eliciting intuitions and personal experience (Ford et al. 1990; Hisrich and Jankowicz, 1990). Stewart and Stewart (1982), allude to it as a technique that appears to offer a highly relevant framework and methodology for mapping the decisions that investors have made in the past—decisions which, consciously or unconsciously, will affect their perceptions and judgements in the future.

Hisrich and Jankowicz (1990) used Repertory Grid technique to study intuition in venture capital decisions. Their study was not particularly focused on technology-based ventures nor did it address intangible aspects. However, they found that some aspects of the investment decision used by venture capitalists have been researched less, in particular the nature and extent of decisions involving intuition, “personal chemistry,” or “gut feeling.” They emphasised not only the content of venture capitalists’ constructs—what they actually say about the proposals used—but also the way investors concretise their intuitions about a typical proposal.

### 2.1.1 Personal construct theory

Repertory Grid is a technique developed by George Kelly (1955) based on the rationale that people assign significance to all phenomena utilising their own construct system. Kelly wanted to develop an investigative technique that would remove the influence of the investigator's frame of reference on what was observed. Also, he was interested in a method that would enable him to make precise statements—and confident predictions—about the behaviour of individual people.

With these concerns in mind, Kelly (1955) developed his theory of personal constructs over several years. Kelly's theory rests on the assumption that people are actively engaged in making sense of, and extending, their experience. According to Kelly, the degree to which we understand others—or ourselves—is measured by the extent to which we understand how people make sense of their experience. The system of hypotheses which we begin evolving at birth, and which continues to grow until death, is not like a filing cabinet; rather Kelly says it is more like a pair of spectacles, through which you get information, but which also condition what you see and how you see it. Kelly described this as the 'construct system,' because the word 'construct' carries with it both the sense of having been constructed or developed from experience, and the sense of being that through which we construe—or see and interpret—the world.

The term “personal construct” in Kelly’s theory refers to the set of models, hypotheses, or representations that each person has made about his or her world. Kelly invented Repertory Grid interviewing as a way of getting people to reveal their own personal models. In other words, Kelly (1955) argued that people actively interpret the events around them, and their behaviour needs to be understood in terms of personally construed ideas and explanations of how the world works. Furthermore, Kelly suggested that people should not be victims of their biographical history because the ways in which they see the world are open to alternative interpretations or constructions. In this sense, people have a choice to revise their formerly held assumptions actively.

To illustrate this point, Kelly (1955) created a metaphor “man is a scientist” (p.4). The scientist’s ultimate goal was seen in the prediction and control of the universe. To this end, the scientist creates working hypotheses, which are then tested via experiment. If a hypothesis fails to predict or explain the actual outcome, the scientist will alter the initial hypothesis in light of the recently obtained evidence. Then this new hypothesis will be tested again, and should it be verified by empirical assessment, the hypothesis will be considered valid for as long as it continues to predict new outcomes accurately. The scientist will, therefore, continuously revise the hypotheses in the general direction of increased predictive validity. Kelly argued that people, like scientists, seek to predict and control the course of events with which they are involved. While people live in an objective reality, they make sense of this reality through subjective interpretations of what happens to them.

Kelly (1955, p. 46) argued that it is a fundamental postulate of personal construct psychology that “a person’s processes are psychologically channelled by the ways in which he anticipates events.” Kelly emphasized that the wording for the fundamental postulate was carefully selected, since it was to state the most basic premise on which the theory of personal constructs was built. From this basic postulate Kelly derived eleven propositions or corollaries, which can be grouped into three categories. Four corollaries refer to the process of construing (construction corollary, experience corollary, choice corollary, and modulation corollary), another four to the structure of construct systems (dichotomy corollary, organisation corollary, fragmentation corollary, and range corollary), and three to the social context of construing (individuality corollary, commonality corollary and sociality corollary).

## **2.2 Expertise theory**

The expertise literature is concerned with identifying differences in the cognitive structures of novices and experts with the goal of understanding the development and nature of expertise. Cognitive science research, for example, on the phenomenon of expertise shows that novices and experts differ along three important dimensions. These dimensions can be referred to as procedural knowledge, declarative knowledge, and contextual or situational knowledge (Glaser and Chi, 1988).

Procedural knowledge is used in problem-solving situations. It is knowledge about certain actions or manipulations that help the problem solver make transitions from

one problem state to the next. Experts and novices were shown to differ in the strategies they use to solve problems (Frederiksen, 1984).

As described by De Jong and Ferguson-Hessler (1993), contextual or situational knowledge refers to problem situations as they typically appear in a particular domain of experience. Situational or conditional knowledge helps the problem solver create a more accurate representation of the problem by focusing perception directly to the main features of the problem. Once these have been identified the problem solver can draw on his or her procedural knowledge to solve the problem.

Experts, then, gain procedural knowledge within a particular domain or context. From a constructivist perspective, experts acquire their expertise, to a large extent, through personal experiences. However, as described by Adams-Webber (1995), experts find difficulty in communicating this knowledge, even though it is imperative for their competence. It shares, therefore, some features with Polanyi's (1966) concept of "tacit knowledge." Tacit knowledge is personal knowledge that leads to an understanding of a situation or problem, by relying on an awareness of the particulars of the situation without being able to articulate these. Polanyi (1966) suggested that a person has knowledge of these particulars only in a sense that they lead him or her to attend their consequences or meaning. While the person is able to specify their meaning, the knowledge of the particulars themselves remains tacit.

Declarative knowledge, or conceptual knowledge, on the other hand, is knowledge that can be articulated by experts. As qualified by De Jong and Ferguson-Hessler (1993) it is “static” knowledge and is based on facts and principles relevant for a particular domain. Declarative knowledge adds to the problem solving process in that it provides meaningful information in terms of laws or principles to be followed. Nonaka and Takeuchi (1995) refer to this kind of knowledge as explicit.

Kelly (1955) assumed that as people gain more varied experiences, the structure of their construct systems would change so as to make more accurate predictions. With regard to both investors’ and entrepreneurs’ constructions about investment opportunities, the experience corollary suggests that people with varied experiences in the investment decision-making profession will have developed more functional, effective, and efficient constructions about detecting successful investment opportunities than their more inexperienced colleagues.

As described by Ford et al. (1990), genuine expertise is more than the successful accumulation of “book knowledge.” This seems to be the case in most interesting domains, for example, in the assessment or communication of investment proposals. In fact, much of an expert’s unique collection of knowledge and skills are of his or her own construction. In other words, human experts acquire their expertise not only from explicit knowledge such as that found in textbooks (i.e. widely shared consensual beliefs), but also from personal experience. Consequently, they construct a repertory of working

hypotheses or “rules of thumb,” that, combined with their fund of book knowledge, make them expert practitioners (Agnew and Brown, 1989).

Several studies have reported that when domain experts are asked to explain how they have reached a given conclusion, they often construct plausible lines of reasoning that have little or no relevance to their actual problem-solving methods (Johnson, 1983; Ford et al. 1990). As described by Waterman (1986), the more competent domain experts become, the less they are able to describe the knowledge they use to solve problems. Thus, the greater their expertise, the more the experts’ schemata or construct systems can deviate from those of typical practitioners. As a consequence, experts may not be able to verbalise the incremental knowledge responsible for their evolution. One possible explanation of this problem is the lack of a shared method for expressing it. In other words, each expert has developed a unique collection of functional, but fallible hypotheses (i.e., a personal construct system). In some important respects, these hypotheses do not coincide with publicly available domain knowledge, making it difficult to state explicitly (Bradshaw, Ford and Adams-Webber, 1993). But perhaps herein lies the most significant facet of expertise.

From this perspective, Repertory Grid seems to be a tool able to bring the experts’ self-constructed knowledge to the surface—making explicit the valuable heuristic knowledge that experts possess but are frequently unable to articulate.

This study thus explored the possibility of using the Repertory Grid technique to enhance traditional methods for the assessment of business plans. That is, it includes estimates of venture viability assessed by expert practitioners. In other words, by eliciting experts' knowledge and incorporating it in the decision process we will hopefully increase the predictive validity of success for new ventures. For instance, the assessment of investment opportunities seems limited by the inability to communicate those aspects that are intangible. The study assumed that, to enhance our understanding of this process, we should observe not only an investor's perspective but also the expertise of those who have been successful in transmitting the value of a new idea. Thus, it considered two kinds of experts: expert investors and expert entrepreneurs.

#### 2.2.1 Venture capitalists and entrepreneurs

Venture capitalists are considered experts in new venturing financing (Zacharakis and Meyer, 1998). In our study, we selected these experts from a group of venture capitalists investing in technology-based ventures in Canada. Professional venture capital is defined as the funding provided by firms of such full-time professionals. One of their objectives is to invest alongside management in new, rapidly growing or changing ventures that have the potential to develop into significant competitors in global markets.

As discussed by Timmons and Sapienza (1992), the successful development of a business can be critically impacted by the interaction of the involved venture capitalists with the management team. Interestingly, venture-capital backed start-ups have been



found to achieve a higher survival rate than non-venture-capital backed business (Zacharakis and Meyer, 1998). The expertise of venture capitalists derives from the number of business plans and proposals they usually assess, sometimes one hundred or more a month, from which they typically invest in only one to three (Timmons, 1994).

This study also includes a second group of experts, successful “high-tech” entrepreneurs in Canada. Their expertise is based on their experience of successfully launching a technology-based venture. The importance of such experts comes from the complementary knowledge that they incorporate into understanding some of the current demands placed on business plans for new technology-based ventures.

### **2.3 Reliability, significance, and validity of Repertory Grids**

Considering the broad application of different forms of Repertory Grids to different domains of human expertise, it becomes obvious that the question regarding the validity and the reliability of Repertory Grids cannot be answered (Bannister and Fransella, 1986). As mentioned by Smith and Stewart (1977), from a methodological viewpoint, it is doubtful if concepts of reliability and validity can be applied to ideographic uses of the grid. Kelly himself referred to “reliability” (specifically test-retest) of the grid as a measure of how much the person has failed to develop since the last time (Ryle, 1975). Slater (1976) illustrates this concept with a convincing argument, “the reliability and significance of a grid cannot be investigated by the methods used for a battery of tests given to a group of subjects.” He elaborates, “The reason is that the theory

from which psychometric methods for measuring reliability and significance are derived assumes that samples can be drawn at random from an objectively defined population. The assumption can be satisfied by the nomothetic [actual] data in a table of test scores but not by the ideographic data of a grid.” Slater further argues that to assess the significance of a grid, one should test the null hypothesis by asking this question, “What is the probability that I would obtain these results by chance alone?” As a step towards answering this question, he produced the program GRANNY, which generates random numbers for grids of any specified size. For example, one hundred 10 x 10 random grids had a first component accounting for an average of 30 per cent of the variance (standard deviation 0.0635). Thus, a 10 x 10 experimental grid whose first component accounts for more than twice this percentage of the variation is almost certainly not random and almost certainly has some additional significance. Such is the case with all our experimental results (see Table 4.4). Notwithstanding these very persuasive arguments, some researchers have attempted to assess reliability and validity of the grid in conventional terms. For example, Epting (1975) obtained test-retest reliabilities of grids in three areas of 0.65, 0.62 and 0.64.

Fransella and Bannister (1977) also provide a detailed consideration of reliability. They argue, “If we consider forms of grid to be attempts to enquire into a person’s construct system then under what circumstances would we expect stability or change?” They conclude, “We should look to the grid not to repeat the same result but to see, when it shows change, what it is signifying. In short, reliability is perhaps best seen as merely one aspect of validity.”

The validity of the grid itself is also complex to assess. With respect to construct validity, however, there is considerable evidence in the literature that the results obtained from Repertory Grid studies are consistent with the assumptions underlying personal construct theory (Adams-Weber, 1979). Perhaps more relevant to the topic of this study is the research related to measuring predictive validity of grids in management studies. Bender (1976) reports a study in which grids were used to predict the behaviour of certain men towards other people. These predictions were then validated against their wives' reports of actual behaviour towards the same people. The results were highly significant ( $p = 0.00006$ ). Fransella and Bannister (1967) attempted to forecast voting preferences from the results of a grid with ten people known to the subjects as elements. Five hypotheses were tested, and the authors concluded, "The Repertory Grid has both concurrent and predictive validity when used as a measure of political construing."

#### **2.4 Fuzzy set theory**

The Repertory Grid methodology has evolved in the light of application experience and now has major differences from that described by Kelly (1955). For example, Shaw (1980) took advantage of the processing power and interactivity of computers to introduce on-line analysis and feedback to the person from whom the grid was being elicited. In expert systems terms, this feedback can be seen as highlighting correlations that might be spurious and lead to incorrect rules in later analysis. Shaw and

Gaines (1986) introduced new forms of analysis of the Repertory Grid based on fuzzy set theory, which became the basis of rule extraction.

Fuzzy set theory, or fuzzy logic, first proposed by Zadeh (1965), represents an attempt to construct a conceptual framework for the systemic treatment of vagueness and uncertainty both qualitatively and quantitatively (see Appendix A). When Zadeh (1965) introduced the notion of a “fuzzy set,” his primary objective was to set up a formal framework for the representation and management of vague and uncertain knowledge. More than 20 years passed until fuzzy systems became established in industrial and social applications to a larger extent. In the social sciences, fuzzy logic was first applied to the problem of social choice and self-organisation in the mid 1970's (Dimitrov, 1976). Díaz de León (1997) used fuzzy logic to design an expert system that provides guidelines for the creation of a multimedia document. His results provide evidence of the ability of fuzzy expert systems to provide an effective framework when merging different domains of expertise. In the present study the author used fuzzy logic to merge the expertise provided by investors and entrepreneurs when assessing and communicating investment opportunities of technology-based new ventures.

Moreover, fuzzy logic is suited to studying “subtleties” in social systems because of its ability to:

- Deal with vague, ambiguous and uncertain qualitative ideas and judgements
- Concentrate on paradoxical and enigmatic aspects of decision situations

- Focus on the margins of any decision making “space”
- Appreciate the uniqueness in any decision-making act.

Also, fuzzy logic provides an alternative way of understanding uncertainty. From this new way of understanding can be derived innovative approaches and strategies for working with the uncertainty that so often characterises social systems. This is the case in investment-decision making, where information is scarce, ambiguous and incomplete.

#### 2.4.1 Fuzzy vs. specific or crisp logic

The process of articulating a new idea, describing the concept for a new product, or explaining the notion of a new service, is frequently a challenging one. The innovator who tries to bring about a new concept often recurs to the use of expressions, analogies, anecdotes and metaphors.

Fuzzy set theory, especially its ability to accommodate multi-valued logic, is a powerful theory for dealing with the area of linguistic logic (Novak, 1995). Linguistic logic treats the use of natural language in human thinking, recognizing that human inference depends heavily on the structure of natural languages. As discussed by Novak (1995), this connection with classical linguistics is an area of ongoing research, and is one of the most complex questions in fuzzy set theory.

As is often the case with realistic decision problems, it may be difficult to perform measurements on specific (crisp) variables (Fedrizzi, Fedrizzi, and Ostasiewicz, 1993). This may be due to the complexity of the problem under consideration, as well as the possible lack of any known measurement procedure. These problems may be dealt with by the application of linguistic values, which express the intensity of these variables. These linguistic expressions may then be represented as fuzzy numbers.

In linguistic logic, a fuzzy set membership is described in terms of linguistic qualifiers. Examples of these qualifiers are: highly, very, and somewhat. For example, membership in the set of entrepreneurs who are innovative could be described in terms of highly innovative, very innovative, or somewhat innovative. By treating a variable linguistically, the values of that variable can be generalized by a linguistic label. Moreover, linguistic variables present a major advantage: they are much easier for humans to express, and as a result have been instrumental in the increasing use and commercialisation of fuzzy set theory (Dutta, 1993).

#### 2.4.2 Fuzzy vs. conventional expert systems

Fuzzy set theory is particularly useful when the problem domain is too complex to be modelled precisely with the application of conventional techniques. Fuzzy set systems can be used to model any continuous system, and in some instances it has been found that fuzzy models are more useful and accurate than conventional mathematical models (Dutta, 1993; Kosko and Isaka, 1993). One of the most significant differences between

fuzzy and conventional modelling of systems is that fuzzy models permit the use of heuristic rules and linguistic variables (Dutta, 1993).

Business applications of fuzzy set theory have been primarily focused on its application to rule-based systems, leading to the development of fuzzy-expert systems (Hruschka, 1988; Kosko and Isaka, 1993). This has generally consisted of modifying the If - Then statements of the rule base with fuzzy linguistic variables, resulting in a system with much greater adaptability and robustness than traditional expert systems (Ditta, 1993).

#### 2.4.3 Fuzzy systems vs. case-based reasoning systems

During the course of this research, the following question came to mind: Are investors “matching the case” when assessing new investment opportunities? This proposition suggests that investors compare new investment opportunities against an “ideal case” (Hall, 1992). Their decision then will depend on how good the new case resembles or “fits” such an ideal case existing perhaps only in the investors’ mind.

In an attempt to answer this interesting question, a review of extant literature in the area of case-based reasoning is presented here. A case-based reasoning system (CBR) supports decision-makers when solving new decision problems on the basis of past experience (i.e., previous cases). To assist a decision-maker, the process followed by a CBR system is as follows: a previous case similar to the new decision problem (new

case) is retrieved; the solution of the previous case is mapped as a solution for the new case; the mapped solution is adapted to account for the differences between the new case and the previous case; and the adapted solution is then evaluated against hypothetical situations (Aamodt and Plaza, 1994). To aid in future decision-making, feedback of the success or failure of the evaluated solution is obtained from the decision-maker (Montazemi and Gupta, 1997). Thus CBR make it possible to capture and reuse knowledge in form of case management.

CBR systems have been adopted successfully in support of complex decision problems within a variety of decision environments (Leak 1996). However, these CBR systems are generally developed in support of specific task domain with little ability to share their reasoning processes among other related decision domains. In fact, this deficiency has been cited to exist for other knowledge-based systems (Hayes-Roth 1997). For example, a diagnostic CBR system for repair of AC-Motors is unable to assist a designer with the design of a new AC-Motor. Obviously, inability to share embedded knowledge among different types of knowledge workers reduces the value of CBR systems in the context of organizational knowledge management. This inability is also true for investment decision-making because new ventures (new cases) are fundamentally different from each other. In other words, this method would not facilitate the assessment of the idiosyncrasies of such new ventures. That is, most likely every new investment opportunity will present a different idea, a different market opportunity, different risks, and a different environment, but most importantly, different people, thus making it difficult to map against others.



Furthermore, given that the focus of this thesis is in new ventures at their early stages of financing, the information available to assess them is not only scarce but also vague and imprecise. In these situations, decision-makers are left with their intuition or gut feeling (Hisrich and Jankowicz, 1990; Kosko 1993). Actually, Kosko (1993) advocates that decision-makers use a fuzzy weighted average. He suggests that, when making a decision, “we add up a lot of things and weight each thing to some degree, then we go with the average or “centroid” or centre of mass” (Kosko, 1993 p.176). Furthermore, when assessing technology-based new ventures experts analysts commonly use linguistic qualifiers thus presenting an opportunity for fuzzy logic to contribute towards communicating the implicit value of such investment opportunities.

The question still remains are investors making investment decisions, at any time by “matching the case?” Bachher, Díaz de León and Guild (2000) shed some light towards answering this challenging question. They studied investment criteria assessed by Canadian investors when screening new ventures. Their interesting results highlight investors’ important criteria to screen new opportunities. For example, they found that some investors are interested only in business plans that come from a trustworthy source. The location of the new venture within a certain geographical region, and the quality of the business plan were found to be some of the reasons, among others, to reject an investment proposal, regardless of the potential success that such a new venture offers. They also found that investors are attracted mostly by those ventures that fall within their field of interest. Some venture capitalists invest only in “biotechnology” or

“telecommunications” so that when they are presented with an investment opportunity from a different area, for instance “software,” they find it almost uninteresting (Bachher et al. 2000). In light of these results, it seems that investors are making decisions by “matching the case” only the first time they see an investment proposal (Hall and Hofer, 1993).

Furthermore, the fast pace of change in technology represents another challenge for decision-makers. A recent poll published at GTEC (1998) by an Angus Reid Group (commissioned by SAP Canada) surveyed 278 key decision-makers on their concerns with speed of technology advancements. Some of their results show that “keeping up with technology” topped respondents' lists when asked what they consider to be the main challenges facing their decisions. In other words, the need to experiment, sample, check and re-check opportunities, spread risk, share rewards and seek global markets quickly are only a few of the difficulties that investors of technology-based new ventures face. As suggested by Mitchell (2000), “In technology you need information that quickly becomes obsolete. And you need the frameworks to help identify whether markets are in an early, middle or late stage and assess the implications. It makes business more exciting than it ever was before.” Consequently, having an “ideal case” to map against seems to be an

dynamic assessment method. In other words, in the process of moving toward a decision, some of the positive impressions of a proposal during the screening stage translate later into important reasons to invest (Bachher et al. 2000). As described by Hurry, Miller and Bowman (1992), some venture capitalists' firms, aimed at gaining new technology, make a first investment in a new venture with the objective to gain an implicit right, or option, to acquire the new technology at a future point in time. This option is often exercised by making the additional investment required to adopt the new technology. As described by Myers (1984), the purchase of a real call option is often the outcome of the first-stage decision while the outcome of the second is the exercise of this option. Specifically, a real call option works analogously to a stock call option in conferring a right to take future unrestricted action towards capturing an underlying economic opportunity (Bowman and Hurry, 1987).

Perhaps a better way to describe the process of investing in technology new ventures is described by Mitchell (2000). He uses the following analogy:

“Managing technological innovation is not so much about making a bet on the future as it is about steering the process by which we create wealth. In looking to the future, you need ultimately to get to the point where you can make a significant investment. To do that you need to get in the game—and most corporations recognize there's a small cost of carrying a number of new ideas. It's a little bit like a game of poker where you have to make a small wager to stay in the game. Very few ideas spring up fully developed and market-ready. So over several years, you move ideas along. It's like

poker, where you pay to see the next card; you make a small investment for a little more information. As your options become clearer, you bring down the uncertainty to where you can make a major investment. That's a very delicate process" (page 1).

#### 2.4.4 Advantages and disadvantages of fuzzy expert systems

Several benefits are apparent in the application of fuzzy set theory:

- Systems which utilize fuzzy set theory tend to be much more robust, having the ability to degrade 'gracefully' when dealing with minor variations in the available information.
- The number of fuzzy rules which are required for a particular inference is significantly less than if the inference were based solely on conventional rules.
- Systems which are based on fuzzy rules are usually simpler to build and maintain.
- The preference structures of decision participants are much easier to determine than in other conventional approaches.

The application of fuzzy set theory also has several shortcomings, among which are:

- Problems in developing membership functions may lead to difficulties in application and validity.
- Serious problems may arise in applications due to the sophisticated construction techniques or strict assumptions which may be necessary.
- Problems may become computationally intractable due to dimensionality. The number of fuzzy rules tends to grow exponentially as the number of system variables increases. This leads to trade-offs between precision and computational manageability.

**“Science can purify religion from error and superstition.**

**Religion can purify science from idolatry and false absolutes.”**

**—John Paul II, Pope (Karol Wojtyła)**

## **Chapter 3**

### **Research method**

This chapter describes the methods used during the three phases of this study. The objective of the first phase was twofold: to elicit vocabulary from a group of experts in the area of investment decision-making and to find evidence of the need for communicating and assessing intangibles when evaluating investing proposals. During the second phase two separate studies were carried on. The first study focused on improving our understanding of the role that intangibles play during the investment decision process. The second study used Repertory Grid: a rather new technique extracted from psychology, to understand the constructs that investors and entrepreneurs use when evaluating investment proposals. Finally, the third and last phase of this study consisted on the design of a concept demonstration system based on fuzzy set theory. A set of five interviews concluded a validation of the system providing evidence of the remarkable contribution of Repertory Grid and fuzzy logic toward solving this complex problem.

### **3.1 Phase I**

One of the objectives of this thesis was to identify current methods used by practitioners to assess intangibles when making investment decisions. Also, the study focused in eliciting vocabulary from investors and entrepreneurs. That is, this research is interested in detecting practitioners' understandings of some of the terms and concepts defined by researchers in the area of management of technology. Terms such as "absorptive capacity", "core competence," and "strategic intent" are some examples of these concepts. The first phase was designed in order to answer some of these questions. Specifically, this first phase was exploratory in nature using a quasi-experimental design (Campbell and Stanley, 1963), in the sense that selection of subjects was non-random. Participants were eight venture capitalists and four entrepreneurs, each of them with over five years of experience. The entrepreneurs were founders of their companies that range in size (measured by annual sales) from \$ 5M to \$ 30M. The participants were interviewed in Toronto and Waterloo in Ontario, Canada.

Data were collected through a set of open-ended interviews. During this interviews all participants were asked with the following list of questions:

When assessing (or creating) a business plan for a technology-based new venture:

1. Do you consider any intangible aspects?
  - Could you give me some examples?
  - How do you measure them?
2. Do you consider the knowledge of the managing team?

- How about the capacity of the entrepreneur to create new knowledge?
  - How do you measure this?
3. Do you consider the capability of the team to create new products or services?
- How do you measure this?
4. Ability to assimilate knowledge that is new and external to the new venture?
- How do you measure this?
5. Please describe your ideal business plan.
6. How many business plans have you received in the last six months?
- How many have you rejected/accepted?

All the responses were analysed using verbal think-aloud protocols in order to elicit thought processes from the subjects as they answered the questions (Ericsson and Simon, 1993). Each subject spent approximately one hour on answering the questions. They took the tasks seriously and seemed to enjoy thinking through them. For example, even though most of the interviewees communicated the importance of intangibles they also acknowledge the lack of a method to detect them and measure them.

### **3.2 Phase II**

The second phase of this thesis consisted on two different studies. The first study focused on answering one of the basic research questions motivating this work, “do intangibles play a role in the investment-decision process of new technology-based ventures during their early stages of financing.” To this end, this study strived on locating



important intangibles among a large set of investment criteria. Correspondingly, the second study used Repertory Grid in order to provide evidence of the capacity of this technique to elicit tacit information from experts. This study attempted to answer the second research question, “is there a method to evaluate some of the intangibles used by investors and entrepreneurs when assessing business proposals of new technology-based ventures.” Kelly’s (1955) Repertory Grid technique made sense for several reasons:

- It could elicit from experts, both investors and entrepreneurs, what they perceive to be the concrete representations of the domain “intangibles in technology-based ventures.”
- It could elicit from experts some of the repertory of intangibles they typically use to assess investment opportunities.
- It permitted for the translation of this complex and tacit information into more tangible and objective criteria.

The participants in this study were experts in the area of investment decision-making in early-stage technology-based ventures. The first group consisted in five Canadian venture capitalists. A set of selection criteria was developed in order to identify the sample for this stage. One of the criteria was to target one venture capitalist per venture capital firm in order to provide independence of observation. Specifically, a greater similarity was expected within a venture capital firm as compared to between firms. The sample in this stage was identified from the Canadian Venture Capital Association (CVCA) directory. The June 1999 version was the most recent directory at the time of data collection, which contained a listing of 60 full members. For each

member, the directory provides a profile including the size of the funds managed by the venture capital firm, type and stage of preferred investments, as well as contact information and a listing of partners. From this group of investors, the study focused on those venture capitalists with the following characteristics:

- They had made investments in early-stage technology-based ventures,
- They were located close to Waterloo.

The total population was reduced to about ten Canadian investors after these criteria were applied. All ten investors were contacted and only five showed interest in participating with the study.

The second group of experts consisted of Canadian entrepreneurs, who have been successful at starting their own venture. That is, the study looked for entrepreneurs that have experience raising capital from investors. It was a challenge for this study to locate people with these characteristics in Canada. Some of them are so busy that it was almost impossible to get 30 minutes of their time. A snowball sampling technique was used. Each entrepreneur was asked to refer others who might be willing to participate in the study. Five entrepreneurs agreed to participate in the study.

As discussed by Keeney and Winterfeldt (1991), when eliciting knowledge to design an expert system, the number of experts involved in the knowledge acquisition processes should be kept to an effective minimum. For example, Hwang (1999) presented a grid-based fuzzy expert system environment using only three experts in his study. Also, Garg-Janardan and Salvendy (1988) presented a structured knowledge elicitation method

for building expert systems extracting knowledge from three expert operators. Moreover, Abdolmohammadi (1987) suggested the need to rely on a single expert when acquiring knowledge. Siegel et al. (1995) also support this finding when eliciting decision rules from experts. More on this topic can be found in Turban (1988) and Clement and Winkler (1985).

### 3.2.1 First study

The first study was conducted in an attempt to understand further the “tangibility” of investment criteria used to assess technology-based new ventures. That is, the research reported in this thesis is a continuation of the investigation described by Bachher et al. (2000). They investigated the decision-making criteria used by Canadian equity investors—Business Angels (BAs), Private Venture Capitalists (PVCs), and Investment Managers at Public Venture Capital Firms (PVCFs)—to assess investment proposals from early stage technology-based ventures at two different points in time: screening (first impression) and evaluating (point of investment). In their study a total of 60 investors were interviewed by administering a survey comprising 95 decision-making criteria organized in five categories. As an extension of this work, this study was interested in increasing our understanding of the importance of intangibles when screening and evaluating these ventures.

The following paragraphs describe the research method used in this first study. Each of the 95 criteria, from an original survey designed by Bachher (1994), were

classified a number of different ways. In the first case, they were classified as being either subjective or objective. In the second case, the classification was either tangible or intangible. In the third case, they were classified as being assessable in the present, or in the future. These three classification cases were completed using three separate surveys, each being completed by a different group of ten researchers from the Department of Management Sciences at the University of Waterloo.

Each criterion was classified as being either one (i.e. tangible, objective or assessable in the present) or the other (i.e. intangible, subjective or assessable in the future) from a choice of two options. Six different classifications were probed, using the definitions below:

- A subjective criterion implies aspects of ventures that are influenced by personal feelings, attitudes, opinions or beliefs and are thereby biased.
- An objective criterion implies aspects of ventures that are NOT influenced by personal feelings, attitudes, opinions or beliefs and are thereby unbiased.
- A tangible criterion implies an aspect of a venture that can be readily perceived, or is capable of being appraised at an actual or approximate value.
- An intangible criterion implies an aspect of a venture that can NOT be readily perceived, or is NOT capable of being appraised at an actual or approximate value.

- Present indicates that the criterion can be assessed on information currently available.
- Future indicates that the criterion can be assessed based on information that may be available in the future.

The survey included a 7-point Likert Scale used for gathering responses on the investment criteria. For example, on the Likert Scale “1” represented “Extremely Intangible” and “7” represented “Extremely Tangible.” Respondents were also given the option of selecting “N/A” implying the specific investment criteria were not applicable to the new venture.

### 3.2.2 Second study

The second study used Repertory Grid, as a method to elicit intangibles from investors and entrepreneurs. Five venture capitalists and five entrepreneurs were interviewed.

As reported by Smith and Stewart (1977), Repertory Grid has shown a tremendous potential in areas such as “management psychology”. It concentrates on the individual and the way that he structures his view of his world. Essentially, Kelly (1955) developed this technique for investigating his theory of Personal Constructs. That is, Kelly maintained that all men behave as scientists, exploring their environment. On the basis of these explorations and experiences, we construct a “mental map” of our world. In

other words, our behaviour is determined, to a large extent, by our map. It was an objective of this study to further our understanding of how investors and entrepreneurs construct intangibles in investment proposals. That is, this study investigated the cognitive maps of expert practitioners in investment decision-making of technology-based ventures.

Furthermore, our behaviour is canalised by our mental maps, thus we need a technique, which renders them objective and explicit. As described by Adams-Webber (1979), Repertory Grid was developed to meet this need. Moreover, as suggested by Slater (1976), Repertory Grids can be used on a strictly empirical basis as a general methodology.

Repertory Grid is a technique that has developed dramatically since it was first used and there exists now many variations of its procedure. However, the classic case incorporates essential features generally proceeding in five stages: eliciting the elements; eliciting the constructs; completing the grid; analysing the grid; and interpreting the results. The following paragraphs describe the first three stages of the process. Analyses and results of this study are described in the following chapter.

#### 1. Eliciting the elements

It was Kelly's (1955) belief that thoughts were made up of two things: the elements and the constructs. The elements are objects of people's thoughts. The

elements can be other people such as, boss, customer, employee; they can be objects such as cars, planes, trains and boats; they can be abstract qualities such as justice, democracy, anarchy, and tyranny. The elements are analogous to the towns and villages on a map. The subject area or domain of this study is in technology-based ventures. In other words, this research was interested in mapping intangible aspects of these ventures as constructed by investors and entrepreneurs. To this end, each interviewee was asked to recall six business plans. Such investment proposals, from early stage technology-based ventures, had to have been assessed or created during the previous 18 months. It is important to note that specific details about the ventures remained completely confidential since each interviewee was asked only to recall such investments. Thus, the six business plans became the elements under examination and were distributed as follows:

- Two business plans considered “big hits”
- Two business plans considered “average or marginal”
- Two business plans that were rejected or where the investment had been lost.

## 2. Eliciting constructs

The constructs are the qualities that people use to think about the elements.

Continuing with our previous analogy, constructs can be seen as the lens through which

we view our world. In other words, constructs are analogous to directions on a map. In order to elicit each participant's constructs the study used the "triad" method. Each of the participant's business plans was codified with a single word representing that venture. Then, each code was written on a separate card. Three of the cards (business plans) were selected at random and presented to the expert who had originally remembered them. Each expert was then asked to distinguish between these plans so that two of them shared an intangible not possessed by the third. The expert could of course, choose any two cards, the choice would depend on the way that he thought of the elements in the triad. When the expert had made a choice, he was asked to say what made two the same and different to the odd business plan out. This property we called a construct. Such constructs were categorised by each expert as bipolar attributes in such terms as "good management skills/poor management skills," "experienced entrepreneur/inexperienced entrepreneur," and so forth.

