

Evaluating the Propensity of Repeat Entrepreneurs
to Use Intuitive Decision Making: A Pilot Study

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Alla mamma e` papa`

Grazie per tutti i sacrifici che avete fatto per me.

Mamma tu eri veramente una mamma
meravigliosa, affettuosa, noi sentiamo la tua macanza

Susan and Jake La Pira

**Love has its, trial tribulations and challenges and yet for those who endure love
answers all, provides all, and is the sweetness to life's existence**

When one takes on a project of this size it is going to affect those people who are near and dear. I couldn't have completed this thesis without the support, love and encouragement of my family. Susan my wife has shown an incredible amount of patience and support during this period. Susan you are my companion, my friend, my lover, I am truly blessed to call you my wife. Jake, my son's only known time on this planet has been through the experience that dad is 'too busy, he's working on his PhD'. Son, I hope you realise how much you mean to me, I love you dearly.

Murray and Loris Gillin

'If I have seen further it is by standing on the shoulders of others'

Thank you both for your support and help over the time it has taken to complete this work.

Abstract

'Listening to our hearts gives us a sense of direction even when the road is not well marked.' – Andrea Van Steenhouse PhD.

Most of the available literature on intuition takes a cognitive based perspective, arguing that intuition is learned behaviour (intuition as expertise). However, the elements generally agreed to be important to intuition as expertise can also be attributed to intuition as sensing (non-local).

Whilst the business literature tends to take a phenomenological approach to intuition, this research uses an empirical approach with a psycho-physiological measure. This work argues that those feelings associated with intuition may be the result of an entrepreneur's passionate attentional focus (Bradley 2006a). A recent publication concerning the electro-physiological evidence of intuition (McCraty et al 2004) has shed some light on how we interpret meaning in the world around us and its impact on decision making.

This research proposes that entrepreneurs have a propensity for intuitive decision making and that the heart's autonomic nervous system is involved in processing and decoding intuitive information. A qualitative case study methodology was used for this study of thirty English and Australian repeat entrepreneurs. This research presents the results of a multi-methods pilot study testing the efficacy of a new computer-based experimental protocol developed to isolate and measure the non-local intuition in entrepreneurs. The computer-based experimental protocol incorporates a physiological measure of one's intuitive response to future events.

The goal was to evaluate the protocol's measurement discrimination in predicting future outcomes of investment decisions in entrepreneurs. Therefore, the purpose of the pilot study was methodological – testing the measurement system and the protocol. The aggregate physiological results presented of non-local intuition in entrepreneurs were inconclusive. The individual results, however, were promising and indicated a trend consistent with the work of other researchers in the field.

The results of the Cognitive Style Index (CSI) and the content analysis of the interviews strongly support the proposition that repeat entrepreneurs have a greater propensity for intuitive decision making. This research found that 'seeing the bigger picture' was found to

be the most important factor in entrepreneurial decision making. This is consistent with the view of intuition as a function that apprehends the totality of a given situation. This can best be summed up by one repeat entrepreneur's comment, 'I built this business this way so I can spend three days a week working and the rest of my time giving back to my community. Why? Because I really wanted to make a difference, what other reasons are there?'

Student Declaration

This thesis contains no material which has been accepted for an award of any other degree or diploma, except where due reference is made in the text of the thesis. To the best of my knowledge this thesis contains no material previously published or written by another person except where due reference is made in the text. Where work is based on joint research or publications, the relative contributions of the respective authors is disclosed.

Signed:.....

Dated:

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Glossary of Terms

AGSE – Australian Graduate School of Entrepreneurship

ANS - autonomic nervous system

CDQ – choice dilemma questionnaire

CSI – Cognitive Style Index

ECG – Electrocardiogram

EEG – electroencephalogram (measures of brain response)

EPR – Einstein Rosen and Podolsky

ESP – extra-sensory perception e.g.: (remote viewing, precognition, etc.)

EQ - emotional intelligence

GEM – Global Entrepreneurship Monitor

HRV – Heart Rate Variation

IHM – Institute of HealthMath California

IQ - intelligence quotient

nAch – need for achievement

S1 – sample 1 (first sample of repeat entrepreneurs) average age is 52 years

S2 – sample 2 (second sample of repeat entrepreneurs) younger group of repeat entrepreneurs average age is 35 years

Sx (x=n) Sample number of the individual participant eg: S17

SCL or SC – Skin Conductance Level

SQ – Spiritual intelligence

S – stimulus

O – organism

PSA – psychophysiological systems activity)—(skin conductance and heart rate variability)

R – response

RNG – random number generator

RPA – random permutation analysis

SD – Standard Deviation

SMEs – small to medium enterprises

Definitions

Whilst the author appreciates that some of these terms have been used outside the business literature context, the definitions used in this thesis relate exclusively to business.

Autonomic Nervous System – the portion of the nervous system that regulates most of the bodies involuntary functions including heart rate, the movements of the gastrointestinal tract and secretions of many glands. It consists of two branches, the sympathetic and parasympathetic. The ANS regulates over 90 percent of the body's functions. The heart, brain, immune, hormonal, respiratory and digestive systems are all connected by this network of nerves.

Extra-sensory perception (ESP) – encompassing paranormal abilities such as telepathy, precognition and clairvoyance.

Holism – a philosophical position which claims that wholes cannot be taken apart, every apparent whole can be understood only in the context of the larger whole containing it, and a whole is more than the sum of its parts.

Non – linearity - A disjointed, discontinuous non-linear event that cannot be studied successfully with methods developed for examining linear processes.

Non-local communication – instantaneous 'communication' between particles separated by vast regions of space and time, and in which particles act as if they have 'knowledge' of events before these events actually occur.

Intuition – direct perception of truths, facts, etc. independent of any reasoning process which is immediately sensed by the body as certainty of knowledge or feeling about the totality of a thing distant or yet to happen, this feeling can include either positive or negative emotions..

Non-local intuition – the process by which information normally outside of the range of cognitive processes is immediately sensed and perceived in the body and mind as certainty of knowledge or feeling about the totality of a thing distant or yet to happen. The ‘thing’ can be an object, entity or event in the material world, or an intellectual construct, such as a thought or idea. Often the feeling of certainty is absolute – intuition is experienced as beyond question or doubt. It can encompass positive emotion such as excitement or optimism or negative emotions such as dread or fear. Bradley (2005) argues that this results because of the passionate attentional interest of the individual.

Passionate Attentional focus – according to Bradley (1998) individuals who have a passionate attentional focus are likely to create and maintain a relationship of energetic resonance between themselves and an object of interest.

Precogs – short for precognition. This is a term used by Myers to define those people who claim that they are able to foresee the future.

Quantum Mechanics – explains the behaviour of particles at the sub-atomic level. At the sub-atomic level relationships are the key determiners of everything. Observer and observed are interrelated and there is a deep interconnectedness between everything

Repeat entrepreneur – an individual who has selected, created and grown a number of profitable ventures regardless of whether that was concurrently or consecutively.

Requisite Holism - The breadth and width of an investigation, because total holism requires constraints if it is to be of any value.

Spiritual Intelligence – is the intelligence that rests in the deep part of the self that is connected to wisdom from beyond the ego, or conscious mind, it is the intelligence with which we not only recognize existing values, but with which we creatively discover new values. SQ is not culture or value-dependent. It does not follow from existing values but rather creates the very possibility of having values in the first.

1.0 Introduction

The proper study of entrepreneurship can only occur through the development of a proper understanding of the role of the entrepreneur (Mitton 1989 (Baron 2004a)). Therefore it is not surprising that the behaviour and characteristics of the entrepreneur have been a central focus of research into entrepreneurship in the past (Gartner 1988).

This research proposes that how an entrepreneur chooses one opportunity over another, i.e. the decision making process, is an important aspect of entrepreneurship.

In order to understand how an entrepreneur makes decisions, one must gain an appreciation of all the different factors that affect entrepreneurial behaviour. Thus the study of entrepreneurship must use a multi-disciplinary approach.

Quite a few disciplines have contributed to our understanding of the factors that influence an entrepreneur to choose one opportunity over another. Indeed quite a few factors outside an entrepreneur's control may inhibit or encourage him or her to become an entrepreneur initially. Therefore, it is appropriate that a new approach is required to understand why anybody would become an entrepreneur at the outset, and then to understand how and why they make their decisions.

1.1. Setting the Scene

There are two constructs that are prominent in this research, non-linearity and holism. This work proposes that entrepreneurial behaviour is non-linear and that decisions made by an entrepreneur must be made based on a consideration of the bigger picture, i.e. from an holistic perspective.

1.1.1. Non-linearity

Despite the findings of the last 100 years which reveal that the Newtonian model of physical reality may not always be the most appropriate paradigm, the type of thinking that appears to pervade the literature on entrepreneurship is that of linear, logical and dispassionate thinking derived from an Aristotelian logic. Although this type of thinking is not wrong, the problem is it limits one's ability to be able to see beyond this linear logic, and therefore does not tell the whole story (Zohar and Marshall 2000). The developments in quantum mechanics, chaos theory and non-linear dynamics provide alternative paradigms of the world (Radin 2004).

The fundamental uncertainty which is central to the quantum world confirms certain processes, that are as understood as linear, seem to be random and unpredictable. Whilst a large number of radioactive particles obey the laws of statistics, the moment of decay of an individual atomic nucleus cannot be predicted. "This is not unique to radio active molecules this is a fundamental aspect of uncertainty which applies to all atomic and subatomic matter" (Davies 1990).

A peculiar aspect of how quantum mechanics has changed the prevailing Newtonian views is Heisenberg's 'uncertainty principle'. According to Heisenberg, one cannot predict the location of a molecular particle with 100% certainty. One can only predict the location of a particle within a range of probabilities. Accordingly, there is a limit to how accurately we can predict nature's behaviour (McEvoy 1996)

1.1.2. Holism

Taking a holistic approach to the way an observer sees the world impacts on the observer's perception of reality. Only by removing one's blinkers and seeing the world as a whole can we see the real world (White 2005). White (2005) argues that we do not live in isolation and the interconnectedness of the natural world forms dynamic wholes, which are sub-systems of greater wholes.

It is proposed that, entrepreneurship is the ability to see the whole, to see beyond the immediate reward of embarking on a new venture. It is essentially about 'doing what feels right' and that sense of what is right emanates from our innate interconnectedness.

1.2. Research Rationale

Although some authors acknowledge the value and importance of intuition (Burke and Miller 1999; La Pira and Gillin 2004; Miller and Ireland 2005; Sadler-Smith and Shefy 2004) others regard it with apprehension and suspicion (Myers 2002). However, intuition has long been regarded as an important adjunct to decision making by both managers and entrepreneurs.

Paul Cook, founder of the Raychem Corporation, revealed that 'his company made two or three big mistakes because he did not follow his intuition faithfully' (Collins and Lazier 1992). Sam Walton from Wal-Mart and Paul Galvin, the founder of Motorola, have also espoused the benefits of intuition and its connection to their success. Some authors regard intuition with such reverence that they provide a guide as to how one should use it effectively (Collins and Lazier 1992, p.11). There is a

consistent acceptance in the business community that intuition is a necessary attribute of successful business owners (Hayashi 2001, p.60). Entrepreneurs often attribute their success, partner selection, industry and opportunity identification, as well as various other decisions, to following their intuition (Mitchell et al 2005, p. 653).

Although the centrality of intuition to success in business has been regarded with skepticism (Myers 2002), it is still considered important to entrepreneurial decision making (Lieberman 2000). As such, it should be considered seriously in any research on understanding entrepreneurial decision making. Busenitz and Lau (1996) agree that it is fruitful to focus on how entrepreneurs acquire knowledge about the environment and how this knowledge is processed in the minds of the entrepreneur.

Allinson and Hayes' (1996) research on entrepreneurial decision making suggests that particular styles of knowing are more appropriate than others for the conduct of entrepreneurial decision making. Consider the experience of some entrepreneurs who just seem to be 'at the right place at the right time', whilst others just never seem to 'get it right'.

Unlike scientists, entrepreneurs do not enjoy the luxury of making decisions on the basis of orderly, time consuming, rational analysis (Simon 1987). In rational decision making, goals and alternatives are made explicit, the consequences of pursuing different alternatives are calculated and these consequences are evaluated in terms of how close they are to the original goals (Barnard 1938). For the entrepreneur to succeed in today's business world, decisions often need to be made rapidly, often too rapidly to allow for an orderly, sequential analysis of the situation. Furthermore, in today's information economy, the amount of information available provides a significant hindrance to a thorough analysis.

Allinson et al (2000) argue that the nature of entrepreneurship and the style of the successful entrepreneur will, by necessity, be more intuitive. Entrepreneurs tend to bypass rigorous analysis because they are decisive, and because they appreciate the time-value of money and the competitive nature of business. The literature on intuition, not unlike the literature on entrepreneurship, is full of contradictions and disagreements as to what constitutes intuition. According to Langham-Fox (13th Feb 2007, pers. comm.), there is much disagreement in the psychology literature on how best to measure intuition.

The notion that intuitive perception is solely the result of forgotten experiences, or learned behaviour stored in the subconscious has been challenged by recent studies (McCraty et al 2004a, p. 135). This research does not dispute the existence of a

learned behaviour aspect of intuition; this work proposes a new way to interpret intuitive fore-knowledge.

1.3. Literature Review

This research begins with an examination of the extant literature on entrepreneurship, from its foundation in economics, through to the contribution of the behavioural sciences, sociology, anthropology and psychology. Although all three disciplines have contributed to an improved understanding of the entrepreneurial process, the focus of this research is on the psychological perspective. The cognition literature provides an appreciation of how and why entrepreneurs make decisions and provides the launching pad for an analysis of entrepreneurial decision making.

There are two ways of knowing, which are commonly referred to as intuitive or analytical. The literature generally supports intuition as learned behavior. This work argues that there is an alternative understanding of intuition, and that is intuition as sensing. Although researchers conceptualise intuition in many different ways the literature supports both intuition as sensing and learned behavior.

Recent research has found that the heart appears to receive intuitive information before the brain and that intuition is not confined to cognitive based perception alone but involves the entire electrophysiological system, manifesting through a wide range of emotional feelings. This work examines the evidence that intuition is experienced as physiological changes which are immediately sensed by the body.

Recent findings suggest that the heart plays a significant role in the body's sensing and processing of information from non-local objects and events. The heart's ability to sense information affects the HRV and this is believed to be a source of knowledge or wisdom that 'comes from the heart' this nonlocal intuition can be explained by quantum physics.

In quantum physics, the observer and the observed (sub-atomic particles) are inextricably linked. The notion of interconnectedness is not just a conceptual construct, the entanglement of everything in the universe at the quantum level is a peculiarity of quantum physics that has been empirically validated in repeated laboratory experiments.

Non-locality is an important aspect of intuition as sensing because it provides an explanation as to why information can be sensed beyond time and space. In 1982 Alain Aspect and his team confirmed that under certain circumstances subatomic

particles (electrons) are able to instantaneously communicate (nonlocally) with each other regardless of the distance separating them. This offers a possible explanation to the transmission of information through intuition as sensing. Bohm believes Aspect's findings imply that objective reality does not exist, and that despite its apparent solidity, the universe is a gigantic and splendidly detailed hologram.

The important appeal of holographs is the principle of distributedness. A hologram teaches us that if we try to take apart something constructed holographically, we will not get the pieces of which it is made, we will only get smaller wholes. Similarly, it has been discovered that holograms possess an astonishing capacity for information storage. It is argued here that this explains why an entrepreneur's passionate attention creates a biological energy which activates an emotional connection to the object of interest.

Finally this chapter proposes three propositions. Firstly, using a self-report questionnaire, proposition one aims to determine whether the selected cohort of entrepreneurs have a greater propensity for intuition, the second proposition aims to uncover whether the content analysis supports the findings of the first proposition and develops an understand of the elements critical to intuitive decision making, and finally the third proposition endeavors to ascertain whether the entrepreneur's passionate attentional focus creates a physiological effect that can be measured.

1.4. Research Methodology and Data Collection

A multi-method approach was used involving case studies. The case studies incorporated a Cognitive Style Index (CSI, a self-report questionnaire), an interview and an experimental protocol. It was deemed necessary to take this approach to ensure that entrepreneurs were indeed intuitive and that the results were valid and reliable before the pilot experiment was conducted.

A sample of entrepreneurs who were most likely to demonstrate a propensity for intuitive decision making were chosen. It was considered important to select a group of entrepreneurs who had significant business experience, and whose success could not be attributed to luck alone. For this reason, repeat entrepreneurs were chosen. It was postulated that if entrepreneurs have a propensity for intuitive decision making then repeat entrepreneurs are more likely to have a greater propensity for intuition and therefore possessed a higher level of sensitivity to intuitive signals, providing a greater likelihood that such an effect could be measured. For this reason a sample of 30 repeat entrepreneurs was selected.

As this research involved a pilot study to determine the validity of this conceptual construct, a control group was not included because the aim was to assess the validity of the construct and to determine whether intuition of the type posited could be measured.

The cohort of repeat entrepreneurs chosen was provided with a CSI. The CSI was used as a discriminator to select the individuals most likely to demonstrate a propensity for intuition. Those respondents whose result indicated a propensity for intuitive decision making were interviewed using an open-ended questioning format. Factors critical to decision making extracted from the literature served as a basis for the interview protocols. Respondents who demonstrated a propensity for intuitive decision making were then offered an opportunity to become involved in the electrophysiological test, measuring skin conductance and Heart Rate Variation (HRV). Seventeen participants took part in the electrophysiological pilot.

1.5. Research Findings and Analysis

In this section the findings and analysis of the data are discussed in relation to the propositions. The chapter begins with the Cognitive Style Index (CSI) results, then the findings and analysis of the content analysis of the transcribed interviews and finally a synopsis of the outcome of the psycho-physiological experiments. In this chapter the research links data to propositions and tests for rival explanations. This work aims to determine whether or not, a) repeat entrepreneurs are intuitive (through the CSI and interviews), b) the elements of intuition found in the literature adequately represent the factors critical to intuition (through interviews), and c) whether passionate attentional interest provides a greater proclivity for intuitive awareness (through interviews), and finally d) if a physiological measure can detect intuitive decision making (psycho-physiological experiment). Each section commences with a discussion of the findings, and then relates these findings to the proposition which acts as a filter to refine the data in arriving at the final result. Therefore each proposition is linked to a particular data collection stage.

1.6. Discussion

As this pilot study took a multi-method approach, the data is presented from three different perspectives: the Cognitive Style Index (CSI), interviews of repeat entrepreneurs, and the physical experiment. From each perspective the discussion considers to what extent entrepreneurs have a propensity for intuition and whether there is some congruency between the results of the three different perspectives.

This section also discusses the pilot experiment and if it detects physiological effects through either skin conductance or HRV, and if intuition can be attributed to that physiological effect. The results are discussed and provide an argument as to whether or not intuition is learned behaviour, sensing or both.

In the discussion the theoretical framework is re-introduced to ascertain whether the quantum holographic framework is an adequate explanation of intuition as sensing and whether this information is transmitted through the entrepreneur's passionate attentional focus.

The findings indicate that intuitive types have some common characteristics with entrepreneurs: they tend to be self-sufficient and trusting of their own judgment (self-efficacy); they are able to live with ambiguities and uncertainties; and they are confident to take action with the little information they have at hand because they are action-orientated.

1.7. Conclusion

The conclusion refers the reader to the purpose of this research which was to a) evaluate the propensity of entrepreneurs to use intuition, and b) to serve as a pilot study whose aim was to test a psycho-physiological experiment for intuitive decision making in repeat entrepreneurs. The underlying reason why this topic was chosen was to shed some light on why some entrepreneurs seem to make better decisions in recognising opportunities, and acquiring resources than others. Whilst a great deal has been written about the process of finding and evaluating new opportunities, very little work has considered how entrepreneurs choose one opportunity over another. Contrary to most accounts of intuition, which have limited themselves to its phenomenology, this work attempts an empirical validation of intuition.

Additionally, this thesis provides a framework by which one can appreciate the factors affecting the decision making process and arrive at an understanding of whether entrepreneurial decision are rational or intuitive, and why. This provides a greater understanding of why entrepreneurs take a particular course of action.

This research has found that all entrepreneurs have a greater propensity for intuition than do than managers. Also, it appears that intuition and rational decision making are not on the same continuum, in that the decrease in one way of knowing does not automatically assume a greater propensity for the other decision making style.

Although the aggregate result of the psycho-physiological tests was inconclusive, the individual results supported the view that information is received by more than just the five senses.

1.8. Author's Background and Experience

It is difficult to take a completely unbiased approach to anything we do. The following offers an account of the factors that have influenced the author's experience and beliefs.

I was born to an Italian immigrant family that arrived in Australia when I was just two years old. Being raised in an immigrant family where work was considered more important than educational qualifications creates some challenges for first generation Australians, particularly as they get closer to school leaver age. From a very early age I was working on the family farm. Hard work was a necessary aspect of growing up in an Italian family in the early 1960s.

Working on the land during the 60s was hard, back-breaking work, the desire to ensure a good return on our harvest was foremost in our minds. Three times a week we would travel to the Victoria market to sell our vegetables. Getting a good price was often made more difficult if you did not have a good product and we became known for providing good quality vegetables. That was my earliest experience in work and business.

I subsequently married into another farming family in the area, but contrary to my families expectations I decided that farming was not for me. As I was raised on a farm, just a few short miles from the Royal Australian Air force's ab-initio pilot training college in Point Cook, I developed a love of flying and aircraft. My love of aircraft and aviation was fulfilled, when at the age of 20, I completed my commercial pilot's license on both helicopters and aeroplanes. Once I had accumulated enough accident-free flight hours to be considered a low risk pilot, (from an insurance and experience perspective) I became a freelance helicopter pilot. Being a helicopter pilot has an impact on a person's behaviour. A pilot is the anti-thesis of an entrepreneur as there is no room for creativity. Aviation companies look for people who are good at systems management. The airlines and the military both spend millions of dollars choosing the right people to train as their pilots.

The general aviation industry does not share the same attitude and as most helicopter operations are lifestyle businesses they do not share the same degree of

concern when selecting pilots. Operating costs are considered the most important factor.

Due to the nature of the industry, (lifestyle), and the low barriers to entry, the helicopter aviation industry is a saturated market. Most operators compete on price alone. Subsequently, the Civil Aviation Authorities and aircraft manufacturers design airway procedures and aircraft operating systems so that pilots are protected from each other and the community at large. It can be a dangerous profession. In 1984 I had a first hand experience with this danger.

During an aerial spraying run I struck a power line, and awoke 24 hours later in intensive care in a Sydney Hospital with a tracheotomy tube protruding from my throat. I was lucky, I had survived. During my 25 years in the aviation industry I had lost a many friends in aviation accidents.

After aerial spraying I moved into Search and Rescue operations. In Search and Rescue, when operating in a dangerous situation, one becomes acutely sensitive to any unusual noises, signals or circumstances. An unusual sound or effect gets the pilots attention immediately. Factors outside the pilot's control are continuously monitored to determine how they impact on the safety of the crew and the aircraft.

Search and Rescue is a very dangerous profession and has killed many pilots over the last 30 years because pilots often find themselves flying their aircraft to the limits of their performance, and often in extreme weather conditions. There were many times, in my ten years in Search and Rescue, when I felt dangerously uncomfortable. As pilot in command I was responsible for the safety of the aircraft, the crew and the rescue operation. Therefore, it is incumbent upon the pilot in command to make the right decision, regardless of where the information comes from, as people's lives are often at stake. There were many instances when things "didn't feel right" and I aborted an operation. It is with this in mind that I felt that intuition is an important element in decision making.

In one instance I was tasked to respond to a beacon that had been activated 160 km south east of Mallacoota. When we arrived at the location we found a fishing vessel that had exhausted their fuel supply. We sent a crewman down to the vessel. The vessels crew only wanted fuel to replenish their vessel. I felt uncomfortable about leaving the crew 160km off shore without fuel and directed the crew to retrieve all of the vessels three crew and we returned them to shore. Shortly after we retrieved the crew their beacon failed and that vessel was never seen again. It was highly likely

that if we had left the crew on the vessel to return with fuel that we would never have found the vessel again.

In 1992 I enrolled in an undergraduate business program, and studied part-time whilst I continued to fly part time. In the year 2000 I completed a Masters degree in Entrepreneurship and Innovation. I retired from flying in 2003 after 25 years and 7,500 flying hours.

Not long after retiring from flying, I contracted a condition known as hypopituitarism, a condition where the pituitary gland ceases to send a signal to the body's endocrine system to produce and regulate the bodies' hormones.

It took my doctors three months to determine the cause, despite numerous tests and hospital internments. During this period I was very ill. I lost a considerable amount of weight, I suffered from lethargy and blurred vision, and I was unable to drive or walk without assistance for months. As my doctors were unable to diagnose my condition I sought a way that I could try and improve my own quality of life. That was when I embarked on the Freeze Frame® method of managing my well being.

A few months before contracting this condition I was assessing Freeze Framer, a stress management software. Freeze Frame is a scientifically proven system that helps one manage his or her emotional state and improve their health by focusing on appreciation.

Freeze Frame teaches one how to manage their mental state by using a computer based system that records the beat to beat HRV of the user in real time. The user gains instant feedback on how they are performing. When I began using Freeze Frame, I was quite ill my HRV was very erratic and averaged 110-1300 beats per minute (bpm). It was very difficult to concentrate for any more than a few minutes when practicing the Freeze Frame meditation technique. Within a few weeks I was able to concentrate for 20 minutes, achieve a coherent heart rhythm and reduce my heart rate to 90-100 bpm. Though I had not completely recovered, I was feeling much better than I was during the few weeks before I started using Freeze Frame. It was this experience that alerted me to the impact that one's heart can have on his/her state of mind and physiological well being.

1.9. Publications and Conferences

Publications generated in the course of development of this thesis are reported here. Much of the work presented in this thesis first appeared in the following publications:

- Gillin, M. La Pira, F. McCraty, R. Bradley, R. Atkinson, M. Simpson, D. Scicluna, P. (2007) Before cognition: the active contribution of the heart/ans to intuitive decision making as measured on repeat entrepreneurs in the Cambridge Technopol; *International Journal of Entrepreneurship and Small Business* forthcoming edition
- La Pira, F and Gillin, M 2006, 'Non-local intuition and the performance of serial entrepreneurs' *International Journal of Entrepreneurship and Small Business*. Vol 3 no 1
- La Pira, F. 2002, Replication Strategy: An entrepreneurial approach to endogenous growth SEANZ 15th Annual conference 22-24th of October 2002 Adelaide, Australia.
- La Pira, F and Gillin, M 2004, 'The Importance Of Intuition In The Decision Making Strategies Of Entrepreneurs' AGSE-Babson Regional Entrepreneurship/ Innovation Exchange, La Pira, F, Australian Graduate School of Entrepreneurship, Swinburne University of Technology Australia, Australian Graduate School of Entrepreneurship.
- La Pira, F, Gillin, M and Scicluna, P 2006, 'Non-Local Intuition: Developing Electrophysiological Measures for Decision making Serial Entrepreneurs' Third AGSE International Entrepreneurship Research Exchange Unitec, Auckland New Zealand, 17.
- La Pira F. Atkinson, M. Scicluna, P. (2007) 'Beyond Hyperbole and hypothesis: a protocol for measuring intuitive behaviour; Fourth AGSE International Entrepreneurship Research Exchange QUT Brisbane.

2.0 Literature Review

2.1 Introduction

This section of the dissertation has two aims: a) to understand entrepreneurship, how it has developed, and hindrances to its further development; and b) to position this research within the entrepreneurship framework. This section takes an historical perspective of the subject from an economic to a behaviourist view. The discussion will also position non-local intuition within the entrepreneurship framework.

2.2 Uncovering the Entrepreneur

Definitions of entrepreneurship are as wide and as varied as the individuals who research and write about the subject. It is not surprising therefore that there seems to be some confusion surrounding what differentiates an entrepreneur from an owner/manager or anybody else for that matter.

As some of the research suggests, entrepreneurs, are not conscious of their assumptions; therefore it is not surprising that scholars have very different views about the nature of entrepreneurship as a phenomenon (Gartner 2001 p.27). There have been many conferences involving researchers from disciplines impacted by entrepreneurs, from economists and psychologists, to anthropologists and sociologists. According to Herron (1992), each discipline has its own unique perspective of entrepreneurship which remains relatively unaffected by the perspectives of other disciplines. This section commences with a look at entrepreneurship from an economic perspective.

2.3 History of Entrepreneurship

2.3.1 The Economic View

The term entrepreneurship has a rich and long tradition within economic theory. Up until the sixteenth century entrepreneur meant, 'grasp take hold of, or surprise and discover' (Formaini 2001 p.3). The word entrepreneurship originates from the French verb *entreprendre* meaning, 'undertaker', or to undertake a task or course of action. The noun form of the verb was first used in economic theory in a treatise published in 1755 by Richard Cantillon on '*L'essai sur la nature du commerce en general*'. Cantillon described the entrepreneur as 'the agent who buys a means of production at certain prices in order to combine them' (Burnett 2000), ostensibly for Cantillon, 'entrepreneurs are equilibrating agents in the market systems' (Formaini 2001 p.3).

Cantillon belonged to a group of thinkers called the physiocrats, who were lead by the

political economist Francois Quesnay. Quesnay, like Cantillon, believed that 'the entrepreneur bears uncertainty and organises and supervises production whilst introducing new methods and new products, and searching for new markets' (Formaini 2001 p.3).

Some time later, in the early 1800s, another French economist, Jean-Baptiste Say, also took an interest in the role of the entrepreneur. He regarded the entrepreneur as a risk taker because they invested their own money (Filion 1997 p.1). In his writings, Say (1803) drew a distinction between the entrepreneur and the capitalist, associating the entrepreneur with innovation (ibid p.1). Schumpeter (1954) drew heavily from Say's work. He launched the field of entrepreneurship in the Anglo-Saxon community by associating it with innovation and explicating the importance of entrepreneurs in economic activity (ibid p.3).

In the 25 years leading up to the 1800s, general equilibrium theory was central to the economic 'state of the world' (Legge and Hindle 2004 p.25). There was no place for the entrepreneur because economic growth was at the ebb and flow of supply and demand. Orthodox economists explained economic growth through three factors: increase in the labour force, accumulation of capital, and technological change. General equilibrium theory predated Schumpeter by 50 years and, while anecdotal evidence was available to support Schumpeter's theory, general equilibrium theory had more rigorous statistical support (Kirchhoff 1994 p.5).

The role of the entrepreneur was not considered important in economic growth even though in 1934 Schumpeter wrote, that 'those who focussed on equilibrium theory were missing the point'. For Schumpeter, the creativity of the individual entrepreneur lead to the destruction of less innovative/entrepreneurial firms and the economy's advancement through a process of creative destruction (Legge and Hindle 2004 p. 29). Schumpeter (1936) argued that entrepreneurship was a disequilibrating force (Mitton 1989 p.9).

General equilibrium theory is the core of neoclassical economics. For neoclassical economists, the role of the entrepreneur is obsolete. According to them, the market economy 'takes the form of equilibrium between supply and demand, the equilibrating mechanism being price' (Kirchhoff 1994 p.13). Technological, political, social, regulatory and other types of change offer a continuous supply of new information about different ways to use resources and enhance wealth. This alters the value of resources and, therefore, the resources' proper equilibrium price (Shane and Venkataraman 2000 p.221).

The neoclassical system is attractive to theoreticians because it can be formulated in

Newtonian mathematics, where it can be expressed with mathematical elegance (Kirchhoff 1994). Perfect markets are conceptual constructs of neoclassical economists, where change or change agents (entrepreneurs) must remain imperceptible and ineffectual in order for the economic models to have validity. The role of the entrepreneur in economic theory has been largely insignificant. Such an omission arises, to a large extent, from focussing on the formal analytical models of general equilibrium theory (Bygrave and Minniti 1999 p.47).

Up until Birch (1979) published his findings, neoclassical economists hypothesised that large corporations were the major contributors to a region's employment and economy.

Birch's (1979) landmark findings stunned economists, politicians and researchers when, contrary to the popular opinion of the day, he concluded that 81.5 percent of new jobs in the United States between 1969-76 were created by new and growing small firms.

It was now evident that new firm creation is a critical driving force of economic growth (Low and MacMillan 1988 p.139). Current Australian Small Business research provides evidence to support this finding. In the survey period of 1999-2000, it was found that 18 percent of Small-Medium Enterprises (SMEs) contributed to 56 percent of employment¹.

Very few, if any, authors will now dispute the importance of the entrepreneur in the role of employment and the economic activity of a region. One of the criticisms of neoclassical economists is that they have not been able, nor are they willing, to integrate the role of the entrepreneur in economics. The economists' inability to accept non-quantifiable models clearly demonstrates the limits of economics to the field of entrepreneurship research (Filion 1997 p.3). Furthermore, Boulding (1981 p.87) suggests that Schumpeter's creative destruction hypothesis is a 'Darwinian evolutionary theory which involves a richness that cannot be explained using Cartesian/Newtonian mathematics'.

As a result of the impact of Newtonian mathematics on western science, neoclassical economics evolved because it used mathematical modeling (Boulding 1981). This linear thinking has been a significant hindrance to the economists' ability to incorporate the role of the entrepreneur, because the neoclassical approach is incapable of usefully addressing the issue of entrepreneurship, due to its epistemological standpoint.

Although entrepreneurship faded from neoclassical theory, it was central, and some argue complementary, to the Austrian School (Adaman and Devine 2000 p.2). The essential function of entrepreneurs is to direct their efforts toward the achievement of

¹ Small Business in Australia update 1999-2000 (1321.0.55.001) ABS Data.

potential profits by discovering what is or is not possible. The Austrian School regards this problem as an economic problem of the social mobilisation of tacit knowledge, through the interaction of rival entrepreneurial activities (ibid p.5). Therefore the Austrian School attributes the entrepreneurial role to individuals and has focussed on the dynamic aspects of the market process as spontaneous order. Adaman and Devine (2000 p.3) argue that it is because of its subjectivism that it has never developed a proper theory of the firm.

Out of Schumpeter's radical economic view and the Mises/Kirzner's Austrian School of economics, two views of what defines entrepreneurs have evolved (Kalantaridis 2004). For Schumpeter, the essence of entrepreneurship is 'the ability to break away from routine, to destroy existing structures, to move the system away from the even circular flow of equilibrium. The entrepreneur is the disruptive disequilibrating force that dislodges the market from the somnolence of equilibrium' (Kirzner 1999 p.7). The Schumpeterian entrepreneur introduces new ideas and new combinations, thereby challenging existing firms and the economic way of life. The Misesian-Kirznerian entrepreneur plays an equilibrating role by detecting and exploiting opportunities. Kirzner (1999 p.13) argues that there is some consistency between his and the Schumpeterian entrepreneur, for entrepreneurial alertness expresses itself in aggressive, bold and creative leadership qualities. It is not the leadership qualities themselves that matter but the pure 'alertness' which these qualities express and sustain.

While economics has been useful in helping to identify what entrepreneurship is and when it occurs, economists have not contributed to the explanation of questions as to how and why (Mitchell et al. 2002) As Bygrave (1989) indicates 'entrepreneurship research must be a social science because the social sciences are preeminent in the field of entrepreneurship research'.

2.3.2 The Behaviourist View

To understand the behaviourists' perspective, it is important to capture the disciplines involved. The behaviourists' perspective involves the disciplines of, sociology, anthropology and psychology. Sociology is the study of social structure and organisation, whilst anthropology emphasises the cultural influences and actions of individuals in societies. In contrast, psychologists focus on individuals, it is the study of the human spirit or soul (Shaver and Scott 1991 p.25). In the entrepreneurship literature, the focus has been on the psychological attributes of the individual entrepreneur. To begin this section, the anthropological perspective is first reviewed followed by sociological and

psychological.

2.3.2.1 The Anthropological Perspective

The anthropologists' interest in entrepreneurship was a post-war phenomenon, peaking in the 1950-1970s (Stewart 1991 p.71). The area of interest from an anthropological perspective is the social and cultural perspective. For anthropologists of this period, entrepreneurs were individuals. Bailey (1969) wrote 'I feel uneasy when faced with any analysis which does not allow man a central role as an entrepreneur' (Stewart 1991). The area of entrepreneurship has been particularly challenging for anthropologists because of the difficulty in reaching a definitional consensus due to the multi-dimensional aspect of entrepreneurship (ibid p.73).

Greenfield and Strickon (Greenfield and Strickon 1986 p.15) wrote 'no single dimension or aspect is emphasized as the essence of entrepreneurship. Instead, the approach is multidimensional in that entrepreneurship, which is seen as one aspect of a continuous variation, innovation and selection, is part of the ongoing process of human life.'

Anthropologists' understanding of what constitutes entrepreneurial behaviour has been derived from spending time with families in very diverse cultures, where the factors of production may have a very different meaning and purpose. An example of such a cultural impact can be seen in the case of the Sumi Indians. For the Sumi Indians, the cost of their items for sale increases as the number of available items decreases, because their purpose for being at the market was more important from a social and community perspective. If they sold all of their produce before the end of the market, then they had no reason to stay and socialise².

Stewart (1991 p.75) suggests that anthropologists are not too attracted to business related issues. According to Stewart (1991), the number of anthropologists conducting research in business represents less than one percent of the total registered anthropologists. He argues that they may have lost faith in the development of entrepreneurial research.

Anthropologists may have lost interest in the field of entrepreneurship because 'situational factors and characteristic traits are not enough to create a firm and entrepreneurship is too imprecise a concept to be of any use to researchers in the explanation of how a firm is created' (Low and MacMillan 1988 p.141). Anthropologists may have found this area challenging because it is difficult to know precisely what they

are looking for if there is no accepted theory and they only know, with some degree of apprehension, that it involves the supply and distribution of a product or service by an individual or a group of individuals for which they may or may not derive some benefit for the supply of that good or service.

The early literature that evolved from anthropology discusses rather abstract concepts such as: opportunism, individual agency, goal-seeking behaviour, manipulation and mobilisation (Stewart 1991). One of the most influential definitions of entrepreneurship in anthropology originated from Fredrik Barth and Cyril Belshaw in the 1960s. Entrepreneurs were seen as people taking the initiative in the pursuit of profit (in some form) from the manipulation of other people and resources through the single-minded concentration of one type of value (profit) (ibid p. 74). However, Belshaw (1965) was dissatisfied with this definition so he broadened it to include 'a propensity to take advantage of opportunities with orientation towards expansion'. It seems that (Belshaw 1965) had growth in an organisational setting in mind when he modified his original definition. Cultural perspectives are but one aspect of exogenous factors, other factors such as the environment and societies have a significant impact on the role of the entrepreneur.