### 3. Completing the grid

Each participant's list of elements and constructs were then used to produce a grid with the elements along the top and the constructs down the side. Each expert was presented with a simple five-point rating scale. Once a construct had been elicited, the expert assigned each of the six plans a value from one to five. For example, a value of one could be assigned to a plan in one pole of the construct, say "experienced entrepreneur." Correspondingly a value of five would be assigned to another element on the other pole of the construct, in this case "inexperienced entrepreneur."



The technique proceeded to elicit all further constructs from the expert by presenting successive fresh triads of plans. The expert could then add important constructs that may not have been possible with the random combination of plans being presented. All the ratings elicited from the expert were structured in the form of a matrix known as Repertory Grid.

Figure 3.1 shows an example of a completed Repertory Grid: how one of the respondents construed the six business plans.

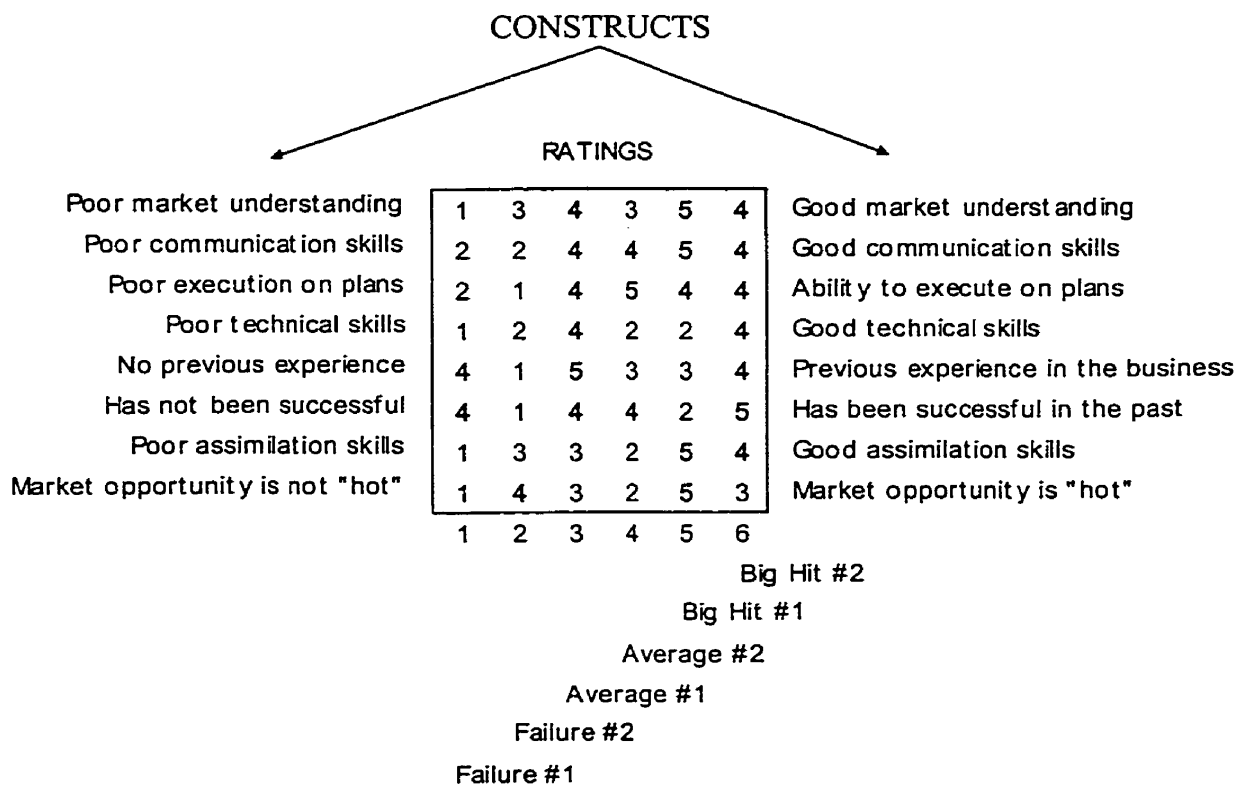


Figure 3.1 Example of a repertory grid

By using a grid rather than a usual rating scale, a person's otherwise unconscious and implicit repertory of constructs, and the complex relationships between them, can be made explicit. In contrast to a usual rating scale, the grid, in its original form, also has the advantage of not imposing on the respondent to select from a limited number of options that were all predetermined by the researcher.

### **3.3 Phase III**

The third and last phase of this thesis consisted of the implementation of an expert system to help with the diagnosis of the viability of a new venture. Such expert system was expected to address the following issues:

- Utilize the information elicited during the previous phase and organise it, providing an efficient framework that would facilitate the evaluation of intangible aspects immersed in new venture opportunities.
- Permit the combination of different domains of expertise (in this case that of investors and entrepreneurs) in order to agree sooner via estimates in the assessment of an investment opportunity.
- Provide an environment able to improve the meeting of variables and context when assessing new ventures.
- Accept imprecise and incomplete information as an input.
- Offer an ability to work with linguistic terms.

With these ideas in mind a fuzzy inference system was implemented. A software package called “The Fuzzy Logic Toolbox” was used to develop the fuzzy inference system described in this thesis. The Fuzzy Logic Toolbox is a collection of functions built on the MATLAB® numeric-computing environment. Fuzzy inference is the process of formulating the mapping from a given input space to an output space, and the primary mechanism for doing this is a list of if-then statements called rules. All rules are evaluated in parallel, and the order of the rules is unimportant. The rules themselves are useful because they refer to variables and the adjectives that describe those variables. The mapping then provides a basis from which decisions can be made, or patterns discerned. There are two types of fuzzy inference systems that can be implemented in the Fuzzy Logic Toolbox: Mamdani-type and Sugeno-type. These two types of inference systems vary somewhat in the way outputs are determined.

Fuzzy inference systems have been successfully applied in fields such as automatic control, data classification, decision analysis, expert systems, and computer vision. Because of its multidisciplinary nature, fuzzy inference systems are associated with a number of names, such as fuzzy-rule-based systems, fuzzy expert systems, fuzzy modeling, fuzzy associative memory, fuzzy logic controllers, and simply (and ambiguously) fuzzy systems.

The expert demonstration system described in this thesis used a Mamdani-type inference system. Mamdani's fuzzy inference method is the most commonly seen fuzzy

methodology. Mamdani's method was among the first control systems built using fuzzy set theory. It was proposed in 1975 by Ebrahim Mamdani (1975) as an attempt to control a steam engine and boiler combination by synthesizing a set of linguistic control rules obtained from experienced human operators. Mamdani's effort was based on Lotfi Zadeh's (1973) paper on fuzzy algorithms for complex systems and decision processes. Although the inference process described in the next sections differs somewhat from the methods described in the original paper, the basic idea is much the same.

Mamdani-type inference, as defined in the Fuzzy Logic Toolbox, expects the output membership functions to be fuzzy sets. After the aggregation process, there is a fuzzy set for each output variable that needs defuzzification. It's possible, and in many cases much more efficient, to use a single spike as the output membership function rather than a distributed fuzzy set. This is sometimes known as a *singleton* output membership function, and it can be thought of as a pre-defuzzified fuzzy set. It enhances the efficiency of the defuzzification process because it greatly simplifies the computation required by the more general Mamdani method, which finds the centroid of a two-dimensional function. Rather than integrating across the two-dimensional function to find the centroid, the weighted average of a few data points was used.

Several authors have discussed the steps necessary to design a fuzzy system (e.g. Cox, 1994; Terano et al. 1994). The general approach to designing fuzzy systems can be summarised as follows:

- Identifying input and output variables
- Defining the fuzzy sets associated with these input and output variables
- Developing the rule base defining the relationships between the variables
- Determining the appropriate defuzzification technique.

### 3.3.1 Membership functions of inputs and outputs

A membership function (MF) is a curve that defines how each point in the input space is mapped to a membership value (or degree of membership) between 0 and 1. The input space is sometimes referred to as the universe of discourse, a fancy name for a simple concept.

A fuzzy set may be represented by a membership function. This function assigns the degree of membership within the set to any element of the universe of discourse. The membership function maps the elements of the universe onto numerical values in the interval  $[0, 1]$ . As Silva (1995) points out, it is important to note that a membership function is a possibility function and not a probability function. For example, a membership value of zero implies that the corresponding element is definitely not an element of the fuzzy set. On the other hand, a membership function value of unity means that the corresponding element is definitely an element of the fuzzy set.

Moreover, as pointed out by Terano et al. (1994), the formulation of membership functions is a critical issue and source of much criticism, in the development of fuzzy

systems. Several approaches have been suggested for the formulation of membership functions. However, this study was based on the approach suggested by Hruschka (1988). This approach assumes that five basic triangular membership functions, corresponding to the linguistic qualifiers are associated with a variable: Very Low, Low, Medium, High, and Very High. As a result, six parameters were elicited for each variable such that a (Figure 3.2):

- (P1) maximum value for a variable to be unambiguously classified as very low;
- (P2) maximum value for a variable to be unambiguously classified as low;
- (P3) maximum value for a variable to be unambiguously classified as medium;
- (P4) maximum value for a variable to be unambiguously classified as high;
- (P5) maximum value for a variable to be unambiguously classified as very high.

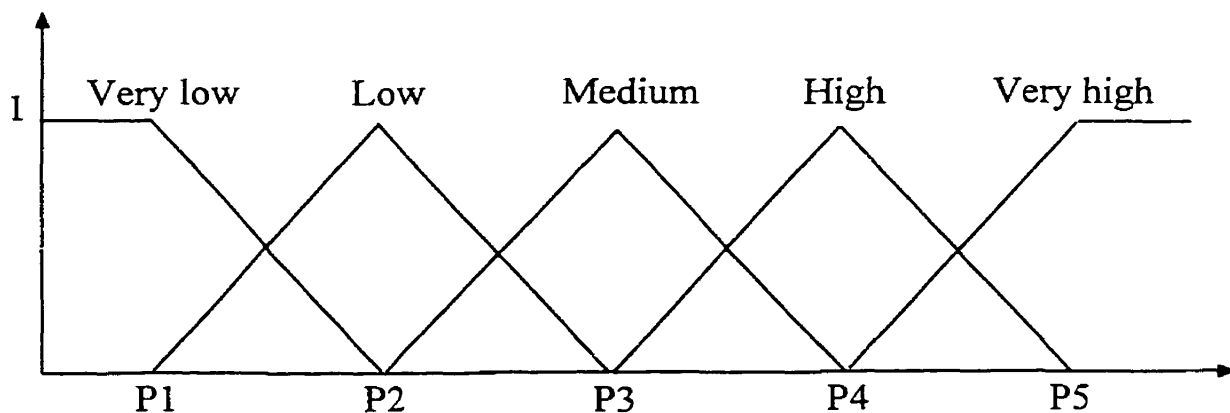


Figure 3.2 An example of a membership function

These parameters specify ranges of the original input and output variables. Based on them, the triplets defining each of the fuzzy sets can be derived.

As discussed previously, a problem arises when dealing with variables for which these parameters cannot be easily identified. In this case, the approach was to treat these concepts as intermediate variables and identify associated measurement variables.

A final issue that was addressed is the development of overall membership functions from those of each expert. This study used a conservative aggregation method. That is, a method based on the minimum and maximum of individual parameters. As a result, the normalised triplets represent the aggregate membership functions (Hruschka, 1988):

Very Low:	$\{0, \min(P1), \min(P2)\}$
Low:	$\{\min(P1), \min(P2), (\max(P4)-\min(P3))/2\}$
Medium:	$\{\min(P3), (\max(P4)-\min(P3))/2, \max(P4)\}$
High:	$\{\min(P5), (\max(P6)-\min(P5))/2, \max(P6)\}$
Very High	$\{(\max(P6)-\min(P5))/2, \max(P6), 1\}$

### 3.3.2 Developing a fuzzy associative memory system

The information elicited using Repertory Grid was used to generate a list of fuzzy variables. As proposed by Simpson (1990) and Kosko (1992), an effective method of implementing this framework is the Fuzzy Associative Memory (FAM). Unlike systems based on propositional and predicate calculus in their reasoning, FAM's reason through the manipulation of fuzzy sets. While both paradigms can encode structured knowledge

in linguistic form, the fuzzy approach translates it into a linguistic score rather than the symbolic framework of conventional expert systems (Kosko, 1992).

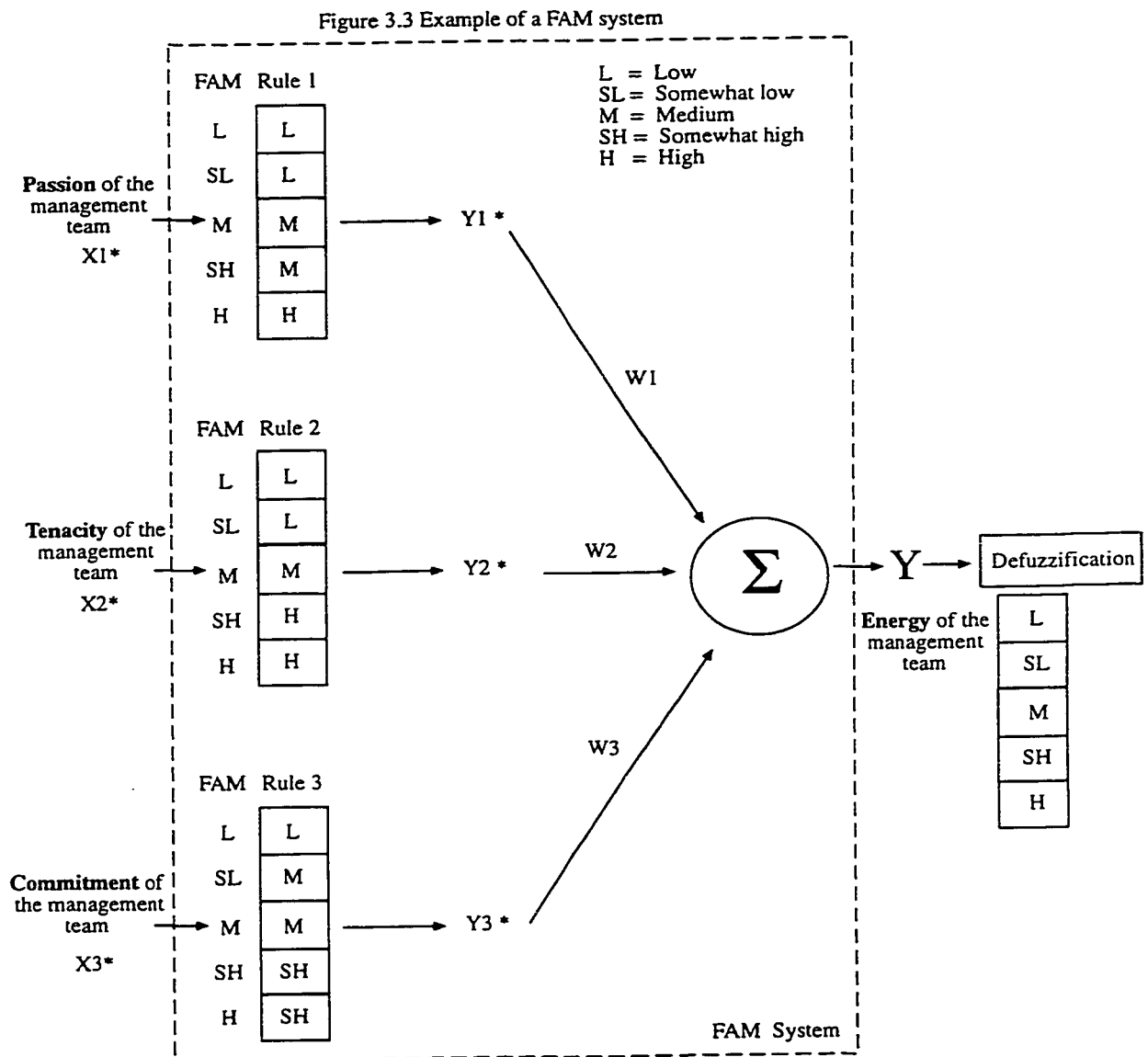
In general, a FAM maps inputs to outputs, encoding the association  $(x_i, y_i)$ , which associates the  $m$ -dimensional output set,  $Y$ , with the  $n$ -dimensional input set,  $X$ . An advantage of this approach is that structured knowledge can be directly encoded in the FAM, removing the requirement of training the system as in neural network applications (Kosko, 1992). While this knowledge is encoded into a FAM correlation matrix, in practice the need to manipulate a large numerical matrix can be replaced with a linguistic representation scheme. This is accomplished by encoding the fuzzy set association between matrix elements  $(x_i, y_i)$  as a single linguistic entry in a FAM linguistic matrix (Kosko, 1992).

This study implemented a FAM system based on a “FAM bank” consisting of 16 FAM rules, an example of one of these FAMs is shown in Figure 3.3. In this architecture, each input to the FAM system activates each stored FAM rule to a different degree. For instance, the degree of activation of each FAM rule generating output  $Y^*$ , increases as the actual input,  $X^*$ , more closely resembles the ideal input,  $X$ .

The overall output of a FAM bank consisted of the weighted sum of these partially activated fuzzy sets. As discussed by Kosko (1992), these weights may reflect the strength, frequency or credibility of the fuzzy association. Once the output,  $Y$ , has been determined it is common for it to be defuzzified to a single numerical value (Kosko,



1992; Cox, 1994). There are several approaches that can be used in this defuzzification operation; however, the centroid method was used. This method is one of the most common and most robust defuzzification methods (Cox, 1994). The result of this operation was then used as the basis of a linguistic score.



### 3.3.3 Fuzzy-rule sets of input and output variables

Table 3.1 shows a sample rule subset based on the assessment questions to business plans proposed by (Sahlman, 1997). This is an example of a rule-set used in the development of a technology-based assessment methodology.

Table 3.1 Business Plan Assessment Rule Set	
Condition	Consequent
Education of founders is high	Business plan is Acceptable
Fairly good description of cost to acquire a customer	Business plan is Moderately Acceptable
Good description of the context	Business plan is Acceptable
Very good description of the people, opportunity, and context as a moving target	Business plan is Acceptable

From this table, it can be seen that some of the concepts are inexact and vague; that is, the rules are fuzzy. Therefore, a small subset of fuzzy variables and their associated term set can be identified, as shown in Table 3.2. Further, each of the values in the term sets associated with the fuzzy variables can be thought of as describing a membership function.

Table 3.2 Sample Fuzzy Variables and Term Sets	
Fuzzy Variable	Term Set
Business Plan	Unacceptable, Acceptable with Modifications, Acceptable
Education (team)	Low, Somewhat Low, Acceptable, Somewhat High, High
Description of cost to acquire a customer	Very bad, Bad, Fairly Good, Good, Very Good
Description of the context	Very bad, Bad, Fairly Good, Good, Very Good
Description of the people, opportunity, and context as a moving target	Very bad, Bad, Fairly Good, Good, Very Good

The information presented above was used to develop a simple FAM. Since the rules examined are of the form IF A is x THEN B is y, the resulting FAM matrices were reduced to vectors, and an architecture similar to scaled monotonic chaining approach discussed by Cox (1994). While it is possible to aggregate the various rules into higher order FAM architectures, this approach would be very inefficient. For this reason, only FAM matrices smaller than four dimensions were used. Conversely, if rules were encountered having propositions with greater than five variables, they were decomposed into lower order rules.

As can be seen in Figure 3.2, each of the input variables, for example quality of the business plan, was mapped to a fuzzy set representing the associated term set for that fuzzy variable. In this example, the fuzzy sets represent: L – low quality of business plan to H – high quality of business plan. Associated with each input is a FAM representing the mapping from the input fuzzy set to the associated “investment opportunity” output fuzzy set. In each of the FAM cells, the value of the investment opportunity fuzzy set for that rule is indicated by L – low investment opportunity to H – high investment opportunity. Therefore, if an input corresponding to high opportunity communication, H, was presented to FAM rule 2, then the associated investment opportunity would be high, H.

Once all FAM rules have been evaluated, their outputs were aggregated and defuzzified. The defuzzification procedure resulted in a linguistic rating of each of the fuzzy outputs, which in turn operated as fuzzy inputs for the next FAM. In addition, this approach allowed investigation of individual rules to provide the user with insights into potential opportunities identified for each of the areas considered.

**“The statistical method shows the facts in the light of the average, but does not give a picture of their empirical reality. While reflecting an indisputable aspect of reality, it can falsify the actual truth in a most misleading way... The distinctive thing about real facts, however, is their individuality. Not to put too fine a point on it, one could say that the real picture consists of nothing but exceptions to the rule, and that, in consequence, reality has predominate the characteristic of irregularity.”**

**(C.G. Jung, 1957 on individual personalities)**

## **Chapter 4**

### **Results**

This chapter describes the analyses performed on the data collected, and presents the results obtained from the three stages of this study. During the first stage twelve participants were interviewed and given a small open-ended questionnaire. The objectives of this first stage were to elicit experts' vocabulary and find evidence of the need to communicate intangibles. In the second stage, data from a poll of 30 Canadian researchers were analysed with the objective of understanding the role that intangibles play during the assessment of new investment opportunities. Also, during the second stage, five venture capitalists and five entrepreneurs were interviewed in depth to elicit some of the intangibles used when assessing or communicating business plans. The third stage consisted of the implementation of a concept fuzzy expert system proposed as a framework for merging expertise from both investors and entrepreneurs (Díaz de León, 1997). Data collected in the previous stages was incorporated into the fuzzy expert system. The system was validated by five venture capitalists in Canada.

#### **4.1 Phase I**

During this phase it was found that venture capitalists and entrepreneurs are approachable when they are contacted within a network. This study benefited from a network created through the completion of previous studies at the Institute of Innovation Research in the University of Waterloo.

One of the objectives of this stage was to identify some degree of correspondence between the terms used in academia and those used by practitioners. It was a concern of this study to find differences in understanding of terms originally developed in academia. For example, some researchers, in an effort to characterise strategic ideologies for competitive advantage, have coined terms such as strategic intent (Hamel and Prahalad, 1989), core competence (Prahalad and Hamel, 1990), or absorptive capacity (Cohen and Levinthal, 1990). In an effort to find evidence for correspondence in understanding of such terms, we asked the participants questions related to some of the concepts mentioned above. For example, the capacity of the entrepreneur to acquire new and external knowledge is strictly related to the concept of absorptive capacity. Also, the ability of entrepreneurs to use their knowledge for creating new products and services is somewhat related to concepts such as core competence and strategic intent.

Additionally, through the application of this questionnaire we looked for evidence of the ability of expert practitioners to assess strategic concepts in business plans. In other words, researchers in academia have reported on the importance of managing

corporations using different strategies to achieve sustained competitive advantage.

However, it still remained a question for us whether such strategies were applied during the early stages of new ventures.

Six open-ended questions were presented to the participants. From the twelve participants, only ten agreed to be recorded. Appendix B includes the transcription of those ten interviews. The following sections describe the most relevant findings from this first stage of the study:

#### 4.1.1 Importance and consideration of intangibles

The first question was as follows:

**When assessing (or creating) a business plan for a technology-based new venture:**

**1. Do you consider any intangible aspects?**

- Could you give me some examples?
- How do you measure them?

Investors and entrepreneurs of technology-based ventures are frequently challenged by the difficult task of assessing and communicating new ideas. The objective of this question was to obtain an idea of current methods used by experts to assess intangibles.

The answers to this question were consistent with the conclusion that intuition and experience play a big role. For example, when describing the process that he usually follows, one of the respondents characterized it as “a little bit intuitive, so I would call

this intangible because it is hard to measure at the first cut.” Generally, respondents agree that assessing the team of the venture is a difficult challenge. For instance, one respondent explained, “[We consider] primarily intangible assets, and by intangible assets [we mean] its people and their historical background. We love companies who have failed and individuals who have failed because they’ve learned so much and we love people who have succeeded because they know a lot too.” When asked more specifically about the method followed by their firm, he responded, “Well that is the best question, because [it] is very hard to measure. We come fiddling around with different ways and seeing whether or not we can qualify them, but we haven’t been able to do it so far.” Then, he added, “We look at the market first, whether or not there is a market with the right pace of growth, not too busy but not too small or not too big. Secondly, we do look at the technology, what do they own, if anything? The vast majority of companies we’re seeing today don’t have anything except ideas and perhaps an access point to an opportunity. The third thing we look at is the current team, who they are and what’s their background. And the fourth thing we look at is a box, which we just call ‘question mark.’ Are they people we want to work with? Do we trust them? Do we have a good feeling? Do we like the name of the Company? Are they inclined to listen? Do they talk more than they should? Are they arrogant? Do they put ‘billion’ too many times in the business plan? All the intangible aspects are good or bad and whether or not they will succeed and we can work with them.”

Moreover, when speaking of the nature of early stage ventures, one investor mentioned, “I guess the other intangible factor that we could talk about here is the market



place itself. A lot of the early stage ventures may be creating the market, so the market isn't something where I can go and get some forward studies or reports. I've got to essentially decide whether they are going to be able to create it."

#### 4.1.2 Knowledge of the management team

When assessing a business plan for a new venture, the recognition of tacit knowledge and its importance has a number of crucial implications. For example, it gives rise to a whole different view of the new venture—not as a machine for processing information but as a living organism. Within this context, the objective of the second question was intended to obtain an idea of how investors and entrepreneurs consider the knowledge of the new team. The question was as follows:

**2. Do you consider the knowledge of the managing team?**

- **What about the capacity of the entrepreneur to create new knowledge?**
- **How do you measure this?**

Participants recognized that knowledge is an asset. In fact, some of them mentioned the implications of knowledge as an important characteristic of the entrepreneur. One investor summed it up, "[The knowledge of the entrepreneur] is a very important aspect, it is key. For example, if the person is very good at delegating they have to understand what they are delegating. They have to be able to assess new products or services, although in a business proposal this is difficult to find. However, it can be measured by having communication with the entrepreneur." In addition, some of them

mentioned a caveat that there is a problem sometimes when entrepreneurs feel they “know it all.” This seems to be a major problem, according to some investors. One of the participants expressed it in a few words, “That is often a challenge for entrepreneurs because sometimes they feel that they can conquer the world and they can be everything and tell the market they are great, with no interest in sharing the spotlight. You have to be careful about those kind of people because it is pretty tough for only one person to run a successful company.”

When asked about a method to measure knowledge participants were not specific. However, some investors acknowledged that they frequently hire a third party consultant from their network to make an assessment.

#### 4.1.3 Ability to create new products or services

The research area of this thesis is in Management of Technological Innovation and Change, thus our interest in understanding how investors of technology ventures regard the entrepreneur’s capacity to innovate. Innovation—the successful exploitation of new ideas—is considered by researchers to be key to sustained competitiveness. The third question was related to this topic:

**3. Do you consider the capability of the team to create new products or services?**

- **How do you measure this?**

Participants answered this question in several ways. An investor, for example, explained this with an analogy, “Frankly, we are looking for people who have the ability to go sideways, go laterally as well as they can go forward. Just like in technology we are looking for open architecture systems, so we are looking for people with ‘open architecture attitudes.’ We like people who are prepared to overcome change and rapid change, people who can restart all over very quickly, re-invent themselves, especially with web related ventures. Be able to adapt to their market.”

Additionally, investors consider that entrepreneurs should not only be innovators but also need to anticipate future changes in technology in order to remain competitive. An investor summarised this need in a few words, “Yes, I think the team will need to convince us that they are already thinking about a next generation of products. This is particularly true when you are investing at an early stage. Everybody likes to invest in some kind of platform technology, but especially if you are going after an emerging market, you are not a 100 per cent sure what is going to emerge or if it’s going to emerge.” On the other hand, several investors mentioned that the entrepreneur’s ability to innovate is an intangible, which is difficult to assess. Sometimes, for example, investors need to be aware of entrepreneurs’ unrealistic expectations. One investor summarised this caveat saying: “You want people who are visionaries but not dreamers.”

An explicit objective of this question was to investigate the existence of a method to assess the entrepreneurs’ ability to innovate. Some investors provided details of the method they usually follow. For instance, one investor shared a two-step-check-up

method that he follows; “I look for two things. I focus on the entrepreneur’s previous unique employment and experience: to what extent have they been in situations before where they have been innovative and created new products successfully? That’s a key indicator. Another key indicator is their availability to be market-driven. Often, you get entrepreneurs who come in and the plan talks a lot about the technology but not a lot about what is the product? What need is it answering? Why should it be developed? Why should it be such a product in order to meet a need? And you can pretty quickly get a sense of whether an entrepreneur is a technology-driven or market-driven. So, that’s primarily how I do it.”

#### 4.1.4 Absorptive capacity of the entrepreneur

Cohen and Levinthal (1990) defined absorptive capacity as the ability to exploit external knowledge as a competitive advantage. This study focused on understanding the investors’ and entrepreneurs’ consideration of this important asset for technology-based new ventures. Therefore, the fourth question asked:

**4. Ability to assimilate knowledge that is new and external to the new venture?**

- **How do you measure this?**

Participants regarded this as a very important characteristic of the entrepreneur. In fact, one expert put it in the following words, which agrees with most of the answers to this question, “It’s very important because if the market is shifting or competitors are coming in they have to recognize those changes. If they have a board of directors with

very good people that are giving input and suggesting changes to be made, they've got to be able to sort of learn from that in making the changes. You don't want people who think, 'This is the way we are going to do it, and I don't care what external factors say.' So, I think that's very important. Now, can you quantify it? No. But you can sort of see, based on the previous track record of that individual and their personality, if they are really stubborn or don't want to listen to input from others. You get a sense for it, it is more like an intangible but it is a very important thing."

#### 4.1.5 Business plan

The last two questions of the interview were focused on the business plan. The objective of the first question was to identify characteristics of what investors would consider an ideal business plan. The objective of the second question was to obtain some idea of the number of business plans that get funding after being screened and reviewed.

What follows is a summary of features from an "ideal business plan" according to investors:

- Reasonable market analysis
- Attractive market opportunity
- Good description of the management team
- Brief and succinct document
- Good description of the competitive advantages

- Realistic expectations

From the answers provided by investors to the last question, we learned that they invest only in approximately 1 per cent of all the business plans that they receive. Generally, investors had received around 100 business plans during the six months prior to the interview. From those 100 plans, they almost immediately screened out 80 to 90 per cent. After that, they usually invested in only one or two. One of the major reasons for rejecting business plans, according to the participants of this study, is the lack of communication between investor and entrepreneur.

The purpose of this initial stage was to elicit experts' vocabulary and find evidence of the need to communicate intangibles. Some observations from this phase of the research indicated the following:

- Intangibles play an important role in the assessment process of new technology-based ventures.
- There is no current method used by expert practitioners to assess intangibles in new investment opportunities. Moreover, experience, gut feeling, and intuition seem to be the driving forces when making decisions regarding intangibles.
- There is no shortage of ideas.
- There is apparently no shortage of money.

- There is a need to improve the assessment and communication of new ideas.
- A better understanding of concepts such as core competence, absorptive capacity and strategic intent, could provide a competitive advantage if included in the strategic management of new technology-based ventures.
- Expert practitioners use linguistic terms to describe characteristics of new ventures.
- Generally, there is no such thing as an “ideal business plan” in the investors’ mind. However, experts seem to consider two things to be of major importance when assessing new ventures: management team and market opportunity.

A content analysis of the twelve interviews was done in order to summarise the results of this phase. Such analysis is presented in Appendix F, which includes the following points:

- A) A list of some intangibles mentioned by investors
- B) Current methods used by investors to assess intangibles
- C) Importance of the knowledge of the entrepreneur to investors
- D) Importance of the capability to create new products and services
- E) Importance of the ability to assimilate new knowledge
- F) Characteristics of an ideal business plan

Our objective at this stage was not only to obtain vocabulary but also to find some support to our assumptions of the importance of intangibles in technology-based new ventures. Table 4.1 shows how the answers from the different participants support these assumptions.

Table 4.1 Summary of the results from twelve interviews								
Interview	Question 1		Question 2		Question 3		Question 4	
	Consider intangibles?		Consider knowledge?		Consider ability to create new products?		Consider ability to assimilate new knowledge?	
	Support	No support	Support	No support	Support	No support	Support	No support
1	√			√	√		√	
2	√		√		√		√	
3	√		√		√		√	
4		√	√			√	√	
5	√		√		√		√	
6	√		√		√			√
7	√		√			√		√
8	√		√		√		√	
9	√			√	√		√	
10	√		√		√		√	
11	√		√			√	√	
12	√		√		√		√	



## 4.2 Phase II

### 4.2.1 First study

The first study of this phase was focused on obtaining an idea of the “tangibility” of investment criteria. To this end, a continuation of the study started by Bachher et al (2000) was carried out. The study was completed in three steps. In the first step we were interested in identifying intangibles from a list of 95 criteria summarised by Bachher (1994). The results were promising and prompted us to look for further evidence of intangibles. Table 4.2 shows a list of intangible criteria, we considered a criterion to be clearly intangible when seven or more of the participants agreed on such categorization.

Only eight out of 95 criteria were considered clearly intangible. Appendix C shows a list with the criteria that were either clearly tangible or intangible.

**Table 4.2 List of intangible criteria**

#### **Decision-Making Criteria**

##### **Characteristics of the Entrepreneur(s)**

<b>Personal Attributes</b>	<b>Tangible</b>	<b>Intangible</b>
Ability to anticipate need for change	0.3	0.7
Ability to bring about change	0.2	0.8
Ability to react to changing risk	0.1	0.9
<b>Market Need</b>		
There is little threat of competition during the first three years	0.3	0.7
<b>Investor(s) Requirements</b>		
Ability to attract a viable investor group	0.2	0.8
Investor(s) will not be expected to make subsequent investments	0.3	0.7
<b>Characteristics of the Investment Proposal</b>		
Evidence of truthfulness in the proposal	0.2	0.8
Realistic financial projections contained in proposal	0.3	0.7

The possibility of a misinterpretation of the term “intangible” motivated us to design a second study. This second study repeated the first and replaced the term tangible with objective and intangible with subjective. Again, the results indicated that only a few items were considered to be subjective. Only three items were regarded as both intangible (by the first group of ten researchers) and subjective (by the second group). Table 4.3 summarises a list of 15 criteria considered to be clearly subjective. Appendix D includes a list of all the criteria that were considered either clearly objective or clearly subjective.