2.3.2.2 The Sociological Perspective

So how does sociology contribute to our understanding of entrepreneurship? Entrepreneurship occurs within an environmental framework and some environments are more likely to support entrepreneurship than others (Reynolds 1991). 'Social systems are groups of individuals, such as self-employed people, organizations, clubs, religious sects, political parties, government agencies or indigenous communities' (Reynolds 1991 p.47). The conceptual frameworks of the social system contribute to our understanding of entrepreneurship in a number of important ways, including societal conceptions regarding productive activities, societal characteristics affecting entrepreneurship such as cultural factors, the government's role and finally through the impact of social context on individual behaviour (ibid p.47).

In order to understand societal conceptions, it is important to appreciate the social system concept. Parsons and Schemler (1956 p.7) define a social system as 'the system generated by any process of interaction, on the socio-cultural level between two or more actors. The actor is either an individual or a collective'. The equilibrium model

² Presentation by Leo-Paul Dana at the entrepreneurship research conference, Unitec New Zealand 2006

of societal consensus is based on the 'notion that the natural state of a society is one of steady state or an absence of change and internal conflict' (Reynolds 1991 p.51). This absence of change and internal conflict is bought about by the economic dominance of society by massive productive organisations, which assumes the decline of entrepreneurial firms (Herron et al. 1992 p.10).

'Societies consist of an interlocking conceptual framework of systems and subsystems, which encompass actors who have roles in a number of sub-systems' (Reynolds 1991 p.49). Societies are special cases of systems. They contain all the subsystems necessary for survival. Change frequently reflects the competition within and between industry players, and within the macro and micro economic environment. The entrepreneur's contribution to this conceptual framework is as an agent of change, a mediator between subsystems (ibid p.50). The disequilibrating role of the entrepreneur contributes to change which helps to bring about integration between the economic subsystems (Schumpeter 1975 (1942)). This equilibrium functional model is not unlike general equilibrium theory in that its utility as a conceptual framework is problematic because of its assumption of the absence of change.

The alternative proposition to the functional model framework is the class competition model. This framework emanates from Karl Marx's work on the relative economic dissonance of different groups in society (Reynolds 1991). The underlying assumption in this construct is that it is easy to accumulate wealth once capital is available; the only consideration is its distribution. Once again, large organisations are the feature of centralised economies. According to this proposition, large organisations become the dominant force. Therefore the small scale entrepreneur should be discouraged through punitive actions if necessary because they are wasting valuable resources. It is assumed that entrepreneurial activity or managerial talent did not contribute to economic growth, because large organisations would naturally drive out smaller firms (Reynolds 1991 p.52). Both the functional-equilibrium model and the class competition model posit that in advanced economies large organisations are assumed to be so efficient that they will drive out all smaller firms. Modern social organisations have demonstrated the falsity of this claim (Herron et al. 1992). Both these conceptual frameworks fail to recognise that as organisations grow so do systems, and therefore any opportunities afforded and provided through the scale of economies is sabotaged by the increasing bureaucratisation of the organisation.

'There is now substantial evidence that entrepreneurial activity is a significant feature of advanced economies' (Granovetter 1984), yet a model of society that provides a satisfactory treatment of entrepreneurial behaviour has not been conceptualised. So for

the time being social institutions can be examined through the impact they have on entrepreneurial behaviour. As the findings in the Global Entrepreneurship Monitor (Autio 2005) show, high-expectation entrepreneurs, though relatively few and far between, are responsible for up to 80 percent of all jobs created by entrepreneurs, so their significance should not be underestimated.

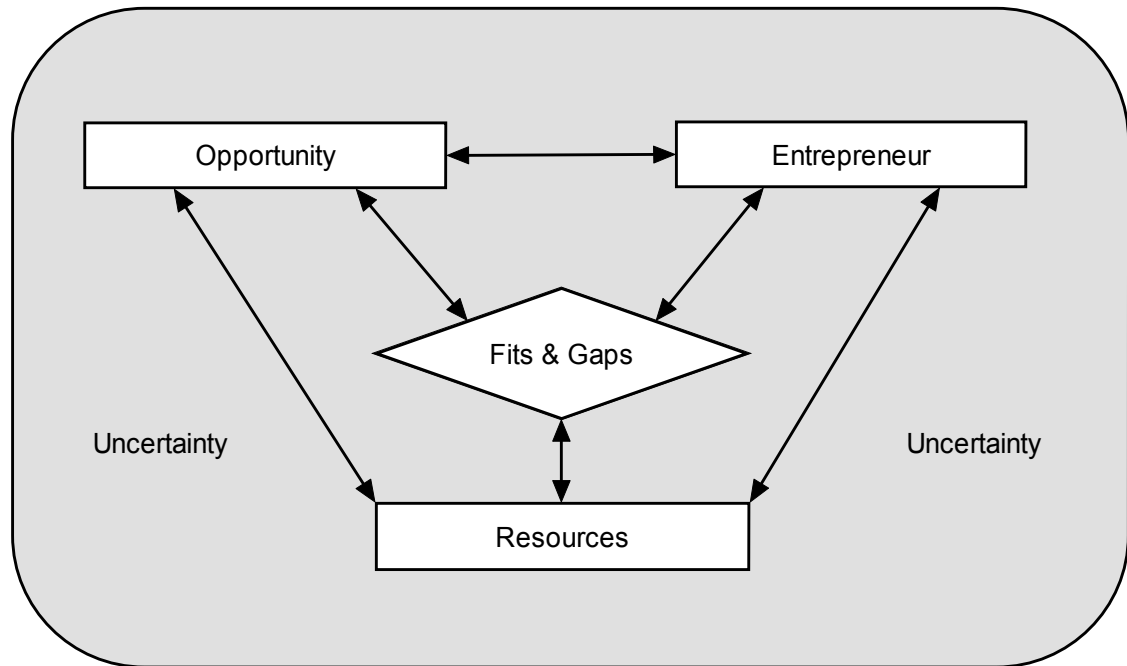
Whilst the discipline of sociology has contributed to our understanding of the interdependence of various social systems and subsystems, and how they encourage or discourage entrepreneurial behaviour, there does not seem to have been much application of how individuals construct their social world. Once again, it is evident that no single discipline can provide an adequate understanding of all aspects of entrepreneurship. Nevertheless, sociology has made some distinctive contributions (Reynolds 1991 p.67). In the next section, the individual level is reviewed through the psychology literature.

2.3.2.3 The Psychological Perspective

Figure 2.1 depicts the three driving forces of entrepreneurship according to Timmons and Spinelli (2003). There are three crucial components needed for entrepreneurship to occur, and they are the opportunity, the entrepreneur and resources. The integration between these components occurs within an environment of uncertainty and the fits and gaps between the three main components will determine if the idea will be successful.

An entrepreneurial venture is an irreducibly complex system, without access to any of the key components in figure 2.1 the organisation will not come into existence. As depicted in figure 2.1, without the entrepreneur, opportunity and resources alone will not create a new venture. This is the launching pad of the psychological perspective. The psychological perspective attempts to understand the behaviour and the contents of the mind. Therefore, for psychologists, the unit of analysis is the individual entrepreneur.

Figure 2.1 Three driving forces of entrepreneurship



Source: (Timmons and Spinelli 2003)

So who or what is an entrepreneur? Entrepreneurship is about paradoxes. For some, an entrepreneur is simply anyone who creates an enterprise as a new organisation or as an initiative from within an existing organisation (Gartner 1985; Hindle and Legge 1997; Westhead and Wright 1999). Others believe that to make money one first must lose money; to build wealth one must relinquish wealth' to succeed, one has to experience failure (Bygrave 1997). For Schumpeter, the human component of entrepreneurial behaviour is very important. He saw the entrepreneur as a special person, with a unique character. Schumpeter believed that entrepreneurship 'requires aptitude that is only present in a small fraction of the population' (Schumpeter 1975 (1942) p.132).

In other contemporary works of the time, Weber (1930) suggested that entrepreneurs had particular value systems which conveyed formal authority, and that they were independent people who sought out opportunities to innovate. Conversely, Chandler (1971) proposed that the entrepreneurial character was one who had a need for power and control over the factors of production (Formaini 2001 p.4).

Some of the literature tends to paint entrepreneurs as rare individuals who have the capacity to create extraordinary organisations that make valuable contributions to their areas or regions' economy, while others argue that it requires a particular characteristic profile to be a successful entrepreneur (Herron and Robinson 1993). Mitton (1909 p.10)

proposed that the proper study of entrepreneurship can only occur through the study of the entrepreneur, for the proper study of humankind's behaviour is humans (Pope 1966).

Most theorists see the entrepreneur as central to the role of entrepreneurship (Mitton 1989 p.9) and as such, a considerable amount of research has been carried out to better understand that individual.

'Trying to understand the entrepreneurial process without considering the entrepreneur is like trying to bake bread without yeast, an essential ingredient that makes the entire process possible' (Baron 2004a p.222). To many involved in the development of entrepreneurial ventures, the individual is still the most important element of a successful venture. For instance, venture capitalists are more likely to invest in a mediocre opportunity with a highly motivated and passionate individual than a good opportunity with a less capable or motivated entrepreneur (Bygrave 1997).

The areas of interest to psychologists have been behaviour and traits. Behaviour is the 'actions or pattern of activities of an individual' and traits are the 'individual's distinguishing features qualities or characteristics' (Macquarie Dictionary 3rd edition 2001). The purpose of some of the entrepreneurship research has been to enumerate a set of characteristics describing this rare species known as the entrepreneur (Gartner 1988 p.12).

Some of the most enduring character traits attributed to the entrepreneur are: locus of control, need for achievement, tolerance for ambiguity, and risk taking propensity (Burns 2001). McClelland's need for achievement was thought to have been the first great theory of entrepreneurship. His notion was that entrepreneurs were different psychologically from non-entrepreneurs because they had a higher need for achievement (Bygrave 1989a p.13). The psychology discipline refers to the discovery of these attributes as the personological endeavor. Such searches for trans-situational consistency went out of style in the late 1960s because personality was regarded as a consequence of person-situation interactions (Shaver and Scott 1991 p.25), nevertheless this research continues (Carland et al. 1984; Mitton 1989; Singh et al. 2002).

In the earliest definition of an entrepreneur, Cantillon (circa 1700) described the entrepreneur as a rational decision maker and risk taker. Mill (1848) believed that the difference with an entrepreneur was the willingness to bear risk. Schumpeter (1942), however, countered that risk bearing was that of the capitalist and not the entrepreneur who was the combiner of resources (Carland et al. 1984). It is still undecided whether or not a willingness to take risk is required to be an entrepreneur (Timmons and Spinelli

2003).

Brockhaus and Horowitz (1986) found that researchers began to investigate whether founders were higher in propensity toward risk than were people who did not start businesses. Most of the researchers had employed some version of the Kogan and Walsh's (1964) Choice Dilemma's Questionnaire (CDQ). The instrument consisted of a number of short vignettes in which each participant was asked to decide between a safe and risky alternative.

The subjects of the test were required to give advice to another, and this was then interpreted as the risk taking propensity of the participant. Shaver and Scott (1991) argue that there are some significant methodological issues around attempting to measure a nascent entrepreneur's risk taking propensity using this instrument. Firstly, the participants were being asked to make a decision on behalf of somebody else. Secondly, the CDQ was never designed to determine investment in risky businesses, it was designed to measure levels of treacherous behaviours as a consequence of action group discussions. Finally, it has since been demonstrated that people faced with the same choice in real life tend to be more conservative in their decisions. Another popular trait which is hard to measure is locus of control. It has been argued that entrepreneurs have an internal locus of control, believing that they can control their environment and therefore their destiny (Burns 2001 p.28).

An internal locus of control infers that entrepreneur's regard their innate knowledge and experience as important to their decision making. Many management studies have found that executives rely on their intuition to solve complex problems because linear methods are simply not effective (Hayashi 2001).

There has been an increasing interest in intuition. Up until 2000 less than 10 articles had been published on intuition in management and entrepreneurship journals. Since 2000 25 articles on intuition have been published in management and entrepreneurship peer reviewed journals. This demonstrates the increasing interest in the role and importance of intuitive decision making. There's a recognition that where complex decisions need to be made, in the midst of an overwhelming mass of information, managers and entrepreneurs rely on their intuition (Dane and Pratt 2007; Miller and Ireland 2005; Vance et al. 2007)

Shaver and Scott (1991) argue that to gain a better understanding of the psychological perspective it is important to understand the origins of psychological analysis. According to them (1991), psychologists subscribe to some form of stimulus-organism-response (S-O-R) analytical perspective. They argue that personological analysis does not work

because people react to their environment and that whilst the stimulus (S) and response (R) can be known, the factors that contribute to the action of the organism (O) can only be inferred.

Problems with methodology in understanding psychological traits have been noted by Gartner (Gartner 1988), Low and MacMillan (Low and MacMillan 1988), Sexton and Bowman (1985), and Vander, Werf and Brush (ibid p.32). Shaver and Scott (1991) have given a number of reasons why one should be careful in using trait measuring instruments. One aspect of human behaviour does not determine the entrepreneurial orientation of an individual. Human beings are very complex creatures and one cannot ignore the context and environment of the individual. Unfortunately, the single minded fascination of entrepreneurship with personality has led to distortions in psychology's representation in entrepreneurship theory and practice (Herron et al. 1992 p.9). Nevertheless, the trait approach to entrepreneurship research is persistent. Entrepreneurs seem to be, as suggested by Schumpeter (1934) and many others, special people who achieve things that most of us do not. It is assumed that these achievements are based on unique psychological traits (Gartner 1988 p.22). One of the fundamental challenges and central issues in the trait research is the inability to distinguish entrepreneur's characteristics from the rest of the population (ibid, 1988).

From a research perspective, it is pointless aggregating all of the traits and characteristics attributed to entrepreneurs because there is a mixture of normative and empirical characteristics and the research groups lack homogeneity (Carland et al. 1984).

Shaver and Scott (1991) suggest a superior process of representing what happens in the mind of the entrepreneur. One needs to combine external circumstances with intra-psychic processes – as defined in Lewin's expression below:

Behaviour (B) is a function of both the (P) persona and (E) environment; neither alone constitutes a sufficient explanation of an individuals behaviour (ibid, p.25).

$$B = f(P,E),$$

However, there are so many environmental variables that cannot be easily incorporated in the instrument that it raises questions over their measurement validity and usefulness.

It is worth bearing in mind Bygrave's (1989 p.7), thought that 'entrepreneurship is a very young discipline and that if it is to grow in stature as a separate discipline, it will need to develop its own theories and methods', because through borrowing the theories and methods of other disciplines it runs the risk of being driven by them or worse being considered irrelevant because the methods and theories of other disciplines may not explain the entrepreneurs behaviour because they do not measure what is required.

2.3.2.4 Cognition

The failure to identify the entrepreneurial personality has created a vacuum that was waiting to be filled (Keh et al. 2002; Mitchell et al. 2002). Mitchell et al (2002) argue that, the socio-cognitive aspect offers researchers techniques that better explain the human aspects of entrepreneurial behaviour. The value that cognition theory brings to our understanding of entrepreneurship is that it attempts to explain individual behaviour as it is moderated by the person-environment interaction.

As psychologists began to realise the limitation of the personological theories, cognitive psychology emerged to explain how individuals interact with others and their environment (Mitchell et al. 2002). Entrepreneurship scholars took an interest in cognition theories so they could hopefully shed some light on the perennial issues that trait theorists have failed to address.

Cognitive theory has yielded impressive results in the leadership field and may help entrepreneurship scholars to answer a number of important questions such as; 'why do some people and not others choose to become entrepreneurs, why do some people recognize opportunities and why are some entrepreneurs more successful than others' (Baron 2004a p.222). Shane and Venkataraman (2000) argue that the cognitive aspects of an individual, as well as the information they possess, will lead to the probability that a particular type of person and not others will identify and exploit an opportunity.

It is argued that the socio-cognitive aspects of the entrepreneur may indeed provide some valid and robust explanations of what it is that entrepreneurs do (Mitchell et al. 2002). The cognitive perspective assumes that everything that is said or done is influenced by mental processes – the cognitive mechanisms through which information is acquired, stored, transformed and used (Baron 2004a p.221). Entrepreneurial cognition 'helps us to understand how entrepreneurs think and why they do what they do' (Baron 2004a). For Allinson et al (2000), the cognitive approach is concerned with the entrepreneur's preferred way of gathering, processing, evaluating and using information.

Mitchell et al (2003, p.97) regard 'entrepreneurial cognition is the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation and growth'.

Like the earlier studies of entrepreneurship, leadership research began by investigating the characteristic traits of leaders. However, no empirical evidence was found to support that explanation. Leadership researchers made progress by focussing on the behaviour of leaders, and by determining what situational factors or conditions moderate the effects of their behaviour (Ven de Ven 1980). Gartner (1988) nevertheless agrees that

'behaviour' is a fruitful area of investigation in understanding entrepreneurs.

Some of the theories, schemas and variables proposed by the cognitive theorists include: signal detection theory, prospect theory, regulatory focus theory, counterfactual thinking, risk perception, planning fallacy, self-efficacy, illusion of control, self serving bias, representative errors, belief in small numbers, cognitive biases such as overconfidence, and schemas such as heuristics, pattern recognition and intuition (Baron 2004a; Keh et al. 2002; Mitchell et al. 2002; Vance et al. 2007).

Table 2.1 is a modification of Baron's (2004, p.237) diagram with the addition of other cognitive perspectives deemed important by other cognitive scientists (Keh et al. 2002; Mitchell et al. 2002) in understanding entrepreneurial cognition.

Table 2. 1 Cognitive factors tool kit - entrepreneurship issues

Why do some people and not others become entrepreneurs?	Why do some people recognise opportunities?	Why are some entrepreneurs more successful than others?
<p>Reduced perceptions of risk</p> <p>Prospect theory, Persons who become entrepreneurs overweigh small probabilities</p> <p>Entrepreneurs are affected by;</p> <ul style="list-style-type: none"> • Optimistic bias • Self-efficacy • Planning fallacy • Illusion of control • Overconfidence • Intuition (learned behaviour) 	<p>Perceptual processes - Entrepreneurs are more proficient than others at heuristics and pattern recognition</p> <p>Signal detection theory, entrepreneurs are more capable of distinguishing hits from misses</p> <p>Regulatory focus theory persons adept at recognising opportunities show a mixed pattern of promotion and prevention focus</p> <p>Entrepreneurial alertness</p>	<p>Counterfactual thinking – imagine what might have been</p> <p>Systematic vs. Heuristic entrepreneurs are better switching between processing styles</p> <p>Entrepreneurs are not susceptible to:</p> <p>Sunk costs and other biases</p>

Adapted and modified from (Baron 2004a)

The human dimension of entrepreneurship is critical to an understanding of the field, and cognitive scientists are providing an understanding of the behaviour of the entrepreneur in opportunity recognition, new venture creation and growth. Cognitive theorists are a subgroup of the wider psychology discipline whose aim is to provide an explanation of

entrepreneurial behaviour by examining the mental processes of an individual by referring to the outcome of that process - actions and behaviours. 'Entrepreneurship is strongly affected by a mass of other economic and societal factors, therefore a lot more than cognitive processes matter from the point of view of understanding the entrepreneurial process' (Baron 2004a p.223).

Entrepreneurship requires an approach that recognises and *embraces* 'uncomfortable aspects such as ambiguity, discontinuity, irrationality anomaly and paradox. This requires extending our knowledge of entrepreneurship into the non-linear/holistic realm' (Campbell 2003 p.8).

2.4 A Non-Linear, Holistic Approach to Entrepreneurship

It has been argued that entrepreneurship is associated with a disjointed, discontinuous non-linear event that cannot be studied successfully with methods developed for examining linear processes (Bygrave 1989a p.7). This type of thinking pervades the entrepreneurship literature and social sciences generally. It is a dispassionate thinking derived from Aristotelian logic (Bygrave 1989a; Campbell 2003; Hindle 2004). Radin (2004) argues that because of the developments in quantum mechanics, chaos theory and non-linear dynamics over the last 100 years, the Newtonian model of physical reality may no longer be valid. Conversely, Zohar and Marshall (2004) suggest that linear thinking is not wrong, the problem is it limits one's ability to be able to see beyond linear logic, and therefore it does not tell the whole story.

In his research on developing a holistic perspective of entrepreneurship incorporating the intangible elements of entrepreneurship, Campbell (2003) discovered that the success of the entrepreneurial process depends on far more than the linear descriptions that are so common place in the literature. Entrepreneurs appear to make sense of complexity and non-linearity by focussing on the relational attributes among the elements of a venture. The following table (2.2) contrasts the difference between the linear and non-linear paradigms.

Table 2. 2 Contrasts between Linear and Non-linear

Linear	Non-Linear
Policies procedures, command and control, fixed expectations	Creative, innovative, unexpected
Best practice, standardisation	Holistic, considers contexts
Quantitative logical, cause and effect	Qualitative, paradoxical
Incremental improvements, optimisation	Complete transformations of products and industries
Suits stable industries and technology	Suits irrationality and uncertainty
Suits project management aspects of entrepreneurship	Quantum leaps of entrepreneurship

Source: (Campbell and Gillin 2002)

A linear view assumes that firms and their entrepreneurs are predictable and deterministic, whereas a non-linear view of the world assumes uncertainty, quantum changes, creativity and uncertainty. Whilst linearity is about stability and sustainability, a non-linear perspective requires an appreciation of the relationships in disparate information and associations (Campbell 2003).

Bygrave (1989 p.11) argues that entrepreneurship models must be rooted in psychology and sociology if they are to have theoretical validity in understanding the human dimension. However, the deterministic nature of modern science may limit entrepreneurship research if it is accepted that entrepreneurs do not behave according to Newtonian laws of physics. An example of a deterministic approach is the preponderance in using regression analysis to explain entrepreneurial behaviour. Some researchers (Davidsson 1989; Shepherd and Krueger 2002) rely on regression models to explain firm and entrepreneurial behaviour. Davidsson acknowledges that regression models are not suitable in all instances but may be acceptable in instances when comparing unambiguous variables (9th Feb 2007 pers comm.)

Regression analysis is reductionist and usually generates smooth changing analytic functions, while entrepreneurship deals with sudden and discontinuous changes. In addition, regression models assume a few stable variables, rather than unstable models with many variables (Bygrave and Hofer 1991). Another example of how we limit our

understanding of entrepreneurship is evidenced in the diverse disciplines that contribute to the literature.

Despite the potential for richness and texture that such a diverse mix of disciplines brings, a major weakness is that, in many cases, researchers from one discipline have tended to ignore entrepreneurship studies by researchers in other disciplines (Bull and Willard 1993). Herron et al (1992 p.7) also found that economics, psychology, sociology, anthropology and business all have their own perspective and therefore have remained relatively unaffected by the viewpoint of the other disciplines. Entrepreneurship research has so many different concepts from diverse disciplines it is not surprising that some question whether such a construct even exists (Bygrave 1989a p.10).

Recognising that there are differences might be a way for entrepreneurship scholars to begin to see how these differences might be an aspect of the same whole (Gartner 2001). Low and McMillan (1988) see entrepreneurship as occurring at a number of different levels: the individual, the group, the organisation and industry. They infer that researchers will gain a greater perspective of the entrepreneurial process if they consider the different levels and take an holistic approach. Bygrave (1989 p.20) suggests that the proper way of carrying out entrepreneurship research requires a willingness to look at the situation as a whole and takes into account all of the important elements affecting the entrepreneurial process.

The general principle of holism first appeared in Aristotle's *Metaphysics*. Aristotle said, 'the whole is more than the sum of its parts'. The term, however, was first coined by South African Statesman Jan Smuts (1965) in his book, *Holism and Evolution*. Holism as a philosophical construct is opposed to reductionism. A reductionist believes that a whole can be understood by breaking down and analysing its parts and the relationship between them. In contrast, a holist looks at systems in aggregate and argues that more can be known about them when viewed as a whole³.

Taking a holistic approach to the way an observer sees the world impacts on the observer's perception of reality. Only by removing one's blinkers and seeing the world as a whole can the real world be seen (White 2005). White (2005) argues that humans do not live in isolation and the interconnectedness of the natural world forms dynamic wholes, which are subsystems of greater wholes, which Arthur Koestler termed Holons.

³ <http://abyss.uoregon.edu/~js/glossary/holism.html>

At the sub-atomic level, everything is composed of miniscule particles operating in relation to one another. The atom – the essential unit of existence – is a system and the relationship gives the inert particles their meaning and function (ibid).

According to White (2005), the systemic nature of the atom depicts our physical reality. In biology cells are made up of chemical elements operating in relation to one another. They sustain themselves through closed, internal interaction and by open, external relations with their environs. In an ecosystem, the components behave in ways that hold the whole ensemble together. Human beings are likewise a complex ensemble of interdependent systems that engage with each other and their environment through interconnected relationships. This system creates a web of relationships where everything influences everything else. 'Pull a string on one end of a web and you will find it is attached to every other part of a web' (White 2004).

2.4.1 Entrepreneurial Decision Making

Understanding how and why entrepreneurs make certain decision requires an understanding of relationships that occur both at the macro and micro level. Therefore, a discussion of how information is collected and assimilated is necessary. There are two ways of knowing, which are commonly referred to as intuitive or analytical.

Our knowledge and understanding of decision making has advanced in recent years, and it can now be understood as a composite phenomenon involving interplay between knowing (intuition as expertise) and sensing (intuition as feeling). However, there is evidence to suggest that individuals do not always process information consistently across all situations (Hayes and Allinson 1994). Allison, Chell and Hayes (2000) suggest that there are particular situations where intuitive decision making is more likely to occur; where there is either too little or too much information, where there are time constraints, or a great deal of complexity.

Making well informed decisions in today's complex environment is harder than it was in the past because of the sheer volume of information available through the world wide web, the level of competition, and the unlikely quarters from where a new competitor may emerge. Unlike scientists, entrepreneurs do not always enjoy the luxury of making decisions on the basis of orderly, time consuming, rational analysis (Simon 1987). In rational decision making, goals and alternatives are made explicit, the consequences of pursuing different alternatives are calculated and these consequences are evaluated in terms of how close they are to the original goals (Barnard 1938). The limitation for entrepreneurs arises from the use of the standard analysis tools such as business plans, financial models, budgeting systems, due diligence etc. Whilst all these tools are

valuable and important, 'paralysis by analysis' can result if the entrepreneur takes too much time trying to refine these models. It can inhibit an entrepreneur's ability to make rapid and timely decisions in a dynamic environment where the outcome is uncertain.

Whilst there has been a significant focus of attention on entrepreneurial behaviour, understanding how entrepreneurs make decisions has been less researched and therefore less well understood. Most scholars agree that what differentiates entrepreneurs is their behaviour. Nevertheless, attempting to differentiate the behaviour of an entrepreneur from others has thus-far proved difficult (Keh et al. 2002; Mitchell et al. 2002).

2.4.2 Intuition

Deciding which opportunities to pursue is an important consideration for the entrepreneur and Mitchell et al (2005) argue that intuition can be useful in helping entrepreneurs in opportunity identification. However, they argue that this type of decision making is problematic because there are too many interpretations as to what constitutes intuition and that there are too many factors that influence one's ability to use it, factors such as the environment, brain organisation, experience, training and factors one has no control over, such as the ability to access that information as and when required. Whilst Mitchell et al (2005) argue this type of decision making is problematic because of the number of interpretations and variables, it is proffered that there is enough evidence from the literature for a consensus as to what constitutes intuitive decision making.

Intuition is a method of making decisions that is both holistic and non-linear. In general, scholars feel uncomfortable with this conceptualisation because of the nebulous nature of the construct. It is likely that this results from an inherent assumption that knowledge is recognisable and valuable only when it is explicit, untainted by feelings, and open to conscious thought and introspection (Sadler-Smith and Shefy 2004). Nevertheless, intuition is a *sine qua non* of human decision making. It is critically important for entrepreneurs because when decision demanding situations arise they do not have the luxury of making decisions on the basis of orderly, rational analysis, (Simon 1991).

Intuitive types have some characteristics in common with entrepreneurs. They tend to feel self-sufficient and trusting of their own judgment (self-efficacy), they are able to live with ambiguities and uncertainties, and are confident in the information they have at hand to make the decisions they need to make. Furthermore, when outcomes are difficult to predict through rational means, entrepreneurs tend to be more tolerant of ambiguities and respond in a pragmatic way by utilising their intuitive judgment (La Pira

and Gillin 2005).

The term intuition may be traced to the Latin *intueor or intueri*, meaning to contemplate or look within (ibid p.81). Intuition has gained the attention of entrepreneurship and strategy scholars because entrepreneurs, as well as business executives, regard intuition as an important adjunct to their decision making strategies. Many authors argue that rational analysis is over-emphasised and many industries are fully committed to the rational approach to problem solving. 'We have learned to analyse everything so that we can avoid the big dumb decisions through good market research, cashflow analysis and budgeting. If a little is good then more is better' (Behling and Eckel 1991 p.46). Myers's (2002) argues that there is some consensus amongst psychologists as to the differences between rational and intuitive decision making (table 2.3).

Table 2. 3 Two ways of knowing

Experiential (intuition)	Rational (logical)
Rapid – enables immediate action	Slow – delayed action
Emotional – attuned to what feels good	Logical – based on what is sensible or reasonable
Mediated by past experience	Mediated by conscious appraisal
Self-evident experiencing is believing	Justified with logic and evidence

Source: Adapted from (Myers 2002 p.30)

The following represents a discussion on the many definitions of intuition in the literature. Barnard (1938) was one of the earliest authors in the field. He did not regard the non-logical processes of decision making as magical in any sense, he argued that they are grounded in knowledge and experience.

Researchers conceptualise intuition in many different ways (Behling and Eckel 1991). For instance; the thinker arrives at an answer with little or no awareness of the process by which he or she reached it. Rarely can they provide an adequate account of how they obtained the answer, and may be unaware of just what aspects of the problem situation they were responding to (Bruner 1960).

A monograph written by Myers (2002) on intuition provides evidence for intuition's power and importance, and then warns the reader of its perils. The author provides numerous

examples of the power and perils of intuition. The book discusses learning, memory recall, and one's interpretation of reality and consciousness as critical elements of intuition. Myers (2002) limits his argument to psychological perspective of intuition and no evidence is presented to compare the psychological work with any empirical research outside the field of psychology. In order to gain an appreciation of how it is considered, the following table outlines the authors and their theoretical perspectives (table 2.4).

Table 2. 4 Intuition perspectives and authors

Perspectives	Authors
Holistic decision making, an integration of disparate information	Bunge (1982), Bradley (2005), Allinson et al (2000), Bastick (1982), Vaughan (1989), Radin (1997), McCraty (2004)
Grounded in knowledge and forgotten experience	(Mitchell et al. 2005), Burke and Miller (1999)
Explicit, observable, rational and logical	Myers (2002), Agor (1989)
Emotionally driven, a vague sense or feeling	Bradley (2006), Burke and Miller (1999), Kahnemann (2003), Radin (1997), McCraty et al (2004)
Paranormal experience	Bradley (2006a), Behling and Eckel (1991), McCraty et al (2004), Radin (1997), Bierman (2000), Bierman and Radin (1997)
Decision making rule or heuristic	Riqueleme and Watson (2002)
An unconscious process or pattern that, cannot be expressed in words	Myers Briggs (1998), Rowan (1986), Isaack (1978), Barnard (1938), Crossan, Lane and White (1999), (Larsen and Bundesen 1996), Khatri and Alvin (2000), Sadler Smith et al (2003), Radin (1997), McCraty et al, Bierman (2000), Radin (1997)
Daring conclusive leap	Bennett (1998)
An aspect of organisational or implicit	Lawrence et al (2005), Lieberman (2000)

learning	
Fast, automatic, effortless, difficult to control	Kahnemann (2003), Bradley (2006), Myers (2002)

Aside from the plethora of perspectives outlined, some authors have attempted to develop a typology of intuition. Behling and Eckel (1991) derived six conceptualisations of intuition from 87 definitions. According to them, the only continuity between them was that intuitive decisions are made without any obvious formal analysis.

Table 2. 5 A typology of intuition

1	No formal analysis
2	Paranormal power #
3	Personality trait *
4	Unconscious process
5	Set of actions
6	Distilled experience

Source: (Behling and Eckel 1991)

The six conceptualisations were: intuition as a paranormal power or sixth sense, intuition as a personality trait, intuition as an unconscious process, and as a set of actions, intuition as distilled experience (table 2.5). They promptly discarded intuition as a paranormal experience #. They also discard the personality trait * arguing that a person with a propensity for intuitive decision making is a preference, not demonstrating ability. Finally, they also dismissed intuition as a residual category because this is the approach that defines what intuition is not, rather than what it is. The argument is that those authors did not comprehend the construct and therefore were not committed to defining it. Behling and Eckel (1991) came to the conclusion that intuition is an unconscious process where experience plays an important part.

Burke and Miller (1999, p.92) defined intuition in terms of five themes they elicited from practitioners. They were: experience-based decisions, affect-initiated decisions based on feelings and emotions, cognitive-based decisions applying skills and knowledge, subconscious mental processing and value-based decisions (table 2.6).

Table 2. 6 Intuition themes

1	Experience based decisions
2	Affect-initiated decision
3	Based on feelings and emotions
4	Cognitive based decision
5	Applying skills and knowledge
6	Subconscious mental processing based on values

Source: (Burke and Miller 1999)

According to their findings, no one in their cohort viewed entrepreneurship as a paranormal experience or personality trait. The conclusion they arrived at was that intuition 'is based on a decision maker's previous experience and emotional inputs'. Whilst this research takes a phenomenological approach in identifying intuition and its use, it leaves a lot of questions unanswered. Very few of the articles address the importance of the emotional aspect of the decision or the ability of the decision maker to see the totality of the problem. It could be likened to asking a frequent flyer who has no understanding of the dynamics of flight to explain Bernoulli's gas principle.

In an effort to determine whether intuition is a friend or foe, Miller and Ireland (2005) explored the use of intuition throughout the ages and have decided that it is a problem child and if it is to be of any use it is best used in the exploratory stage of an organisations development. Mitchell et al (2005) likewise regard intuition as a challenge and suggest that it should be used during the opportunity search phase only.

Considering the varied perspectives provided by Mitchell et al (2005) as outlined in table 2.3, there appears to be some consistency as they fall into one of four categories: previous experience, subconscious, holistic and emotion based. This is consistent with the findings of other researchers in that intuition is multi-dimensional (table 2.7). Bunge (1982), Bradley (2005), Allinson et al (2000), Bastick (1982), Vaughan (1989) Radin (1997), Burke and Miller (1999), Kahnemann (2003), McCraty et al (2004 a and b), Behling and Eckel (1991).

Table 2. 7 Intuition elements

Previous experience	Burke and Miller (1999) (Colvin et al. 2001), Isenberg (1984), Khatri and Ng (2000), Prietula and Simon(1989)
Not expressed in words/subconscious	Barnard (1938), Rowan (1986), Isaak (1978), Khatri and Ng (2000), Isenberg (1984), Wierzbicki (1997), Parikh (1994), Behling and Eckel (1991)
Holistic	Vaughn (1989), Bastik (1982), Allinson et al (2000)
Emotion based	Burke and Miller (1999), Khatri and Ng (2000)

Source: (Mitchell et al. 2005 p.657)

Mitchell et al (2005) also regard the antecedents of intuition as problematic. They argue that the variety of intuition antecedents limits the effective use of intuition as an entrepreneurship research construct. The examples provided by Mitchell et al (2005) mostly relate to either learned experience or the observation of experts. The conceptual construct that they offer as an explanation for the nature of intuition relates to learning and memory from a psychological perspective. Furthermore, Mitchell et al (2005) argue that because of the multi-dimensional nature of entrepreneurship, antecedents and consequences 'it confirms the necessity for bounding and better defining the construct' (ibid p.657).

It is argued that there is sufficient research to provide an empirical validation of intuitive decision making. Furthermore, the use of intuition is not restricted to any particular functional aspect (Behling and Eckel 1991; Burke and Miller 1999; Issack 1978; Miller and Ireland 2005; Sadler-Smith and Shefy 2004; Simon 1987). Researchers in this and other empirical works (Khatri and Alvin 2004; La Pira and Gillin 2005) have found that intuition is a decision making strategy that is useful in all aspects of firm growth and development. In their research, Sadler-Smith and Shefy (2004) found that intuition was significant for decisions in corporate strategy, planning, marketing, human resource development, research and development, public relations, investments and acquisitions, mergers and alliances.

To endeavor to understand where this journey has taken the reader thus far, this work still relies on the psychological perspective because to date it is the most coherent literature on the construct available. The following table is derived from the psychology literature on intuition. It categorises the conceptualisations of intuition according to whether they fit into sensing, learned behaviour or both.

Table 2. 8 Intuition as expertise or sensing

Intuition as expertise(knowing)	Intuition as sensing
Personality trait	Paranormal /spiritual/mystical
Distilled experience/expert knowledge/previous experience	Understanding without rational or logical thought
Chunking/pattern recognition/decision making rules/heuristics	
Rational, logical brain skill	
Feelings rooted in past experience	
A set of explicit observable actions	

Table 2. 9 Intuition as both knowing and sensing

Intuition as expertise(knowing)	Intuition as sensing
-----Automatic-----	
-----Rapid-----	
-----Outside conscious awareness-----	
-----Emotionally charged-----	
-----Difficult to control or modify-----	
-----Integration of disparate information/ holistic-----	

As tables 2.8 & 2.9 show, two theoretical approaches of intuition have evolved: the sensing and the logical processing (knowing). In the next section some of the logical

processing models of intuition are discussed. Baron (2004) argues that a number of interrelated processes are used in decision making such as the recognition of objects or patterns. One such process is the feature-analysis model (Larsen and Bundesen 1996).

This model suggests that patterns are identified by their distinctive features. In opportunity recognition this may be economic value and newness of a product or service. The drawback with this model is that it is primarily applicable to simple patterns.

In contrast, prototype models apply to more complex patterns. It is suggested that through experience entrepreneurs construct the prototype model. For opportunity recognition an entrepreneur may seek central characteristics such as the likelihood of competition, economic value, desirability and other characteristics critical to their prototype. The likelihood of a match would enable an entrepreneur to conclude whether the opportunity is worth pursuing (Craig and Lindsay 2001).

Another model of pattern recognition emphasises the importance of specific knowledge. It is known as an exemplar model (Hahn and Chater 1997). Hahn and Chater (1997) also propose that individuals compare existing opportunities with exemplar models of excellent and poor business opportunities. Simon (1987) provides an example of how this pattern recognition may be learnt. He uses a Grand Chess Master's ability to make strong moves quickly. He argues that a Grand Chess Master's skill is in the knowledge, acquired by long experience of the kinds of patterns, clusters that occur on chessboards. 'For a Chess Master a chess board is not an arrangement of 24 pieces but an arrangement of a half a dozen familiar patterns that previous experience recognizes'. Accordingly, the skill of the manager results from expert knowledge, the same kind of intuitive skills of chess masters (Simon 1987).

However, Goleman's (1999) ground breaking work in emotional intelligence provides an alternative perspective to the value of expertise and IQ. He found that the more complex the job, the more emotional intelligence matters. Research on interviews of hundreds of managers of large US organisations found that emotional competence was found to be twice as important as expertise and intellect combined (ibid p. 32).