**Table 4.3 List of subjective criteria**

**Decision-Making Criteria**

**Characteristics of the Entrepreneur(s)**

<b>Personal Attributes</b>	<b>Objective</b>	<b>Subjective</b>
Ability to accept criticism	0.2	0.8
Ability to bring about change	0.2	0.8
Ability to react to changing risk	0.2	0.8
Demonstrated leadership ability in the past	0.3	0.7
Personality compatible with investor(s)	0.2	0.8
Willingness to work and cooperate with investors	0.3	0.7

**Overall Skills**

Research and development skills	0.3	0.7
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**Characteristics of the Venture Offering (Product or Service)**

Demonstrate a defensible competitive position	0.3	0.7
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**Investor(s) Requirements**

Ability to attract a viable investor group	0.3	0.7
Cash out potential (e.g. going public)	0.3	0.7
Familiarity with the technology of the venture	0.3	0.7
Investor’s familiarity with the market targeted by the venture	0.2	0.8

**Characteristics of the Investment Proposal**

Evidence of creativity in the proposal	0.2	0.8
Overall quality of proposal	0.3	0.7
Overall quantity of proposal	0.1	0.9

The last step of this study consisted of administering the same questionnaire to ten more people. The objective this time was to obtain an idea of the best timing for assessing each criterion. That is, as a result of the previous two steps, we were interested in detecting a shift from subjective to objective in the criteria. Participants were then asked to indicate whether each criterion could be assessed the first time an investor reviewed a business plan, or perhaps it would only be assessable in the future. The results of this study showed that 51 criteria were considered to be assessable in the present, while only eight out of the 95 were considered to be assessable only in the future.

The outcome of this study showed interesting results. For example, we learned that investors considered some criteria to be intangible or subjective. However, these results certainly discourage using this method as a way to identify intangibles in business plans. In other words, there was a need then for a technique that could elicit from experts, both investors and entrepreneurs, what they perceive to be the concrete representations of the domain “intangibles in technology-based ventures.” Additionally, a technique was needed that could elicit from experts some of the repertory of intangibles they typically use to assess investment opportunities. Finally, such a technique should assist in the translation of this complex and tacit information into more tangible and objective criteria. Repertory Grid seemed to be a method that includes all these characteristics mentioned above.

#### 4.2.2 Second study: Repertory Grid

We elicited a total of 149 constructs from the ten interviewees. Out of those, a total of 83 constructs were obtained from the five investors. Correspondingly, the five entrepreneurs provided 66 constructs. The constructs were content-analysed following a standard procedure proposed by Honey (1977). Table 4.4 summarises the content of the constructs classified in six main category headings.

A two-stage process was used to check the reliability of the classification scheme. First, we grouped similar constructs together following a common theme. Once we were satisfied with the classification of all the constructs as pertaining to common themes, they were randomised, and two researchers (graduate students from the Department of Management Sciences) were asked to reassign the constructs to the six original categories. Their respective success rates were 84 and 73 per cent. Then, we discussed and amended the category scheme based on the inaccurate assignments. For example, we renamed two of the categories to better reflect the theme of the constructs they were grouping. The last step consisted of randomising and assigning the constructs to the new set of categories. At this stage, the constructs were successfully reassigned in 89 and 86 per cent of the cases by two additional researchers (graduate students from the Department of Management Sciences).

<b>TABLE 4.4</b> List of categories and number of constructs from respondents		
<b>Category</b>	<b>Entrepreneurs</b>	<b>Venture Capitalists</b>
Personality of the entrepreneur	14 constructs	24 constructs
Background of the management team	11 constructs	8 constructs
Skills of the management team	23 constructs	41 constructs
General attributes of the management team	13 constructs	6 constructs
Business plan (business model)	4 constructs	4 constructs
Investor-entrepreneur relationship	1 construct	
<b>TOTAL</b>	<b>66 constructs</b>	<b>83 constructs</b>

Appendix E presents a list of all the constructs, which belong to each of the categories in Table 4.4. One noticeable finding of this study is the similarity between investors and entrepreneurs in terms of their assessments of importance of constructs. A quick look at the number of constructs from each group shows that both investors and entrepreneurs regard the management skills of the founder (or management team) to be critical. This category includes not only the skills of the management team but also their core competencies, abilities, and business acumen. The category thus includes constructs related to the personality of the entrepreneur. Examples of these include honesty, integrity, passion, and business etiquette.

The results shown in this study replicate some of the findings of Hisrich and Jankowicz (1990) in which management was identified as the most important category. Hisrich and Jankowicz (1990) provide a scientific proof of otherwise anecdotal evidence with regard to intangibles in investment of technology-based ventures. In our study, investors mentioned several times the importance they usually place in evidence of honesty from the entrepreneur. Also, having “good business etiquette” seemed to be a

decisive attribute for some investors. When asked for an elaboration, one investor stated, “If they don’t show any courtesy with us as partners, how could we expect that they will respect and anticipate their customers’ needs?”

Once the summary of the general results was complete, we analysed each grid following three separate procedures. First, we cluster-analysed the data in order to identify ways in which the individual respondents structured their thinking about investment applications. As a second test, we completed a principal component analysis on each grid to gain an idea of the cognitive complexity of each respondent. Then we calculated the rating extremity, a measure frequently interpreted as an indication of the importance or “meaningfulness” to the subject of a given construct or element (Bonarius 1977).

#### 4.2.2.1 Cluster analysis

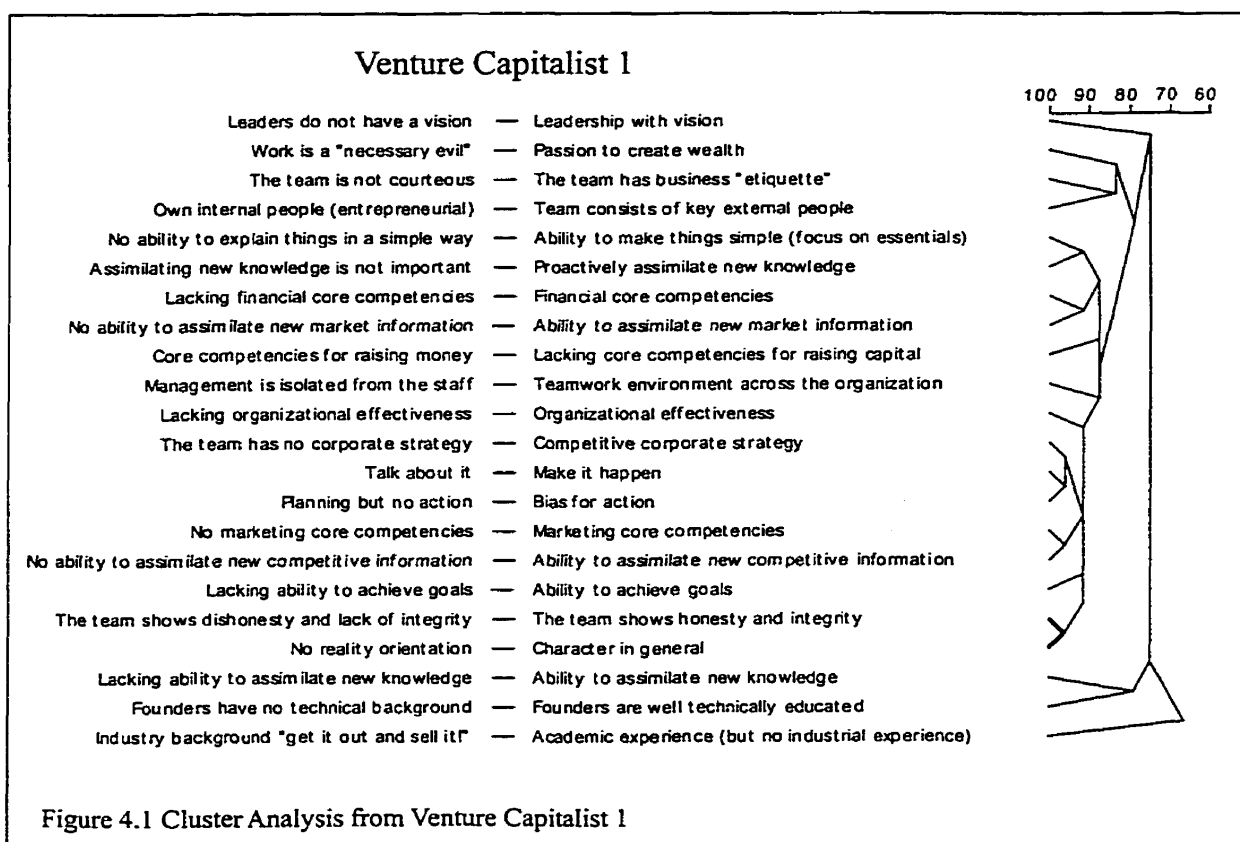
Using software based on the FOCUS technique (Jankowicz and Thomas, 1982, 1983), the grids were cluster-analysed. This technique uses a nearest-neighbour distance metric. In other words, the algorithm depends on a two-way cluster analysis based on pattern recognition, grouping items (elements and constructs) by their interrelationships. That is, the FOCUS algorithm computes the summed differences between pairs of ratings in each grid, calculating first by columns and then by rows. A cluster-analysed grid (shown in Figure 4.1) repositions the most similarly rated constructs to appear side by side. As mentioned by Shaw (1980), the result is a graphic representation of patterns of

groupings of elements on constructs and constructs on elements. This technique provides a personal theory from each respondent employed either when making a funding decision (venture capitalist) or when presenting a funding proposal (entrepreneurs) (Hisrich and Jankowicz, 1990).

#### Cluster analysis for venture capitalists

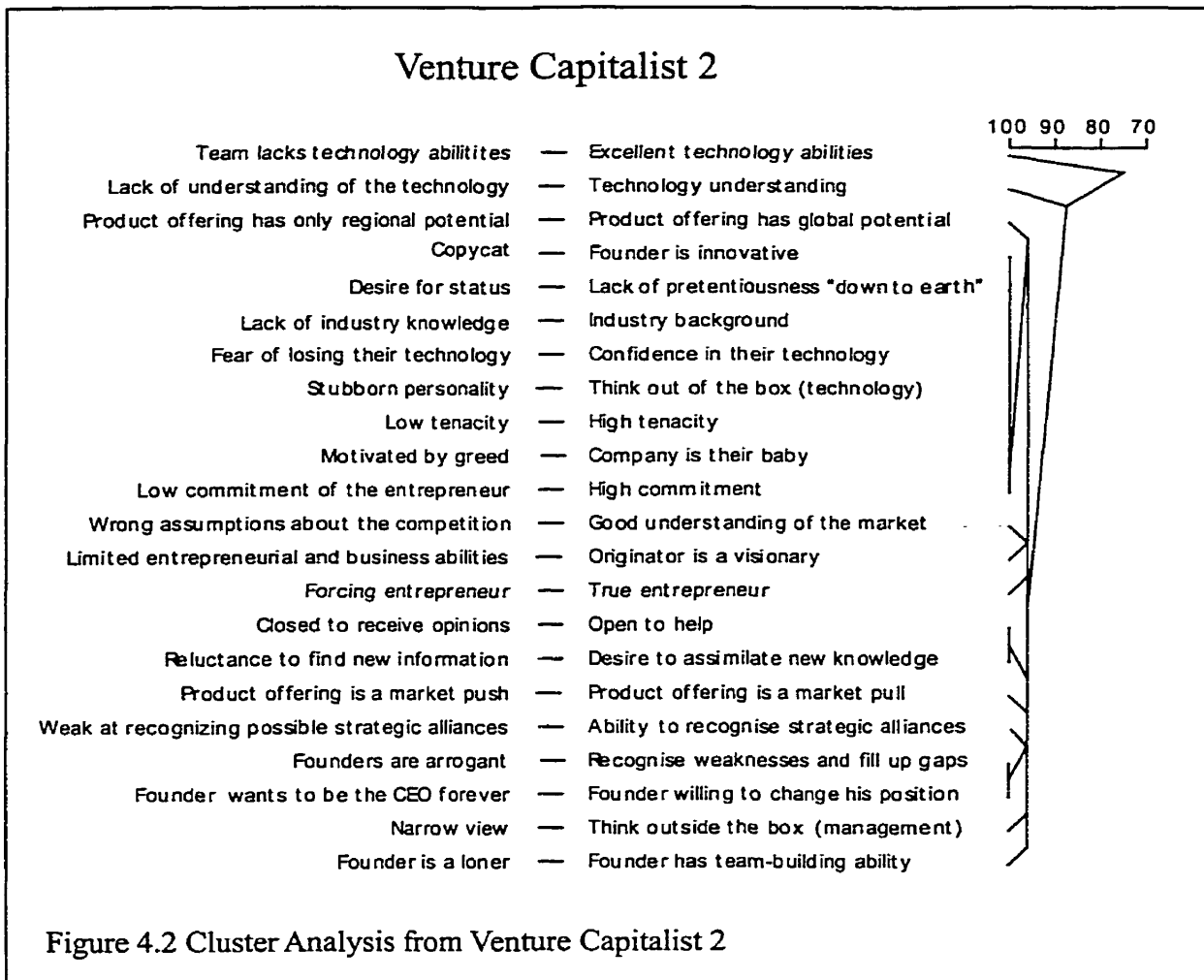
Respondent 1 shows three principal clusters. That is, one subcluster associates the importance of having a competitive strategy with the ability to “make things happen” or “bias for action.” A second subcluster consists of the entrepreneur’s honesty, integrity and character in general as opposed to not having a “reality orientation.” A third subcluster groups the entrepreneur’s ability to assimilate new competitive information as well as marketing core competencies.

Figure 4.1 shows the corresponding cluster analysis for Respondent 1. The “tree-diagram” at the right shows a link in the respondent’s rationale. Constructs connected along neighbouring “branches” are closer together in the respondent’s mind than those connected along non-adjacent branches. The scale shows the percentage similarity of constructs, calculated from the respondent’s original ratings: follow any pair of adjacent branches to the right until they meet, then, read up from that point onto the scale. For example, there’s a 95 per cent match between “honesty and integrity” and “character in general” in this respondent’s thinking (lines in bold). Whenever he says “honesty and integrity” he also says “character in general” and vice-versa.

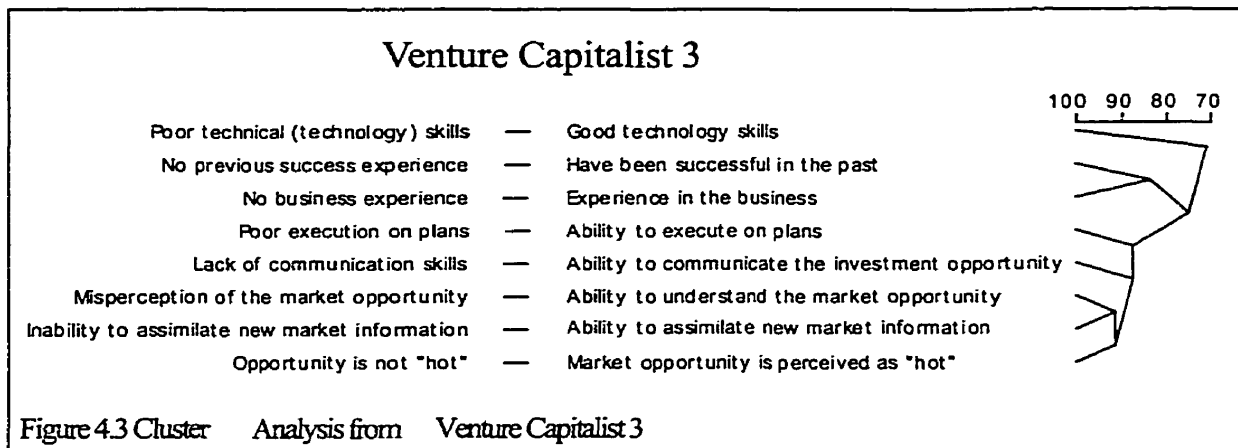


Respondent 2 shows three highly matched (100 per cent) clusters. As shown in Figure 4.2, the first is a cluster grouping eight constructs. This reflects the importance that this investor places on the entrepreneur's ability to "think outside the box." Constructs in this cluster range from tenacity, commitment, innovativeness, and confidence, to lack of pretentiousness of the entrepreneur. A second cluster reflects the importance the investor places on the desire of the entrepreneur to assimilate new knowledge as well as the entrepreneur's openness to opinions and help. A third cluster includes two constructs dealing with the entrepreneur's ability to recognise weaknesses and fill gaps in the team as well as the entrepreneur's lack of arrogance when recognising the need to change his position in the future.

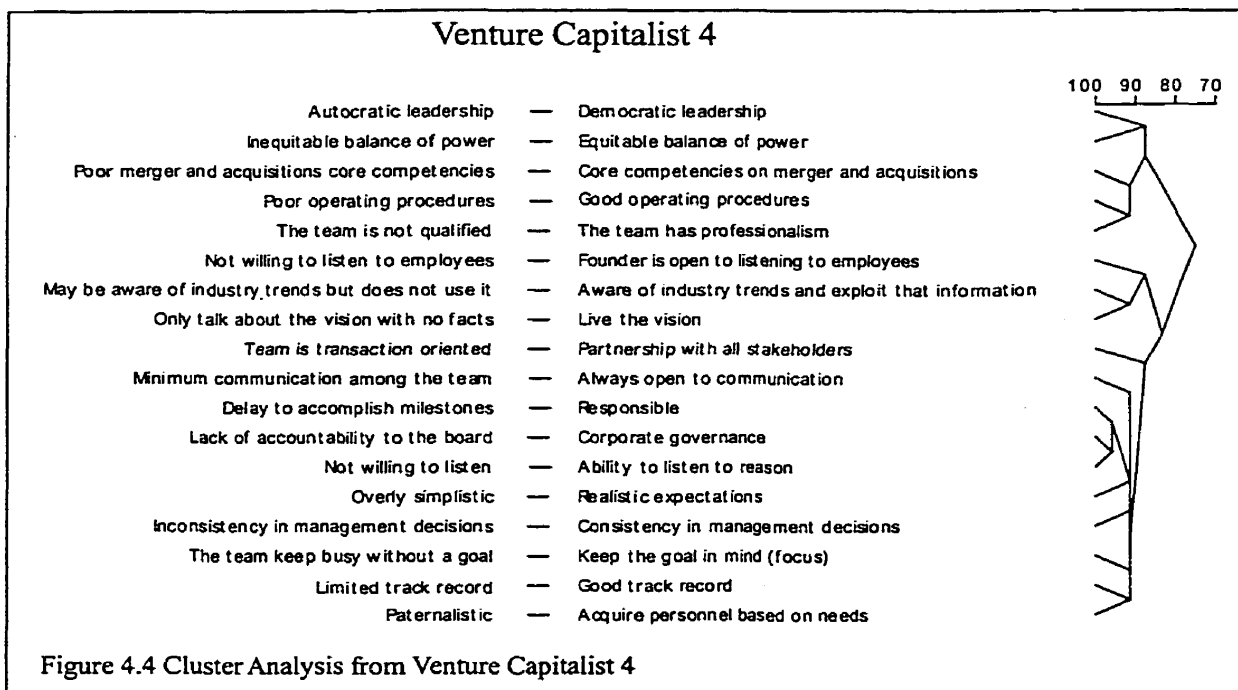




Respondent 3 shows a looser structure (Figure 4.3). In other words, the different constructs are utilised as rather independent ways of assessing a proposal. One subcluster associates the ability for understanding the market opportunity with the importance of assimilating new market information as well as the market perceived as a “hot” market or as a niche. The entrepreneur’s business experience and past successes are somewhat less closely related to other constructs and represent factors to which this investor gives separate and distinct consideration.

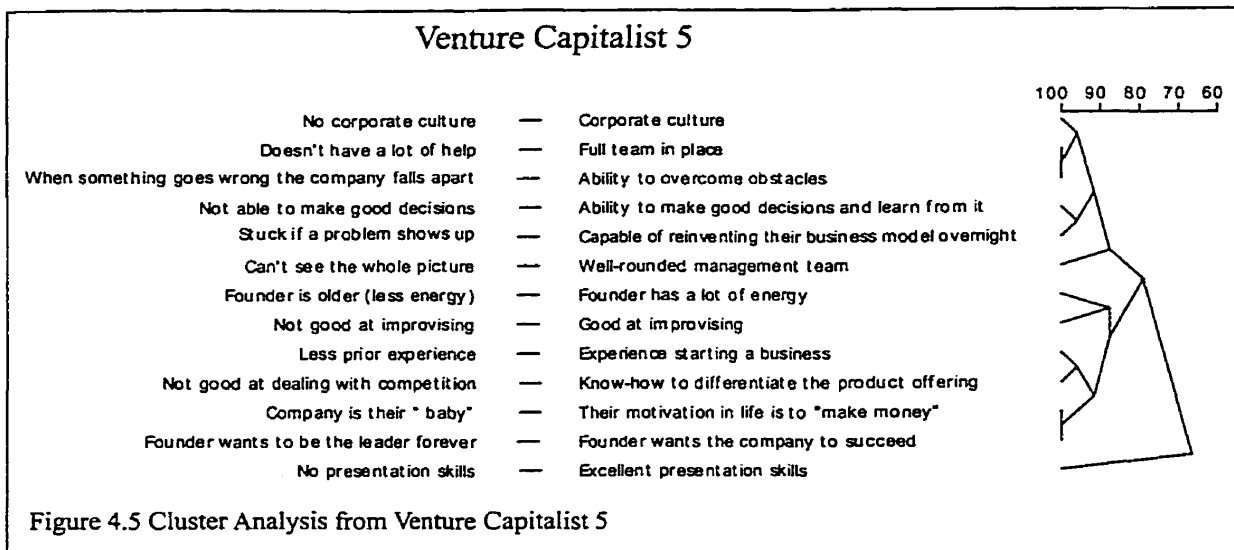


Respondent 4 also shows a somewhat loose structure (Figure 4.4). One cluster associates three highly matching constructs (96 per cent). These constructs relate to the responsibility of the entrepreneur as well as to openness to listening and accountability to the board by way of corporate governance.



There are two constructs slightly related to this subcluster dealing with realistic expectations of the entrepreneur and consistency in management decisions. Qualified entrepreneurs with good operating procedures constitute independent aspects of this investor's decisions.

Respondent 5 shows two tight clusters (Figure 4.5), one of which groups two highly matched (100 per cent) constructs related to the ability of the team to overcome difficult situations. These constructs are characterised by “surviving when something goes wrong” and having a “full team in place,” where, in contrast, ventures with an incomplete team are more vulnerable to “falling apart” when things do not happen as planned.

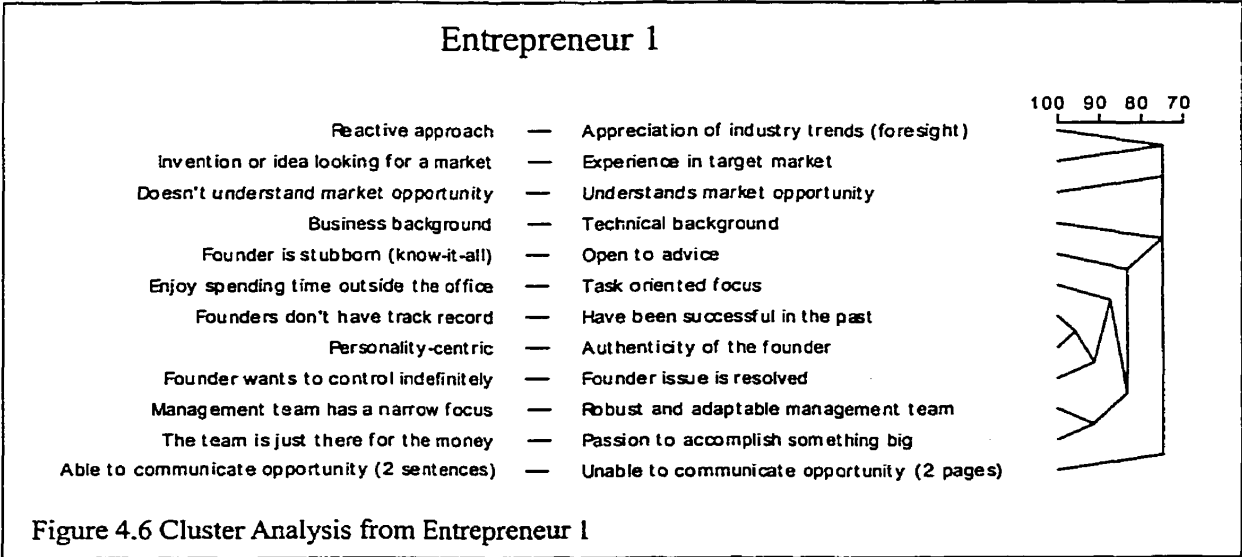


This investor seems to relate survival with the corporate culture of the new venture as well as the “team’s ability to make good decisions and learn from [mistakes],” and the ability to “reinvent their business model overnight.” A second cluster includes

another highly matched pair of constructs. These constructs are characterised by the desire of a founder to succeed and his motivation to make money, as opposed to the determination of founders unwilling to relinquish the leadership of a new venture due to a feeling of the venture’s being “their baby.” This cluster includes two somewhat looser constructs related to the experience and know-how of the founder.

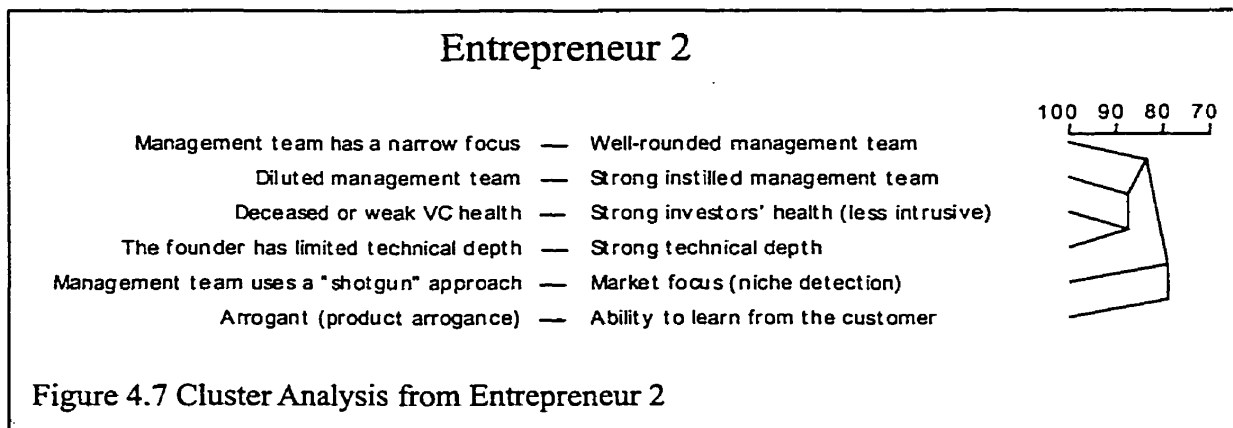
4.2.2.2 Cluster analysis for entrepreneurs

Respondent 1 shows a loose structure (Figure 4.6). This entrepreneur considers as an important factor of success the wisdom of the founder to trust the management of the new venture to a more qualified manager. This is the opposite of a founder who wants to control his venture indefinitely. The contrast is interesting, for the construct corresponds to what several investors considered a very problematic situation.



One could argue that these constructs are part of the respondent's personal theory with respect to success of a new venture. In this case, he is associating this issue with two highly related constructs, "founder has been successful in the past" and "founder is genuine." Having a "robust and adaptable management team" and "passion" are two additional constructs that belong to this subcluster.

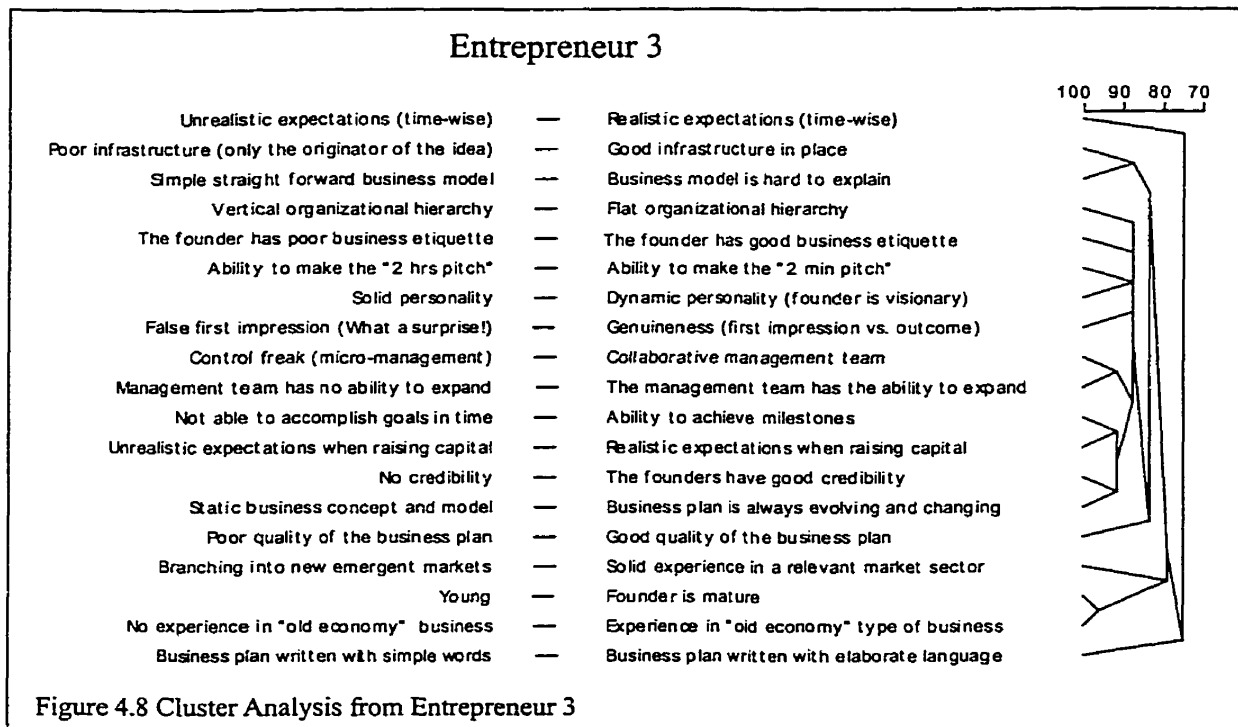
Respondent 2 shows a subcluster with three constructs (Figure 4.7). One deals with the "health" of the investor. When asked to elaborate, the entrepreneur explained this in terms of "being more intrusive / being less intrusive," where an investor with financial difficulties would be considered more intrusive, therefore putting unnecessary pressure on the management team. This interesting finding would not have surfaced had we only considered investors in the study. It would seem to have important implications for those entrepreneurs looking for financing.



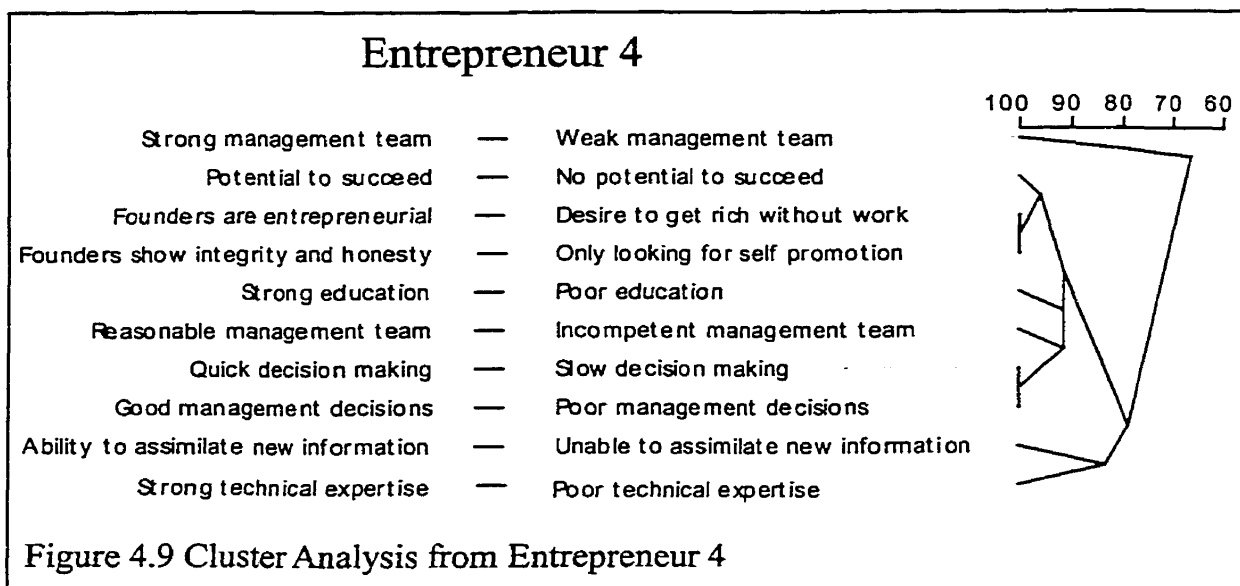
The construct dealing with "health" of the investors is associated with the strong technical grounding of the founder as well as a "strong instilled" management team. On

the other hand, “niche detection” and the ability to learn from customers are issues that indicate separate concern.

Respondent 3 shows one main cluster (Figure 4.8). A group of six constructs form a tight (96 per cent) subcluster. A dynamic business plan “constantly evolving and changing” and good credibility are related to the ability to achieve milestones to “keep the money happy” as well as to have realistic expectations of “how much capital to raise” and “when.” Moreover, the team’s “ability to expand” seems to be influenced by its having a collaborative management team. A group of five constructs dealing mainly with the personality of the founder complements this cluster. Issues associated with “business etiquette” and “dynamic personality” as well as “genuineness” belong to this group of constructs.