Emotional competence includes emotional Self-awareness, which is the ability to recognise one's own emotions. Our emotions run in parallel to our stream of thoughts. Most people are unlikely to tune into these subtle moods and emotions during our daily lives. The rhythm and pace of life crowds out the 'quiet inner voice that offers an inner rudder that could be used to navigate through life' (Goleman 1999 p. 56). Goleman (1999) argues that emotional self-awareness can be cultivated and provides former CEO of silicon graphics Edward McCracken as example. McCracken argues that 'in some

industries senior managers don't have time to think, they still have to do all their homework but then they have to go with their intuition without letting their minds get in the way'.

McCracken believes that the conditions under which executives operate may sometimes limit or even preclude the use of rational analysis. However, rational analysis is the norm in many organisational decision processes. Yet, intuition has gained broad support for its utility in executive decision making (Vance et al. 2007). So much so that even critics of non-linear thinking (intuition) acknowledge the need for intuition (Miller and Ireland 2005).

2.4.3 Intuition as Sensing

Intuition, unlike rationality, is a synthetic function that apprehends the totality of a given situation or psychological reality. It does not work from the part to the whole but apprehends the totality directly in its living existence (Assagioli 1971). It has been found that such intuitive foreknowledge involves the perception of implicit information about non-local objects and/or events by the body's psycho-physiological systems (Bradley 2006b). There are instances when 'intuitive insights' are unrelated to information and experiences stored in the subconscious. Bradley (2006) proffers that these intuitive insights are related to a persons (entrepreneur/manager) passionate attentional focus which, Bradley (2006) argues, emanates from the heart.

A number of recent studies have found that the heart appears to receive intuitive information before the brain and that intuition is not confined to cognitive based perception alone but involves the entire electrophysiological system, manifesting through a wide range of emotional feelings and physiological changes which is immediately sensed by the body as certainty of knowledge or feeling about the totality of a thing distant or yet to happen. This suggests that intuition is not confined to cognitive based perception alone, but involves the entire psycho-physiological system, associated with emotional and or physiological responses (McCraty et al. 2004b), Bierman 2003, Radin 1997 and 2003, Spottiswoode and May 2003). Such responses are part of a process by which information normally outside of the conscious processes is sensed and perceived in the body and mind as certainty of knowledge or feeling about an occurrence that is yet to happen. It also appears that the body processes intuitive information in the same way it processes information from ordinary sensory input (Bradley 2006). Intuitive perception can include feelings of either positive or negative emotions and is often recognised as being beyond doubt (McCraty et al. 2004b; Radin 2004).

Radin (1997a) and Bierman (1997) began to explore physiological predictors of future

events by investigating whether the human autonomic nervous system could unconsciously respond to randomly selected future emotional stimuli. Radin (1997) designed experiments to induce responses using randomly selected emotionally arousing or calming photographs measuring skin conductance level and measures of the heart rate and blood volume (ibid p.3). These results have been replicated many times by Bern (2003), Bierman (2000), Bierman and Radin (1997), Bierman and Scholte (2002), Radin (2003), and McCraty et al (2004a). The experiments found compelling evidence that the body's psycho-physiologic system receives and process information about a future event before the event actually happens. Radin (1997), Bierman (2000), and McCraty (2004a), all found that the participants bodies responded to an emotionally arousing stimulus prior to experiencing the stimulus. 'The electrocardiogram results revealed that the heart is involved in the processing and decoding of intuitive information and once the pre-stimulus information is received in the psycho-physiological systems, it appears to be processed in the same way as conventional sensory input' (McCraty et al. 2004a p.133).

Twenty-six participants took part in McCraty's (2004a) experiment. Each participant had demonstrated a capacity to induce a physiological coherence mode (an analogue for a passionate intentional participant) by combining intentional heart focus with the self generation of a genuine positive emotion (2004). An electrocardiogram (ECG) was used for the measurement of heart rate variability and an encephalogram (EEG) for cortical and heartbeat evoked potentials. McCraty's (2004a &b) used well established operational criteria. Their participants were not made aware of the true purpose of the test. They were told that they were participating in a study to test their response to different types of emotionally arousing photographs. Each participant viewed 45 pictures in each of two experimental sessions; each session consisted of 30 calm pictures and fifteen emotional pictures selected from the International Affective Picture System (IAPS).

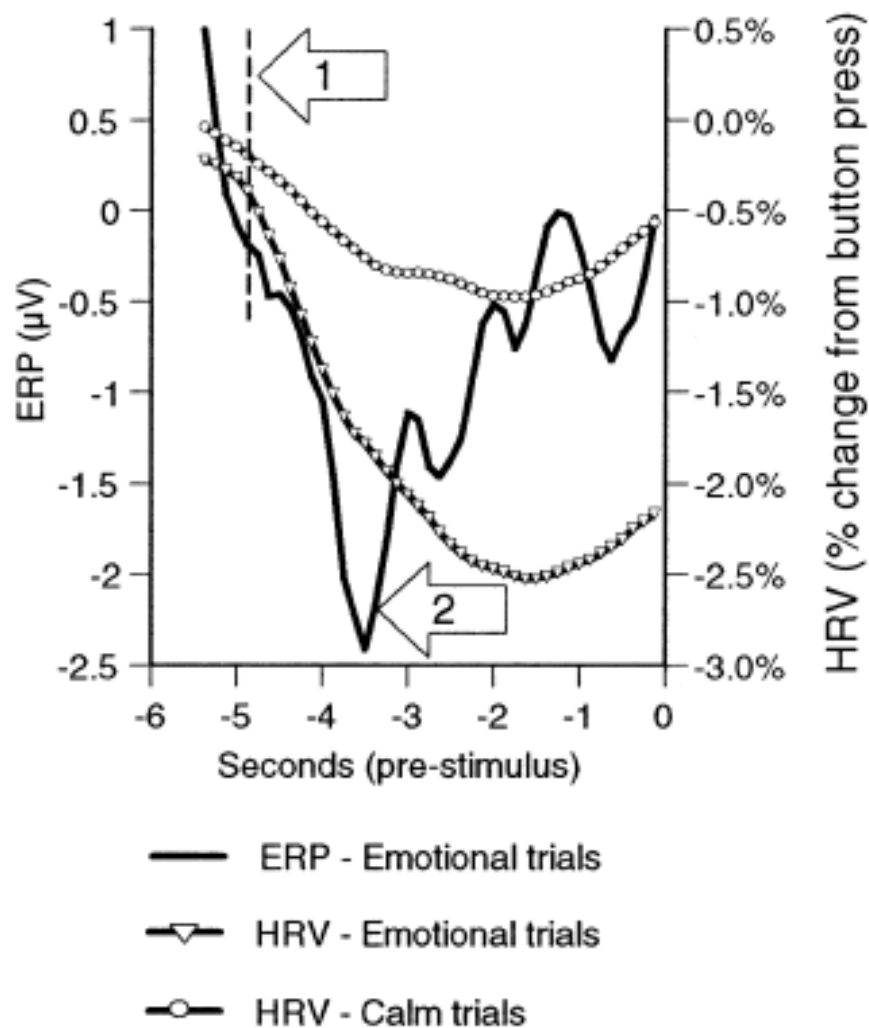
Drawing on the findings from (McCraty et al. 2004a, 2004b) the greater emotional significance of a future stimulus, the larger the physiological response to experiencing the stimulus. Prior research had shown that the heart rhythm directly reflects the processing of emotional experience in the body.

Figure 2.2 depicts the outcome of the HRV trials and Event related potentials (ERP). There were a number of important findings from this study. The first was that the heart receives 'informational input regarding the future emotional stimulus' (Bradley 2007 p.67). As where the gradient of the heart rate deceleration curve for the emotional trials starts to diverge from the slope for the calm trials (ibid). According to Bradley (2007 p.67)

this data suggests that the heart responds to the unknown stimulus in the same way it does when the future stimulus is known. Another finding is that there were significant differences in heartbeat evoked potentials between the calm and emotional trials, primarily in Condition 2, the psycho-physiological coherence state.

Especially noteworthy was evidence of an apparent interaction between the HREPs and ERPs in the females during the emotional trials. This suggests that input from the heart to the brain contains information pertaining to the future stimulus, and also that females may be more attuned to information from the heart. Overall, these findings suggest that intuitive perception is not a discrete function produced by a single part or system of the body alone – the brain – as previously thought. Rather, it appears that intuition is a system-wide response.

Figure 2. 2 Temporal dynamics of both heart and brain pre-stimulus response



Source: (Bradley 2007 p.68)

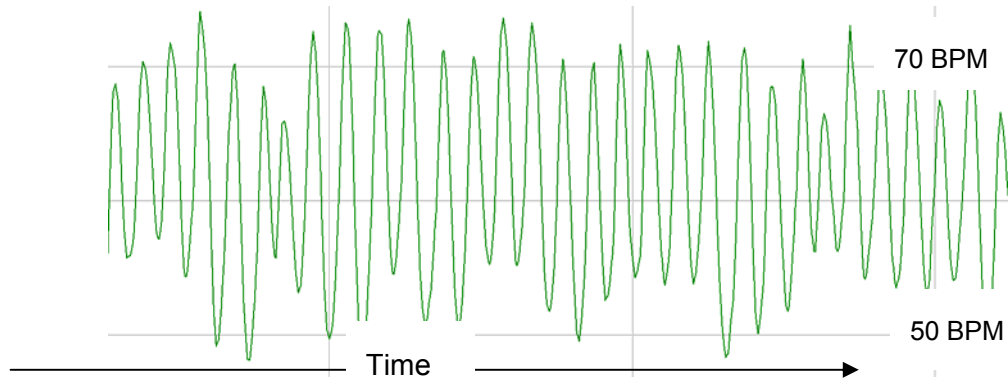
Figure 2.2 also shows that the heart rate deceleration curve for the emotional trials deviates from that of the calm trials (sharp downward shift) about 4.8 seconds prior to the stimulus (arrow 1), whereas the emotional trial (ERP) shows a positive shift about 3.5 seconds prior to the stimulus (arrow 2). This positive shift in the ERP indicates when the brain 'knew' the nature of the future stimulus. The time difference between these two events suggests that the heart received the intuitive information about 1.3 seconds before the brain (from McCraty, Atkinson, and Bradley, 2004b). The process involved at least the heart and brain working together to analyse and decode intuitive information (McCraty et al, 2004a, 2004b).

2.5 Coherence and the Role of the Heart

This thesis argues that the heart plays a significant role in the body's sensing and processing of information from non-local objects and events. Throughout history, many cultures and spiritual traditions have shared a regard for the heart as a source of emotion, courage and wisdom. McCraty, Bradley and Atkinson, through the Institute of HeartMath Research Center have explored the physiological mechanisms by which the heart communicates with the brain. They have experimented with many different types of psychological and physiological measures, and consistently found that the heart rate variability, stood out as being the most dynamic and reflective of our inner emotional states (Childre 1998).

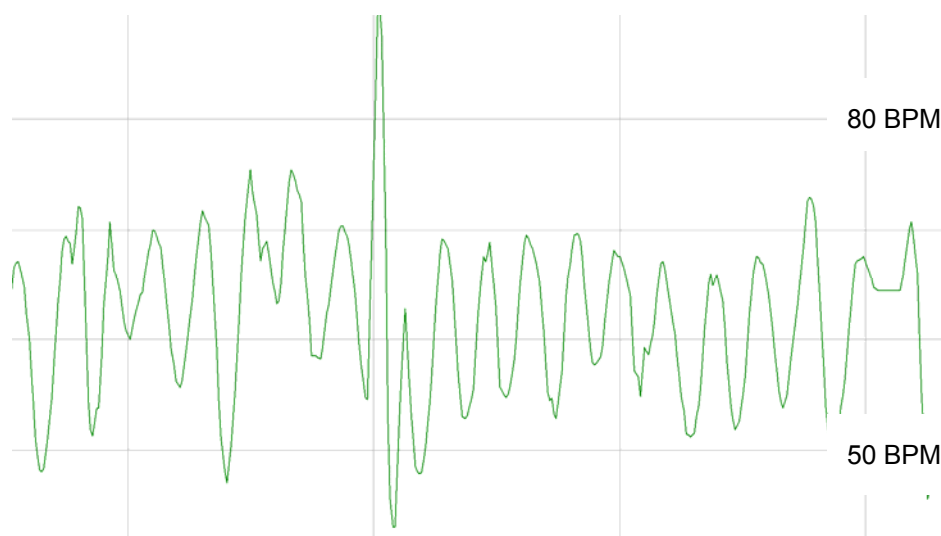
Many traditional conceptions of the heart, from widely differing cultures, have a common belief that the heart harbours an 'intelligence' which operates independently of the brain, yet in communication with it (McCraty et al. 2004a, 2004b). The bodies' psycho-physiological systems generates numerous energy fields that radiate out from the body. Of these, the heart generates the most powerful EM field (Bradley 2006b). Calming extraneous thoughts through the adoption of a positive mental state causes coherence, a state in which there is synchronisation between the heart brain and body, which results in smooth rhythmic patterns in the heart rate (figure 2.3). Synchronised oscillations across the wave field results in coherent interaction between the subject and the source of attention.

Figure 2. 3 Coherent Heart Rate Variation (HRV)



Once a person achieves coherence, they may enter into a positive state paying attention to some object of interest, such as a distant locale or a future event. This focus establishes a resonant relationship with the quantum level of the location or the future event. A positive emotional state induces a shift to a coherent wave field in the heart's beat-to-beat pattern of rhythmic activity (Bolte et al. 2003; McCraty 2002; McCraty and Atkinson 2003). See figure 2.3, coherent interactions. Bradley (1998) argues that individuals in a positive state are more likely to produce results which are more creative and holistic. They are also more likely to maintain a relationship of energetic resonance between themselves and an object of interest. Thus the importance of passionate attentional focus. Alternatively, a person who is under stress and has not achieved coherence will have an erratic heart rate, such as that shown in figure 2.3. The difference between figures 2.3 and 2.4 is the variation in heart rate, and the erratic nature of the heart beat. In figure 2.4 the result is asynchronous oscillations with no interaction/communication.

Figure 2. 4 Incoherent HRV



Electrical frequencies of the heart change dramatically when one is in a different emotional state, and this can affect those around. The impact of the heart is so effective that the heart rate can cause a change in their brain waves activity of people standing nearby (McCraty et al. 1996). Research shows that the heart is a highly sophisticated sensory organ and information processing system which contributes crucial input to the mental and emotional systems which it transmits to the brain and throughout the body ((Stamp 2000). McCraty et al, Bradley (2004a) and Radin (1997b and 2004) all agree that it is therefore an important element in the process of interconnectedness.

Biophysicists have found that the heart is a powerful electromagnetic generator because 60 percent to 65 percent of the cells of the heart are neural cells, not muscle cells, which generate a field that is affected by our emotional state (Stamp 2000). The heart is capable of processing and decoding information received through these interconnections (McCraty et al. 2004a). It is not only able to receive information, but also to generate information. It is in their outgoing and incoming fields that information is communicated.

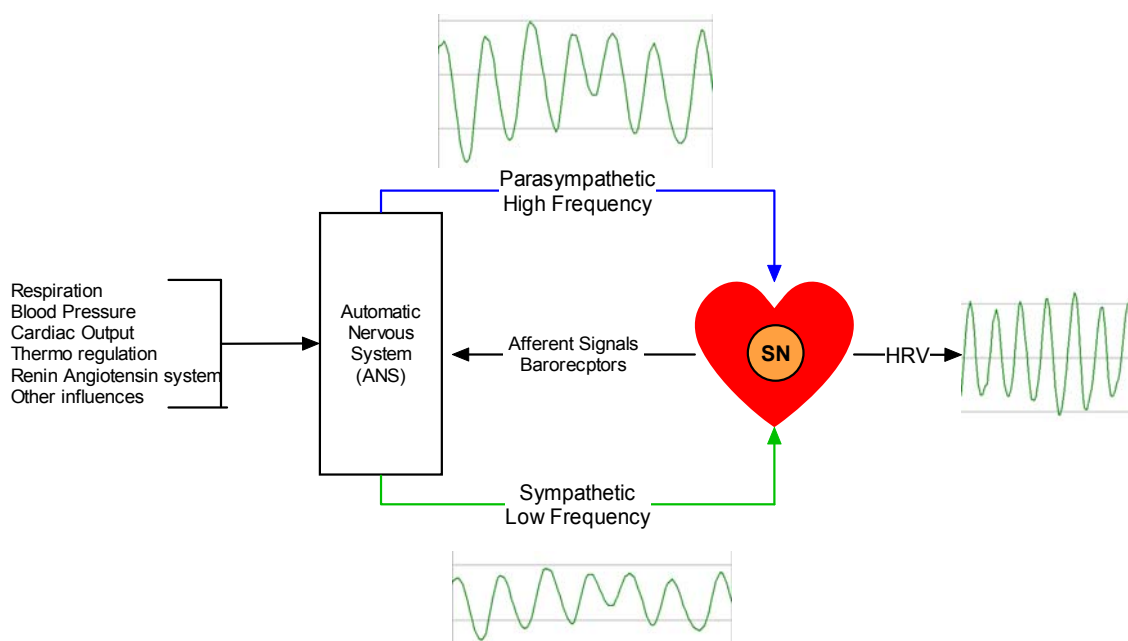
In addition to being an efficient pump supplying blood to our entire body, the heart also produces 2.5 watts, almost 60 times more electrical power than the brain. (Childre 1998).

The heart is the source of its own beating, through the sino-atrial node (SN) (otherwise known as the heart's pacemaker). The heart has an intelligence system which brings both the emotional and mental systems into balance. One's mental and emotional state affects the Heart Rate Variability (HRV) and this occurs through the heart brain connection through various sympathetic and parasympathetic links as depicted in figure 2.5 (Tiller 1997).

The sympathetic nerve link of the autonomic nervous system causes the heart rate to increase. When one is in a fight or flight situation, the sympathetic nervous system is called into action. It increases the energy expenditure, raises the blood pressure and raises the heart rate. The parasympathetic nervous system causes the heart rate to decrease. When one is in a relaxed state, the parasympathetic nervous system engages to save energy. Blood pressure decreases, and the heart beats slower. In both instances the degree of change depends on the activity in Automatic Nervous System (ANS). Therefore, the HRV will depend on the activity in ANS through the parasympathetic and sympathetic links. The ANS is part of the peripheral nervous system and controls many organs and muscles within the body. In most situations, the ANS functions in an involuntary, reflexive manner. For example, one does not notice when blood vessels change size or when our heart beats faster.

When anger and frustration are experienced, a chaotic pattern results which causes an incoherent rhythm. This rhythm indicates that the two branches of the nervous system – sympathetic and parasympathetic – are out of sync. The system is getting signals to speed up and slow down – at the same time! Just as driving a car with one foot on the brake and the other on the accelerator is not good for the car’s engine and wastes fuel, a chronically stressed nervous system is reflected by an incoherent heart rhythm (see figure 2.4) (Childre 1998).

Figure 2. 5 Sympathetic and parasympathetic affect on HRV



Source: Adapted from (Childre 1998)

Afferent signals also affect the ANS which in turn impacts on the HRV (figure 2.5). Therefore the heart's ability to sense information will also affect the HRV and this is believed to be a source of knowledge or wisdom that 'comes from the heart' that is argued here as non-local intuition which emanates from the quantum potential.