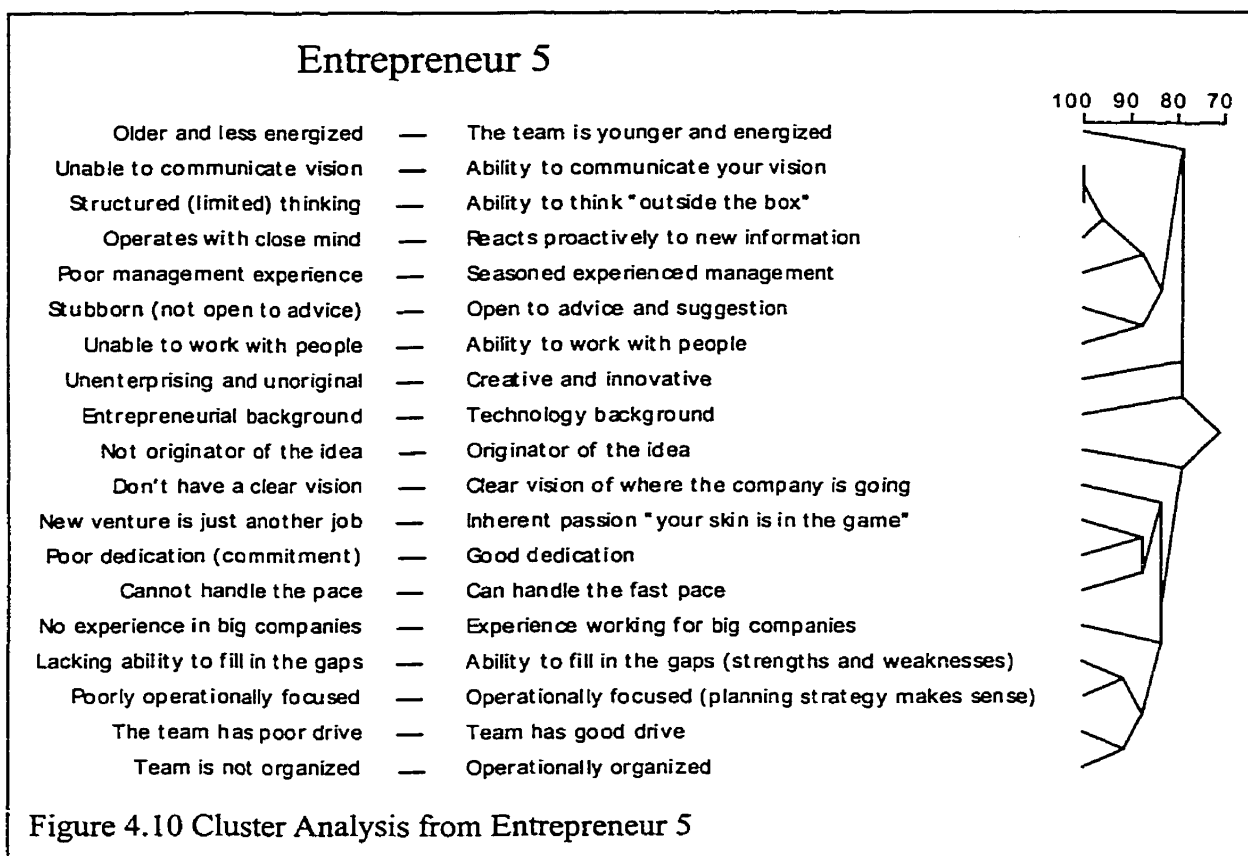


Respondent 4 shows one tight cluster (Figure 4.9). Integrity and honesty are highly related to his concept of “being an entrepreneur,” and are also linked to a “potential to succeed.” Similarly, a management team with an ability to make “quick” and “good” management decisions is considered to be “reasonable” rather than “incompetent.” “Education of the founders” is explained as “having professional degrees” and belongs to this cluster as well. “Strong technical expertise” and the “ability to assimilate new knowledge” are constructs to which this participant gives different consideration.



Respondent 5 provided a total of 19 constructs (Figure 4.10) clustered in two main groups. An ability to communicate the founder’s vision is associated with an ability to “think outside the box.” Similarly, “being open to advice and suggestions” is linked not only to experience but also to proactive reaction to new information as opposed to operating with “a closed mind,” which is closely related to the ability to “work with

people.” A second group includes constructs associated with “inherent passion,” “dedication,” “clear vision,” and “handling a fast pace.” Somewhat linked to this cluster are abilities to “fill in the gaps in terms of weaknesses or strengths,” “be operationally focused,” “have good drive,” and “be operationally organised.” Interestingly enough, team characteristics such as “being creative and innovative” as well as “being originators of the idea” are issues of separate concern to this entrepreneur.



In general, these descriptions are diverse with several distinct constructs in each case. In other words, while investors and entrepreneurs draw on a fairly common set of



constructs, they associate them in different ways and form their impressions of a venture proposal by focusing on different aspects.

Some constructs were represented as independent of the main clusters and are worthy of separate analysis. A possible explanation of this circumstance is the fact that some of the constructs are unique to each venture and therefore should be assessed on an individual basis. In other words, one could hypothesise that when assessing a new venture proposal, most investors and entrepreneurs look for the presence of certain characteristics (the founder's experience and background, for example). At the same time, there are idiosyncrasies particular to each venture. The conclusion might be that, initially, investors are matching a venture proposal's characteristics against somewhat standard criteria. After an evaluation of certain fundamentals, investors focus on the particulars of such a venture. One implication is that, in assessing a new venture, a simple verification of a list of criteria would probably result in unrealistic understandings of its value. In other words, only a comprehensive assessment process can produce a more realistic evaluation of a new venture proposal.

#### 4.2.3 Principal component analysis

A principal component analysis provides a description of the connections between elements and constructs in a grid. It reveals how a large number of individual judgements made by the subject in rating all the elements on all the constructs are manifestations of a relatively more simple underlying structure. It also shows contrasts between the different

elements (business plans, in this case). These contrasts are indicated in terms of which constructs are of major importance in the subject's system.

The principal component analysis extracts successive components—the first being able to account for the most variation, the second accounting for the most residual variation and so on. In most grids, the first principal component accounts for between 30 and 50 per cent of total variance, the second for 10 to 25 per cent and subsequent components for diminishing proportions (Ryle, 1975). For most practical purposes, the first two or three components provide an adequate picture of the subject's system (Bell, 1990).

Our interest in analysing principal components is to obtain an indication of the cognitive complexity that investors and entrepreneurs use when assessing proposals. Cognitive complexity can be summarised in terms of the differences in which subjects construe the same issues independently of each other (Adams-Webber, 1996). For example, a highly complex individual will take into account markedly different aspects of an issue when thinking about it, as opposed to viewing it in terms of the one or two themes dominating his thinking. As described by Adams-Webber (1970), the proportion of total variance accounted for by the largest factor or first principal component provides an index of the cognitive complexity. A useful rule of thumb in repertory grid work is to regard a situation in which 60 per cent or more of variance is accounted for by the first principal component as an indication of low cognitive complexity (Smith and Stewart (1977); Smith (1980)).

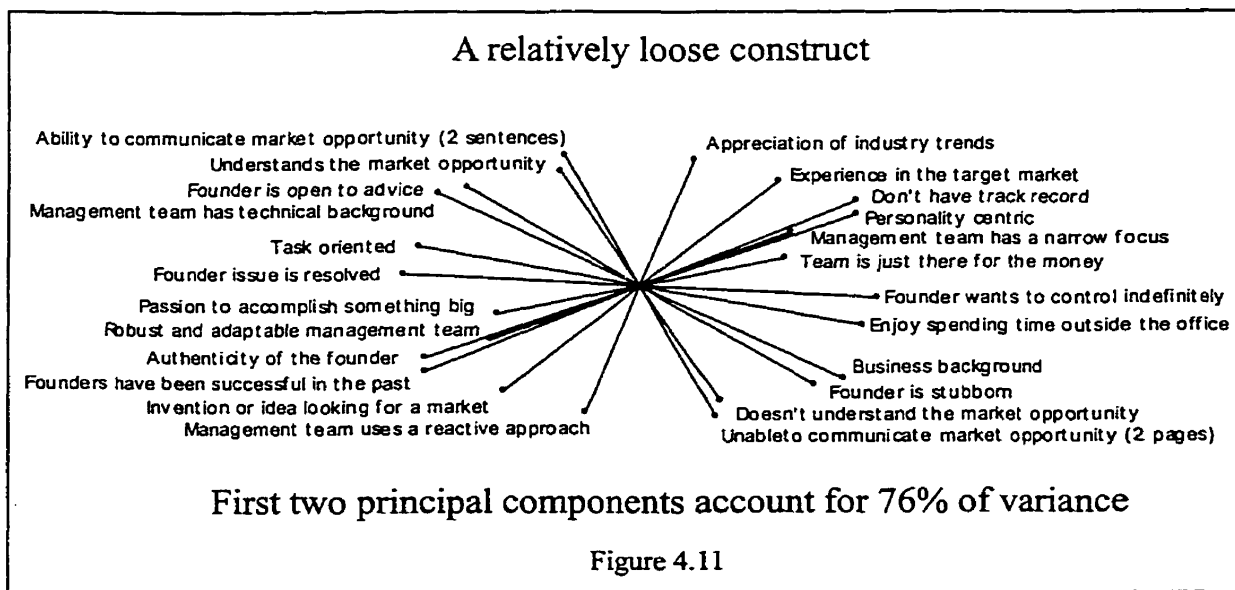
Table 4.5 provides a summary of separate principal component analyses of each individual grid. The results of these analyses indicate that all respondents show a relatively low complexity with just one or two themes representing their thinking. After analysing each grid, we labelled the themes corresponding to each participant. Those labels were taken from the nearest two constructs to the first principal component axis. Table 4.6 shows a summary of these labels for the first principal components.

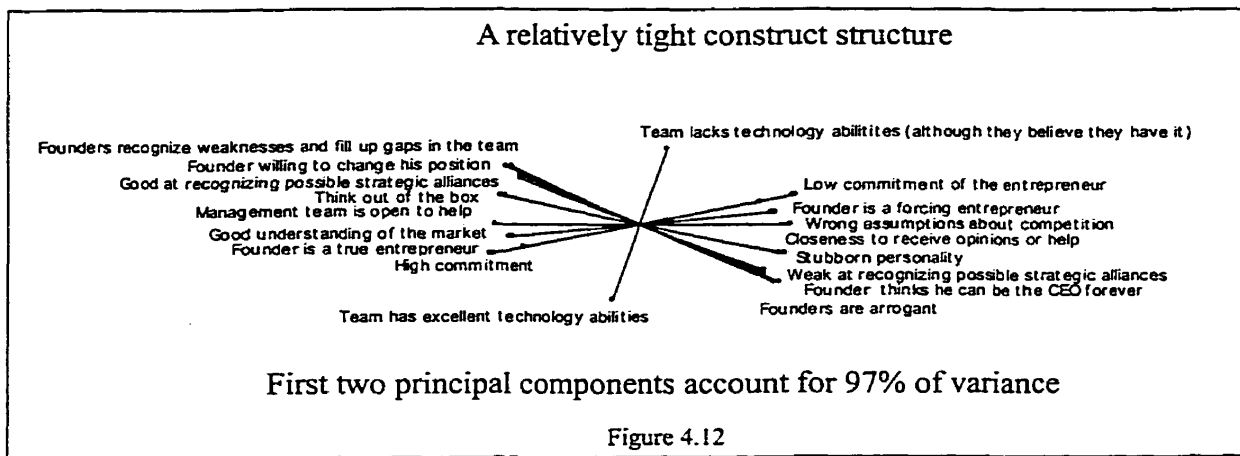
TABLE 4.5 Variance accounted for by each principal component of the 10 repertory grids						
	Principal component No.					
Venture Capitalist	1	2	3	4	5	1+2
1	75.70	12.29	6.42	3.90	1.69	<b>87.99</b>
2	89.80	7.47	2.14	0.54	0.05	<b>97.27</b>
3	47.87	39.01	8.21	3.27	1.65	<b>86.88</b>
4	73.95	14.49	4.63	3.82	3.11	<b>88.44</b>
5	79.16	10.59	5.75	3.10	1.40	<b>89.75</b>

	Principal component No.					
Entrepreneur	1	2	3	4	5	1+2
1	57.91	17.79	10.90	7.50	5.89	<b>75.7</b>
2	69.98	15.70	9.52	2.86	1.94	<b>85.68</b>
3	64.32	21.49	7.43	4.38	2.38	<b>85.81</b>
4	78.35	11.85	6.12	2.64	0.64	<b>90.6</b>
5	53.15	27.71	9.76	6.52	2.85	<b>80.86</b>

TABLE 4.6		Labels and correspondent themes for each participant (Based on nearest two constructs to principal component axis)	
Venture Capitalist	Label	Theme	
1	Organizational effectiveness Character in general	Effective of management team Honesty and integrity	
2	Entrepreneurial abilities Market understanding	Tenacity, high commitment, innovativeness Knowledge of market potential	
3	Hot market Successful entrepreneur	Attractive product offering Solid experience and background	
4	Goal oriented Awareness of trends	Keep goal in mind Open to communication	
5	Corporate culture Full team in place	Persistent management team Well rounded management team	
Entrepreneurs	Label	Theme	
1	Team has focus Authentic management team	Task oriented management Trustworthy management	
2	Technical background Investor's health	Founder has strong technical depth Less intrusive venture capitalist	
3	Collaborative management Dynamic business plan	Synergic management Always evolving and changing	
4	Entrepreneurial team Personal quality	Desire to succeed Founder's integrity and honesty	
5	Fill gaps (weakness/strength) Motivated team	Effective management team Team has drive	

A loose construct structure is characteristic of high cognitive complexity: an example of this kind of structure is shown in Figure 4.11. Correspondingly, Figure 4.12 shows an example of a tight structure characteristic of low cognitive complexity. This figure shows most constructs sketched together neighbouring the first (horizontal) principal component. A perusal of Table 4.6 shows that the preponderant themes (from both investors and entrepreneurs) relate to the adequacy of the management team with the business proposal. Associating the two main constructs from each first component with their groups (described in Table 4.4) corroborated this result. We found that most of the two main constructs belong to groups two and five (personality of the entrepreneur and business proposal respectively). In this area, our results correspond to those reported by Hisrich and Jankowicz (1990).





### **Analysis of extremity**

Several studies have defined rating extremity as an indication of personal meaningfulness (Shepherd, 1999). For example, Bonarius (1970) has shown that subjects rate their close associates (e.g., my best friend) more extremely than remote acquaintances (e.g., my doctor). Also, there is considerable evidence, reviewed by Adams-Webber (1979), that subjects tend to rate themselves and others more extremely on elicited constructs than on supplied ones. Moreover, as discussed by Adams-Webber and Benjafield (1973), rating extremity also correlates with personal judgements of the relative meaningfulness of supplied constructs. It has been agreed that the higher the extremity score, the more meaningful the statement is for the respondent. In other words, an extremity score indicates how far a respondent rated the elements from the midpoint of a scale. Rating extremity is then calculated by subtracting the midpoint of a scale from each assigned rating. In our case we used a scale of 1 to 5 with a midpoint of 3. For example, a rating of 1 on a scale from 1 to 5 would have an extremity score of  $|1 - 3| = 2$ .

The resulting extremity scores for each element (business plans in our study) are added up and divided by the number of plans rated (in this study, there were six).

Table 4.7 Summary of the two higher extremity scores for each participant and the correspondent loading weight in the principal component				
Participant	Description	Extremity Score	Loading in first component	Within two heaviest weights?
<b>Venture Capitalists</b>				
1	Organizational effectiveness	1.67	4.364	✓
	Character in general	1.67	4.078	✓
2	Confidence in technology	1.83	4.328	✓
	Thinking "out of the box"	1.83	4.328	✓
	Industry background	1.83	4.328	✓
	High tenacity	1.83	4.328	✓
	"Down to earth"	1.83	4.328	✓
	Not motivated by greed	1.83	4.328	✓
	Innovative founder	1.83	4.328	✓
3	High commitment	1.83	4.328	✓
	Ability to execute on plans	1.33	2.171	
4	Successful in the past	1.33	0.039	
	Founder has realistic expectations	1.50	3.823	✓
5	Merger and acquisitions core competencies	1.50	3.103	
	Know-how to differentiate product offering	1.67	3.517	
	Excellent presentation skills	1.67	2.845	
<b>Entrepreneurs</b>				
1	Invention or idea looking for a market	1.50	1.887	
	Founder has been successful in the past	1.33	2.956	
2	Strong technical depth	1.50	3.298	✓
	Less intrusive investor	1.33	3.276	✓
3	Business plan evolving and changing	1.67	3.871	✓
	Experience in "old economy"	1.50	2.545	
	Collaborative management team	1.50	4.001	✓
4	Founders are entrepreneurial	1.67	4.134	✓
	Integrity and honesty	1.67	4.134	✓

5	Team is originator of idea	2.00	1.737	
	Operationally organised	1.67	4.098	✓
✓ Indicates a construct that is within the two largest weights in the principal component				

Table 4.7 provides a summary of the two higher extremity scores for each participant. The last column shows a checkmark (✓) indicating those constructs that not only have the most extreme values but also correspond to the top two highest weights from the principal component. These constructs contribute two characteristics. First, they are meaningful to the participant. Second, by knowing their loading, we can predict the participant's ratings with great accuracy (please refer to Table 4.5 to confirm the variance accounted for by the first component of each grid).

Using the previous results, an analysis of the overall correlation between the extremity scores and the first component loadings was calculated. The results of this analysis show a statistically significant overall correlation of .662 ( $p < 0$ ). This is an interesting finding with general implications for grid structure (Adams-Webber, 1979). In other words, the evidence considered above lends support to Bannister's (1962) general assumption that the degree of statistical association between constructs in repertory grid data primarily reflects the level of integration of experts' conceptual structures.

### 4.3 Phase III

During this phase, a fuzzy concept demonstration system was validated in front of experts. The objective of such system was to pre-test our Fuzzy Expert System (FES) by



having a panel of experts, five venture capitalists in this case, evaluating the system performance. Based on their feedback, the model will be refined prior to full validation in the future.

The experimental design for the system validation was based on a modified Turing test (Turban, 1988). In this case, each expert was asked to assess some intangibles of a new venture. The assessment consisted of the following four major areas:

- Background
- Personality
- Management skills
- Investment opportunity

The participants in this study were experts in the area of investment decision-making in early-stage technology-based ventures. The group consisted in five Canadian venture capitalists. The sample was identified from the current network at the Institute for Innovation Research. All five venture capitalists were contacted in order to validate the FES. Each investor was asked to recall a recent investment (not older than six months). Some investors preferred to recall an investment opportunity that they had accepted, while some other preferred to assess a venture in which they had already invested some capital. That is, by using the expert system to review the characteristics of such investment opportunities, investors were interested in validating what they had already decided. In other words, the objective of the exercise was to corroborate the outputs of the system with their own answers.

A laptop computer with a MS Power Point presentation guided the expert through the different levels of assessment. Figure 4.13 shows an example of one of these levels: experience of the management team. The system includes a total of 52 fuzzy variables organised in sets of no more than four variables. For example, an assessment of the energy of the management team consists on the following fuzzy variables: passion, tenacity, innovative skills and commitment (see Table 4.8 and Figure 4.13). It is worth mentioning that each of these fuzzy variables can be specified using at least three fuzzy qualifiers. For example, experts were asked to evaluate the experience of the management team in the target market by specifying whether it was limited, somewhat limited, medium, somewhat broad, or broad.

Once the expert had assessed a fuzzy variable, the author would input the result into the fuzzy expert system (designed using Matlab) running in the background. Both the investor and the system provided an output. The expert was asked then if there was agreement between his answer and the one provided by the system. When the expert disagreed with the output provided by the system, we considered only his answer in further assessments. Such disagreements were noted down and discussed at the end of the session with the expert. Most of the time, we concluded that the explanation of the disagreement was due to a particular characteristic of such investment. Consequently, some investors suggested that the final system should have the flexibility of modifying an answer provided by the expert system at any time. Once the four main areas were completed, the system provided an overall assessment of such investment opportunity.

An important step in the development of a fuzzy expert system is the design of its rules. The rules in a fuzzy system are a representation of the knowledge elicited from experts. In other words, the rules in a fuzzy system indicate what to do in certain situations. For example, let's consider the portion of FAM illustrated in bold letters in Table 4.8, this is a fuzzy associative memory that attempts to assess the energy of the entrepreneur, an example of one of its rules is (see Appendix G for an example of representative rules):

IF Passion is low AND Tenacity is somewhat low AND Innovative Skills are weak AND Commitment is low THEN Energy is low.

Table 4.8 shows the structural design of the fuzzy expert system (FES). It also indicates the 52 fuzzy variables as part of the accumulated knowledge from different phases of the research. A ✓ indicates that such variable was elicited during the corresponding phase. For the particular case of Phase II, the table shows the type of analysis from which such variable was elicited: Cluster Analysis (CA), Principal Component Analysis (PCA) or Extremity Analysis (EA). The column "Expert" indicates when the knowledge was elicited from an entrepreneur (E) or from an investor (I). The column FAM shows the label that characterizes the corresponding Fuzzy Associative Memory for those variables. The column "From Content Analysis" shows the four main areas of intangibles assessed with the FES, these areas were elicited during the content analysis shown in Table 4.4. The last column shows the "Overall Opportunity" as the final output of the FES. Note that the output of each group of four fuzzy variables becomes the input to its corresponding FAM, then, the outputs of the FAMs become the input to each of the four main areas; finally, the output of the four main areas become the

inputs for the “Overall Opportunity.” Take for example the fuzzy variables shown in bold letters. Once these variables have been assessed, the FES creates an output for each of them, such output becomes the “fuzzy” assessment of the FAM: “Energy of the management team.” Then, once this variable together with “Ethical Qualifications,” “Respectfulness,” and “Openness” have been assessed, they become the input to one of the four main areas: “Personality.” Next, once “Personality” has been assessed together with “Background,” “Management Skills,” and “Investment Opportunity” they become the input for the last FAM: “Overall Opportunity,” which provides an overall assessment of the intangibles of the investment opportunity.

Table 4.8 Design structure of the fuzzy expert system (FES) with the accumulated knowledge from different phases of the research

Fuzzy variable	Phase I	CA	PCA	EA	Expert	FAM		Phase I	Phase II	From Content Analysis	Overall FAM
						Experience of the management team	Professional qualifications				
Experience in the target market	✓	✓		✓	✓	✓	✓	✓			
Professional experience	✓			✓		✓	✓	✓			
Technical experience		✓		✓	✓	✓	✓	✓			
Management experience	✓			✓		✓	✓	✓			
Successful in the past	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Entrepreneurial experience	✓	✓			✓						
Business background		✓								✓	
Academic background				✓							
Passion		✓	✓	✓	✓	✓	✓	✓			
Tenacity			✓	✓	✓	✓	✓	✓		✓	
Innovative skills		✓		✓	✓	✓	✓	✓			
Commitment		✓		✓	✓	✓	✓	✓			
Authenticity	✓	✓	✓	✓	✓	✓	✓	✓			
Genuineness				✓	✓	✓	✓	✓		✓	
Integrity				✓	✓	✓	✓	✓			
Honesty				✓	✓	✓	✓	✓			
Pretentiousness	✓	✓									
Business etiquette				✓	✓	✓	✓	✓		✓	
Work environment				✓	✓	✓	✓	✓			
Team cohesiveness				✓	✓	✓	✓	✓			
Receive advice	✓	✓	✓	✓	✓	✓	✓	✓			
Relegate power				✓	✓	✓	✓	✓			
Assimilate new knowledge	✓	✓		✓	✓	✓	✓	✓			
Receive help	✓	✓	✓	✓	✓	✓	✓	✓			
Potential to succeed				✓	✓	✓	✓	✓			
Ability to achieve milestones		✓									
Ability to keep the goal in mind	✓			✓	✓	✓	✓	✓			
Ability to execute on plans				✓	✓	✓	✓	✓			
Management skills		✓	✓								
Background		✓									
Experience of the management team		✓	✓								
Professional qualifications		✓									
Energy of the management team		✓									
Passion											
Tenacity											
Innovative skills											
Commitment											
Authenticity											
Genuineness											
Integrity											
Honesty											
Pretentiousness	✓	✓									
Business etiquette											
Work environment											
Team cohesiveness											
Receive advice	✓	✓	✓	✓	✓	✓	✓	✓			
Relegate power											
Assimilate new knowledge	✓	✓									
Receive help	✓	✓	✓	✓	✓	✓	✓	✓			
Potential to succeed											
Ability to achieve milestones											
Ability to keep the goal in mind	✓										
Ability to execute on plans											

Table 4.8 (Continuation)

Assimilate new market info.	√	√				√	Absorptive capacity	√	√		
Assimilate competitive info.			√	√		√					
Ability to learn from the customer	√					√					
Ability to recognize weaknesses	√		√			√					
Decision making	√	√	√			√	Decision-making skills		√		
Management decisions		√	√	√		√					
Planning decisions		√	√	√		√					
Ability to act		√				√					
Financial core competencies			√	√		√	Core competencies	√	√		
Marketing core competencies			√			√					
Organizational effectiveness	√		√			√					
Core comp. for raising capital			√	√	√						
Attitude with investors	√	√				√	Management team	√	√		
Entrepreneur	√		√			√					
Age of the team		√	√			√					
Attitude against obstacles	√	√	√	√	√						
Communicates vision of company		√				√	Opportunity communication		√		
Communicates investment opportunity	√	√	√	√	√						
Presentation skills			√			√					
Communicates market opportunity	√	√	√	√	√	√					
Potential of product offering		√				√	Business plan	√	√		
Perceived market opportunity	√			√	√	√					
Business plan document	√	√	√			√					
Language level in business plan	√	√	√			√					

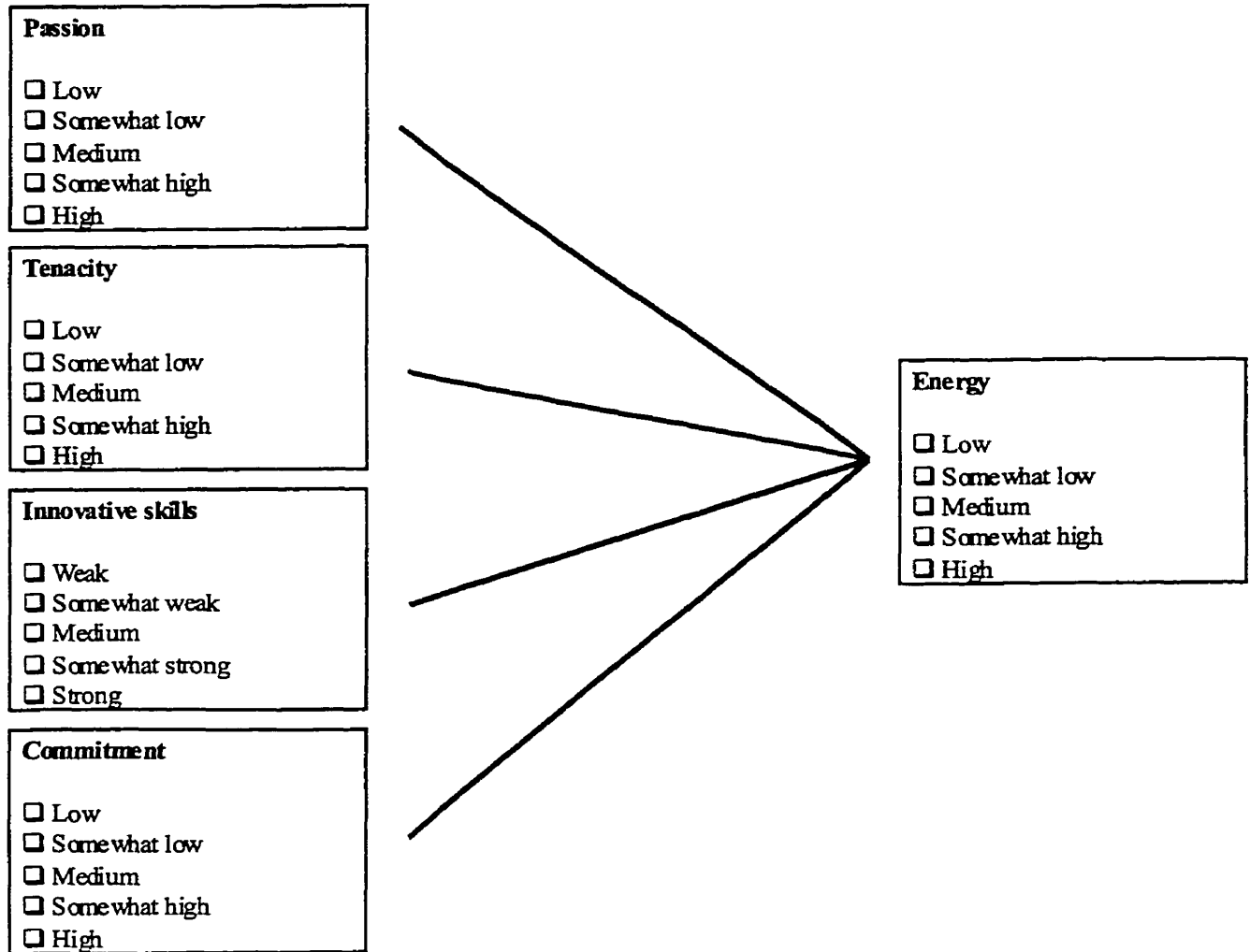


Figure 4.13 Assessment of energy of the management team.

At the end of the session, each expert was asked to fill-out a small questionnaire once the assessment of the new venture was completed. The results of the survey are reported on Table 4.9, it included a 7-point Likert Scale used for gathering responses on 22 questions about the method. For example, on the Likert Scale “1” represented “Disagree” and “7” represented “Agree.” Respondents were also given the option of

selecting “N/A” implying the specific investment criteria were not applicable to the new venture.

Table 4.9 Summary of results for validation of FES			
Assessment of Intangibles in Business Plans for Technology-Based New Ventures			
Question		Total Average	Std Dev.
1	The four major areas identified in the methodology are important for assessing some of the intangibles that these ventures have.	6.20	0.84
2	In terms of assessing the experience of the entrepreneur the proposed methodology is complete.	5.00	1.73
3	In terms of assessing the professional qualifications of the entrepreneur the proposed methodology is complete.	5.80	0.45
4	In terms of assessing the background of the entrepreneur the proposed methodology is complete.	4.60	2.07
5	In terms of assessing the energy of the entrepreneur the proposed methodology is complete.	5.50	1.00
6	In terms of assessing the ethical qualifications of the entrepreneur the proposed methodology is complete.	5.40	0.89
7	In terms of assessing the respectfulness of the entrepreneur the proposed methodology is complete.	5.60	0.55
8	In terms of assessing the openness of the entrepreneur the proposed methodology is complete.	5.60	0.55
9	In terms of assessing the personality of the entrepreneur the proposed methodology is complete.	4.40	2.07
10	In terms of assessing the strategy skills of the entrepreneur the proposed methodology is complete.	4.80	1.64
11	In terms of assessing the absorptive capacity of the entrepreneur the proposed methodology is complete.	5.60	0.55
12	In terms of assessing the decision-making skills of the entrepreneur the proposed methodology is complete.	5.60	0.55
13	In terms of assessing the core competencies of the entrepreneur the proposed methodology is complete.	5.60	0.55
14	In terms of assessing the management skills of the entrepreneur the proposed methodology is complete.	5.20	0.84
15	In terms of assessing the management team the proposed methodology is complete.	5.40	0.55
16	In terms of assessing the communication of the opportunity by the entrepreneur the proposed methodology is complete.	6.00	0.71
17	In terms of assessing the quality of the business plan the proposed methodology is complete.	5.80	0.45
18	In terms of assessing the investment opportunity the proposed methodology is complete.	4.80	1.10
19	In terms of assessing the overall opportunity the proposed methodology is complete.	5.20	0.45



20	The scales used with each concept are appropriate.	5.60	1.14
21	The proposed methodology would provide a useful assessment tool when considering these ventures.	5.80	0.84
22	The proposed methodology would be useful tool only after significant modifications.	3.00	1.41

The results of this face validation stage show that experts generally agreed with the output provided by the system. One of the limitations of this validation phase was the availability of investors to assess more than one technology-based venture. In other words, each session took about 45 minutes in order to assess only one investment opportunity. However, the results shown in Table 4.8 indicate that experts consider this tool as useful when assessing technology-based ventures.

**“If A equals success, then the formula is A equals X plus Y plus Z. X is work. Y is play. Z is keep your mouth shut.”**

**Albert Einstein (Recalled on his death 18 April 1955)**

## **Chapter 5**

### **Conclusions and remarks**

Most of the evidence available today, documenting successful investments made by venture capitalists in technology-based new ventures, is anecdotal. The news media and business publications frequently publicise individual experiences shared by entrepreneurs. Such stories may create an unrealistic expectation in terms of the availability of large amounts of venture capital, the relative ease to raise capital, and entrepreneurship as a ticket to success. However, the reality is that entrepreneurs often have difficulty raising capital. For example, venture capitalists claim that there are very few deals in which they wish to invest; there is limited amount of capital available for new ventures at early stages; and there are more failures than successes of technology-based new ventures. Perhaps an explanation of this phenomenon is the intangible nature of most of such investment opportunities. This study offers an empirical first look at the assessment of intangibles in technology-based new ventures.

The results of this study not only provide evidence of the effectiveness of using repertory grids to elicit intangibles but also increase our knowledge of the venture capital decision process. A new and innovative approach was used by considering two perspectives—the investor’s and the entrepreneur’s—on this decision-making problem.