2.5.1 Quantum Theory

Quantum theory forms a pillar in what has become the new physics and provides the most convincing evidence that consciousness plays an essential role in the nature of physical reality - in that the observer and observed are inextricably interconnected (Davies 1990). Scientists are now working with energies fields⁴ that influence or explain behaviour (Bradley 2005; McCraty et al. 2004a; Radin 1997b; Tiller et al. 2001).

The quantum mechanical view of the world departs significantly from the accepted understanding of physics (Bohm and Peat 2000). Indeed, two of its most recognised theoreticians Niel Bohrs and Erwin Schroedlinger said that, 'anyone who is not shocked by quantum theory has not understood it' and "I don't like it and I'm sorry I ever had anything to do with it' (Wheatley 1999). Quantum theory is at present the most basic method available in physics through which it is possible to understand the fundamental and universal laws relating to matter and its movement (Bohm 1980). In quantum physics, the observer and the observed (sub-atomic particles) are inextricably linked. The notion of interconnectedness is not just a conceptual construct, the entanglement of everything in the universe at the quantum level is a peculiarity of quantum mechanics that has been empirically validated in repeated laboratory experiments (Aspect et al. 1982; Tittel et al. 1998))

Quantum phenomena does not exist as objective reality; at the quantum level electrons respond to a scientist's choice of measures, because in the quantum world relationships are the key determinants of everything (Wheatley 1999). This is not unlike the concept of *enactment* (Weick 1979). Weick observed that there is no objective reality in organisations and that the environment does not exist. Instead, it is co-created through the acts of observation. Eastern philosophy has known for many generations that the body's psycho-physiological systems generate numerous fields of radiating energy. Therefore, many evidence based western theoreticians such as Bohm have spent time

⁴ It is not within the scope of this work to delve deeply into the meaning of Energy fields. For more information I'd refer the reader to Tiller's (2001) work on Unconscious Acts of Creation.

with eastern philosophers to better understand how everything is interconnected. (Talbot 1991). Tiller (2001) has spent 25 years examining these subtle energies and their implications and has discovered that focussed intention can create an energy field which influences experimental measures. For this to occur there must be interpenetration of wave fields that create a connection between the percipient and the object of focus (Tiller 1997).

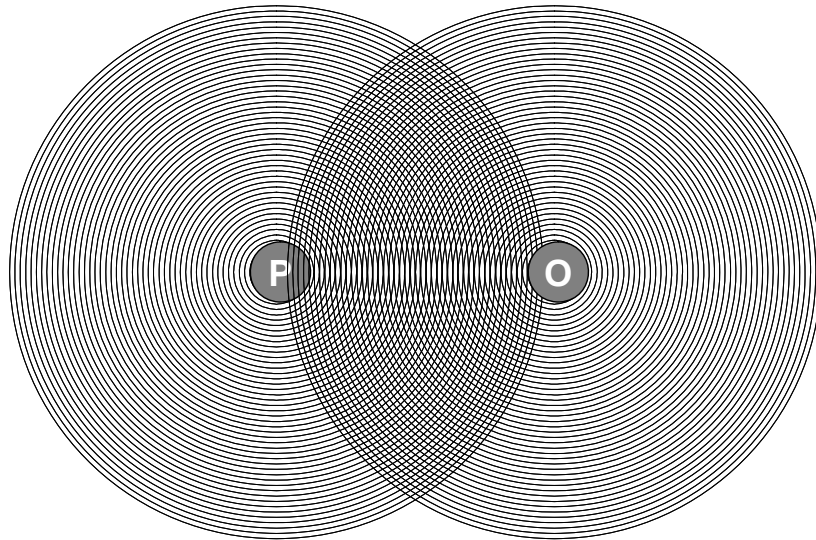
2.5.2 Interconnectedness

At the quantum level of reality, the number of paradoxes increases. Change happens in (quantum) jumps and beyond any power of precise prediction. The resulting behaviour is the outcome of quantum interconnectedness and a deep and intimate order (Bohm 1980; Wheatley 1999). There are no familiar ways to think about the levels of interconnectedness that seem to characterise the quantum universe.

The property of universal interconnectedness was demonstrated by Bell's theorem (Aspect et al. 1982).. His experiments showed that it was impossible to break the connection between a pair of entangled sub-atomic particles, even when each particle was separated by metres, which at the micro-scale, represents enormous distances (ibid). When the experimental condition was applied to one of the entangled photon pair, the other simultaneously changed its behaviour at the same instant. Aspect (1982) concluded that 'the photon pair is a non-separable object, that is, it is impossible to assign individual local properties to each photon'. Bradley (2007) and Mitchell (2004 p.155) argue that this suggests 'that all biomatter at all scales of organizations is informationally interconnected by non-local quantum coherence'. There are many examples of interconnectedness. Synchronisation occurs when two or more pendulum clocks are positioned side by side. Jazz musicians improvising often demonstrate a high degree of synchronisation where communication appears to occur outside conscious awareness. This type of sensing is not unique to humans. Throughout recorded history accurate premonitions of impending natural disasters by birds and animals have been recorded. A comprehensive study of animal's premonition concluded that pets can sense the return of their owners long before they can see or hear them (Sheldrake 1999).

The following de Moiré diagram (figure 2.6) depicts how interconnectedness between different objects and a percipient may occur. In order for coherent interaction to take place, the percipient and the object must resonate at the same frequency for a communication channel to open up much the same way a television or radio signal connects a transmitter and receiver.

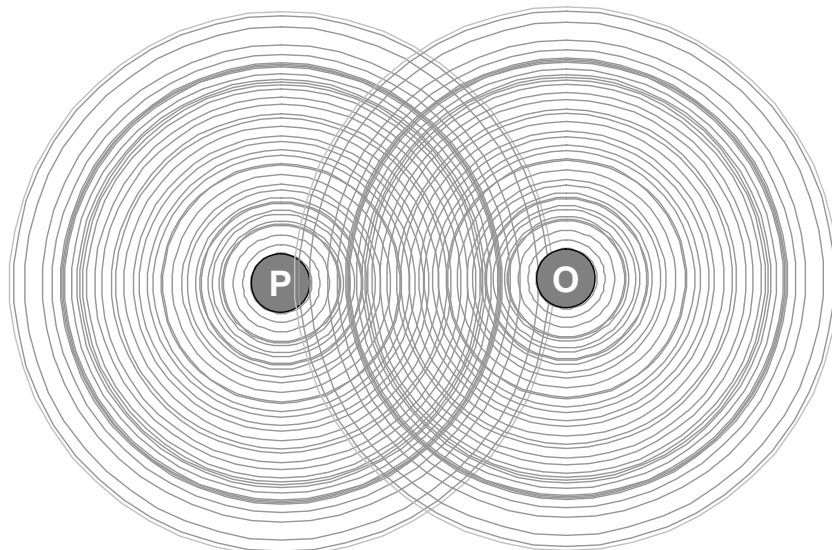
Figure 2. 6 Synchronous channels of interaction



Source: (Bradley 2006b p.82)

If the percipient and the object do not resonate at the same frequency (figure 2.7) then resonance does not occur and a communication channel does not open up between the percipient and the object.

Figure 2. 7 Asynchronous oscillations



Source:(Bradley 2006b p.82)

McCraty et al (2004a) are not the only ones to have challenged the conventional view of intuition. Other studies have challenged the perception that intuition is merely accessing forgotten information stored in the unconscious. Studies conducted by Bierman (2003), Radin (1997 and 2003) and Spottiswoode and May (2003) have all confirmed that the body can and does respond to events pre-stimulus (McCraty et al. 2004b). However, it is not suggested that decision making skills are an either or approach - analytical or intuitive. Adopting a dichotomous approach to decision making is an oversimplification of the decision making strategies that entrepreneurs adopt. Neither is it regarded that entrepreneurs rely exclusively on non-local intuition, or intuition as expertise. The following discussion explains how non-local intuition accesses a field of energy/information into which information about a future event is enclosed.

2.5.3 Non-Localities

Non-locality is an important aspect of intuition as sensing because it provides an explanation as to why information can be sensed beyond time and space. Mitchell (2000) argues that non-locality provides the only testable mechanism discovered to date which offers a possible solution to the host of enigmatic observations and data associated with such consciousness phenomena. The concept of non-locality was established in the field of quantum physics to provide a relatively intelligible and intuitively graspable account of how the quantum process may be described. Bohm (2000) uses the term 'active information' to emphasise the fact that although an electron moves under its own energy, the information in the form of its quantum wave or field directs the energy of the electron.

Bohm (2000) states:

When several particles are treated in the causal interpretation then, in addition to the conventional classical potential that acts between them, there is a quantum potential which now depends upon all the particles. Most important, this potential does not fall off with the distance between particles, so that even distant particles can be strongly connected. This feature, in which very distant events can have a strong influence, is what is meant by a non-local interaction and is strongly at variance with the whole spirit of classical mechanics (Bohm 2000).

In 1964, J.S. Bell published a theorem that provides evidence for the existence of

non-locality. The origin of Bell's research was a famous 1935 paper by Einstein, Rosen and Podolsky (EPR). Its title was 'Can Quantum-Mechanical Description of Physical Reality be Considered Complete?' EPR considered what Einstein referred to as 'spooky action-at-a-distance', which seems to be part of Quantum Mechanics. Einstein, Rosen and Podolsky postulated that quantum mechanics was either incomplete, because of a hidden variable, or was outright wrong. Therefore, Bell's aim was to uncover the hidden variable that was the cause of non-local interaction between particles. Bell (1964) found that nature provides strong evidence of a non-local form of interaction. In 1982 Alain Aspect and his team confirmed that under certain circumstances subatomic particles such as electrons are able to instantaneously communicate with each other regardless of the distance separating them. Whilst quantum theory has its critics, one aspect that is not in dispute is non-locality (Bradley 9th Feb 2007, pers. Comm.). Yet, how can we explain non-locality given that it violates Einstein's long-held tenet that no communication can travel faster than the speed of light?

2.5.4 Holography

The holographic model received empirical support in 1982 when a research team in Paris, led by physicist Alain Aspect, demonstrated that the web of subatomic particles that compose our physical universe possesses what appears to be holographic properties (Benson 1999). The theories of a holographically-based universe were originally championed by two of the world's most eminent thinkers: David Bohm, a physicist, and Karl Pribram, a neurophysiologist from Stanford University. Bohm, believes Aspect's findings imply that objective reality does not exist, and that despite its apparent solidity, the universe is at heart a phantasm - a gigantic and splendidly detailed hologram (Talbot 1991).

A hologram is a three-dimensional photograph made with the aid of a laser. To make a hologram, the object to be photographed is first bathed in the light of a laser beam. Then a second laser beam is bounced off the reflected light of the first and the resulting interference pattern (the area where the two laser beams commingle) is captured on film.

The important appeal of holographs is the principle of distributedness. Any fractional portion of the recorded hologram contains sufficient information to reconstruct the complete original 3-D information pattern⁵. If a hologram of a plant is cut in half and then

⁵ A hologram is a lenseless method of recording light phase and intensity, the result is a unique way of storing information. Each individual part of the picture contains the whole and the whole picture is in a condensed form Zohar, D 1990, *The Quantum self: Human Nature and*

illuminated by a laser, each half will still be found to contain the entire image of the plant.

Indeed, even if the halves are divided again, each clip of film will always be found to contain a smaller yet complete version of the original image. Unlike normal photographs, every part of a hologram contains all the information possessed by the whole. The 'whole in every part' nature of a hologram provides us with an entirely new way of understanding organisation and order, for western science has laboured under the bias that the best way to understand a physical phenomenon is to dissect it and study its respective parts. A hologram teaches us that some things in the universe may not lend themselves to this approach. If we try to take apart something constructed holographically, we will not get the pieces of which it is made, we will only get smaller wholes.

This insight suggested to Bohm another way of understanding Aspect's discovery. Bohm (1980) believes that the reason subatomic particles are able to remain in contact with one another regardless of the distance separating them is because their separateness is an illusion. He argues that at some deeper level of reality such particles are not individual entities, but are actually extensions of the same fundamental something (Talbot 1991). Pribram was attracted to the holographic model by the puzzle of how and where memories are stored in the brain. For decades numerous studies have shown that rather than being confined to a specific location, memories are dispersed throughout the brain. In a series of landmark experiments in the 1920s, brain scientist Karl Lashley found that no matter what portion of a rat's brain he removed he was unable to eradicate its memory of how to perform complex tasks it had learned prior to surgery. The only problem was that no one was able to come up with a mechanism that might explain this curious 'whole in every part' nature of memory storage.

Then in the 1960s Pribram encountered the concept of holography and realised he had found the explanation brain scientists had been looking for. Pribram believes memories are encoded not in neurons or small groupings of neurons, but in patterns of nerve impulses that criss-cross the entire brain in the same way that patterns of laser light interference criss-cross the entire area of a piece of film containing a holographic image. In other words, Pribram believes the brain is itself a hologram (ibid 1991). Pribram's theory also explains how the human brain can store so many memories in so little space. It has been estimated that the human brain has the capacity to memorise something in the order of 10 billion pieces of information during the average human lifetime. A great deal of research exists regarding holographs in nature and these studies show that

Consciousness as defined by the New Physics, Quill/William Morrow, New York..

dolphins, bats, fish, flies, birds, as well as humans all process sensory information holographically (Bradley 2006).

Similarly, it has been discovered that in addition to their other capabilities, holograms possess an astonishing capacity for information storage. Simply by changing the angle at which the two lasers strike a piece of photographic film, it is possible to record many different images on the same surface. The storage of memory is not the only neurophysiological puzzle that becomes more tractable in light of Pribram's (1991) holographic model of the brain. Another is how the brain is able to translate the large amount of information it receives via the senses (light frequencies, sound frequencies, and so on) into the concrete world of our perceptions.

Encoding and decoding frequencies is precisely what a hologram does best. Just as a hologram functions as a sort of lens, (a translating device able to convert an apparently meaningless blur of frequencies into a coherent image), Pribram (1971) believes the brain also comprises a lens which uses holographic principles to mathematically convert the frequencies it receives through the senses into the inner world of our perceptions.

It is argued here that the entrepreneur's alertness and passionate attention is the biological energy activated in his or her emotional connection to the object of interest, which attunes him or her to an object of unfolding patterns of activities (Bradley 2006) and to the implicit order of its future potential (Bohm 1980). Quantum holography bridges the spatial and temporal elements of non-local information transmission. It links quantum theory with the holographic communication of information.

Broadly speaking, there have been two approaches in recent works to build a scientific explanation for communication of intuitive information. The most common approach is based on various applications of holographic theory. The other is based on an extension to the space-time dimensionality underlying relativity theory – EM information transmission which is discussed in appendix 1.

There are a number of similarities between these two propositions of quantum holography and EM information transmission. They both use interconnectedness and inseparability of everything at the quantum level as a means to achieve non-local information communication. Both assign a key role to the body's emotional and mental state in establishing bio-energetic connection to the energy fields of their external environment through which non-local information can be communicated Bradley (2006a). Bradley (2006a) argues that Mitchell (2000), Marcer and Schempp's (1998) theory of quantum hologram seems to fit best with the physics and psycho-physiology of the information processing involved in intuitive perception. It combines the information

storage capacity and processing efficiency of holography with the inherent interconnectedness of objects and events at the quantum level, to create a theory which explains intuitive perception of objects or events over great distances.

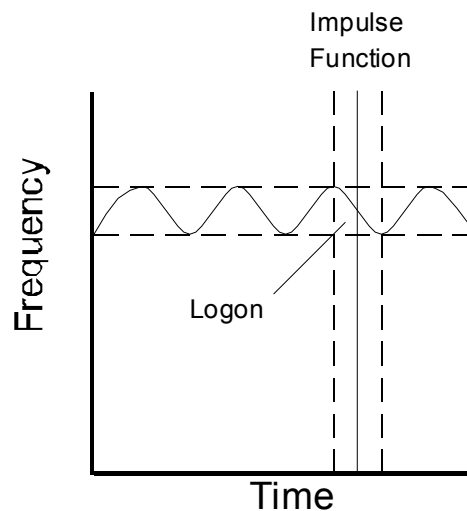
2.5.5 Quantum Holography

Marcer, (1997), Schmepp (2000) and Mitchell (2001) combined the information processing efficiency and storage capacity of holograms with the inherent interconnectedness of objects at the quantum level to create a theory that explains this model of information processing (non-local intuition). Using this model of intuition the receiver's behaviour is affected by their ability to sense information, in that the receiver and the source of information are in a resonant relationship. Although quantum holography is a theoretical construct, researchers assert that there are no technical obstacles to its existence (Benson 2000).

Quantum holographic theory is built on non-local quantum interconnectedness as a medium for the transmission of information. As previously mentioned, any fractional portion of a hologram contains sufficient information to reconstruct the complete original 3-D information pattern (Benson 1999). This information is encoded into the movement of energy and distributed throughout a field of potential energy to all points and locations, enabling anybody to receive that information from any location (Bradley 2006).

Quantum holography is based on the Logon. The Logon is an energy based concept of information which is essential to the hologram which was invented by Nobel Laureate Dennis Gabor (1946).

Figure 2. 8 Logon diagram

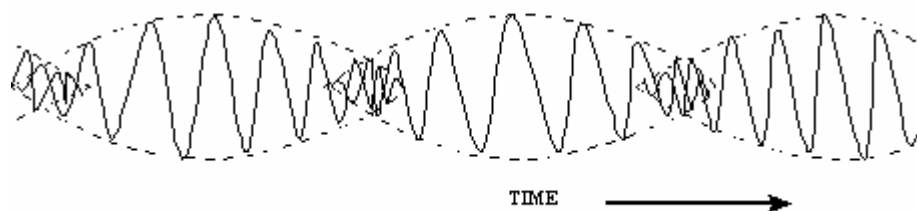


Source: (Bradley 2006)

The Logon, also known as a quantum of energy, is the smallest area in space and time in which a signal can be encoded as a pattern in the movement of energy and still maintain its fidelity (figure 2.8). The Logon provides the foundation of a non-determinist holographic organisation. This signal is the modulation product of a harmonic oscillation (of energy) of any frequency with a pulse in the form of a probability function (Bradley 2006b, 2006). An important point which relates to the question of free-will is that Logons are not discrete units, they occur as space-time-constrained sine waves wrapped in a probability envelope. They are a series of overlapping units in which the 'heads' and 'tails' of adjacent units interpenetrate (figure 2.9).

This is the essence of quantum theory where reality remains as a matter of probabilities. This paradox is best reflected in the wave particle duality where the future is just potential and does not manifest itself until there is focus on it. The behaviour of subatomic particles is either wave-like or particle-like simultaneously. On their own, neither can explain their essence, yet one can only measure them when a choice is made to measure either a wave or a particle.

Figure 2. 9 Representation of the overlap among logons

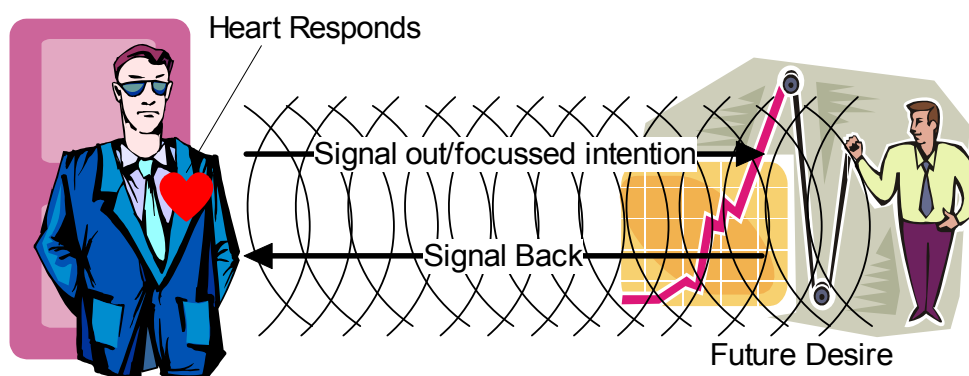


Source: (Bradley 2006)

This overlap represents indeterminacy, in that the data in each unit is enfolded into the data of adjoining units. This overlap among logons contains an overlap with the future (Gabor 1946) and explains how information is communicated at the quantum level.

Everything in the universe is in a constant state of oscillation at different frequencies. These energetic oscillations generate energy wave fields that radiate outward and interact with other wave fields. As two wave fields interact with each other, 'part of the wave is reflected directly from the object's surface and part of the wave's energy is absorbed, causing the object to become energised and emit another wave back towards the source of the initial wave' (Bradley 2006) (see figure 2.10).

Figure 2. 10 Wave field interactions



'The interaction between these wave fields generates an interference pattern which encodes the object's internal and external organisation and its event history' (Bradley 2006). An example of this effect has been found in nuclear medicine wherein the returning wave in functional magnetic resonance imaging (fMRI) contains non-local

quantum information about the object's internal organisation as well as the micro and macroscopic features (Schempp 1992).

At the quantum level, 'each point of intersection in the interference pattern is a quantum hologram, containing quantum-level information reflecting this macro-scale process' (Bradley 2006). Because each point of 'intersection involves an interaction between wave fronts, in which the movement of energy in one wave front is constrained by the movement of the other, it is equivalent to Gabor's (1946) unit of energetic information, the Logon' (Bradley 2006).

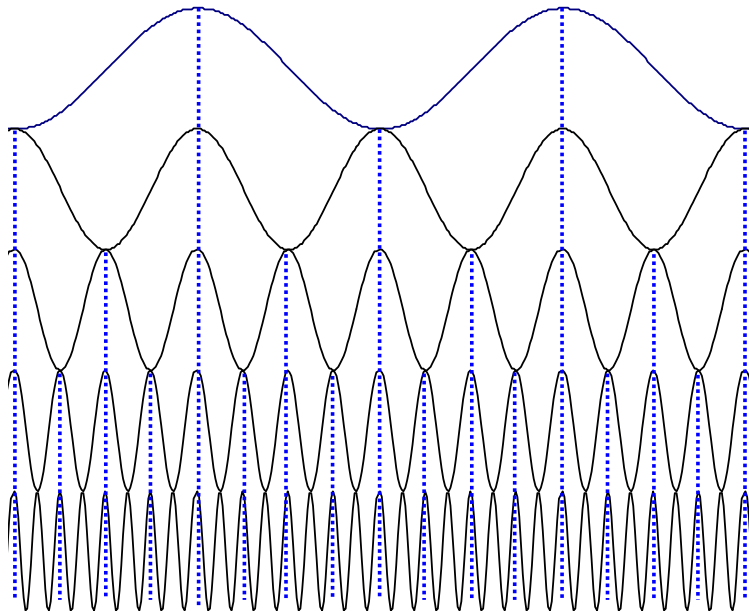
This means that the quantum hologram is a space-time-constrained hologram (Pribram 1991). 'Since each logon contains non-local information about the past and the future, then each quantum hologram also contains quantum level information about the past events and the future organisation of the object with which it is associated. This provides an information processing mechanism by which moment-by-moment intuitive anticipation of future order can occur, such as that involved in rapidly moving animal collectives like shoals of fish and flocks of birds' (Bradley 1996; Bradley and Pribram 1998).

In order for a shoal of fish or a flock of birds to move rapidly as a collection there has to be a coherent interaction. When two (figure 2.6) interpenetrating wave fields are generating synchronised, oscillations occur at the same energy frequency, and a channel of coherent interaction is created connecting the object source points of the two wave fields (Bradley et al. 1998). This connection is a Logon transmission pathway for optimal information communication. This does not hold for interaction between wave fields of different energy frequencies (see figure 2.7). Effective communication is blocked by an incoherent pattern of interpenetration between the two wave fields. However, 'when wave fields at different energy frequencies oscillate in harmonic resonance, as shown in figure 2.9, a coherent channel of communication emerges from synchronised oscillations across the wave fields' (ibid).

A wave field constitutes a harmonic series when, 'two waves, four waves, eight waves, or more per cycle, synchronise wave peaks and troughs across the series' (ibid). This creates a channel of communication across the different frequencies of individual wave fields (depicted with a dashed vertical line in the figure 2.11). 'This provides for a Logon transmission pathway for non-local information communication across different scales of organisation – from the quantum level micro-scale domain, to the four-dimensional macro-scale world, and vice a versa. Since the overlap among Logons means information about future order is enfolded, it is suggested that this creates an information

processing mechanism by which foreknowledge of the future is contained in the logon or quantum hologram' (ibid).

Figure 2. 11 Synchronised oscillations across wave fields



Source; (ibid., p.14)

2.5.6 Where to from Here: The next step?

No single dimension or aspect is emphasized as the essence of entrepreneurship. Instead, the approach is multidimensional in that entrepreneurship, which is seen as one aspect of a continuous variation, innovation and selection, is part of the ongoing process of human life (Greenfield and Strickon 1986).

Entrepreneurship is a very complex process involving many influences, the result of which is a confluence of the individual, the environment and the opportunity (Timmons 2002). This research aims to provide evidence of the ways in which entrepreneurs obtain information and make decisions, a manner which involves more than just the cognitive processes.

Evidence from the literature suggests that individuals process and use information in ways that are not generally in keeping with rational/logical approaches. However, there is a propensity to engage in linear planning methods in which there is a high expectation of a predictable outcome. It is argued that the process of new venture creation is a

complex phenomenon involving a disparate number of variables making the new venture creation process anything but predictable. The purpose of this research is to shed some light on some of these mysteries.

As non-local intuition is a new approach to understanding intuitive decision making, the aim here is three fold: a) to find a group of individuals who demonstrate intuitive sensitivity; b) to find a method to measure this information transmission; and c) to determine whether indeed it can be measured.

From an entrepreneurial perspective, the role of antecedents, nature, upbringing and society will affect the individual and his or her propensity to become an entrepreneur. A number of other entrepreneurship researchers (Bygrave 1989a; Campbell 2003; Gillin and Campbell 2002; Hindle 2004) regard entrepreneurship as insolubly holistic in nature. The connections between society and the individual are indivisible because 'what was previously thought of as separate entities are the fundamental ingredients of all creations' (Wheatley 1999), the connection between all life (Bohm 1980).

Therefore this researcher's framework encapsulates the belief in the non-linearity of the entrepreneurial process which is captured in a holistic approach through the fundamental interconnectedness of the human existence. The data collection, observations and analysis are examined from this standpoint providing the following propositions.

2.5.7 Review and Propositions

The propositions used in this research are derived from the entrepreneurship literature, the role and importance of intuition to decision making, and information transmission using quantum holographic theory. Furthermore, the aim of the literature review was to provide the researcher with an understanding of the elements important to entrepreneurial decision making. A number of propositions were derived from the literature.

From the literature review, it can be seen that intuition can be the result of learned expertise or sensing. Learned experience (as intuition) is embedded in the cognitive aspects of an individual, whilst intuition (non-local) through sensing, is the result of information in the quantum potential. This research proposes that repeat entrepreneurs experience intuition not just as learned experience but also non-locally, which is argued here is an important aside to an entrepreneur's overall decision making strategies.

Intuition is a more appropriate method of decision making for entrepreneurial behaviour because some styles of knowing are more important than others in the determination of

appropriate options (Allinson et al. 2000), and that entrepreneurs have a preference for 'seeing the bigger picture' (Mitton 1989). The level of uncertainty faced by the entrepreneur is substantially greater than managers of well-established firms who have access to historical trends, past performances and the resources to research the future potential opportunities for that firm (Ucbasaran et al. 2001). In contrast, small firms, or new firm owners, have to rely on their own skills and limited resources to determine future strategies and opportunities.

A challenge for both small and large businesses alike is the amount of information available, which affects both CEOs and entrepreneurs. Studies have found that when too much information is available there is a tendency to paralyse the decision maker, particularly if they have a propensity to take a rational approach, the more options available the higher the likelihood of 'paralysis through analysis' (Eisenhardt and Zbaracki 1992).

In today's highly competitive marketplace, starting a firm, let alone managing one, requires rapid decision making. Accessing the resources necessary in a timely fashion to start a new firm is critical because any competitive advantage or opportunity has a limited life. Because of that limited life, and the time value of money entrepreneurs expedite their market entry and exploitation of their competitive advantage or opportunity. According to Miller and Ireland (2005), rapid decision making may be the only possible approach when resources such as time and funds for decision support are constrained.

Intuitive decisions have an emotional basis (Bradley 2006; Burke and Miller 1999; Kahneman 2003a; La Pira and Gillin 2006) and it may be negative or positive (Bradley 2006), but it appears to provide guidance when critical decisions have to be made.

The important conclusions from previous studies is that intuitive perception of future events are related to the degree of emotional significance of that event (Bradley 2006). Therefore, passionate attentional interest may be a significant factor in the intuitive capacity of entrepreneurs, which provides a role for the heart in responding to intuitive information.

Proposition One: - The selected cohort of entrepreneurs have a greater propensity for intuitive decision making.

Proposition Two: – Entrepreneurial decision-makers have a propensity to make decisions that are consistent with intuitive decision making.

Proposition Three: - Psycho-physiological measures can discriminate intuition in

entrepreneurial decision-makers.

Proposition three will be tested using the psycho-physiological test. For the purpose of testing this proposition Bradley was asked to elaborate on his passionate attentional interest. (Pers comm. March 2008). Bradley (2008) proffered that passionate attentional interest comprises of passion and focus. For an entrepreneur to have a passionate attentional interest in an object or event they must focus their effort on its outcome.

2.5.8 Research Questions and Themes

The research questions and themes chosen aim to determine if a particular cohort of entrepreneurs have a greater propensity for intuitive decision making using a triangulated approach and, specifically, through the development of an experimental protocol that can measure the signal processing of a percipient. This research is testing for non-local intuition with a tool that has been adapted to measure the psycho-physiology of entrepreneurs. In order for these objectives to be achieved the following questions need to be resolved:

- Which group of entrepreneurs is most likely to exhibit a propensity for intuitive decision making? (It is pointless to measure intuitive decision making in entrepreneurs if their preferred style may not be intuitive.)
- What is the preferred decision making style of entrepreneurs, rational or intuitive? (It is important to establish whether intuitive decision making is important, and to what extent it is used.)
- To what extent do entrepreneurs rely on their intuition for decision making in operating their firms? (The intention is to determine the amount of analysis that has gone into their decision to choose their particular industry or business. Is there an identifiable system or process used in making decisions?)
- What are the critical factors that contribute to entrepreneur's propensity for intuitive decision making? (The aim of this final question is to uncover whether the entrepreneur's decision making is influenced by feelings sensed or perceived in the body and mind as certainty of knowledge or feeling.)

2.6 Summary

This chapter has taken the reader on a journey through the entrepreneurial decision making literature, the literature on quantum theory and the role of the heart to arrive at the issues relevant to the focus of this research. The key issues covered are that entrepreneurship is a multi-disciplinary construct, which requires an approach that

considers the complexity inherent in such a construct. It is this approach that is considered relevant in providing a better understanding of the entrepreneurship is holism.

The intuition construct has been discussed, including its current understanding in the literature and the limitations to its understanding. Therefore, this work proposes that an original approach be considered to developing an understanding of the importance of intuition. This original construct takes an empirical perspective in gaining an appreciation of how entrepreneurs make decisions.

This thesis aims to use an empirically validated psycho-physiological approach used by McCraty et al (2004a and b) and Radin (1997) to attempt to measure the non-local intuition of entrepreneurs. How this will be conducted will be discussed in the next chapter on research methodology.

3.0 Research Method and Data Collection

3.1 Introduction

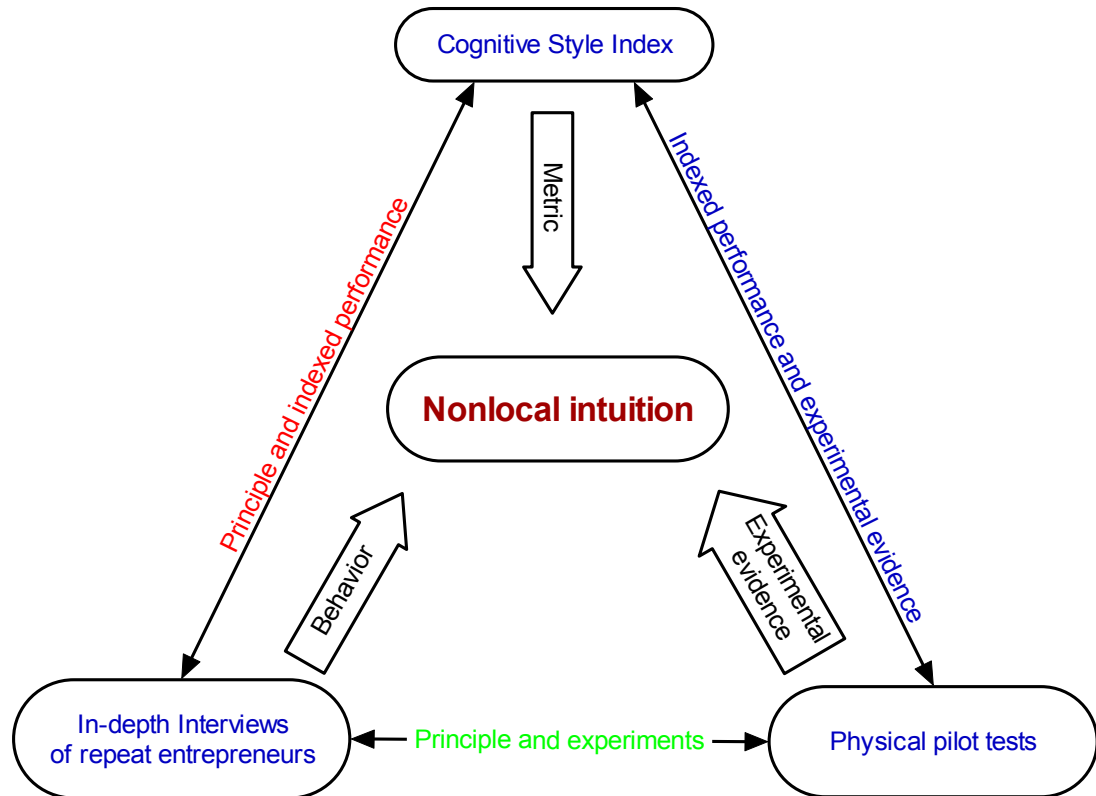
Understanding the type of intuitive decision making strategies employed by entrepreneurs requires a novel methodological approach. As this work proposes a uniquely different understanding of intuition, a pilot study approach has been adopted. The first step was to choose the most appropriate cohort of entrepreneurs. Once an appropriate group of entrepreneurs was chosen, it was then necessary to develop an approach which could differentiate between intuitive and rational decision making.

If indeed intuition was used in entrepreneurial decision making, then the approach adopted must determine the factors that influence or entice entrepreneurs to use their intuition, rather than rational decision making, so as to ensure that it is intuition that is being measured. Furthermore, it was necessary to differentiate between intuition as learned behaviour and non-local intuition. For this purpose, a pilot experimental protocol was devised with the assistance of the Institute for Heartmath.¹

As a pilot study approach was used to determine the validity of this conceptual framework, a control group was not included because the aim was to assess the validity of non-local intuition and to determine whether it could be measured. A triangulated approach was used involving a case study approach. The case study approach incorporated a self-report questionnaire (CSI), an interview and an experimental protocol as depicted in figure 3.1. The data collected from each apex of the triangle was then compared and contrasted with the data collected from the other apexes.

¹ See appendix 2 for more information on the Institute for Heartmath

Figure 3. 1 Data Triangulation



This research began by screening entrepreneurs. A validated survey instrument (CSI) was used to screen the propensity of interviewees to use either an intuitive or analytic approach to decision making. Based on the results of the CSI, entrepreneurs who demonstrated a score in the intuition range were invited to participate in a semi-structured interview in accordance with an agreed protocol. The results of those interviews were analysed using a qualitative software program known as NVivo®. Participants were then subjected to a electrophysiological test to measure whether intuitive decision making had a physiological affect.

3.2 Participant Selection

Given the importance of intuition to decision making in business, it was considered important to select a group of entrepreneurs who had significant business experience, and whose success could not be attributed to luck alone. For this reason, repeat entrepreneurs were chosen. It was postulated that if entrepreneurs have a propensity for intuitive decision making then repeat entrepreneurs are more likely to have a greater propensity for intuition and therefore possess a higher level of sensitivity to

intuitive signals, providing a greater likelihood that such an effect could be measured using the available instrumentation.

The selection of participants for this research was made to assist in the development of a pilot study to empirically validate the conceptual framework using an electrophysiological experiment involving a new experimental protocol. A control group was not used because it was important to have a cohort of participants who had a propensity for intuition and could help in the development of the pilot experiment.

It was considered important to determine whether there was an appropriate intuitive signal related to intuition and whether or not it could be measured. The introduction of a control group for the development of the experimental protocol was inappropriate until such time that the experimental protocol could be refined and tested to determine its efficacy. As successful repeat entrepreneurs are not 'one hit wonders', it is believed that this group was most likely to demonstrate a propensity for intuitive thinking. It was hypothesised that repeat entrepreneurs would have to deal with a greater level of ambiguity because they had many more decisions to make due to fact that the complexity of issues increases exponentially with each new business, particularly if the firms were in diversely different industries.

To be considered a repeat entrepreneur, the entrepreneurs must have employed at least five staff. Each participant was required to have, or have had, at least two successful businesses which were created sequentially or concurrently. Whilst the entrepreneur was required to be the founder and owner of the business, they need not have been the sole founder. Success was assumed to mean that the entrepreneur made a profit - no minimum criteria was laid down as to the level of profitability. The entrepreneur's opinion as to whether the firm was profitable² (or not) was taken as given. Retired entrepreneurs were also included in the cohort of research participants.

² Profitability was considered a mark of success. Firms that were closed or sold due to their failure to achieve an acceptable return on investment were not considered successful.

Table 3. 1 Research participants

Participants involved in the data collection					
Total	Sex M/F	CSI	Interviews	Experiments	
				S1	S2
33	29/4	33	16	8	9
				Total = 17	

3.2.1 Unit of Analysis – Repeat Entrepreneurs

'The proper study of entrepreneurship can only happen through the study of the entrepreneur' (Mitton 1989 p.10). Despite the limitation of the personological research method, it seems counter-intuitive to ignore individual differences (Krueger 2003), particularly individual differences in decision making styles. For repeat entrepreneurs, uncovering opportunities for a new venture is a pre-occupation (La Pira and Gillin 2005). They appear to identify opportunities based on cues or signals from the environment that they filter and process through a number of mechanisms (Krueger 2003). Shapero (1975) uses the analogy of an 'antennae', suggesting that entrepreneurs have their antennae tuned to opportunity recognition frequencies.

Fiet et al (2004) urges researchers to focus on repeat entrepreneurs because their success is not due to providence alone. They are most likely to have learned or developed particular strategies or heuristics in their selection, evaluation and exploitation of new ventures. If 80 percent of new ventures last less than five years (Headd 2001), then the probability of a repeat entrepreneur surviving more than five years in two ventures is only four percent. The probability of surviving in three or more ventures is less than one percent.