Thus, a new appreciation was gained of the elements in a subjective evaluation of early stage technology-based ventures.

Furthermore, the outcome of the FOCUS based cluster analysis provides additional evidence of individual differences among venture capitalists with respect to their cognitive complexity in terms of their evaluations of entrepreneurs, which supplements that derived from the principal component analysis. Moreover, while investors and entrepreneurs draw on a fairly large set of constructs, they associate them in different ways and form their impressions of a venture proposal by focusing on a variety of aspects. This is a result of major significance. In other words, it very effectively illustrates the fundamental importance of personally constructed knowledge in the development of high-level expertise.

An analysis of the constructs from each group reveals that both place high importance on the perceived qualifications of the management team. This category considers not only the skills of the management team but also their core competencies, abilities, and business acumen. Constructs related to the personality of the entrepreneur—honesty, integrity, passion, and business etiquette, for example—are also included.

Some of the results replicate the findings of Hisrich and Jankowicz (1990) in which management was regarded as the most important category. Furthermore, this rather new technique provided a systematic assessment of otherwise anecdotal evidence with

regard to intangibles in investment of technology-based ventures. For example, the investors' frequent mention of honesty confirms how important this intangible is; in the same way, "good business etiquette" seemed to be a decisive factor for some investors.

The findings of this study are not fully consistent with research by Hall and Hofer (1993). Their main point was that venture capitalists are not concerned with the assessment of human capital when screening new investment proposals. Perhaps their findings were due to the design of their study, which determined only the earliest phase of deal screening. This is where venture capitalists are sifting through hundreds of proposals by target company managers. One possible assessment method used by investors at this time is to screen opportunities by comparing the new proposal's characteristics against general working guidelines, such as area of investment, geographic location, and stage of the venture. By the time the investors move to the in-depth due diligence research phase, it is very clear from the results of this dissertation that venture capitalists are concerned with an effective assessment of some of the intangibles involved in the proposal.

Another interesting finding of this study, although mentioned only once by an entrepreneur, is the construct related to the "health of the venture capitalist." This is worth mentioning since this study, unlike others, includes a consideration of the point of view of the entrepreneur. A further investigation of this construct detailed how a "healthy" investor is one without financial troubles. According to this entrepreneur, a

venture capitalist struggling with financial difficulties is “more intrusive” and puts “unnecessary pressure” on the management team.

These findings cause us to reconsider our earlier efforts to locate a set of fully generalised “intangibles.” We understand better the contextual idiosyncratic and dynamic nature of these important attributes.

The results of the third phase of this study show that fuzzy set theory provides a “natural” framework for the expert assessment of intangibles. Perhaps, this is due to the linguistic approach used by experts when assessing investment opportunities. The experts’ use of fuzzy terms was evident along the different phases of this research. It was clear that when assessing technology-based new ventures there are usually no “black and white” but mostly “grey zones.” This was even more apparent when assessing intangibles. For example, when asked to describe an “ideal” business plan during the first phase of this dissertation, both investors and entrepreneurs almost always used fuzzy terms, such as “good”, “complete”, or “attractive.”

A remarkable contribution of this study is the link between Repertory Grid, an elicitation technique capable of detecting some of the intangibles used by experts, and fuzzy set theory, providing a suitable structure for the communication and assessment of such intangibles. Some studies have suggested the association of these two techniques (Hwang, 1999; Gaines and Shaw, 1980). However, this is the first study focused on

applying both techniques to the assessment and communication of intangibles in business plans of technology-based new ventures.

**“Knowledge-based companies represent this country’s best chance to create high-wage jobs, build exports and add wealth... yet they often have difficulty getting funding because their assets are intangible, consisting of people’s ideas and innovations”**

**Holger Kluge, CIBC President, 1995.**

## **Chapter 6**

### **Future research**

Future studies could make a contribution by focusing on early stages of new technology-based ventures at various points. In other words, a longitudinal study could provide evidence of the dynamism as well as the idiosyncratic characteristics of a new venture. Technology-based ventures not only experience constant change but also need to adjust to this change in order to survive. This situation is even more critical for new ventures. Therefore, having a list of criteria to appraise the value of these ventures at only one point in time would probably result in an unrealistic assessment. Thus our results show that an on-going assessment process is probably more appropriate than a one-time assessment. We need, then, a method to assess a new venture over different points in time.

Our investigation suggests that a longitudinal study should consist of eliciting impressions and significance of a new venture from a group of entrepreneurs, incubators and venture capitalists at three points. The first occurs when an idea is initially presented to an investor and curiosity is piqued. The second comes when the entrepreneur presents the idea in the form of a business plan to an incubator. The third takes place when the new venture is ready for its first round of financing, usually from a venture capitalist. A

longitudinal study would allow us to consider three angles of the same problem 1) the ideas, which usually come from an entrepreneur, 2) the management, which is usually provided by incubators, and 3) the capital, which usually comes from a venture capitalist.



## Bibliography

Aamodt, A., and Plaza, E. 1994. Case-based reasoning: Foundational issues, methodological variations, and system approaches. *AI Communications*. 7: 39-59.

Abdolmohammadi, M. J. 1987. Decision support and expert systems in auditing: A review and research directions. *Accounting and Business Research*. (Spring): 173-185.

Adams-Webber, J. R. 1970. An analysis of the discriminant validity of several repertory grid indices. *British Journal of Psychology*. 61: 83-90

Adams-Webber, J. R. 1979. *Personal Construct Theory: Concepts and Applications*. John Wiley and Sons.

Adams-Webber, J. R. 1995. Constructivist psychology and knowledge elicitation. *Journal of Constructivist Psychology*. 8: 237-249.

Adams-Webber, J. R. 1996. Cognitive complexity. In Corsini, R. and Auerbach, A.J. (eds.) *Encyclopaedia of psychology* (p. 154). New York: John Wiley and Sons.

Adams-Webber, J. R. and Benjafield, J. 1973. The relation between lexical marking and rating extremity in interpersonal judgement. *Canadian Journal of Behavioural Science*. 5: 234-241

Agnew, N. M. and Brown, J. L. 1989. Foundations for a theory of knowing: II. Fallible but functional knowledge. *Canadian Psychology*. 30: 168-183.

Abernathy, W. J., and Clark, K. B. 1985. Innovation: mapping the winds of creative destruction. *Research Policy*. 14: 3-22.

Bachher, J. S. 1994. *Decision-making criteria used by Canadian equity investors to evaluate early-stage technology based companies*. Masters Thesis, University of Waterloo.

Bachher, J. S. 2000. *Venture capitalists investment criteria n technology-based new ventures*. Ph.D. Dissertation. University of Waterloo.

Bachher, J. S., Díaz de León, E., and Guild, P. 2000. Understanding the investment process for technology-based ventures. Submitted to the *Journal of Business Venturing*.

Bannister, D. 1962. Personal construct theory: a summary and experimental paradigm. *Acta Psychologica*. **20**: 104-120.

Bannister, D., and Fransella, F. 1986. *Inquiring man: the psychology of personal constructs*. (Third edition). Dover, NH: Croom Helm.

Beck, N. 1992. *Shifting gears: thriving in the new economy*. Harper Collins Publishers Ltd.

Bell, R. C. 1990. Analytic issues in the use of repertory grid technique. In Neimeyer, G. J. and Neimeyer, R. A. (eds.) *Advances on Personal Construct Psychology*. JAI Press. **1**: 25-48

Bonarius, J. C. J. 1970. *Personal Construct Psychology and Extreme Response Style. An integration of meaningfulness, maladjustment, and communication*. Amsterdam, Netherlands: Swets and Zeitlinger.

Bonarius, J. C. J. 1977. The interaction model of communication: through experimental research toward existential relevance. In Cole, J. K. and Landfield, A. W. (eds.) *Nebraska Symposium on Motivation*. Lincoln: University Press.

Boulton, R. E. S., Libert, B. D., Samek, S. M. A business model for the new economy. *Journal of Business Strategy*. **21**(4): 29-35.

Bowman, E. H., and Hurry, D. 1987. Strategic options. Working paper 87-20, *Reginald Jones Center*. Wharton School.

Bradshaw, J. M., Ford, K. M., and Adams-Webber, J. R. 1993. Beyond the repertory grid. *International Journal of Intelligent Systems*. **8**: 287-333.

Bygrave, W. D., and Timmons, J. A. 1992. *Venture capital at the crossroads*. Boston, MA: Harvard Business School Press.

Campbell, Donald T., Stanley, Julian C. 1963. *Experimental and quasi-experimental designs for research*. Houghton Mifflin, Boston, MA.

Clemen, R. T., and Winkler, R. L. 1985. Limits for the precision and value of information from dependent sources. *Operations Research*. **33**(2): 427-442.

Clement, W., Hammerer, G., and Schwarz, K. 1998. Intangible investment from an evolutionary perspective. *Organization for Economic Co-operation and Development*.

Cohen, W. M., and Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*. **35**: 128-152.

Cox, E. 1994. *The fuzzy systems handbook: A practitioners guide to building, using, and maintaining fuzzy systems*. AP Professional Press. Boston Massachusetts.

De Jong, T., and Ferguson-Hessler, M. G. M. 1993. Types and qualities of knowledge. *AERA Conference*. April 12-17. Atlanta, GA.

Díaz de León, E. 1997. *Toward a fuzzy inference system to merge domains of expertise for the design guidelines of a multimedia document*. Masters Thesis. University of Waterloo.

Díaz de León, E., and Paul Guild. 2000. Using repertory grid to identify intangibles in business plans. Submitted to *Journal of Venture Capital*.

Dimitrov, V. 1976. Social choice and self-organisation under fuzzy management. *Kybernetes*. **6**: 153-156.

Dubini, P. 1989. Which venture capital backed entrepreneurs have the best chances of succeeding? *Journal of Business Venturing*. **4**: 123-132.

Dutta, S. 1993. Fuzzy logic applications: technological and strategic issues. *IEEE Transactions on Engineering Management*. **40**(3): 237-254.

Epting, F. R. 1975. Order of presentation of construct poles. What are the factors to be considered? *British Journal of Social and Clinical Psychology*. **14**: 427-428.

Ericsson, K.A., and Simon, H. A. 1993. *Protocol Analysis*. Revised Edition, MIT Press, Cambridge, MA.

Fedrizzi, M., Fedrizzi, M. and Ostasiewicz, W. 1993. Towards fuzzy modelling in economics. *Fuzzy Sets and Systems*. **54**: 259-268.

Fenn, G. W., Liang, N., and Prowse, S. 1995. *The economics of the private equity market*. Washington, DC: Board of Governors of the Federal Reserve System.

Ford, K. M., Adams-Webber, J. R., Stahl, H. A., and Bringmann, M. W. 1990. Constructivist approaches to automated knowledge acquisition. In McGraw, K. L., and

Westphal, C. R. (eds.) *Readings in Knowledge Acquisition: Current trends and practices*. pp. 34-54 New York: Horwood.

Fransella, F., and Bannister, D. 1967. A validation of repertory grid technique as a measure of political construing. *Acta Psychologica*. **26**: 97-106.

Fransella, F., and Bannister, D. 1977. *A Manual for Repertory Grid Technique*. London: Academic Press.

Frederiksen, N. 1984. Implications of cognitive theory for instruction in problem-solving. *Review of Educational Research*. **54**: 363-408.

Fried, V. H., and Hisrich, R. D. 1994. Toward a model of venture capital investment decision-making. *Financial Management*. **23**(3): 28-37.

Gaines, B. R., and Shaw, M.L. 1980. New directions in the analysis and interactive elicitation of personal construct systems. *International Journal of Man-Machine Studies*. **13**: 81-116.

Garg-Janardan, C., and Salvendy, G. 1988. A structured knowledge elicitation methodology for building expert systems. *Journal of Man-Machine Studies*. **29**: 377-406.

Gladstone, D. 1988. *Venture Capital Investing*. Englewood, NJ: Prentice Halls.

Glaser, R., and Chi, M. T. H. 1988. Overview. In M. T. H. Chi, R. Glaser, and M. J. Farr (Eds.), *The nature of expertise* (pp 1-23). Hillsdale, N. J.: Lawrence Erlbaum Associates.

Groupe Secor. 1998. Financing knowledge-based small business. *Task Force on the Future of the Canadian Financial Services Sector*.

GTEC. 1998. Internet document.  
<http://www.newswire.ca/releases/October1998/27/c6661.html>

Guild, P. D., and Bachher, J. S. 1996. Equity investment decisions for technology-based ventures. *International Journal of Technology Management*. 12(7): 787-795.

Hall, R. 1989. *Venture capitalist decision-making and the entrepreneur: an exploratory investigation*. Ph.D. Dissertation, University of Georgia, Athens.

Hall, R. 1992. The strategic analysis of intangible resources. *Strategic management Journal*. 13(2): 135-144.

Hall, R., and Hofer, C. W. 1993. Venture capitalists' decision criteria in new venture evaluation. *Journal of Business Venturing*. 8(1): 25-42.

Hamel, G., and Prahalad, C. K. 1989. Strategic intent. *Harvard Business Review*. May-June. pp. 66-73.

Harvey, M. G., and Lusch, R. F. 1995. Expanding the nature and scope of due diligence. *Journal of Business Venturing*. 10: 5-21.

Hayes-Roth, F. 1997. Artificial intelligence: What works and what doesn't? *AI Magazine*. 18(2): 99-113.

Hisrich, R. D. and Jankowicz, A. D. 1990. Intuition in venture capital decisions: An exploratory study using a new technique. *Journal of Business Venturing*. 5(1): 49-62.

Honey, P. 1977. The repertory grid in action. *Industrial and Commercial Training*. 11: 452-459.

Hruschka, H. 1988. Use of fuzzy relations in rule-based decision support systems for business planning problems. *European Journal of Operational Research*. **34**: 326-335.

Hurry, D., Miller, A. T., and Bowman, E. H. 1992. Calls on high-technology: Japanese exploration of venture capital investments in the United States. *Strategic Management Journal*. **13**(2): 85-101.

Hwang, G. J. 1999. A new environment for developing fuzzy expert systems. *Journal of Information Science and Engineering*. **15**: 53-69.

Jankowicz, A. D., and Thomas, L. D. 1982. An algorithm for the hand-cluster-analysis of repertory grids. *Personnel Review*. **11**: 15-22

Jankowicz, A. D., and Thomas, L. D. 1983. An algorithm for the hand-cluster-analysis of repertory grids. *Personnel Review*. **12**: 22

Johnson, P. E. 1983. What kind of expert should a system be? *The Journal of Medicine and Philosophy*. **8**: 77-97.

Keeney, R. L., and Winterfeldt, D. 1991. Eliciting probabilities from experts in complex technical problems. *IEEE Transactions on Engineering Management*. **38**(3): 191-201.

Kelly, G. A. 1955. *The psychology of personal constructs*. (2 vols.). N.Y., Norton.

Knight, R. M. 1994. Criteria used by venture capitalists: a cross cultural analysis. *Proceedings of ASAC*.

Kosko, B. 1992. *Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence*. Englewood Cliffs, NJ, Prentice Hall.

Kosko, B. and Isaka, S. 1993. Fuzzy Logic. *Scientific American*. July pp. 76-81.

Kozmetsky, G., Gill, M. D. Jr. and Smilor, R. W. (eds.), 1985. *Financing and Managing Fast-growth Companies: The Venture Capital Process*. Lexington, MA: Lexington Books.

Leak, D.B. 1996. *Case-Based Reasoning: Experiences, Lessons, & Future Directions*. AAAI Press, Menlo Park, CA.

MacMillan, I. C., Siegel, R., and SubbaNarasimha, P. N. 1985. Criteria used by venture capitalists to evaluate new venture proposals. *Journal of Business Venturing*. 1(1): 119-128.

Mitchell, G. 2000. Internet document.  
[http://www.ebizchronicle.com/wharton/10\\_graham\\_mitchell.htm](http://www.ebizchronicle.com/wharton/10_graham_mitchell.htm)

MacMillan, I. C., Zemann, L. and SubbaNarasimha, P. N. 1987. Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *Journal of Business Venturing*. 2(2): 123-137.

Mamdai, E. 1977. Application of fuzzy logic to approximate reasoning using linguistic synthesis. *IEEE Transactions on Computing*. 26(12): 1182-1192.

Montazemi, A.R. and Gupta, K.M. 1997. On the effectiveness of cognitive feedback from an interface agent. *OMEGA, International Journal of Management Sciences*. 25(6): 648-658.

Myers, S. C. 1984. Finance theory and financial strategy. *Interfaces*. 14(1): 126-137.



NVCA. 1999. *National Venture Capital Association*. Internet WWW page, at URL: <http://www.nvca.org>

Nonaka, I., and Konno, N. 1998. The concept of “Ba”: Building a foundation for knowledge creation. *California Management Review*. **40**(3): 40-54.

Nonaka, I., and Takeuchi, H. 1995. *The knowledge-creating company*. New York: Oxford University Press.

Novak, V. 1995. A new proof of completeness of fuzzy logic and some conclusions for approximate reasoning. *Proceedings International Conference FUZZY-IEEE/IFES'95*. Yokohama, Japan. pp. 1461-1468.

Poindexter, J. B. 1976. *The efficiency of financial markets: the venture capital case*. Ph.D. Dissertation, New York University.

Pohlmann, C. 1988. *Small business primer*. Canadian Federation of Independent Business Research and Reports.

Polanyi, M. 1966. *The tacit dimension*. London:Routledge and Kegan Paul.

Prahalad, C. K., and Hamel, G. 1990. The core competence of the corporation. *Harvard Business Review*. May-June. pp. 79-91.

Pratt's. 1995. *Pratt's guide to venture capital sources*. Sec. Data Publishing, Inc.

Roberts, E. B. 1990. Initial capital for the new technological enterprise. *IEEE Transactions on Engineering Management*. **37**(2): 81-94

Robinson, R. B., Jr. 1987. Emerging strategies in the venture capital industry. *Journal of Business Venturing*. **2**(1): 53-77.

Ryle, A. 1975. *Frames and Cages: The Repertory Grid Approach to Human Understanding*. London: University of Sussex Press.

Sahlman, W. A. 1997. How to write a great business plan. *Harvard business review* 75(4): 98-108.

SBA. 1997. The facts about small business. *US Office of Economic Research, Office of Advocacy*.

Simpson, P. K. 1990. *Artificial Neural Systems: Foundations, Paradigms, Applications and Implementations*. Pergamon Press, New York.

Shaw, M. L. G. 1980. *On Becoming a Personal Scientist. Interactive Computer Elicitation of Personal Models of the World*. Academic Press.

Shaw, M. L. G., and Gaines, B. R. 1986. Interactive elicitation of knowledge from experts. *Future Computing Systems*. 1(2): 151-190.

Shepherd D. A., and Douglas, E. J. 1999. *Attracting equity investors: Positioning, preparing, and presenting the business plan*. Thousand Oaks: Sage.

Shepherd, D. A. 1999. Venture capitalists' assessment of new venture survival. *Management Science* 45(5): 621-632.

Siegel, P. H., Strawser, J., and Korvin, A. 1995. Knowledge acquisition and the development of decision rules: studying and evaluating internal control structure. In *Applications of Fuzzy Sets and Theory of Evidence to Accounting*. Eds. P. Siegel, A. de Korvin, and K. Omer, 71-86. Greenwich. CT: JAI Press.

Silva, C. 1995. *Intelligent Control: Fuzzy Logic Applications*. CRC Press.

Slater, P. 1976. *Explorations of Intrapersonal Space*. London, Wiley.

Smart G. H. 1999. Management assessment methods in venture capital: An empirical analysis of human capital valuation. *Venture Capital Journal* 1(1): 59-82.

Smith, M., and Stewart, B. J. M. 1977. Repertory grids: A flexible tool for establishing the content and structure of a manager's thoughts. In D. Ashton, (ed.) *Management Bibliographies and Reviews*. Bradford, U. K.: MCB Press. 3: 209-230

Smith, M. 1980. Applications and uses of repertory grid in management education. In Beck, J. and Cox, C. (eds.) *Advances in Management Education*. London: Wiley.

Stewart, T. A. 1995. Trying to grasp the intangible. *Fortune* 132(7): 157-158

Stewart, T. A. 1997. *Intellectual Capital*. Doubleday.

Stewart, V., and Stewart, A. 1982. *Business Applications of Repertory Grid*. London: McGraw-Hill.

Sullivan P. H. 1999. Profiting from intellectual capital. *Journal of Knowledge Management*. 3(2): 132-142.

Silver, A. D. 1985. *Venture capital: the complete guide for investors*. New York: John Wiley and Sons.

Terano, T., Asai, K., and Sugeno, M. 1994. *Applied fuzzy systems*. AP Professional Press. New York.

Timmons, J. A. 1994. *New Venture Creation: Entrepreneurship for the 21st Century*. Homewood. IL, Irwin.

Timmonas, J. A., Muzyka, D. F., Stevenson, H. H., and Bygrave, W. D. 1987. Opportunity recognition: the core of entrepreneurship. *Frontiers of Entrepreneurship Research Conference*: 109-123.

Timmons, J. A., and Sapienza, H. J. 1992. Venture capital: The decade ahead. In Sexton, D. L. and Kasarda, J. D. (eds.) *The state of the art of entrepreneurship*. pp. 402-437. Boston: PWS-Kent Publishing Company.

Turban, E. 1988. Review of expert systems technology. *IEEE Transactions on Engineering Management*. **35**(2): 71-81.

Tyebjee, T. T., and Bruno, A. V. 1984. A model of venture capitalist investment activity. *Management Science*. **30**(9): 1051-1066.

Waterman, D. A. 1986. *A Guide to Expert Systems*. Addison-Wesley.

Wells, W. A. 1974. *Venture capital decision-making*. Ph.D. Dissertation, Carnegie-Mellon University.

Zacharakis, A. L. and Meyer, G. D. 1998. A lack of insight: Do venture capitalists really understand their own decision process? *Journal of Business Venturing* **13**(1):57-76.

Zadeh, L. A. 1965. Fuzzy sets. *Information and control*. **21**: 338-353.

Zadeh, L. A. 1973. Outline of a new approach to the analysis of complex systems and decision processes. *IEEE Transactions on Systems, Man and Cybernetics*. **3**(1):28-44.

## Glossary

- Adaptive fuzzy system** A fuzzy system that learns its rules from data. A human expert does not tell the system what rules are. A stream of data feeds into a neural or statistical system and out come the fuzzy rules. An adaptive fuzzy system acts as a human expert. It learns from experience and uses fresh data to tune its stock of knowledge (Kosko, 1992).
- Associative memory** A system that stores data in parallel and searches for data or "recalls" data based on some feature of the data. See also fuzzy associative memory (Kosko, 1992).
- Component** A name for a fuzzy set within a complete system of many fuzzy sets.
- Domain** The range of system input or output values over which the fuzzy set is mapped.
- Expert system** A search tree in artificial intelligence. An expert gives knowledge as if-then rules and a programmer codes these in software. Expert systems consist typically of two pieces: the knowledge and the inference engine. The knowledge base is just the tree or trees of bivalent rules. Fuzzy systems are a type of expert system since they too store knowledge as rules - but as fuzzy rules. Expert systems work with black-white logic and symbols (Kosko, 1993).
- FACT** Fuzzy Applied Control Technology. This is the trade name of the control program used in this system.
- FAM** Fuzzy Associative Memory. This is an array of singleton output values representing all combinations of inputs.
- Fuzzification** The process of decomposing a system input and/or output into one or more qualitative groupings called fuzzy sets.
- Fuzzy cognitive map** (FCM) A fuzzy causal picture of the world. A FCM has concept nodes and causal edges. The concept nodes are fuzzy sets. Each event belongs to or excites a concept node to some degree (most to zero degree). In the simplest case a concept node is just on or off and it acts as a threshold switch. If enough causal juice flows into it, it turns on. Else, it turns off or stays off. In general a concept node "fires" or activates to some degree.

When a concept node fires, it emits a type of causal juice, which flows to the other edge. The edge or arrow is a fuzzy rule between fuzzy sets. The edge is fuzzy because it can permit a small or large or other amount of causal juice to flow through it. The edge acts as a pipe of variable diameter through which the causal juice flows. A FCM edge can learn causal patterns by changing its effective pipe size as a function of how much causal juice flows through it or at what rate.

In practice an expert draws a FCM or a group of experts draws several FCMs. You can always combine any number of FCMs into one FCM. The final FCM graph of nodes and hedges and edges defines a non-linear dynamical system that acts much as a neural network acts. Engineers have applied FCMs to plant control, medical modelling, circuit analysis, and an array of social and political modelling (Kosko, 1992).

**Fuzzy logic**

Has two meanings. The first meaning is multivalued or “vague” logic. Everything is a matter of degree including truth and set membership. This dates back to the turn of the century. The second meaning is reasoning with fuzzy sets or with set of fuzzy rules. This dates back to the first work on fuzzy sets in the 1960s and 1970s by Lofti Zadeh at the University of California at Berkely. Zadeh chose the adjective “fuzzy” over the traditional adjective “vague.”

**Fuzzy rule**

A conditional of the form IF X is A, THEN Y is B. A and B are fuzzy sets: “IF the room air is COOL, THEN set the motor speed to SLOW”. In math terms a rule is a relation between fuzzy rules. Each rule defines a fuzzy patch (the product  $A \times B$ ) in the system “state space” - the set of all possible combinations of inputs and outputs. The wider the fuzzy sets A and B, the wider and more uncertain the fuzzy patch. More certain knowledge leads to smaller patches or more precise rules. Fuzzy rules are the knowledge building blocks in a fuzzy system.

**Fuzzy set**

A defined range of measured or calculated values. For example, a “positive large” fuzzy set may range from 4 inches to 5 inches and a “positive medium” fuzzy set may range from 3.5 inches to 4.5 inches. Each fuzzy set consists of 3 parts: domain, membership function, and degree of membership.

**Fuzzy system**

A set of fuzzy rules that converts inputs to outputs. In the simplest case an expert states the rules in words or symbols. Each input to the fuzzy system fires all the rules to some degree

as in a massive associative memory. The closer the input matches the if-part of a fuzzy rule, the more the then-part fires. The fuzzy system adds up all these output or then-part fuzzy sets and takes their advantage or centroid value. The centroid is the output of the fuzzy system.

<b>Degree of membership</b>	Degree to which a value belongs to a fuzzy set. For example, a level measurement may be 40 per cent positive large and 20 per cent positive medium.
<b>Future</b>	Indicates that the criterion can be assessed based on information that may be available in the future.
<b>Intangible criterion</b>	Implies an aspect of a venture that can NOT be readily perceived, or is NOT capable of being appraised at an actual or approximate value.
<b>Membership function</b>	Curve used in a fuzzy set, triangles in this case, which maps a system input or output value to a degree of membership value.
<b>Objective criterion</b>	Implies aspects of ventures that are NOT influenced by personal feelings, attitudes, opinions or beliefs and are thereby unbiased.
<b>Present</b>	Indicates that the criterion can be assessed on information currently available.
<b>Subjective criterion</b>	Implies aspects of ventures that are influenced by personal feelings, attitudes, opinions or beliefs and are thereby biased.
<b>Tangible criterion</b>	Implies an aspect of a venture that can be readily perceived, or is capable of being appraised at an actual or approximate value.

## **Appendix A**

### **Introduction to fuzzy set theory**

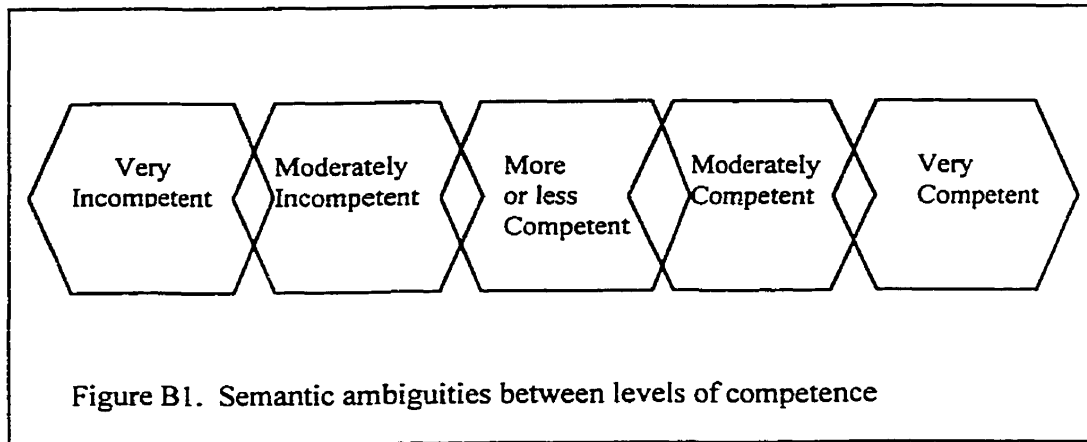
One way to understand what is fuzzy set theory (or fuzzy logic) is to compare it to probability. Consider whether the following questions make sense: “what is the probability that a person is competent in a particular field, that he is tall, that a glass is full or empty or that a car is travelling fast?” Although some of the variables in the questions can be clearly determined by referring to relevant standard measurements of these qualities (e.g. feet, miles per hour etc.) answering the questions requires a deeper understanding of the concept of probability.

If we answer these questions from the probability perspective, we first divide arbitrarily the probability distribution for each variable reflected in the questions into named segments (Cox, 1994). For example, with respect to competence, we may identify three sections in the probability distribution: poor, for the left-hand side of the distribution; medium, for the centre of the distribution; and bright, for the right side of the distribution. However, this distribution will not allow us to answer the questions “what is the probability that Maria is competent?” The reason behind this is that the probability tells us something about populations, not individual instances. Once we have an individual instance, such as Maria, probability evaporates. Probability describes the chances that Maria is competent before she is selected from the population. Once she is selected, the probability is gone. Furthermore, as discussed by Cox (1994), probability is



an uncertainty associated with time. Once a predicted event takes place, probability disappears. Cox (1994) illustrates this point with the following example “there is a 50 per cent chance of rain tomorrow.” If we wait until tomorrow, it may rain or it may not. Subsequently the uncertainty associated with probability disappears. In addition, probability is incapable of capturing any ambiguity or vagueness about the event. In the rain example, there still remains some ambiguity about whether the rain is a mist, light, moderate or heavy. These are fuzzy uncertainties, which can be dealt with fuzzy logic. Fuzzy logic can deal with the characteristics and properties of individual cases.

If we analyse any concept, for example speed, height or competence, it is usually clear to notice that it consists of a number of sub-states that range from a clear non-existence of a characteristic to a clear existence of the characteristic. Throughout the continuum it may be identified various semantic labels that represent various areas of the continuum. For the case of the concept of competence, for example the semantic labels that describe it could be very incompetent, moderately incompetent, more or less competent, moderately competent and very competent. In general, there are areas of ambiguity and therefore overlap between the various semantic labels as shown in Figure B1. As discussed by Zadeh (1965), these overlaps occur naturally and they reflect flexibility in the language.

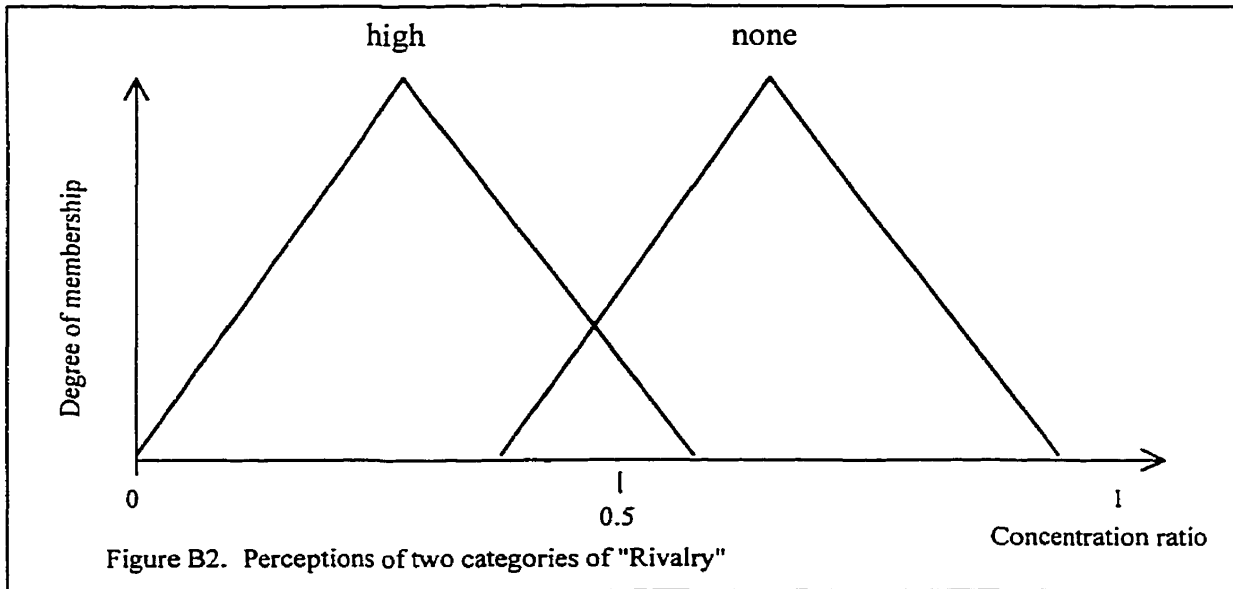


One of the main strengths of fuzzy logic is that it allows the semantic partitions to overlap as shown above. This is a significant improvement on traditional probability, which identifies a group as either having or not having a particular characteristic.

As noted by Zadeh (1965), fuzziness is a measure of how well a value conforms to a semantic ideal. Hence if a list of criteria for measuring competence in a particular area is agreed, fuzziness becomes the measure of how well a particular value associated with these criteria reflects a semantic ideal, for example very competent.

Summarising the previous paragraphs, in set theory, also called *crisp* as opposed to *fuzzy*, an element either belongs to a set or not. On the other hand, in fuzzy set theory, the membership of elements in a set is not in the form of yes or no. That is, an entity may have a membership ranging from 1 for complete set membership to 0 for complete set non-membership. Moreover, the elements have membership values that show the strength of their membership in a set.

This leads to another important aspect of fuzzy set theory, specifically the concept of membership functions. In order to illustrate this concept, consider for example Figure B2. Suppose we ask a group of experts to provide different categories for the concept of *rivalry* as one of the characteristics to be assessed from a business plan. The answers could range from “none” to “high.” Such categorisation could be based on the *H index*\*, defined by Hirschman (1975) and Herfindahl (1950) to measure the market share of an industry. In other words, an *H index* of 1 indicates “none” rivalry whereas an *H index* of 0 (or close to zero) indicates “high” rivalry.



Thus if we consider a company with an *H index* of 0.5, we will find that it has a degree of membership of [0.2] which means that it has a low level of compatibility with the label “high” and also a low level of compatibility with the label “none.” In probability

theory the company has either "high" or "none" rivalry and we are not completely sure whether it is "high" or "low." Also in probability theory, if the probability (or chance) that a company 'A' has "high" rivalry is 20 per cent then the probability that it has not "none" rivalry must be 80 per cent.

In fuzzy logic the membership degree defines to what extent the company is considered to have "high" or "none" rivalry and the related membership does not have to total 1 (Turban, 1992).

As shown in Figure B2, we considered only two categories to determine the boundaries of rivalry. Thus, it can be argued that we should consider more categorical labels in order to improve the perception of rivalry. However, while defining categorical variables may improve the problem analysis, the identification problem at the set boundary remains. This approach can be extended to a fuzzy set approach by defining each of the posed categorical variables as fuzzy variables. This leads to another important aspect of fuzzy set theory, specifically the concept of "multi-valued logic." Using multi-valued logic permits a proposition to have varying degrees of truth associated to it, while approximate reasoning, also commonly referred to as "fuzzy logic," utilises these true levels in the reasoning process.

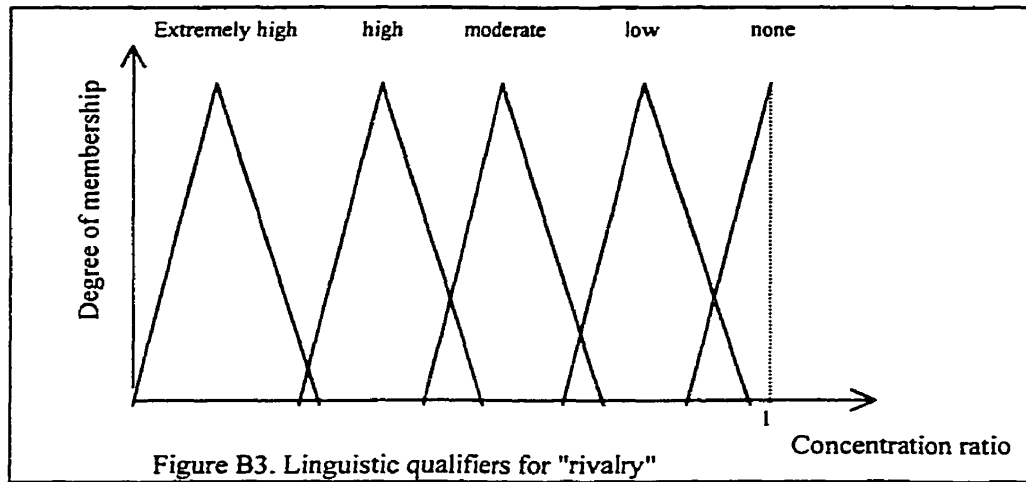


Figure B3. Linguistic qualifiers for "rivalry"

This example also highlights another important feature of fuzzy set theory, its ability to deal with linguistic variables. Linguistic variables correspond to the qualitative levels of a variable, and are combined according to the rules and operators of fuzzy set theory, resulting in linguistic logic. In this case "rivalry" may be thought as a linguistic variable, with the descriptors: extremely high, high, moderate, low, and none (Figure B3). Referred to as linguistic qualifiers, describing different qualitative levels of the object rivalry.

## Appendix B

### Interview # 1

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

I check first if there is a market potential or is it a growing market? A big market? is it a replacement?, Do I have detailed research? Or is it more intuitive? Kind of feeling... and I also look at... is it a crowded market? And again that is a little bit intuitive, so I would call this intangible because it is hard to measure that... at the first cut...

Could you give some examples?

Well, that's the starting point, I think that as you go through the evaluation stage the other intangibles are: Can management do it? Have they done it before? They may have done it before, can they do it in a new venture? In case they are going to follow from a big company in the past can the entrepreneur do that? Can they do that transition from a big Company to a small Company? If you got to entrepreneur can you go beyond the volume thing that probably a technical person can do so as the marketing person?, who are you bringing out for help? They all say they will and push concepts a little bit. However, when you have to replace them as president they are not going to like that.

Do you have a way for measuring it?

No, but, I still believe that a good part of investing is a personal thing, and I could give the same proposal to two different people and get two different answers of whether they should invest or not.

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

It depends on the stage of the company, I mean if it's just a one or two-persons-company the answer is yes, now if it's a little bit later-stage when they've got a product coming out the market it becomes less an important a factor, and that you know, when you are thinking about whether you bring key managers we are trying to identify: Is that a key man? Or, If he dies? Will the company continue? Or not? And that is an intangible...

Do you consider the capacity of the entrepreneur (or the team) to create new knowledge (personal knowledge) as an important aspect of a business proposal?

No, I mean, because that is kind of a given. So, is not something I assess. If they are entrepreneurs they are going to come out with new ideas or coming with something to be

involved all that value is a great new stuff. They have all the spin-off opportunities of a given technology, yet, I like that more of the technology than the entrepreneur.

3. When making a decision to invest in a new technology-based venture, how do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

To a meeting we try to compare with past experiences that we have had with other entrepreneurs, reference checks, and then again I am going back to you got to be building a team so hopefully you can reduce some of over-reliance on a single division quickly. Then get to a team approach, and then you look at spin-off opportunities: How is the technology as oppose? And whether an individual can do it or not.

Do you look for these issues in the business plan?

In a business plan, I look for market analysis, and positioning of the product, anything after that, I sort it out face to face, meet with the management, discuss his ideas, get it the off board, I do my own independent research, I do my own financial projections. But, business plans, they're just there to start my interest in a product in a market place and it gives me some insight into an implementation strategy so that I come in and work with the company to redefine that in an appropriate manner.

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

Yes, knowledge and people, he has to be willing to take in new ideas from another people around them as well as bring them to people.

How do you measure this?

Sometimes in some cases I like to say all right: "You can be president, you are going to be Chief Science Officer" and I see what his reaction is. Often bring in a consultant to review the ideas and the consultant has some negative aspects and see how the entrepreneur reacts to it.

Do you look for these issues in the business plan?

No, again this goes back to the issue of is there a spin-off potential for the technology as oppose to business plan that tell you that an entrepreneur has some exciting ideas and that's seen face to face.

When you say spin-off of the technology, are you implying the ability for the technology to take the product to different industries?

Different industries and different markets. There is nothing worse than one product company in one minor market because that doesn't get anything analyzed. So, you are more interested in a... ideally in a platform technology you can take up vertical markets one at a time or maybe the markets are big enough that you can... you only have to take little pieces of various markets to be successful or are there other opportunities in case one fails.

Technology can always be made to what... invest on it whether or not the market will accept it, if one worked maybe the other one won't...

Do you consider the "core competence" as part of the business plan?

Not in a formal manner, I don't have a list of core competencies that I look for, I try to look for "Have they done it before?" if "yes" that is good, if "no" What reason they believe that they can do it this time? If "no" what reason do they believe that I can bring a new president for the new company? Now chances are that I will personalize.

What is your ideal business plan? Enough for you to be interested and take the plan into the due diligence process?

A Reasonable market analysis as a connotation? So that, although they feel that is a growing market that is not served well... that it could be serve better with this "addition" product. Number one. Number two, that it's a... that it's a "crowded" market but that is a market that people is starting to pay attention to; and number two see people's resumes and other details ...

So, if a plan has amount of information, that will be enough to proceed to the next stage?

Yea, telling me how this technology works is a waist of my time, I don't care how it works, I care of the benefits if you like, I care about whether the market wants something like that.

And the ideal length of a plan probably varies. But, in your opinion what is your target?

Length is not an issue to me, but, I mean... I flip through it I look at all the sections that I want to, ahhh... so length is not an issue to me. Big plans don't scare me, smaller plans don't scare me.

But missing information, scares you?

Yes, I mean, the focus is the information. But if the focus of a plan is on the details of the technologies, that is waisted on me. I am a generalist, I am looking more for the benefits of the plan. It may be different from another individual. I've had other individuals who write more technically, who happened to be recent graduates or think like that, they're coming out of an industry with a technical capacity, so I look at the team. So, from my



case I get excited about the market and they get excited about the technology. They're still thinking, though, in market in terms of fast and growing penetration.

I wonder, though, the challenging must be when you don't have a way of knowing the market. For example with a state-of-the-art-new-product. How can you tell about the market?

I probably can't and my preference is that if there is interest in a Company that hasn't done a sample that has express some interest from a... what I am going to call a strategic partner, someone who really knows the industry, it is often really nice to see a corporate venture capitalist groups who are looking at a company as a competence level. It is also competence down the road but more than anything else is... Newbridge "core" programs is a good example, Newbridge has this program to focus in a technology trend or a market trend. I think that generally speaking if you know the trends in markets and if you are in a seed investing working with Universities you are probably more technically confident than in a data-based-later-stage-investing. So that maybe the guys who see these investments are a little more tuned with the technology and can respond to some of the market issues

## **Interview # 2**

- When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Primarily intangible assets, and by intangible assets is its people and their historical background, we love companies who have failed, individuals who have failed because they've learned so much and we love people who have succeeded because they know a lot too, so I mean that is the primarily intangible.

The intellectual property component and the actual IPR is difficult to put a large value on it. In the absence of having a team and a mentality, even if you work with the mentality of people is very important, so we have a very "separal" force step that we look at:

We look at the market first, weather or not there is a market first the right pace of growth not to busy but too small not too big. Secondly, we do look at the technology, what do they own? If anything. The vast majority of companies we're seeing today don't know anything except ideas and perhaps an access point to an opportunity.

The third thing we look at is the current team who they are and what's their background; and the fourth thing we look at it's a box which we just called "question mark" Are they people we want to work with?, Do we trust them? Do we have a good feeling? Do we like the name of the Company? Have they exhibited a market "bisas"? Are they inclined to listen? Do they talk more than they should? Are they arrogant? Do they put "billion" to many times in the business plan? All the intangible aspects are good or bad and whether

or not they will succeed and we can work with them, so yea! It's huge compounded of any review.

So, how do you go about measuring those intangible aspects?

Well that is the best question, because is very hard to measure, we come fiddling around with different "indesia" and seeing whether or not we can qualify them, but we haven't been able to do it so far. The best way you measure this is by repetition, so instead of having... you never see a plan and make a decision based on that plan, plans are like resumes, so plan is used to say no, we are never used to say yes, we used to say no or used to say yea we're interested, so what we find is repetition is the best way.

We put people quite a few times get to know them over a period of time and take them out of different circumstances and then caught around on the "vertices" of things that we think are indicators of success or failure and on their attitudes or their "capdowns" and we actually have... we had a retreat last year when we all went to Cuba and we sat down and said OK what did we learned over the last year and a half? And it was pretty interesting; now if you look at the relationship between multiple founders in a company it is actually critical it comes how people really thing? How they act? Are they ethical? Are they reasonable? Are they prepared to share any "up-swon" in a company?

It's a lot different in Canada that I think in the Valley because in the Valley you now deal with serial entrepreneurs, they are on their third, fourth, fifth go-round and here there are a lot of people who is spinning out from larger organizations or there are doing it for the first time, so yea, you have to put a little bit more "evaf" to get out. The big moving forward is in formalize in testing the people its some of the can do to the mentality left from the Japanese training companies when everyone is constantly given this tests, character tests, and that is something we are moving towards actually, using testing on people we think they can do very good. I just used it on myself actually, and found it curious how different I am from everybody else in here internally and find out we are people based form various architectures of the mind and personality and character and how we interact because that is the other dimension we are getting worried about.

You mean like psychology tests?

Yea, yea, now we are not to do push-ups and stuff!!! Ja Ja Ja Ja... We have other things to worry.

So those are the biggest intangibles. The market is tangible, kind of, but it doesn't matter where the market is but it matters where the market is going to and that's an intangible, right? Speak of perceptions and how they plan. The technology is tangible, but again it doesn't matter unless you are going to sell the technology too much, where are they going to take it to?

The people is tangible but then again they're going to change over time, so how do you put together, how do you get a good core nucleus, and probably the most intangible

important element is the culture which is how do you combine it altogether and say What is the culture of this Organization?

Because the thing that has killed me over the years is you look at a company and you fire everybody and then you hire a whole new team and then six months later is the same company! What is that? What has actually happened in that organization? Why if its different people? I think that what actually happens is that a culture has develop and the outside world has used you in a certain way. Even if you put in some new passengers at the same vehicle, so everybody sees “this car driving by for some minutes... some small carter ... who made too much money somewhere still order?... or whatever ...” and it’s a perception even if it a different driver, so that’s the other thing that is really important the frames with which others look at you.

How are we doing this, by the way? Am I talking too much?... Ha ha ha ...

- When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

Yea, because both the technological knowledge and a certain commercial... the basis in commercial reality, and the... I think what happens is with the... what we perceive or what the world perceives to be condensed time frames means you are acting faster and people who don’t have the knowledge and steps into knowledge-based markets gets “lodged” so yea it is important that the company kind of have both, something like sort of a “finger in the pulse” finding out what happens in the industry and also an assessment of what are the commercial realities are, but what happens is a lot of things flow from that so it’s not knowledge in background because.. that it’s nice and it’s useful but is more... you know about an industry is for a reason, therefore you will know the champions, you will know the analysts, you will know the supporting... you will know the competitors, you’ll know who went in the industry, and I think rather than giving people a very expensive ten-million-dollar-crash-course in the industry we prefer to take what went in and had that crash-course, makes a huge difference.

- When making a decision to invest in a new technology-based venture. How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

Mmm, in the plan itself? Ahh... educational background, business history, the way the plan is written, and also what they say in the plan, so... and it’s usually a team it’s rarely an individual, so... and also what they’ve done, what the whole idea is, you know, you’ll see a lot of... it’s not... you are not looking for ideas, you are looking for opportunities, so if there is a lot of novelty in their approach but is so graded in reality, that will come through in a plan quite often, you want people who are visionaries but not dreamers, right? Usual through “qedandrum”??? so you’ll see...

Even the way people define a market, would often reflect that somebody is willing to go beyond the obvious meta-study they've just read, and it's really fine at what the dynamics of the market are, and ... I personally, I believe that the creativity exhibited in pretty well any dimension of investigation or analysis will be reflected in the ultimate products near the other end, so they got to be... you're looking for people who are open to that.

- When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

You never know what to do, because you will find people who will only know, you know, one little corner of a city, and will know one little corner of an industry, or one little corner of that "partner purch???" industry and do phenomenally well, and they are so busy they don't know the Second World War is over, and that there already changes happening in society. Sometimes there are single-minded-myopic-drive who will build phenomenal organizations, on the other hand the tendency maybe it's because its people want to deal with it who people who are much more open minded to assimilating and capitalizing on external realities and opportunities what's really happening in the world. How do you taper a plan? I don't know, sometimes you tell from sitting down having a glass of wine with a person, you see how they're like and getting to know them and by doing references and references of references and just... you get a feel for it over time. But, yea, yea, I think we are inclined away from people who are zealots of they're business.

I have seen that a couple of times, I saw one guy who was... ah... when I was being interviewed, he was a partner in one of the law firms , I was being pitched by the firm, and he said, we here at Village... I can't remember the firm, are lawyers lawyers, and we have world experts absolute, would you agree with that? Oh yes, world experts in a... well there are various... absolutely! For example, take Bill, O yea, Bill is a world expert in shopping center leases, and you know, this kind of thought was the hottest thing going and I cracked out laughing and obviously, I barely finished the interview.

So, yea, you can get people who have phenomenon expertise and precisely in vertical areas who do the "due what you want" to have it done which is make money and the enterprises feel proud of it, usually not. But will they be open to new influences, somebody who comes up and doesn't understand color corrections as well as they do and never will and couldn't care less but they understand the market for coding change in entertainment, you know it's an openness to the new "miracles" that may occur and make a couple of them successful, so yea, you want to see it but I am not sure how to assess it.

But the other thing is, you know, you are asking questions about the plan, but I know this will come as a real shock to you, people tend to tell you what they think you want to hear. Over time we are getting a very homogenized delivery of information with people. Really the way to get to know them is time. I can spend... actually I just had a riot, I spent two weeks traveling isolated with between six to ten Canadian Companies in Asia and I got to

meet the CEO's. I saw them making the pictures, I saw them... we sort were helping each other in taking pictures, talk to each other, and that was really interesting and at the end of that there were two of them that I really want to deal with, and there were a few others I don't. So it comes pretty clear...

- What is the ideal business plan? How would you like to see a business plan so that you will feel comfortable investing in it?

Business plans are sort of like sitting down to a meal, right? So are sitting down to a meal and you want to really enjoy yourself, what matters? You know, so let's say you arrive and someone is sitting there and looks clean, looks comfortable, so you are already creating a frame in your mind, so, with a plan, some big ugly weight 25 pounds of lunch is sitting in your desk and you look at it and its very difficult to manage. So, ideally, you may want something that is manageable, you know? Comfortable... because, same when there are selling to you in terms o business opportunity their going to have to sell products or services or solutions or whatever it is in the world, so you want someone who addresses the opening gap of how do you stimulate someone with just one cover or in the first page.

The second thing is, you often get, people who want to show off that they have master itself or they have an accounting package that fits their 25-year projections. I think that ideally, you know, quantitative side, you want someone who understands their business and can convey that in a simple but persuasive way.

For example if you are selling software, you tell me how many employees you have I'll tell you what your burn-rate is, if you tell me what though-line is and I'll tell you what you bottom line is on a normalized basis. You don't deviate 10 to 20 % but basically if you invest in a company they got to be crazy if they deviate 10% from the north, so you don't need to see every little detail but you don't want to see them take through but you want to see a distilled analysis. So, if you sit down with them and ask "Why do you need 10 million dollars?" or "Why do you need 5 million dollars", Well, "we're going to do X million in PR" or "we are going to do X million in advertising on TV". You want to see the way they're thinking, so behind the quantitative element, you want to see the fact process. Probably the most significant two sections are the definition of the opportunity and the description of the people. There's got to be enough detail to be able to pick on the edges and do the reference checks quickly, there's nothing worse than "so and so was a partner in a major business in a major city and a big industry..." those frustrating generic big nonsense references.

Ideally, it's relatively brief and succinct, it reflects an analytical process, it has a decent quantitative element, and also talks a lot about the people and the way they define the opportunity. One way I have found with opportunities that have become really interesting is in the definition to tell a story. Everybody uses the same framework. Now, I think that people could be brain-washed, you know, when you have fourteen-years-old or nineteen-years-old come to you and explaining " We'll grow the market significance and here's

this piece and we did a price point and here's where you see the curve and ..." you know, everybody is thinking in the same way.

You want people who understand mechanics of business, but also can approach it on a more creative basis so whatever they can do to reflect that. Then everybody says forget them, let's look for what they have actually done... Ha ha ha ha ha ... it's all a bunch of dreams but it doesn't make sense, it just doesn't make sense...

And, in terms of length?

You know it's funny, if the first... if it is twenty pages and it's fantastic, then it is a VC bargain and you want more and you know, you leave them all of them wanting more. If it's crap then it doesn't matter if it's one page or a hundred pages, it's crap! The substance should really shine early on. They have to have a summary, to give you a very mundane pragmatic... they have to have a good summary as to what they are trying to do; and any... the need... when we are setting information... imagine... ahh... the entrepreneur should imagine that they are in the other person's shoes, which we did in this trip, so, all the guys were sitting and I would ask the guy, "OK, critique the guy's presentation" and find out what are you really doing and it was great! What you need to know if you were sitting in this shoes and you were to make an investment.

The other thing that happens a lot in plans is that people don't believe what they are putting in them or throwing in them. That is a new revolutionary idea that they think that VC's have a clue of what they are doing and they have some idea knowing of what is going to succeed or fail and that is not true. VC's are just people guessing a crystal ball just like everybody else. But I... quite a few times I have had people come in and they give their presentation and you sit there and you can tell that they are really asking a question rather than making statements, and then they tell me "Do you think is crap?" and I go: "I'm glad to hear you said that, we are going to pull a 10A, we're not sure" it is ridiculous! So, you want people to be honest about where they are also in the fact process. If it's a brand new idea... But often enough they say: "Oh, we have to make sure how we define idea and you are the precise steps we're taking"

From the last six months how many business plans have you rejected?

Just one. Ha ha ha, No, no we as a firm look at probably... Oh, we get all sort of plans, by the way, which is a fair question to ask VC's, Do they use a plan? And What to put in it? We were originally getting around 500 a year and in the last six months stepped up considerably, so let's say 500 in the last six months. We would have rejected... we have a filtering process, so in the first cut we reject 90%, so let's say we reject 400 or 450 in the last six months and that's everything from a very brief conversation "I want to do this" "Are you interested?" to "here is the plan would you take a look at it?" "Give us feedback fast" now, probably about 10% make it to the "Is there an opportunity here?" and then it is still put down in categories, you now, "hot". "cold", whatever...

Thank you, that was my last question...

### Interview # 3

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Absolutely, and the very nature of... I think obviously the most important one off the top of my head is the quality management team I don't have any tangible ways of sizing that up part of it is just the way they come across their attitudes, How well I make a connection with them?, Do I think they are sincere? Do I think they are selling me a line? I mean, some of those are characteristics of the management team, Is what you are interested?...

Some of those tangibles... I only mentioned a few but, I guess their experience is somewhat tangible, by what is in the resume, but also somewhat intangible, I got to make a judgement on their effectiveness off their previous rolls and their success and how do they measured themselves, their personalities is certainly a very intangible, I have to work with these people and they are my partners, so that is very important to me. Who do they know?, and What their networks themselves are like? That's probably tangible partly intangible, I think that covers it for the most part in terms of the management team.

Other intangibles that I think are probably the next most important thing is the market place, one phrase that you may have heard in our industry is " The dogs eat the dog food " and that again is partly tangible I mean there is some tangible ways, and some empirical ways that you can go about looking at that, but a lot of that is just what I call a "paint fresh hole" Which is very intangible, I mean, How badly do the customers or potential customers need this? What is got to motivate them to decide to buy this? Is this really something that resolves a critical need? Or is it something that is some kind of an enhancement to some issue that already exists?

There are intangibles that relate to the product and the technology itself. There is certain amount of intangibles, again, I am going to throw in some keywords that are here in the industry, are they "paradigm shifts" or "ten times factor", "ten x factor" is it truly a "monumental breakthrough" again there is a certain amount of tangibility. I mean, you can look at the competitors, you can look at what else is out there, you can look at the market place as a whole, but at the end of the day there is a certain intangibility as to my judgement as whether they are going to be able to: a) Make it or if they have made it just How big a deal was it? How is the market place going to react? If you are talking about seed stage investments I guess the other intangible factor that we could talking here is the market place itself. A lot of the early stage ventures... they may be creating the market so the market isn't something where I can go get some forward studies or reports I got to essentially decide whether they are going to be able to create it, and then we go back to some of the other points.

Do you have a way of measuring them?

No, often I don't, I think the only way you can measure it is through our own experiences and our own... just general knowledge of what is going on out there. We spend a lot of time just trying to cover the technology universe at a "32,000 foot view point" and sometimes is just the knowledge of what is going on other related sectors that may not be direct competitors but may have an impact or an influence or may have some sort of... impact of on what the company is talking about. So, the earlier the company is, frankly, the more intangibles you get into. MM Venture Partners doesn't tend to do seed stage investments so specifically to us I don't run into some of this questions as much. QX where I was before, I worked at the Silicon Valley for about three years, we did a lot of more of that touchy feeling type of work. So I think that captures most of the intangibles that I can make up right now.

When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

Let me make sure I understand your question properly, this knowledge in terms of his experiences his skill the leverage?

Yes.

Well I mean, people are everything right? in the technology world. Absolutely their experience, their knowledge, their networks. In not just on the entrepreneurs is important, their ability to find the right people, build the right team, straighten the right relationships across all kinds of dimensions is... that's everything, at the end of the day that is in what you are investing in.

Do you have a way of measuring them?

The things that you can't measure or size up to a some degree are: a). Talking to them, that is intangible but that is a measurement, I mean, I take notes and form an opinion from the actual conversation with him. You certainly check references, find out if they are telling the truth, and that other people perceive them as they are representing themselves. You also do other reference checks with their potential customers with their potential competitors and get a view point on them from that. In some cases you may get a little bit more specific, they may have a patent or they may have the actual code so you can have a demonstration or you can... if they have a patent you can have a sense of whether somebody else has validated that it is in fact proprietary I know some Venture Capital firms that do personal forensic audits to individuals, I mean that is done. It is not a practice that we do here in MM Venture Partners, other Venture Capital partners quite often... when we see companies here that have been... to another Venture Capital has been involved in the company we talk to them and feed in their experiences and if the question was more to the actual founder or the CEO I think that the references of the previous companies looking into that are the most direct ways... Often is not the founder that is the technology person or at least there is another technology person, so, just try to



make sure I understand your question we are talking about the technology side of it, or the person side of it? Some times they are not always the same.

Yes, is the person, the personal knowledge.

The best way to find that about is through the people he knows and using your own networks to see if people you know have come across him and try to get their perspective.

2. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

MM, Ah... I appreciated most when an entrepreneur comes to me with a complete management team, if he says that he is going to do everything on his own or with two other people I cast doubts very quickly and again in Venture Partners likes to get into companies who are kind of one stage after the seed stage. So there are venture capitalists... and I have been in this position before where they are willing to make a bet just on the individual and just take on the faith that this person will be able to hire the proper team and bring in the capabilities it needs. Again in Venture Partners our preference is to see, you know, a either very complete management team or a management team that is 90% complete.

You know, they have been an unrealistic to say “ we need to hire this person for boss for our capabilities” there is a lot different skills that go into running a company, and that is what is what the titles come from, we want to see a good CFO, a good CEO, a good COO, we want to see a good Chief Technology Officer and again, that is our preference, and again that is the people at the end.

We want to make sure that they bring new people with the right capabilities across all funds, sales and marketing is one example that a lot of companies, I think, particularly if they come from a kind of a technology background they have this... if you build the customers what kind of attitude which doesn't work so... Do they have the right connections? ...and then the capabilities as well come through in the business plan, what are their strategies, Do they have a business model that I think will work, because if the business model doesn't work I don't care how great they are, it is not going to happen, so their strategic thoughts and experience that goes into the business plan and the history that goes out as well is important in terms of reflecting their capabilities. At the end of the day we are pretty much betting on the experience and the business model, things change so quickly these days that the experience they have is worth a lot so we put a lot of value on that, the previous experience of the team in terms of judgement and capabilities.

3. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

Is the question their ability to adapt in change to the environment around them?

Yes, to assimilate new knowledge.

Absolutely, today's product cycle, you know, lasts six months and competitors are involved and that's always more and more important. It is a struggle as well as a Venture Capitalist you want to see a well thought through plan and you want to have some milestones according to which you want to guide the company so you can't let the company to go changing the plan every three weeks at the same time there's got to be some reality that, you know, the business plan may not be appropriate a year from now. So, that's a very tough thing to judge, I think that all the Venture Capitalist have a very hard time with that. I think one of the real struggles from most Venture Capitalist is knowing when to give up from a company and throwing the towel and a lot of Venture Capitalists is probably one of their weakest trades they continue putting money in to a company thinking the business plan will work, thinking they'll be able to adapt and in some cases is kind of a "pull the plug" So that's a real struggle and I don't have any silver bullets as to when the appropriate time is to stick with management, realize that there has been a change and when the appropriate time is to "pull the plug" I don't really don't have a lot of answers to that, a lot of that comes back to some of the intangibles and the gut-feel and you know "who's fault was it?" get a major competitor to come out with something that put the company in this position? Or did they just screw-up didn't manage their expenses properly and ran out of money and some factors in a company are a little easier to put your hands around them but others aren't. The fact of the matter is that the technology things do change and they can be cataclysmic competitive reactions and sometimes the company does need to change and at the end of the day that is probably just as much the venture capitalist's fault to continue to put money in there and not foreseen that as it is the entrepreneur's fault. Again, back to management if you got somebody you believe in and is strong and has new experience they are probably more able to adapt to that situation. But you never know, I don't have a good answer for that one, you know things are going to change and you got to take on a case by case basis.

What is your ideal business plan?

That's a pretty tough one to answer. I mean, I don't think there is an ideal one, I think it depending on which sectors you are looking at an technology is one way of dividing it up and obviously if it is an internet related play and if they are successful companies and making it great in a nine-month-period that's more of a traditional software company or a telecommunications company and may take several years for the business plan to work out. Again, this goes back to some of the earlier questions you asked you look at the business plan, make an assessment as to what are the realistic milestones are, understand that they may have some bumps in the road as that happens just tries to solve them... I don't really thinks there's an answer to that.

Any particular length?

Yea, historically a Venture Capital Fund is got a five-to-seven-year-time horizon by the time you have the money in your fund, find the appropriate investments, invest in the

companies, take them through some sort of liquidation event. Historically it has been five to seven years, now, with all this internet phenomenon some companies are getting investments and going public in a nine-month-horizon and I don't think that is sustainable.

But I mean length in a business plan.

Oh, you mean the actual number of pages? Well at the first meeting is rare that you read more than the executive summary. I rather have a slightly longer executive summary and if that goes well then you read the rest of the plan, but I don't have time to read a sixty-page-business-plan and I don't think many other people do, there maybe a few sections that you flip through, for a little bit of clarifications, I think a company has to put one together because if you get pass the first meeting that is when you get more into the business plan.

So, the first thing you look at in a business plan is the executive summary, What would be the next thing?

That depends what intrigues me from the business plan, if I think is a really neat concept or if I have some questions about the technology I go there, if I am already familiar with the market place they are in, I'll probably go more to management, and probably one of the last things I'll go to is the financials section, they all kind of look the same, the hockey stick approach, and you know, I don't tend to get as much value out of the financials in most of these companies. Except for that it is helpful to get a sense for where they are now if they got any revenues, if they got a few million on revenues from that perspective it is a very high level I am not going to check the balance sheet and figuring out profitability ratios or anything like that.

From the last six months. How many business plans have you received? In how many did you invest?

How many... Sorry I am not sure that I am understanding you question, How many times did we invest in them? Or how many business plans did I read?

No, in how many plans have you rejected?

Well probably 300 hundred business plans and we made only three investments. So, 297... yea, one percent is probably... I thinks that's from what I have heard pretty much what happens...

Are those three the ones you decided to invest? Or just keep them...

Three were the ones that we invested in, out of those other 300 say there are 20 business plans that I am looking right now, I haven't made a decision one way or the other. We move pretty quickly here, we make a decision usually within the first couple of weeks we get a business plan look at all, meet with the management and get back to them usually

within the first week so between the time we get it and the time we make a decision is probably no more than a couple of weeks so that's why I said the we look at probably 20 business plans or so, but... maybe another twenty more that things could change and I'd be more interested on waiting on something. So we track them, we keep details pipelines off all of companies here. There are 130 companies right now in our pipelines that I met reasonably that there was some point of discussion that I looked at their business plan, rejected it something is on the go, and then after we turn it over it goes into a basically a revisit list that we keep just so that we are always aware of the companies that have come through the door and there is probably 300 companies on that and then there is hundreds of companies that just never make it to the list and either they call up on the phone, and I just, you know, right at the bat I know that it doesn't make sense for us, because is either not technology or doesn't have sort of the prerequisites. Probably I said 300 business plans that came in, but there is probably at least another 400 or 500 of companies who knock at our door that just don't go anywhere.

So, do you take only technology based?

Yea, that is all we do, mostly information technology, we do some biotechnology.

Early stage?

Relatively early... ah we don't do typically peer seed stage, I mean if there is an entrepreneur with just a concept we probably will not invest on that. But we have two deals, we have made six investments since we started a year ago two of them were pre-revenue, pre-customer, pre-product, product is on development I should say. So, yea we could do early stage sometimes.

#### **Interview # 4**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

I guess the key intangible aspect is the history of the management team, have they been involved with previous start-up that eventually evolved into a successful businesses that were exited and now they are going back in again. so they have been there and have done it. Because you may have a very good scientist or a very good technologist who develops the product but the challenge is to make it a business around it to turn it into a business that is going to make money, and there is an exit for them and there is an exit to the venture capitalist. So, I think that surroundingly the start-up individual with a management team, maybe a COO or a good CFO who's been around and done it and can put a business box around the technology is key.

Do you have some more examples of intangibles aspects?

Market potential is another important factor, I mean you look at a market that has a hundred million dollar sales potential versus a market that has a five million dollar market potential, you start to quantify, but you sort estimate that potential so that is very much a key that you need in a business plan. You can estimate the market potential but in the end I think is the science, or is the environment and the technology.

Do you look for these aspects in the business plan?

To me the two key things are market potential for the product or service and the depth and breadth of management experience to turn the product or service into a viable “business”. Because there are a lot of technologies that are great but they never make money and we are not in the business of investing on the potential to make a business of it.

How do you measure it?

I think you try to do sensitivity analysis in the projections. You are going to see the financial forecasts and you are going to do your own independent research as to what you think the market potential is and whether the right management team is already in charge and what is your best case, worst case, likely case in the area and hopefully somebody in there you have the confidence level that if the company does the following things right over the first two or three years and they revenue and they “cover the area in the initial potential” for the business is this, that tells you that you have qualified, but it is a very iterative process. Is almost building your own model, you do a model for the entrepreneur but you want to build your own model so that you test your assumptions.

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

Personal knowledge? Personal knowledge about what, sorry?

His personal knowledge, do you consider it to be an important aspect of the business proposal?

Personal knowledge of the industry? Or product? Or his personal knowledge?

In general, his personal knowledge.

Yea, I guess there is two sides out of it, I mean, the personal knowledge could be sort the scientist, the technology, the ability to develop products the market needs, and the other side is the knowledge and the ability to develop the business, I mean these are two different things and if you can find someone to combine those two things together you got a very dangerous person because typically you get one but not the other you get someone who is very science oriented, they are good at developing the product based on

the needs of the market but they don't know how to capitalize on that to build the business, or you find a very good business man but doesn't have the technology side, sometimes you have two separate people who are thinking in doing a business together but if you get those people together... I think Bill gates is probably a very good example, there is a guy who understands the technology and the needs of the market and is a brilliant business man. So you combine those two together and you got a whack!

3. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

Ah... I don't think that... I mean, if he is coming to you with a certain products or service, and you are giving them the capital, I think they will use that to hire people or maybe take an acquisition of other technologies or businesses, you want to keep the entrepreneur very focus on doing one or two things right initially. Because if they are trying to do so many things up-front none of them will work-out, the company will grow up, so over time the company may develop its own new technologies its own new inventions or they may hire people to develop that ability right now, or make an acquisition of their competitor to do that, is something that I think that will grow after the first two three years of incubation of the company so it is not that important, you got to know the potential right there, for the market but not necessary know that the skill set is there when you make the acquisition.

So you don't measure this?

No.

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

When we say external knowledge is it...?

New external to venture knowledge

Changes to the market place? Or Changes to the technology?

Yes

That's right, it's very important because if the market is shifting or competitors are coming in they have to recognize the changes and make those changes within the organization and if they have a board of directors with very good people that are giving input and suggesting changes be made, they've got to be able to sort of learn from that in making the changes. You don't want people who think "This is the way we are going to do it, and I don't care about what do external factors say" So I think that's very important. Now, Can you quantify it? No. but you can sort see based on the previous

track record of that individual and their personality are they really stubborn or don't want to listen input from others , you get a sense for it, it is more like an intangible but it is a very important thing.

What is your ideal business plan?

It is not a marketing document, it doesn't try to over sell me, it is not full of "ratitudes" and "gody" wording, I mean, it is straight, it is to the point. "Here is the market opportunity", "here is what we have in place", "here is how we are going to capture the market opportunity", and these are some projections that we feel we can hit. Think of service that is a good word for use, they are realistic, they are conservative, they are concise, the shorter the better. Because we are going to get into a lot of that detail later, so, "give me the highlights of the business plan", a nice executive summary, a few appendices, maybe a bit of financial modeling, and then we will work it out later. We get business plans that technically a). We don't have the time to read them, and b). you can fall sleep after ten pages, because they are kind of selling, people get into a sales mode and all their trying is to get the attention of the venture capitalist.

In terms of length, is there any preference?

20 to 25 pages

From the last six months how many business plans have you rejected?

We get thousands every year, because we are one of the biggest funds in Canada and a lot of start-up entrepreneurs or people looking for an expansion capital send their business plan to us. I can ask Lisa, she can probably tell us, she is my assistant. But... I'd say that last year maybe we got... Is it the last year or the last six months?

Six months

I would say 3000.

Now, out of those 3000, How many got rejected?

Maybe 80%.

Right at the first screen?

Yea, the first screen or after the... the first screen is reading the executive summary, talk to somebody on the phone, you'll probably screen about 70 % of them, and then we may have some meetings and then you'll screen another 10 or 15 %. Then we have some preliminary due diligence to screen another 10% or so, so the "rule of thumb" is for every hundred business plans you get, you may do one or two.

That concludes my questions.

## Interview #5

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

And by intangible aspects you mean... technology? or characteristics of the management team? Or.. any of those things?

Yes, any of those things.

Some of the key intangible aspects, if that is what we mean, would be proprietary nature of the technology, how proprietary is it? How much of a sustainable competitive advantage? Is it going to be... How easy is it?.. or is it not going to be to replicate?

Another key intangible aspect is the management team's track record, that is quite intangible, because you can read somebody's resume but it is not measurable, is not some measurement trough per se, in terms that you are not going to... you are not going to have some sort of weighting assign to it to a management but you want to have a sense for it, to an extend of: Have they operated an entrepreneurial venture before? How big did they grow it? How successful were they?

Those are sort two key intangible aspects.

Do you look for these aspects in a business plan?

Yea, particularly when you are talking about investing in technology-based business, you definitively look for those aspects. Because those are the main assets that you are investing on it, as oppose to sort of a later-stage-business, let's say a management buy-out or investing in a company that has already got substantial revenue where at that point you are looking for the management team as well but you are also looking for quality of the underlined business which is more measurable, right? You know, profit margins, expand ratios, market size...

How do you measure the intangible aspects.

I think you look for key identifying factors, key identifying items, so in case of management like I said, it's related to previous experience, have they had analogous previous experiences, How analogous was it? You know, where was it different, Was it in the same industry? Have they grown a company from the similar point to the next point. Do they have substantial technology expertise? Is it in the same area? Or in different area? How long has the management team been together? In terms of the technology I think you're getting a look for either call them "red flags" or call them "key identifying



markers” but, you know, the number of years you man in mind is going to invest in the technology, that is more measurable, assessing proprietary nature, if they thought... they may have buy it or try-out a pile of customers or speaking to them to get a sense for how significant is the technology, try to measure its order of magnitude of improvement over existing technology, so How big is the gap? How significant is the change they are making? How large is it? Because the larger... the bigger the order of magnitude of improvement, obviously the more time you have to commercialize the technology and develop it and get it launched to market place before the existing competitors catch-up.

You look at, you know, patents, patents are a key thing, specially with the new risk U.S. patent rule changes, about being able to patent software, so probably patents are more important. Those are some of the key items.

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

Yes.

So, How do you measure it?

How do you measure the knowledge of the entrepreneur? Well to some extent the entrepreneur’s knowledge is reflected in the business plan. Because usually is the main input source for the business plan so, the degree to which the business plan is comprehensive and deals with not just the product description or the technology description, but also the market potential, and the market positioning and the competitor’s position is all reflecting how much does the entrepreneur knows. The other key thing is when you are meeting with the person and in discussions with him you are asking him questions the ability to respond intelligently and promptly is also an indication of their knowledge level. The other thing is their track record and the previous experiences. If were to give an example, it’s probably not a great example but, we were investing in a very early stage company that was in a optical networking area and I know zero about optical networking, well I mean, a little more than zero, but not very much, and it was a highly secretive company, very technical information disclosure but they did not have any try-out with the customers yet. So how are you going to assess “passing it to???” the technology as well, it so happened that of the core R&D team of 15 people they all came out of Nortel and they all came out of one of Nortel optical networking divisions, and they had previously develop Nortel’s previous “significant???” optical product, and they were... came over as a team, so, I guess you rely mainly on their experience base, in the sense for... what their saying sounds like that it makes sense and obviously they have the track record of having previously develop products, so, if they tell me that theirs is ten times better than the one they develop for Nortel before then, you hope is there and you are relying on their experience base to make some sort of assessment.

3. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

I think two things, again focusing on entrepreneur's previous unique employment and experience so, to what extent have they been in situations before where they have been innovative and creating new products successfully, and to what extent have they not done that, that's key indicator, another key indicator is their availability to be market driven often you get entrepreneurs who come in and the plan talks a lot about the technology but not a lot of what the product is and what the need is answering is, and why it should be developed or why it should be such a product in order to meet a need and you can pretty quickly get a sense of whether an entrepreneur is a technology driven or market driven because the plan analysis has compulsations??? That's when the people talking about the technology those are the technology driven ones, the market driven ones talk a lot about "here is the need", "here is the problem" solve it... "this is why this is a great technology to solve the problem" But they start with the problem first, they start with the need and go backwards. So, that's primarily how I do it.

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

Absolutely, my manager likes two types of investing, people who invest primarily in technology with the management basically being optional or replaceable and they are interested to invest because they like the technology its proprietary and it has certain potential and are very easy to change the management team. The other type of investor are people who rely more substantially on management, you know, technology is significant but management is as equal a factor in their investment decision, and those people rely very heavily on management stability to, as you said, to assimilate new information and make the changes in the corporate strategy, so my... you know, it interests me particularly I definitively rely on management because I tend to invest in management and technology as oppose to just technology and that might be a function of my experience base I don't have an awful lot of operating experience so I am not able to jump in an operate the company myself whereas other people that have more operating experience and may be more tempting to do that. The other thing is, no matter how significant... no matter how proprietary the technology if the market place changes dynamically, changes very fast, and is up to management who are closest to the market to summary all the information and basically propose strategy changes so if you look at very successful technology companies, is hard to guess but is just a guest but I would think that... some proportion of them like 80% or 90% actually change their strategy before they were successful.

5. What is your ideal business plan?

Of course the ideal business plan is the plan that makes me a lot of money with no risk. That by definition is the ideal business plan.

I mean in terms of content...

There is two factors that drives investing in technology oriented knowledge-based businesses, one is greed and the other is fear. So, people usually invests when greed exceeds fear, when fear exceeds greed then they don't invest. The whole point of the plan is to minimize the fears and maximize the greed potential, and that's true, in the sense that practically the content is the opportunity... the market opportunity has to be well described, OK? And again the problem is... or the need is... How are you going to answer the need? How significant... what topology are you going to use to solve the problem? to provide the need? And What kind of sustainable competitive advantage do you have?, so, the more proprietary of the technology the more sustainable is the advantage. So that all deals with the greed side of things, right?

The fear side is, well for example the management's track record, you know?, Have they done it before? Have they not done it before? The fear side looks at exclusively at what the risk items are and having risk mitigation strategies, that's always nice to see in a business plan. A reasonable and thoughtful competitive analysis which is just competitors positioning is also good to see in a business plan because that deals with the fear side of things, you know?, Why am I going to be... ? Why is this company...? Why is this opportunity going to be sustainable? How is it going to compete with its competitors? So, I think the ideal business plans needs to thoughtfully presents what the market opportunity is? How is it going to be attacked? and exploited and also on the risk mitigation side, How is risk going to be mitigated? What is the competitor's positioning? What's the financial resources required? That answers your question?

Yes. The last question is: From the last six months how plans have you received? Out of those, How many did you rejected? How many did you invest?

The last six months, I would have seen, probably on the order of about 30 to 50 business plans, this could be vague, we have a tracking work sheet, we have tracking data base that I could probably check if that is... It is probably in the order of 40 plus or minus five. How many of those have I rejected? That is like a decision tree is a series a decisions of "go", "no go" decision, so if the business plan is a reject out of hand at the screening stage, and then from those who continue on the table some of them are rejected later on. Easily two thirds are rejected "out of hand" and of the one third that goes forward out of those 40 business plans or 50 business plans I invested in one company actually, and I am considering in investing seriously in three or four others, so sort of five out of fifty, are sort of getting serious consideration.

## **Interview # 6**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Yes, typically look for a management team with a track record, that is my first and foremost criteria I use. Is to see have the management team done this before? Or if not, What kind of focus am I getting from them? Like, Are they focus on the opportunity itself? Or Are they “all over the map”? Are they just trying to take on too much? Do they know exactly where are they going to head? So, that’s probably intangible, you don’t get that from numbers or anything like that. So that is one of the ones I look for.

I also look for How is their interact? How is their understanding of the opportunity they have in front of them? In other words, What kind of vision do they have? Are they being sort of realistic about that? Responsive to changes? The level of determination that they may demonstrate, I think those are some things that doesn’t come out in a business plan, I mean you have to be putting down with those guys to understand how are they coming across of what is listed on a paper. To me, I use the business plan for.. like a resume, to get a sense of what are they talking about but nothing compare to actually meeting with them and letting them refer it to you.

How do you measure those intangible aspects?

I think a lot of this is intangible... ahmmm... is gut feeling so it is more... Probably I mentioned that, so... when I am... Ok, there is not clear cut measure. So in other words, when I need... Ok, I’ll give an example and I use that on my survey (Jagdeep’s). One of my recent investments is a company, which doesn’t have failed yet, they developed its product but the guy... At that time, I see the management team, when I am trying to measure it, I am trying to understand, you know, Have they done by themselves... Have they explore what the total opportunity potential is? Two, What are the risks taking that opportunity and three What changes he can make if that happens that needs changing?

I was leaned more towards an anecdotal evidence rather than saying this is a five-on-a-scale-of-ten kind of thing, so its more anecdotal. So, probing him on that front, that is how I would do it. So, I would ask him... Aha !!... questions such as “Why a customer is a potential custo... Who are going to be your customer base? Or which aspect of the market are you going after? or Which segment of the market are you going after? And then going into How is he or she going to be developing that strategy of going after that particular market place? In this particular instinct that I used, they were developing a gas saturation technology for depending gas industrial applications that has tremendous potential, so when I was trying to understand this management team, I wanted to understand what had they done to firstly, technically in terms of developing a product, so that is easily enough. From that to get into things that he knew on the technical side. Secondly, when he is, in this particular case, tell me, How are you going to reduce this risk? He has sign off an agreement with a gas large-multimillion-dollar-company that is a strategic partner for them, that gives me a lot of comfort that someone so large form a strategic... form the market standpoint has willing to sign such agreement. So, mine is more anecdotal, rather than “show me a piece of paper” or something, we don’t get on that basis...

When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

Hugely important, because at the end of the day, know your product, or know your service or know your.. and so therefore... I spend a lot of time actually getting to know his or hers product or technology through the entrepreneur and if he or she does not know it, to me that is extremely negative, because at the end of the day the entrepreneur must know, so I place a lot of importance to that.

How do you measure it?

Again, in terms of measurement a lot of it is through... My whole due diligence process or my whole time that I am spending in deciding if I am going to invest is an exploratory trip, is an anecdotal trip, for me at least. So what I do is I ask a lot, but behind that there is a purpose of why am I asking such things. So in other words, they come out and is not so much the factual stuff the due diligence process is not... is everything complaint... is more an understanding of the management team which is my first and foremost thing I told you... that is the most important thing for me, more than the technology.

The opportunity is more tangible to see... or the technology is more tangible... you can actually measure it much easier than the management team, but at the same time I think things like understanding what's the knowledge base of an entrepreneur gives you a great attempt or concept of has he or she got an understanding of the market place, the opportunity, the potential... you know, the risk, the rewards that could come out. Its not a five-one-ten of scale but that is the way I would do it.

2. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

To me the business plan as I said... I take it from the point of view... as a base to decide whether I actually want to meet with this company or will they meet or whatever way you want to look at it. I really assess that from actually meeting with the management team, the only level of comfort I get is through the biographies really of the management team. Have they the technical skills? If you will, or if they do not have that. Have they done something like this before? It could be experience, it could be technical skills that they picked up.

That's all I get from the plan, beyond that it is pretty much more of face to face that gives that.

When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

Sorry, I didn't get that, the ability to get?...

New external knowledge, new to the venture knowledge.

Yes, I said that. Yes, I will see that as very intangible, from my standpoint, you may get a different views from others, but yes I find that very intangible at that stage, other than the questioning of, you know, I am going back to that whole issue, my little experience is I spend.. I don't read the business for the time duration that I am being the vent... during the due diligence. I think I mentioned earlier that to me the due diligence is an obligated to complaint... is really for me to get a business so that I can participate much better at a board level, and to understand that behind that are people, for me the number one criteria is the management team and you really learn that through the due diligence process. You learn that you can get along with them and you learn that they can get along with you. So a lot of this is, you know, again this more of a soft base...ahh... of... but if they can stimulate... you know, the information out there... or the opportunities out there... I think a way to know that by probing or questioning but do I have a sense of you know, is this a strong skill that they have or is it a weaker skill that they have, I wouldn't say that I do that in an organized way? I am comfortable about them having that or not, so is a little bit of that...

What is your ideal business plan in terms of content?

Sure... I really find... An ideal business plan to me is one that begins with the opportunity. What is the opportunity...? To tell a story... To me... I have always believed in a simple thoughtful business plan. That's what they start with... so it should be that... So it outlines the opportunity, the benefit or the... you know, the potential index, as well as the part time "???? that they feel" . It's almost part of it but... we'll take "noid???" so to keep it out of a busi... I hate this business plans that is partial document, that, you know? Kind of either tight it on the road or when you talk about it they kind of leave it... mitigate it in a way that either is unrealistic or it just doesn't make sense. So, to me a business plan that... you know... is realistic, concise... you know... in terms of form and then there is content, in terms of content, explains the opportunity, the product... all kinds of opportunities, but definitively outlines the opportunities, outlines the risks involved, the payback and all that other stuff and gives a description of... justifies why is that an opportunity?, why is it worth it to look at that business plan.

In terms of form, from my standpoint I personally as a preference I like one that has a very well laid out executive summary, because that's where you can really make out this... that something you can understand often, I mean not that often but I use that as my clearing process really. If I am not getting it doesn't mean... to me the criter... a business plan is sort of a ???? so I don't judge a business by a poor quality business plan, because I have found that ???? some times??? that the business plan wasn't... they didn't have proper financial or intermediary advise or you know, they didn't really have a good CFO that just couldn't get an office with him???

So, but in terms... I would prefer to... personal the village??? form is doesn't get rounding around, you know, the fifty pages and thirty pages of them are... you know, core competence. So those are some of the things that I like to see in a business plan.

Recently, actually about a year ago, I saw this business plan that was a Power Point presentation, about ten pages, at the most that captured everything that you would ever want, and I found that excellent from a VC standpoint this is like a dream come true, you know, expending... the whole thing was very good. The management team that came out of that validated that. I think if you come back to the quality of the business plan it is important that... that who you get it from... that the people behind that should be able to back up that. Sometimes you see a very well written plan but finally when you meet with the people and they are totally... I don't know... they surprise you... And so you get the crappy ones...

On that particular case that you just mentioned, Did you invest on them?

We where looking to invest. What happened was that they got an offer from a strategic investor that just... was widely higher than what you could even think of offering, I mean there was all kinds of due diligence, so went away but... we where ready to, because we had a good management team, good opportunity, everything fitted in place.

Do you know how they are doing?

Very well, very well.

From the last six months how many business plans have you received and out of those rejected?

Probably 3 business plans a week, so that's twelve... about 72 roughly, and that includes all you know, whichever form I am getting in it, you know, so, it could be... we get a lot of emailing of business plans, some come through contacts, or references.

Actually 80 I mean roughly, and I'd say about 60 of those get rejected on the first screen, of the next screen I meet with the management, so of that 20 I have done about 2 deals, so that is the final successful outcome. Now for the other 18, I would have met with the management team, and got into either some pause... either I don't feel comfortable with the management or... and that's most of the time, that management didn't come out strong enough and there is always gaps in management specially on entrepreneurial companies, so it is difficult to find the perfect management team. they feel comfortable when all the aspects of the management are represented strongly, but you want to make sure that your entrepreneur/CEO have got that vision, ability to understand the product and all that stuff...

## **Interview # 7**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Clarity, logic and presentation shown on the business case.

A lot of strategy speak or technology speak and also finding an indication of whether the entrepreneur is or is not a business person. However, can't put a number on it. It renovates within, at the beginning it is either in the business plan or not.

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal? How do you measure that?

Personal knowledge... yes! That is a very important aspect, it is key. For example, if the person is very good at delegating they have to understand what they are delegating. They have to be able to assess new products or services, although in a business proposal is difficult to find. However, can be measured by having communication with the entrepreneur. As well, measuring by challenging the entrepreneur, do they have the experience? Do they know how to develop new products or services? Assimilate new knowledge, they look for new knowledge external?

3. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

I usually do not worry about that...

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

I think this question is very similar to the last one. I usually look for two things, the management team and the market. If those two things please me, then I am interested in them.

### **Interview # 8**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Yes.

Can you give an example?



Oh, management, always management team, characteristics of the management, that's all there is to it.

How do you go about measuring those?

Oh! in a rigorous way? Boy! Good question, I think I did mention it earlier that these deals come as a reference. So, usually at least one member of the management team is known to a member of our network, so beyond checking cross references on the resume, and checking references that way, but we don't have a rigorous method. We end up spending fair bit of time talking to the management team, and probing them, with respect to, How do they feel about working with the management? You know? Supervising 50 or 60 or 160 people. If they are able to execute on the business plan, How do they feel about having a company that big. Those are the things that we like to know about to give us a sense of the kind of flexibility that they may have going forward. We find sometimes honestly, that the flexibility that appear in a business plan is not necessarily the one they will have with the management, and that is problems.

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal? Do you consider the capacity of the entrepreneur (or the team) to create new knowledge as an important aspect of a business proposal?

Yes, very important.

And do you have a way of measuring it?

What we do is we typically go and hire a third party to help us assess that, as part of our network, we pay for that third-party-consultant to help us assess the technological merits of the proposal.

3. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

Look at the resume of the people involved. We do that all the time before we choose to go ahead. We look at what they have done before. Frankly, what we are looking for is people who has the ability to go sideways go laterally as well that they can go forward. We are looking for... just like in technology we are looking for open architecture systems, so we are looking for people with "open architecture attitudes" We like people who is prepared to overcome change and rapid change. People who can restart all over very quickly, re-invent yourself, especially with web related ventures. Be able to adapt to your market.

Do you look for these issues in a business plan?

Well, these things, these intangibles I mean, hopefully we get a sense of them in the business plan, but most of this comes by talking to the entrepreneur.

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

Yes.

Do you have a way measuring it?

No, I'm sorry. But again, this takes us back to the previous point I was making. It is really a whole investor's individual process. We have no way of measuring these things.

How is your ideal business plan?

One that has spent a fair bit of time discussing the skills and the background of the team of entrepreneurs. Also, it has a credible growing market a strategy.

And, Do you usually find those issues on the business plans that you receive?

No. In fact the ones... It is very interesting, people spend a lot of time creating a concept and identifying the prey they want to go after. Often that is enough in itself, so the work is done, right? For example, if it is a web related deal "I have identified a killer application", or a killer niche if you will and they concentrate in having a nice web site. That is not good enough for us. So if we like it we hire someone to go and help the team, if we don't like it, then we ask the team to go back re-think the concept.

From the last six months, How many business plans have you rejected in the screening stage?

Because of how we work here, we look at many more plans than the one we invest in. So, to give you an idea in the last six months we probably looked at about fifty business plans and we have invested in only two or three of them.

## **Interview # 9**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

I guess we would. We have a screening process that's maybe a little bit different than other people and you mentioned "growtech" they have design, I guess a questionnaire that we largely use, we use this questionnaire that is based on Progrid methodology and that is what we use as our initial screening process. So, that's what we often do, we read the business plan, unless we want to go further, because you can read for half an hour to a couple of hours to complete it. It asks key questions that we are interested in, and they develop a grading methodology that gives a score, which we don't rely on exclusively, but it is a factor in our decision. It enables two or three people to look at it, usually one or two people in "growtech"?? and one or two people in "tentro" to look at it takes about 20 min to read the questionnaire that we ask people to complete so we make our preliminary decision based on this so that. So that's the initial decision, based on that. There may be some other intangible factors that somebody may be aware of because of their own background or experience or something else.

Is there anything in particular that you consider to be intangible?

Yea, our process is usually to review that application file, but if we decide to go further then the next thing we decide is probably to have a meeting with the company, and ah... I guess, chemistry with the people, Do they have the passion? Does the team believe that they are able to do it? Are they on a good track?

I think the chemistry of the first meeting is very important.

Are there any ways in which you measure that? Or look for that?

I don't think we have any way to measure that scientifically. We as a group compare notes afterwards, What was your impression? And that's it...

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

I guess it depends on what do you mean by knowledge. If the entrepreneur is going to be the CEO...

Personal knowledge

You mean their education? Personal knowledge about the market? Or the technology?

Yes, the personal knowledge about the market, the technology, just their personal knowledge-base.

Oh! Yea. It is very important, I think you have to be able to recognize what the strengths and weaknesses are. That is often a challenge for entrepreneurs because sometimes they

feel that they can conquer the world and they can be everything and tell the market they are great, share the spotlight. You have to be careful about those kind of people because is pretty tough for only one person to run a successful company. So I would say that the more involved they are... Sometimes the founder, I guess, maybe comes with this great technology, and got some people who are willing to join the team but then later are going to be leaving it, which then makes me think that their personal knowledge will not be that important, but they are going to be part of at least the start-up, which is quite important. I think.

Do you consider the capacity of the entrepreneur (or the team) to create new knowledge (personal knowledge) as an important aspect of a business proposal?

Yes, I think the team will need to convince us that they are already thinking about a next generation of products or other market that can think of taken products. When you are specially investing into early stage, we, if we can, everybody likes to invest in some kind of platform technology, but specially if you are going after an emerging market, you are not a 100% sure whether is going to emerge or if it's going to emerge. If there is any other face you can take this core knowledge or technology to another market that is a key thing for us.

But at the early stage, if you don't see the platform technology, do you still feel comfortable to move forward with the hope that there will be a platform?

It could be, I actually talked about that a bit this morning. I talked about platform technology. I talked ideally proprietary (or in its way to be patented) In any case, if you see a technology that isn't patentable or maybe it is not wise to patent, or if you don't want to disclose what is that you are doing. In that case we are probably looking for some evidence that there is a technology lead and you got a team which is capable of maintaining that lead. So, we have a couple of companies that we consider to be in that category. We have a couple of other companies that probably, could be small or we can make smaller investments. We have a couple of companies that I don't think are ever going to be an IPO candidates because they are not big enough, but the way we structure the investment, they have, we think a really good position in what we see as a clearly defined niche market. There may not be a lot of reasons of why a whole bunch of other people would want to try to get into that market, but overall we think that we can make a decent profit by participating, so we have done a couple like that as well.

So, are they potential acquisitions?

Yes. You know? One case is a company where we think that they can have a pretty stable revenue stream. It is likely that... Quite possibly that somebody will buy them and even if they didn't, in the structure we have an option that we can get equity or receive royalty basically on this one transaction and we think we can make a very good return on the investment of the company. It is a kind of business model where they were going to have recurrent revenue stream for a period of years, we hope, so we probably are going to make a pretty good return on the investment, even if nobody bought it, or even if they don't go public.

Is such a unique situation in which they have a niche market. It is a software-based.

3. When making a decision to invest in a new technology-based venture, How do you consider in a business proposal the capabilities of the entrepreneur that will allow him or her to create new products or services?

Well, because we are a technology-focused funding we are investing at the early stage for the most part. That is why we get this largely technology people and not business people coming to us as the entrepreneur initially, some of them want to continue in that capacity and some of them are prepared to step aside right away, some want to lead it for a period of time. I will make a judgement call based on whatever the scenario is. Usually is their ability or the team's ability to be able to continue to innovate. Although that also depends on the markets they are in too. If you after a more established or mature market where is not growing as fast or maybe not as many people targeting that, doesn't have high grow rates perhaps. We have a company like that, with a very large market but we are not as concerned about the pace of innovation as there might be in a software or in a telecommunications kind of situation where you know you have to provide next generation products on a regular bases.

So, Do you look for these issues I a business plan?

Yes.

And the way you measure them is by...

We have as I said the face to face meeting and one of the processes that we go through in Growtech is to... Are you familiar with the Progrid methodology?

Yea

What we have is we start first with a questionnaire with 15 questions that gives us a preliminary screening. Then we have a meeting with the company and we make some assessments based on that, chemistry, gut feel. Are we impressed by these people? Sometimes they don't always communicate what it is that they are trying to do? Very clear on the business plan or even on the questionnaire and if we go beyond that then we go into something that we call the QA technology assessment. Really is just a more detailed questionnaire. Something like an add if you want. Involves one or two people from Growtech and one or two people form "Kincode" plus all of the key people from the investee company. The entrepreneur and his team and maybe his board or whoever. We all go through all these questions and we ask the team to come up with a consensus answer to that question and that deals anything from market to technology to building a management team. That is done at the meeting. So it is the best learning experience that we can have because it is very comprehensive. The questions are not rocket science but it is a comprehensive test. Sometimes we find that between the management team they are

not on the same wavelength on a certain issue because they are debating “OK, what is the answer to that question?” It has been helpful, for some companies you go through that process, and it is very helpful, for us to watch the interaction with other people. It is not very effective if they have only one person, but if they have a team, and there is a team present it has been very helpful.

4. When making a decision to invest in a new technology-based venture, do you consider in a business proposal the ability of the entrepreneur to assimilate new external to the venture knowledge?

I would say that we spend a lot of time on that. It depends, you know? We want to make sure that the entrepreneur is focused on the business opportunity. We have a couple of situations and I have seen other where it was the desired of the entrepreneur to be focused on another thing as well and that was of concern to us because this requires a 100 % plus commitment. So, they need to balance the team and we want to see that they are focused on the venture.

What would your ideal business plan be?

My ideal business plan would include an indication of Who the management people are now? who are the management? What is the plan to build the management team? Have they thought about that?

We see a lot of plans that sort of dismiss the competition, “this is the greatest product, there is no competition” a competitive analysis is pretty important “what are we going up against?”

A realistic assessment of how long is going to take to achieve things that are mentioned in the business plan. I like to say that an entrepreneur really isn’t an entrepreneur if he is pessimistic in order to predict how long is that going to take to make things happen. That is typically what you see...

If somebody has been through a start-up or has been present, even though they have their eyes I the sky, they know how tough it is, but they are realistic about it. The are still committed but realistic to understand how difficult it is, How long is this going to be? And sit back and think of the problem they are going to face, get on the drive, be on the road... Gone!

How many proposals have you rejected in the last six months?

Well, we are in the middle of an interested situation because being a... One of the challenges of running a labor sponsor fund is that it is not like an institutional flow of capital where you are starting off with X dollars and you make cash calls. We raise money from individuals all year long but the majority comes in January and February, and you never have any idea whether you are going to raise nothing or a lot. So, you have to be cautious on your investments planning, also, the legislation provides rules about

how fast you have to invest that money. In Ontario, a labor sponsor fund for example, any money we raise in a twelve month period from March 1, 1999 to March 1, 2000 and 90 % of that money would come in February of 2000 we have to invest 50% of that money by the end of the following December by December 2000. So, that is a very aggressive schedule and then we have to invest the rest 20 % on the next 12 months. So, it's not just the way you may want to run the business, there is extra challenge for the labor sponsor fund which legislation puts in place. So, if you ask me how many plans did we reject in the last six months, I guess we rejected everyone we looked at except for one because we have seventeen companies in our portfolio we are making sure that we have enough capital to participate in another one keeping on reserve that we have no idea of what is going to happen in the upcoming season. Our chance of being an early stage investor is to make small bets early and then to put bigger on them on the ones that are executing near to what they announce on the plan that they put out. So we don't want to be out of capital to put the next million bucks into those companies. So, we are very cautious about entering new deals.

### **Interview #10**

1. When making a decision to invest in a new technology-based venture, do you consider any intangible aspects when assessing the business plan?

Well everything you can measure, he he. The number one question you have to ask yourself is (and this may be my own box, for example the President of Delrina), he made 20 million bucks, he had what he called the Stapinker rules to run in a business. It is actually very smart, it is very very simple but most entrepreneurs wouldn't even think about it. So, here are the three rules. The key point is that all three conditions must be met if one of the conditions is not met. Is it two out of three? Walk!

This advice is good for starting a company, for joining a company if you want to come in from outside or for investing in a company. Remember, if it doesn't match all of the rules, Walk away! Because eventually you are going to loose the war.

So here are the rules:

Rule number one: "It is got to be a new market". There has to be a new market, right? Or any of those existing markets that hasn't been saturated or isn't absorbed.

Rule number two: "A market whether is no income in it or is well suited to be able to enter it into the market place" so it has to be something to barrier the venture or to the first person there.

Rule number three: “There must be a real want need or desire” A basic one that is not filled today.

So, if all three conditions are met, again, that’s when the luck comes in at right spot at the right time then there is a chance to be very very successful. If any of those conditions are not met, walk away from it. So I don’t know id that answers your question but that’s generally a good advice.

Like here, it is a new market, he has technology which might not be outstanding but all you need is another four or six months to be like that and there is a real need or desire for something to fill today. I believe that people is looking for better service to be able to manage their money more.

So, all three basic conditions are met which makes it more interesting. If for example there is a ton of people who want to be in this business, forget it! I am a huge fan of Jack Wells who you should probably study. Jack Wells is... it’s funny, he is a very interesting guy. Here is a guy who is CEO of this enormously huge business, one of the biggest companies in the world that makes from nuclear reactors to light bulbs. It is kind of a wide range, right? How do you manage something like that? I mean, you can ask a really basic question, How somebody writing them with all these different markets. He has this very simple model, which I think is applicable to high tech, “If you are not number one, or number two, sell the business !! or divest”. Because you are not going to stay and grow. You are always going to be chasing someone. You can be a gorilla or can be a chimpanzee or you can chase the big guy wherever the crums are. But, you know there is going to be a little room left for whoever is going to be number three player, right?

2. When making a decision to invest in a new technology-based venture, do you consider the knowledge of the entrepreneur to be an important aspect of the business proposal?

First of all, nothing replaces customer, right? These guys can talk to the cows somehow, this doesn’t make a difference. But is what customers are talking about. Is what customers are saying, is what analysts are saying. Is got to be an exhaustive competitive analysis, to proof credibility. Whether the competition is weak or not existent or he has already a solution. The way you demonstrate some intangible value is by showing that there is some reasonable market from where you can attach. If he can not define the market he is going after, then I say I want a reasonable 1% of the market or 2% of the market or 3% of the market, I want to face it within one or two years a kind of a practical thing. That’s what actually add good will and intangible value. Because you say, OK, it is going to add this much power and is going to have these many eye balls (if it is in the internet is going to have this kind of eye ball or this kind of presence) and you can apply multiple choice. Is pretty much like doing DPS, you can do that kind of stuff, but you have to be able to understand that base mark. Anything from there you just multiply from that.



Let me put it this way. His knowledge, How can you put it in a business plan as one of his assets?

From his mind comes the delivery of a product. And the product has some value to it. He is nothing more than a slave to the product. To be honest. So the evaluation is based upon this market, this market segment, this market is attached. This is going to get 5% of the market or whatever. I'll put a multiple against it and that is assuming that he is part of it. Other wise he wouldn't be in this place in the first place.

I am not a big fan of putting a value on starts. Because specially in high tech "today is starts tomorrow is go" You turn it off tomorrow, he gets hit by a bus tomorrow, what is the good will? The answer is nothing.

It is the same in the software business. The value is directly what it gets to the people, and the people is directly related to the product. In high tech you can not make the assumption that a guy is working for you from twelve to 24 months, that is a fact. So, it is dangerous to put a value on a superstar, it is very dangerous. These people come and go. So, you have to put a value to the company based on its market.

How would you consider the ideal business plan?

The person is credible. They understand the market better than anyone. Every question any can ask they can answer it from a position of authority. They can do it from a macro market perspective, and understand that market that they are going after. They can understand it from a micro market perspective which is I understand what this customer is saying this, this customer is saying this, this customer is saying this, right? So the have to show that kind of authority first of all.

That is much from a technology perspective, frankly is secondary. I want to see credibility and competency no question about that from a technical perspective, but that is not what I am interested in, that is the initial ramp. What I want to see is that this guy is passionate about his business understand the business cold, has the people to make the job get done and they are always going to get it done.

So, anyway he is a business man. In the business plan he says, this what is going to cost me to run the business, this is what I think is the market that I am going after, here is what I need, here are the risks (the comment you made earlier). Then, I have credibility, then I can feel that the person is credible, but if he can't answer those questions, he s just a "techie" guy frankly. And they come and go.

These things are fundamental. I can tell by reading a business plan within five minutes if this company is going to be successful or not. Not necessarily on what the business plan is there or not is if the person understands. Most business plans are garbage, they show you this great technology and have this great idea that they want to turn into a business. No, no, no, What market? How are you going to get to the market? What happens if

Microsoft enters your market? These are fundamental questions you have to ask. If they can't answer the questions, guess what? The competition will.

How many business plans have you put together that have been successful?

I've looked at hundreds. I look them for people, for VC's. I've written five myself. I've never been rejected, is very simple, once you understand the mechanics for writing a business plan it is not difficult. It is like I was making a comment, you have to do it step by step. Is like anything if you understand the process then it becomes very simple. What's market? Who is doing what? What's the hole? And if you can answer those questions... I have seen a lot of plans. There is a total gap for doing these things in Canada, it is like... Oh! May I turn this off?

## Appendix C

### Tangible Criteria

Decision-Making Criteria		Tangible	Intangible
<b>Characteristics of the Entrepreneur(s)</b>			
<b>Personal Attributes</b>			
Familiarity with technology enablers	1	0	
Demonstrated leadership ability in the past	0.9	0.1	
Familiarity with product and market	0.9	0.1	
Managerial capabilities and business awareness	0.9	0.1	
Success at starting previous business	0.9	0.1	
Track record relevant to the venture	0.9	0.1	
Ability to attend to detail	0.8	0.2	
Familiarity with business drivers	0.8	0.2	
Familiarity with customer requirements	0.8	0.2	
Ability to sustain intense effort	0.7	0.3	
Personality compatible with investor(s)	0.7	0.3	
Commitment to success	0.6	0.4	
Willingness to work and cooperate with investors	0.6	0.4	
<b>Background &amp; Experience</b>			
Referral by a trustworthy source	1	0	
Ability to put a balanced management team in place	0.6	0.4	
Investor(s) familiarity with the entrepreneurs' reputation	0.6	0.4	
<b>OVERALL SKILLS</b>			
Engineering skills	1	0	
Production skills	1	0	
Advertising and promotion skills	0.9	0.1	
Financial skills	0.9	0.1	
Sales force and distribution skills	0.9	0.1	
Research and development skills	0.8	0.2	
Marketing research skills	0.7	0.3	
<b>CHARACTERISTICS OF THE MARKET</b>			
Attractive existing market size	0.7	0.3	
Attractive growth potential	0.6	0.4	
<b>Market Need</b>			
Proposed venture is satisfying an existing market need	0.8	0.2	
<b>Competition</b>			
There is intense price competition in the market	1	0	
There is a strong dominant competitor with a large market share	1	0	

<b>Decision-Making Criteria</b>	<b>Tangible</b>	<b>Intangible</b>
The proposed venture has many competitors	0.9	0.1
Competitors are not yet established	0.8	0.2
Venture is protected by effective barriers to entry	0.7	0.3
<b>Environmental Conditions</b>		
There is a well-established distribution system for product	0.8	0.2
Technology factors are changing rapidly	0.6	0.4
Market factors are changing rapidly	0.5	0.5
Customer need factors are changing rapidly	0.5	0.5
<b>CHARACTERISTICS OF THE VENTURE OFFERING (PRODUCT OR SERVICE)</b>		
Priced with a high profit margin	1	0
First of its type in the market	0.9	0.1
Functioning prototype has already been developed	0.9	0.1
Specifications are very clear	0.9	0.1
Can be protected by a patent	0.8	0.2
Proprietary	0.8	0.2
Higher quality compared to competing products	0.7	0.3
Technical aspects are very clear	0.7	0.3
<b>INVESTOR(S) REQUIREMENTS</b>		
Expected rate of return on investment	0.9	0.1
Geographic location of the venture seeking venture capital	0.9	0.1
It is the first round of investment	0.9	0.1
Percentage equity share of venture held by the investor(s)	0.9	0.1
The venture's stage of development (e.g. seed)	0.9	0.1
Cash out potential (e.g. going public)	0.8	0.2
Familiarity with the technology of the venture	0.8	0.2
Familiarity with the venture offering	0.8	0.2
Size of investment expected from the investor(s)	0.8	0.2
There are other co-investors present in the investment	0.8	0.2
Expected market risk to the investor(s)	0.7	0.3
Familiarity with the industry of the venture	0.7	0.3
Financial provisions for investor(s) rights	0.7	0.3
Investor(s) will have a minority position in the venture	0.7	0.3
Venture performance after first round of investment	0.7	0.3
Investor's familiarity with the market targeted by the venture	0.6	0.4
Proposal recommended by someone known to the investor(s)	0.6	0.4
Track record of co-investors in the deal	0.6	0.4
Expected technology risk to the investor(s)	0.5	0.5
Have the option to be the controlling investor(s) in the future	0.5	0.5

<b>Decision-Making Criteria</b>	<b>Tangible</b>	<b>Intangible</b>
<b>Characteristics of the Investment Proposal</b>		
Clarity of communication in proposal	0.7	0.3
Clear emphasis on key points	0.7	0.3
Effectiveness of graphics, tables and figures in the proposal	0.7	0.3
Quality of competitor analysis	0.7	0.3
Quality of customer analysis	0.7	0.3
Quality of product analysis	0.7	0.3
Overall quality of proposal	0.6	0.4
Overall quantity of proposal	0.6	0.4
Quality of financial analysis	0.6	0.4
Quality of market analysis	0.6	0.4
Speed to evaluate proposal by investor(s)	0.6	0.4
Ease to evaluate proposal by investor(s)	0.5	0.5
Evidence of creativity in the proposal	0.5	0.5

**Appendix D**  
**Objective Criteria**

<b>Decision-Making Criteria</b>	<b>Objective</b>	<b>Subjective</b>
<b>Characteristics of the Entrepreneur(s)</b>		
<b>Personal Attributes</b>		
Ability to react to changing risk	0.2	0.8
Ability to bring about change	0.2	0.8
Ability to anticipate need for change	0.4	0.6
Ability to accept criticism	0.2	0.8
Commitment to success	0.5	0.5
Willingness to work and cooperate with investors	0.3	0.7
Ability to sustain intense effort	0.4	0.6
Personality compatible with investor(s)	0.2	0.8
Ability to attend to detail	0.5	0.5
Familiarity with business drivers	0.6	0.4
Familiarity with customer requirements	0.6	0.4
Demonstrated leadership ability in the past	0.3	0.7
Familiarity with product and market	0.8	0.2
Managerial capabilities and business awareness	0.6	0.4
Success at starting previous business	0.4	0.6
Track record relevant to the venture	0.4	0.6
Familiarity with technology enablers	0.7	0.3
<b>Background &amp; Experience</b>		
Ability to put a balanced management team in place	0.6	0.4
Investor(s) familiarity with the entrepreneurs' reputation	0.5	0.5
Referral by a trustworthy source	0.4	0.6
<b>OVERALL SKILLS</b>		
Marketing research skills	0.6	0.4
Research and development skills	0.3	0.7
Advertising and promotion skills	0.4	0.6
Financial skills	0.9	0.1
Sales force and distribution skills	0.7	0.3
Engineering skills	0.9	0.1
Production skills	0.9	0.1
<b>CHARACTERISTICS OF THE MARKET</b>		
Attractive growth potential	0.4	0.6
Attractive existing market size	0.9	0.1
<b>Market Need</b>		
Proposed venture will create a new market or niche	0.6	0.4

<b>Decision-Making Criteria</b>	<b>Objective</b>	<b>Subjective</b>
Proposed venture will stimulate an existing market	0.6	0.4
Proposed venture is satisfying an existing market need	0.8	0.2
<b>Competition</b>		
There is little threat of competition during the first three years	0.6	0.4
Competition is present or anticipated in first two years	0.5	0.5
Venture is protected by effective barriers to entry	0.7	0.3
Competitors are not yet established	0.6	0.4
The proposed venture has many competitors	0.8	0.2
There is intense price competition in the market	0.9	0.1
There is a strong dominant competitor with a large market share	0.8	0.2
<b>Environmental Conditions</b>		
Market factors are changing rapidly	0.6	0.4
Customer need factors are changing rapidly	0.5	0.5
Technology factors are changing rapidly	0.6	0.4
There is a well-established distribution system for product	0.7	0.3
<b>CHARACTERISTICS OF THE VENTURE OFFERING (PRODUCT OR SERVICE)</b>		
Demonstrate a defensible competitive position	0.3	0.7
Highly innovative	0.4	0.6
Superior and unique	0.4	0.6
Higher quality compared to competing products	0.6	0.4
Technical aspects are very clear	0.5	0.5
Can be protected by a patent	0.8	0.2
Proprietary	0.7	0.3
First of its type in the market	0.6	0.4
Functioning prototype has already been developed	0.8	0.2
Specifications are very clear	0.8	0.2
Priced with a high profit margin	0.8	0.2
<b>INVESTOR(S) REQUIREMENTS</b>		
Ability to attract a viable investor group	0.3	0.7
Investor(s) influence upon management decisions of the venture	0.5	0.5
Investor(s) will not be expected to make subsequent investments	0.6	0.4
Venture's long-term sales will impact investor's performance	0.4	0.6
Expected technology risk to the investor(s)	0.5	0.5
Have the option to be the controlling investor(s) in the future	0.6	0.4
Investor's familiarity with the market targeted by the	0.2	0.8

<b>Decision-Making Criteria</b>	<b>Objective</b>	<b>Subjective</b>
venture		
Proposal recommended by someone known to the investor(s)	0.4	0.6
Track record of co-investors in the deal	0.7	0.3
Expected market risk to the investor(s)	0.5	0.5
Familiarity with the industry of the venture	0.4	0.6
Financial provisions for investor(s) rights	0.9	0.1
Investor(s) will have a minority position in the venture	0.8	0.2
Venture performance after first round of investment	0.5	0.5
Cash out potential (e.g. going public)	0.3	0.7
Familiarity with the technology of the venture	0.3	0.7
Familiarity with the venture offering	0.5	0.5
Size of investment expected from the investor(s)	0.9	0.1
There are other co-investors present in the investment	1.0	0.0
Expected rate of return on investment	0.6	0.4
Geographic location of the venture seeking venture capital	0.9	0.1
It is the first round of investment	0.9	0.1
Percentage equity share of venture held by the investor(s)	0.8	0.2
The venture's stage of development (e.g. seed)	0.7	0.3
<b>Characteristics of the Investment Proposal</b>		
Evidence of truthfulness in the proposal	0.4	0.6
Realistic financial projections contained in proposal	0.5	0.5
Completeness of venture proposal	0.7	0.3
Effectiveness of executive summary in the proposal	0.4	0.6
Ease to evaluate proposal by investor(s)	0.4	0.6
Evidence of creativity in the proposal	0.2	0.8
Overall quality of proposal	0.3	0.7
Overall quantity of proposal	0.1	0.9
Quality of financial analysis	0.8	0.2
Quality of market analysis	0.5	0.5
Speed to evaluate proposal by investor(s)	0.4	0.6
Clarity of communication in proposal	0.5	0.5
Clear emphasis on key points	0.5	0.5
Effectiveness of graphics, tables and figures in the proposal	0.4	0.6
Quality of competitor analysis	0.4	0.6
Quality of customer analysis	0.5	0.5
Quality of product analysis	0.6	0.4



## Appendix E

List of all the constructs for each category from investors and entrepreneurs:

List of categories and number of constructs from respondents			
Category		Entrepreneurs	Investors
1	Personality of the entrepreneur	14 constructs	24 constructs
2	Background of the management team	11 constructs	8 constructs
3	Skills of the management team	23 constructs	41 constructs
4	General attributes of the management team	13 constructs	6 constructs
5	Business plan (business model)	4 constructs	4 constructs
6	Investor-entrepreneur relationship	1 construct	0 constructs

## Category 1 for Entrepreneurs: Personality of the entrepreneur

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Founder issue is resolved	3	5	4	3	1	1	Founder wants to control indefinitely
Founder is open to receive advice	4	4	3	5	1	2	Founder is stubborn (know it all)
The team has passion to accomplish something bigger than themselves	4	4	4	3	1	5	The team is just there for the money
The members of the team enjoy spending time outside the office	2	1	3	4	5	4	The team is only task oriented (work) focus
Character centric (authenticity of the founder)	2	5	4	3	1	2	Personality centric (founder)
Maturity (founder)	1	3	5	4	4	5	Youth (founder)
Dynamic personality (founder is visionary)	5	4	2	4	3	1	Personality is solid (founder)
The founder has good business etiquette (presentable)	3	4	3	4	2	3	The founder has poor business etiquette
Genuineness (first impression vs. how it actually placed out)	5	4	4	3	3	1	False first impression (What a surprise!)
Founders are entrepreneurial	1	5	5	4	1	2	Founders show desire to get rich without work
Founders show integrity and honesty	1	5	5	4	1	2	Founders are only looking for self promotion
Management team is operationally focused (planning strategy makes sense)	4	5	4	3	2	1	Poorly operationally focused (management team)
Founders are open to advise and suggestion	3	4	3	4	1	5	Founders are stubborn (not as open to advise)
Founders show "Inherent passion," "your skin is in the game"	5	5	5	3	5	2	The founders consider the new venture as just another job

## Category 2 for Entrepreneurs: Background of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Founders have been successful in the past	2	5	4	2	1	2	Founders don't have track record
Experience in the target market	5	2	4	5	5	4	Invention or idea looking for a market
Management team has technical background	5	5	2	3	1	3	Management team has business background
The founder has strong technical depth	5	5	5	4	3	1	The founder has limited technical depth
The founder has experience in "old economy" type of business	1	3	5	4	5	5	The founder doesn't have experience in "old economy" business
The management team has solid experience in a relevant market sector	2	5	5	4	3	4	The management team is branching into new emergent markets
Strong education (founders)	2	5	4	4	1	2	Poor education (founders with no professional degrees)
Strong technical expertise (founders)	3	1	5	2	4	4	Poor technical expertise (founders)
Founder has seasoned management experience	4	3	3	4	1	3	Founder has poor management experience
The team comes from a "real entrepreneurial background"	4	4	1	4	3	5	Founder has technology background "techie"
The founder has background in a big company	5	5	4	5	2	2	The founder doesn't have work experience in big companies

### Category 3 for Entrepreneurs: Skills of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Appreciation of industry trends (foresight)	5	2	4	2	4	2	Management team uses a reactive approach
The team understands the market opportunity	5	3	4	4	2	3	The management team doesn't understand the market opportunity
The founder can communicate effectively the market opportunity (2 sentences)	4	3	2	3	2	1	The founder has no ability to communicate the market opportunity (2 pages)
Management team has market focus (niche detection) "sticking to knitting"	5	3	4	2	3	1	Management team uses a "shot gun" approach
The founder has the ability to learn from the customer	5	3	3	5	2	1	The founder is arrogant (or has product arrogance)
Founder has the ability to achieve milestones "keep the money happy"	3	4	4	3	2	2	Founder is not able to accomplish goals in time
Founder has the ability to make the "2 min pitch"	5	4	2	4	2	3	Founder has the ability to make the "2 hrs pitch"
The management team has the ability to expand	4	4	4	3	1	1	Management team has no ability to expand
The founders have good credibility (capable)	4	5	4	4	2	1	The founders has no credibility (sound "loony")
The founders have realistic expectations (time wise)	2	4	3	2	1	1	The founders have unrealistic expectations (time wise)
Realistic expectations of how much capital to raise (and when)	3	5	4	3	2	1	Unrealistic expectations about how much capital to raise (and when)
Flat organizational hierarchy	4	4	3	4	1	2	Vertical organizational hierarchy
Quick decision making (management team)	1	5	3	3	1	3	Slow decision making (management team)
Founders have ability to assimilate new information	2	5	2	2	2	2	Founders lack ability to assimilate new information
Good management decisions (management team)	1	5	3	3	1	3	Poor management decisions (management team)
Management team has potential to succeed	1	5	5	4	2	2	Management team has no potential to succeed
Founders have a definite clear vision of where the company is going	4	5	4	2	5	1	Founders don't have a clear vision of the company
Founders have ability to think "outside the box"	4	5	3	2	1	3	Founders show a more structured (limited) thinking
Ability to get people to understand your vision (founders)	4	5	3	2	1	3	Lacking ability to get people to understand your vision (founders)
Ability to work with people (founder)	3	4	4	3	1	4	Lacking ability to work with people (founder)
Ability to fill in the gaps in terms of weaknesses/strengths	5	5	4	3	1	1	Lacking ability to fill in the gaps
The team can handle the fast pace	5	4	4	3	3	2	The team cannot handle the pace
The team reacts proactively to new information	4	4	3	2	1	3	The team operates with close mind

### Category 4 for Entrepreneurs: General attributes of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Robust and adaptable management team	3	4	4	3	1	4	Management team has a narrow focus
Well rounded management team	4	5	3	1	2	2	Management team has a narrow focus
Strong instilled management team	5	5	3	4	2	2	Diluted management team
Good infrastructure in place (expanded team)	3	3	5	3	2	1	Poor infrastructure (only the originator of the idea)
Collaborative management team	5	5	4	3	1	1	The founders are control freak (micro management)
Reasonable management team	1	5	4	3	1	2	Incompetent management team
Strong management team	2	2	3	5	2	3	Weak management team
Team is originator of the idea	1	5	5	1	5	1	Team is not the originator of the idea
The team is younger and energized	5	5	3	1	3	4	The team is older and less energized
The team is creative and innovative	3	3	4	2	1	1	The team is unoriginal and not enterprising
The team has good dedication	5	5	4	3	4	3	The team has poor dedication (commitment)
The team has good drive	5	5	5	3	2	2	The team has poor drive
The team is operationally organized	5	5	5	2	2	1	The team is not organized

## Category 5 for Entrepreneurs: Business Plan

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
The business plan is always evolving and changing	4	5	4	5	1	1	Static business concept and model
Complexity of the business model (hard to explain)	3	3	5	4	1	2	Simple straight forward business model
Good quality of the business plan (check spelling, organization, etc.)	4	5	4	4	3	2	Poor quality of the business plan (careless writing and preparing)
Business plan wrote with elaborate language	2	2	4	4	2	5	Business plan wrote with simple words

## Category 6 for Entrepreneurs: Investor-entrepreneur relationship

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Strong venture capitalist health (less intrusive)	5	5	2	4	3	1	Deceased or weak VC health (intrusive with the new venture)

## Category 1 for Investors: Personality of the entrepreneur

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
The team shows honesty and integrity	5	4	1	4	1	2	The team shows dishonesty and lack of integrity
Teamwork environment across the organization	4	4	1	4	1	1	Management is isolated from the staff
Character in general	5	5	1	4	1	2	The team has no reality orientation
The team has passion to create wealth (they feel proud of it)	3	5	1	3	2	3	The team thinks that work is a "necessary evil"
The team has business "etiquette"	4	4	2	3	2	2	The team is not courteous
Originator is a visionary	5	4	4	4	1	1	The team has limited entrepreneurial and business abilities
Founders have confidence in their technology	5	5	5	4	1	1	Founders show fear of loosing their technology
Founder is keen at recognizing the need to change his position in the future	5	5	2	4	1	1	Founder thinks he can be the CEO forever
Founders have a desire to assimilate new knowledge	5	5	3	3	1	1	Reluctance to find new information (founders don't want to change)
Founder is open to receive help	5	5	3	3	1	1	Closeness to receive opinions or help
Management team has high tenacity	5	5	5	4	1	1	Team has low tenacity
Founder has lack of pretentiousness ("down to earth")	5	5	5	4	1	1	Founder has a desire for status or money
The company is their baby	5	5	5	4	1	1	The team is motivated by greed
Founder is innovative	5	5	5	4	1	1	Founder is copycat
Founder is a true entrepreneur	5	4	4	3	1	1	Founder is a forcing entrepreneur
High commitment of the entrepreneur	5	5	5	4	1	1	Low commitment of the entrepreneur
The team has ability to listen to reason	5	3	5	4	1	3	The management team is not willing to listen
Autocratic leadership	3	4	1	3	5	5	Democratic leadership
The founder keeps people based on loyalty or tenure or experience (paternalistic)	2	4	4	1	4	4	The founder acquires personnel based on needs (not paternalistic)
Equitable balance of power	4	2	3	3	1	1	Inequitable balance of power
Founders live the vision	5	2	3	4	1	3	Founders only talk about the vision with no facts
Founder has a lot of energy	5	5	2	3	4	2	Founder is older (less energy)
Their motivation in life is to "make money" (founders)	5	5	4	5	2	3	The company is "their baby" (founders)
Founder wants the company to succeed	5	5	4	5	2	3	Founder wants to be the leader forever



## Category 2 for Investors: Background of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Founders are well technically educated	5	4	4	5	4	1	Founders have no technical background
The team has academic experience (but no industrial experience)	2	1	2	5	4	1	The team has industry background "get it out and sell it!"
Team has industry background	5	5	5	4	1	1	Lack of industry knowledge (team)
The team has experience in the business	2	5	1	3	3	2	The team does not have experience
The team has been successful in the past	2	5	2	2	4	1	The team does not have previous success experience
The team has professionalism (high qualifications)	5	3	1	3	2	1	The team is not qualified (experience or degree)
Founder has good track record	5	3	2	5	2	2	Founder has limited track record
The founder has more experience starting a business	5	5	4	4	2	1	Founder has much less prior experience

## Category 3 for Investors: Skills of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Team has ability to act "bias for action"	4	5	2	2	1	2	Planning but no "action"
Make it happen	5	5	2	2	1	2	Talk about it
Founders have leadership with vision	5	5	1	2	4	4	Leaders do not have a vision
Management team has ability to achieve goals	5	4	1	2	1	2	Lacking ability to achieve goals (management team)
Management team has financial core competencies	3	3	3	2	1	1	Lacking financial core competencies (management team)
Management team has marketing core competencies	4	4	2	2	1	1	Lacking marketing core competencies
Management team has organizational effectiveness	5	5	1	3	1	1	Lacking organizational effectiveness (management team)
Founders have core competencies for raising money	3	2	5	3	5	4	Lacking core competencies for raising capital (founders)
Management team has ability to assimilate new knowledge	5	5	4	4	3	3	Lacking ability to assimilate new knowledge
The team gives high importance to proactively assimilate new knowledge	4	3	2	3	1	1	Assimilating new knowledge doesn't seem to be important for the team
Ability to assimilate new market information	3	3	1	2	1	1	Lacking ability to assimilate new market information
Founders show ability to assimilate new competitive information	4	4	1	2	1	1	Lacking ability to assimilate new competitive information (founders)
Founders show ability to make things simple (focus on the essentials)	5	3	2	2	1	1	Lacking the ability to explain things in a simple way (founders)
Founders recognize weaknesses and fill up gaps	5	5	2	4	1	1	Founders are arrogant
Team has excellent technology abilities	3	2	5	5	2	3	Team lacks technology abilities (although they believe they have it)
Team is good at recognizing possible strategic alliances	5	5	2	3	1	1	Team is weak at recognizing possible strategic alliances
Founder has ability to think out of the box	5	5	5	4	1	1	Founder has a stubborn personality
Founders have ability to think out of the box (with regards to business)	5	4	2	4	1	1	Founders have narrow view of everything (looking at 1 industry)
Product offering is a market pull	5	5	3	4	1	1	Product offering is a market push
Technology understanding (management team)	5	5	5	5	2	2	Lack of understanding of the technology (team)
Founders have a good understanding of the market	5	5	4	4	1	1	Founders make wrong assumptions about the market (there's no competition)
Founder has a team-building ability	4	5	2	4	1	1	Founder is a loner (I'm a one-man-show)
The team has ability for understanding the market opportunity	5	3	2	3	1	2	The team has a misperception of the market opportunity
Founder has ability to communicate the investment opportunity	4	4	2	2	1	2	Inability to communicate the investment opportunity
The management team has ability to execute on plans	4	5	2	1	2	2	The management team has a poor execution on plans

Founder has good technical (technology) skills	5	4	2	4	4	2	Founder has poor technical (technology) skills
The team is good at assimilating new market information	5	3	3	4	1	2	The team is poor at assimilating new market information
The team is responsible	5	4	5	3	1	3	The team delays to accomplish milestones
The team is always open to communication	5	4	5	3	2	2	There is minimum communication among the team
The founder has realistic expectations	5	3	5	4	1	1	The founder is overly simplistic
Team has good merger and acquisitions core competencies	5	1	2	3	1	1	Poor merger and acquisitions core competencies
Corporate governance	5	4	5	4	1	3	Lack of accountability to the board
The management team has good operating procedures	5	3	2	3	1	1	The management team has poor operating procedures
The founder is aware of industry trends and exploits that information	5	4	3	4	1	3	The founder is maybe aware of industry trends but does not use it
The founder is open to listen to employees (get new ideas)	4	4	3	4	1	1	Founder is not willing to listen to employees
The team shows consistency in management decisions	5	3	4	4	1	2	The team shows Inconsistency in management decisions
The team keeps the goal in mind (focus)	5	3	3	5	1	2	The team keeps busy without a goal
Leaders of the company are good at improvising	5	5	4	3	3	2	Leaders of the company are not good at improvising
The management team has ability to make good decisions and learn from it	4	5	2	3	1	1	The team is not being able to make good decisions
The team is capable of reinvent their business model overnight	4	5	2	3	1	2	The team is stuck if a problem shows up (obstacle)
Founder has excellent presentation skills	5	5	5	1	3	1	The founder doesn't have presentation skills

### Category 4 for Investors: General attributes of the management team

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Professional management team (formed with external key people)	4	3	1	1	2	2	Own internal people (entrepreneurial)
The founder considers important to have a partnership with all stakeholders	5	3	4	3	2	3	Team is transaction oriented
Full team in place	5	4	2	3	1	1	The team doesn't have a lot of help
Well rounded management team	5	5	3	2	1	2	The team can't see the whole picture
The team has a corporate culture	5	4	1	3	1	1	The team doesn't have a corporate culture
When something goes wrong the company "survives"	5	4	2	3	1	1	When something goes wrong the company falls apart"

## Category 5 for Investors: Business Plan

	Big Hit #1	Big Hit #2	Average #1	Average #2	Failure #1	Failure #2	
Competitive corporate strategy	5	5	2	3	1	2	No corporate strategy
Product offering has global potential (strong)	5	5	5	3	1	1	Product offering has only regional potential (limited)
Market opportunity is perceived as "hot" or niche	5	2	3	4	1	3	Market opportunity is not perceived as "hot" or niche
Founder has know-how to differentiate the product offering	5	5	4	5	2	1	Founder is not good at dealing with competition

## Appendix F

### Elicited vocabulary from interviews with experts

#### A) List of intangibles:

##### Market

- Market potential
- Growing market
- Market is at a right pace of growth, not too busy, not too small, not too big
- Big market
- Replacement
- Crowded market

##### Management

- People (historical background)
- Companies (individuals) who have failed
- Companies (individuals) who have succeeded
- Mentality of the management team
- Do we (as a VC) trust them (the management team)?
- Do we have a good feeling?
- Do we like the name of the Company?
- Are they inclined to listen?
- Do they talk more than they should?
- Are they arrogant?
- Are they ethical?
- Are they reasonable?
- What is the culture of that team?
- Do they put "billion" too many times in the business plan
- Can management do it?
- Have they done it before?
- Can they do it in a new venture? (if they have done it before)
- Can they do that transition from a big company to a small company?
- If you got to entrepreneur can you go beyond what a technical person can do so as the marketing person?
- Who are you bringing out for help?

## B) Measurement of intangibles

- It is a personal thing.
- By repetition
- Test them. “We put people quite a few times to get to know each other over a period of time”
- I could give the same proposal to two different people and get two different answers of whether they should invest or not.

## C) Knowledge of the entrepreneur

- It depends on the stage of the company
- It is very important to have “the finger in pulse” to find out what is going on
- When you are thinking about whether you bring key managers we are trying to identify:
  - Is that a key man?
  - If the founder dies? Will the company continue?
  - Or not? And that is an intangible...

## D) Capability to create new products or services

- Compare with past experiences that we have had with other entrepreneurs
- Reference checks
- Reduce some over-reliance on a single person (or division)
- Get to a team approach

## E) Ability to assimilate new knowledge

- Entrepreneur has to be willing to take in new ideas

## F) The ideal business plan

### **Market**

- Reasonable market analysis
- Positioning of the product
- Opportunity for taking the product to different markets (or industries)
- Even if it is a growing market discover that is not being served well

### **General**

- Implementation strategy

# Appendix G

An example of typical rules of the fuzzy expert system.  
Fuzzy variable: Energy of the management team.

4. If (Passion is Low) and (Tenacity is Somewhat\_low) and (Innovative\_skills is Weak) and (Commitment is Low) then (Energy is Low) (1)

5. If (Passion is Somewhat\_low) and (Tenacity is Low) and (Innovative\_skills is Weak) and (Commitment is Low) then (Energy is Low) (1)

6. If (Passion is Somewhat\_low) and (Tenacity is Somewhat\_low) and (Innovative\_skills is Somewhat\_weak) and (Commitment is Somewhat\_low) then (Energy is Somewhat\_low) (1)

7. If (Passion is Somewhat\_low) and (Tenacity is Somewhat\_low) and (Innovative\_skills is Medium) and (Commitment is Somewhat\_low) then (Energy is Somewhat\_low) (1)

8. If (Passion is High) and (Tenacity is High) and (Innovative\_skills is Strong) and (Commitment is High) then (Energy is High) (1)

9. If (Passion is High) and (Tenacity is Somewhat\_high) and (Innovative\_skills is Strong) and (Commitment is High) then (Energy is High) (1)

10. If (Passion is High) and (Tenacity is High) and (Innovative\_skills is Somewhat\_strong) and (Commitment is High) then (Energy is High) (1)

11. If (Passion is High) and (Tenacity is High) and (Innovative\_skills is Strong) and (Commitment is Somewhat\_high) then (Energy is High) (1)

12. If (Passion is Somewhat\_high) and (Tenacity is High) and (Innovative\_skills is Strong) and (Commitment is High) then (Energy is High) (1)

13. If (Passion is Medium) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is Medium) then (Energy is Medium) (1)

14. If (Passion is Somewhat\_high) and (Tenacity is Somewhat\_high) and (Innovative\_skills is Somewhat\_strong) and (Commitment is Somewhat\_high) then (Energy is Somewhat\_high) (1)

15. If (Passion is Low) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is Somewhat\_low) then (Energy is Somewhat\_low) (1)

16. If (Passion is Low) and (Tenacity is Medium) and (Innovative\_skills is Somewhat\_strong) and (Commitment is Somewhat\_low) then (Energy is Medium) (1)

17. If (Passion is Low) and (Tenacity is Medium) and (Innovative\_skills is Somewhat\_strong) and (Commitment is Low) then (Energy is Somewhat\_low) (1)

18. If (Passion is Low) and (Tenacity is Medium) and (Innovative\_skills is Somewhat\_strong) and (Commitment is Low) then (Energy is Somewhat\_low) (1)

19. If (Passion is High) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is Low) then (Energy is Medium) (1)

20. If (Passion is High) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is Somewhat\_low) then (Energy is Somewhat\_high) (1)

21. If (Passion is High) and (Tenacity is Somewhat\_low) and (Innovative\_skills is Medium) and (Commitment is Somewhat\_low) then (Energy is Medium) (1)

22. If (Passion is Low) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is Low) then (Energy is Somewhat\_low) (1)

23. If (Passion is High) and (Tenacity is Medium) and (Innovative\_skills is Medium) and (Commitment is High) then (Energy is High) (1)

If:                      and                      and                      and                      Then

Passion is	Tenacity is	Innovative_skills is	Commitment is	Energy is
Low Somewhat_low Medium Somewhat_high High none	Low Somewhat_low Medium Somewhat_high High none	Weak Somewhat_weak Medium Somewhat_strong Strong none	Low Somewhat_low Medium Somewhat_high High none	Low Somewhat_low Medium Somewhat_high High none
<input type="checkbox"/> not	<input type="checkbox"/> not	<input type="checkbox"/> not	<input type="checkbox"/> not	<input type="checkbox"/> not

Connection                      Weight:

<input type="checkbox"/> or <input checked="" type="checkbox"/> and	1	Delete rule	Add rule	Change rule	←	→
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FIS Name: Energy

Help
Close