3.2.2 Convenience Sample

The identified cohort of repeat entrepreneurs were from a convenience sample. The choice to use easily accessible repeat entrepreneurs was necessary as repeat entrepreneurs are not only difficult to find but, as they have many companies and therefore many commitments, they are short on time. The members of this sample were found in a number of different ways. They were graduates from the Australian Graduate School of Entrepreneurship, alumni of Swinburne University of Technology,

from the researcher's personal network in his home town of Ballarat, and from the supervisor's network which extends to the Cambridge Technopol in the United Kingdom.

Initially, over 50 repeat entrepreneurs were provided with the CSI assessment sheet and 33 were deemed appropriate subjects. Sixteen were interviewed only, and a further seventeen were both interviewed and took part in the pilot experiment. The final number of entrepreneur/participants used for this research and their contribution is depicted in table 3.1. Of the 30 participants, only four were female.

3.2.3 Rationale for the Number of Cases Selected

Sample size is paramount in both quantitative and qualitative research, and even more so in qualitative research because it requires the careful selection of appropriate samples. Sample selection is crucial to qualitative research where interactivity with the population sample is the standard approach to data collection (Leedy 1997) thereby limiting the sample size. To increase the potential for an enhanced effect, neither polar cases nor random selection of respondents was employed in this pilot study. Eisenhardt (1989) argues that neither is necessary because cases should be selected so they can replicate or extend the emergent theory. Furthermore, 'selection of an appropriate population controls extraneous variations and helps to define the limits for generalizing the findings' (ibid p.537).

Both Eisenhardt (1989) and Yin (2003) suggest that the ideal scenario in case study research is to have multiple cases and to select the appropriate number of cases until data saturation is achieved. Multiple cases were chosen because the analytic benefits derived are substantial, for instance it expands the external generalisability of the conclusions (Yin 2003). According to Eisenhardt (1989), what is considered to be 'multiple cases' is as little as four or a maximum of ten cases. Beyond ten cases, Eisenhardt (1989) argues the data becomes unmanageable.

Alternatively, Yin (2003) argues that five or six cases will suffice if a high degree of certainty is sought. (Yin 2003 p.52). Furthermore, when contextual factors create complexity in the provision of external validity, a greater number of cases should be studied to ensure replicability of the findings (ibid 2003). Conversely, when external conditions are thought not to produce a high degree of variation in findings, a smaller number of cases is sufficient.

A number of cases in excess of those proposed by Yin (2003) and Eisenhardt (1989) was used. The issues that played an important role in the selection of case numbers were as follows:

The lack of credibility of qualitative research in the field of entrepreneurship;

Non-local intuition has not been incorporated into entrepreneurial decision making before;

Deliberately choosing repeat entrepreneurs to enhance any measured effect;

NVivo™ was used to analyse the data and that mitigated the excess workload.

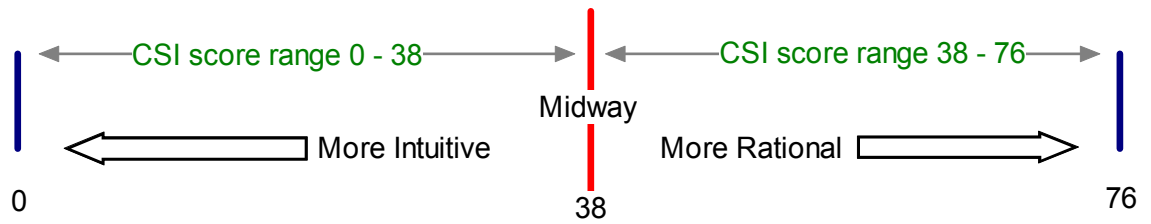
3.2.4 Screening Participants: The Cognitive Style Index (CSI)

The instrument required to screen the participants for a propensity for intuition was required to be an easy to use, self-assessment tool so as not to be too time consuming and cumbersome. Allinson et al (1996) argued that the main problem with the existing instruments were: some were too cumbersome to be used for large scale studies; others were too awkward to be administered; some required trained individuals to code; some instruments required six to eight hours of preparation; and for the few easy to use, self-reporting measures of cognitive style there was a lack of independent evaluation. The tool found to be appropriate for this research was the CSI (Allinson and Hayes 1996).

The CSI is a proprietary instrument developed and owned by Allinson et al (1996). Allinson and Hayes (1996) provided the measuring tool, the score-key and the relevant publications (Allinson and Hayes 1996), providing evidence of the validity and reliability of CSIs.

The CSI (appendix 3) is a self-report questionnaire, which consists of 38 questions. The aim of these questions is to ascertain whether a respondent's cognitive style is either analytical or intuitive. The instrument is designed so that a person who is analytical is most likely to achieve a high score - maximum of 76. A person who is inclined to use both intuitive or rational decision making would achieve a score of 38 (midway), whilst an individual with an intuitive decision making propensity would score less than 38 (figure 3.2).

Figure 3. 2 CSI score's relation to decision making style



Allinson and Hayes (2000) proposed that one could discern whether a person was more inclined to rational or intuitive behaviour based on their cognitive style, and that this could be determined using their CSI. Cognitive style is defined as the consistent individual differences in preferred ways of organising and processing information (Messick 1976). Whilst the CSI was used to measure the repeat entrepreneurs' propensity for non-local intuition, it is acknowledged that this may not be what Allinson and Hayes (1996) had in mind when they designed the instrument.

Allinson and Hayes regard intuitive people as those individuals who have more infra-conscious than conscious associations (knowledge). These infra-conscious associations have relatively weak or ill-defined perceptual expectancies and, therefore, a stimulus can be more complex, novel, surprising, ambiguous, or incongruent without appearing excessively out of line with past experience (Hayes et al 2003a). Hayes et al (2003) regard intuition as stored knowledge as it relates to past experience. Nevertheless, in the absence of a tool designed especially for non-local intuition, the CSI was adequate because all the factors associated with the cognitive based form of intuition still apply to non-local intuition and are tested in the CSI. The difference between this research and the source for the CSI tool used to measure intuition is in the origin of the knowledge derived for the decision – the quantum realm.

The only element not measured by the CSI was whether or not the decision-maker was influenced by feelings towards a decision – that is, if the decision felt right or wrong. This was accounted for during the interview process and the psycho-physiological experiment which is the focus of proposition three in understanding the importance of passionate attentional focus.

3.3 Methodological Debate

Much of the research conducted by entrepreneurship scholars focuses on any one of a number of disciplines. To understand what entrepreneurship is and what it involves, an appreciation of numerous interrelated factors is required (Hindle 2004), not to mention

the most difficult unit of analysis to measure: the human element (Gillin and Campbell 2002). With this in mind, this research takes a subjectivist holistic approach using the case study method.

3.3.1 Qualitative or Quantitative?

Researchers from disparate disciplines adopt a particular strategy when conducting research. For instance, economists choose quantitative analysis, whilst anthropologists favor ethnographic data collection and still others have a preference for case study analysis. There is a tendency for researchers to follow an established research strategy common to their discipline (Neuman 1997). In the field of entrepreneurship there has been a proclivity for a positivist approach, which is not the case in the social sciences generally where, of late, there has been a greater preponderance for qualitative research (Hindle 2004).

The quantitative approach has its roots in Aristotelian logic. Philosophers argue that in modern physics the more you adhere to the rules of logic the more likely you are to be wrong, because in assuming a positivist's perspective science can only reveal those things that are subordinate to it (Braud and Anderson 1998). In contrast, qualitative research is generally non-linear and cyclical, rather than moving in a straight line. It makes successive passes (Neuman 1997), not always moving forward but always collecting data. This approach develops new insights, confirms previous insights and discards old assumptions. It is an interactive process. Bygrave (1989a) and Hindle (2004) argue that the qualitative approach is preferable for the development of the field of entrepreneurship and that researchers should reconsider their propensity for statistical models and adopt a qualitative approach which can provide a more holistic approach.

Although Bygrave and Hofer (1991) suggest that entrepreneurship researchers should 'abandon the linear, incremental thinking that regression models inculcate', it need not be a case of preference of one methodology over the other. Strauss and Corbin (1998) suggest that a researcher should consider using both qualitative and quantitative research. They should think in terms of the 'interplay between qualitative and quantitative methodologies' and that data collection can be carried out in both modes in various combinations and at different phases of the research process (ibid 1998). The interplay occurs when either methodology affects the collection and use of the other. The 'issue is not to use one form over the other but rather how they might work together to foster the development of a robust theory' (Strauss and Corbin 1998 p.33).

This is use the appropriate tools for the appropriate data. Neither a quantitative nor qualitative approach should be the sole approach but a mixture of both methods is recommended (ibid 1998).

3.4 Qualitative Research Methodologies

Between 1994 and 2004 the qualitative base of research in the discipline of social science expanded twenty fold, by conservative estimates. In entrepreneurship research, qualitative research is significantly underrepresented (Hindle 2004). Chandler and Lyon (2001) reviewed 416 double blind reviewed journal articles in the top nine entrepreneurship journals, and found that only eighteen percent of the studies employed any qualitative techniques whatsoever. Qualitative research is the *sine quo non* of the social science disciplines such as anthropology, sociology and psychology. There are four key qualitative research methods used in social science research: ethnography, phenomenology, grounded theory and case studies³. The following table demonstrates how each research method maybe used. The following discussion however, only explains the research method used in this research – the case study method.

³ A discussion on each methodology and why they were not used in this research may be found in the appendix

Table 3. 2 Qualitative research methods comparisons

Research Design	Disciplinary roots	Central Question
Case Study	Medicine and Law	What are the characteristics of this phenomenon
Ethnography	Anthropology	What is the culture of this group of people
Phenomenology	Philosophy	What is the meaning of this experience
Grounded theory	Sociology	What theoretical constructs, themes and patterns are evidenced in this data

Source: (Leedy 1997)

3.4.4 Case Study Method

According to Yin (2003 p.13), a case study is an empirical enquiry that investigates a contemporary phenomenon within a real-life context, especially when the boundaries between phenomenon and context are not clear. 'A case can be both a process of inquiry about the case and the product of that inquiry' (Stake 2000 p. 436). In a case study, a researcher collects detailed information by using a variety of data collection procedures (Leedy 1997), searching for patterns, actions and words in the context of a whole (Neuman 1997). Case studies can involve single or multiple cases and can combine data collection, interviews, questionnaires, observations and include quantitative data (Eisenhardt 1989; Yin 2003).

Not everything in a case is relevant to case study research. The focus of case study research must be a 'functioning specific'. A functioning specific is a bounded system. It is purposive, often has a self and is an integrated system (Stake 1995). A case study cannot be made of a generality, such as a government policy, but can examine the behaviour of a group after the integration of new values. A number of case study typologies have been proposed (table 3.3).

Table 3. 3 Case Study Designs

Case study typologies		
No	Stake (2000)	Yin (2003)
1	Intrinsic	Causal links
2	Illustrative	Interventions
3	Collective	Descriptive or evaluative

The intrinsic case study is for those who want a better understanding of a particular case (ibid 2003 p.437). The aim is not to understand some abstract construct or to build theory, necessarily, but rather to tease out the stories of those living the case (ibid p.437). An illustrative case aims to provide some insight into an issue. The case is of secondary interest, its aim is to facilitate an understanding of something else. Finally, the researcher may study a number of cases in order to investigate a phenomenon, population or general condition. This is known as a collective case study. Conversely, Yin (2003) views all case studies as distinctive types of evaluative research. According to Yin (2003 p.15), there are four possible outcomes of case study research:

To explain causal links in real life interventions that are too complex for other types of research approaches;

To describe an intervention and the real life context in which it occurred;

To illustrate certain topics in a descriptive mode;

To explore situations in which intervention is being evaluated for which no clear set of outcomes has been predetermined.

Case study methodology was considered the most appropriate research method because the outcome of this approach provides the researcher with an understanding of how and why entrepreneurs make decisions. Moreover, how and why entrepreneurs make decisions must be considered contextually, so as to appreciate the extraneous factors affecting the decision maker. Furthermore, case study research allows the use of a Literature Review in *a priori* development of propositions. The case study approach can involve the collection of data through an interview process and the next section discusses the interview process that was adopted for this research.

3.5 Propositions

The following refined propositions informed the interview questions and protocol:

Proposition One: - The selected cohort of entrepreneurs (repeat entrepreneurs) has a greater propensity for intuitive decision making. This proposition will be tested using the CSI and the interviews.

Proposition Two: – Entrepreneurial decision-makers have a propensity to make decisions that are consistent with intuitive decision making (as outlined in table 3. 4).

Proposition Three: - Psycho-physiological measures can discriminate intuition in entrepreneurial decision-makers.

The difference between Proposition One and Two is that Proposition One will be tested exclusively using the CSI, whereas Proposition Two will test the validity of Proposition One and sample the transcripts of the interviews to determine if the entrepreneurial decision makers use the same decision making cues as intuitive decision makers.

3.6 Interviews

Whilst the CSI was used as a screening guide, the interviews were used to confirm the validity of the CSI findings and to provide a greater confidence for the pilot study. The CSI along with the literature findings also gave this research an in-depth understanding of the influences and factors contributing to the intuitive decision making process. The interviewees were told that the aim of this research was to develop an understanding of the way in which entrepreneurs make business decisions.

3.6.1 The Interview Process

As suggested by Yin (2004), the interviewers adopted the method of a guided conversation rather than a structured query. The aim was to illicit as much information as possible in the time available, being aware that this was a pilot study and that any information elicited and recorded could be useful. Therefore open-ended questions were used so the interviewee could express his or her thoughts and practices and provide the interviewer with an opportunity to explore further any relevant themes. In order to encourage the interviewers to relax and speak freely, interviews began by asking the participant to tell his or her story of how he or she began in business. It was

important to understand how the interviewees had made decisions in the past, for example why an interviewee chose a particular strategy and not another.

In order to ensure that there would be no misunderstanding as to the comments and thoughts of the participant entrepreneurs, all interviews were recorded with the permission of the interviewee and later transcribed. The interviews conducted in Australia were transcribed by the researcher, whilst the interviews conducted in the United Kingdom (Cambridge) were transcribed by a transcription service. During this phase of the research it was crucial to differentiate between intuition as a learned behaviour (cognitive process) and intuition as sensing, based on a number of elements that are consistent with non-local intuition.

3.6.2 Interview Questions

According to the Literature Review, the following themes (table 3.4) were found to be important in providing an understanding of intuitive decision making. All these elements were considered integral to understanding intuition. Thus these are the factors that the interviewer was looking for during the interview process, see appendix 3

Table 3. 4 Intuitive Decision Making Themes Validation

Intuitive decision making	Validation for theme
1. Emotion-based decisions	The Literature Review documents that intuitive decisions have an emotional content, in that the decision feels right or wrong
2. Rapid decision-maker	When making a decision time is of the essence, therefore repeat entrepreneurs are likely to use any substantive reason to justify a decision, such as intuition
3. 'Seeing the bigger picture'	Many authors argued that intuition was holistic by nature because it was the ability to comprehend the bigger picture
4. Action orientation	An important element of intuitive decision making is action orientation which is also aligns with spontaneity.
5. Spontaneity	The emotional content of a decision cannot be created these decisions seem to be made spontaneously without any forethought
6. Passionate attentional Focus	It is argued that the individual's passionate attention creates an emotional connection to an outcome because the individual is attuned to the object's unfolding pattern of activity. Bradley (2006b) suggests that a person who has an emotional connection has an intense focus on the object/event of interest
7. Risk-taker	One who has a propensity for rapid decision making, is spontaneous and action orientated and is likely to make decisions with little no information; some would regard this type of decision making as risky

Whilst the first five items in table 3.4 are important to all intuitive decisions, the factors that distinguish non-local intuition from intuition as learned behaviour are items one, six and seven and these are critical for Proposition Three in this pilot study. One, six and seven are these decision making elements that constitute Bradley's (2006) passionate attentional focus.

Whilst the interview had a structure, the protocol adopted permitted the interviewee to express themselves freely and not answer to any pre-conceived views. The interview process employed open questions and was non-directive. The list below indicates the key questions used in the interview process. Additional questions were used to provide clarification where necessary. It was not only necessary to understand the prevalence of intuitive decision making, but also to appreciate under what conditions an entrepreneur relies on their intuition. This helps to determine if the elements identified are indeed critical to intuition and helps to validate the construct.

Why did you go into business?

Why this particular business/industry?

How much time did you spend researching the industry, competitors etc, before entering the market?

How is the business performing?

How long did you consider the industry/business opportunity before you entered the market? This is associated with the speed of decision making and spontaneity

Was the decision to enter this market a serendipitous event? (This is associated with automatic, implicit or difficult to control information gathering.)

Did you experience a feeling about the industry/business you were about to enter, i.e. did it 'feel good' or 'feel wrong'.

To provide greater validity to the research it was believed to be necessary to determine if any of the factors important to rational decision making were evident in the interview responses. The following table (3.5) are the factors found to be important to rational decision making

Table 3. 5 Rational Decision Making Themes

Rational Decision making	Validation for theme
Risk aversion	A risk-averse individual is less likely to take action based on their intuition because of the perceived level of risk. Therefore those who are more inclined to rational decision making would regard making decisions based on intuition as risky
Detail orientation	An intuitive individual is more likely to be a big picture person who likes to see the totality of a thing/event. The argument being they are less likely to be detail orientated
Prefers routine	A person who feels comfortable with routine is unlikely to make decisions spontaneously. As one does not have control of their intuitive sense, decisions made in this way are inimical to those who prefer routine
Rule follower	Intuitive decisions usually have no sense or underlying reasoning, therefore making a decision in this way requires a leap of faith. This is the antithesis of one who likes to know and understand how the decision was derived, the rules for its counsel

The next step in the research method and data collection was the physical experiment. The following describes the protocol adopted and its use.

3.7 Physical Experiment

The third apex of the triangulation-based research design, namely the physical experiment, is described here. The experiment was conducted on those repeat entrepreneurs who had completed the CSI and the interview and had made themselves available for the experiment. The Cambridge Technopol was selected as the research site, since prior research found it to be an important focus of successful high-tech entrepreneurial activity with a strong supportive infrastructure (Vyakarnam and Myint 2005). Repeat entrepreneurs were chosen as participants because they are most likely to have demonstrated that their success is not due to chance alone (Fiet et al 2004). They are also likely to be more attuned to 'opportunity recognition frequencies' (Shapero 1975).

The reason the psycho-physiological approach was adopted was to test Bradley's (2006a) view that non-local intuition should result in a measurable psycho-physical effect. According to Bradley (2006a), when an entrepreneur directs his attention to an object of interest, then a global shift to psycho-physiological coherence is induced which optimises attentional resonance with the incoming quantum level information from the object of interest. This focus creates an harmonic resonance with the incoming wave field of energy from the object/event. The harmonic resonance between the two wave fields of energy creates an optimal channel for communication of non-local information. This affects the Heart Rate Variation (HRV) and skin conductance level which is being monitored and recorded in the pilot experiment. If the bodies electrical activity changes during pre-stimulus this should be detected through the skin conductance, or HRV. According to Bradley (2006a and b) and McCraty et al (2004a and b), the heart reacts to information before it is cognitively processed. This is based on the observation that the heart is a sensory organ which encodes and processes information, enabling it to learn, remember, and make functional decisions independent of the brain (McCraty et al 2004a; Stamp 2000). The skin conductance level (SCL) and the electrocardiogram (ECG) for HRV (beat-to-beat decelerations/accelerations) have all been used before (Radin 1997b) to index specific aspects of sensory information processing, and can be interpreted according to well-established operational criteria. With the help of the Institute of HeartMath (IHM) the following protocols were developed to test for non-local intuition in repeat entrepreneurs.

3.7.1 Research Design and Method

The IHM and McCraty et al (2004a) have conducted some successful experimental trials in measuring intuitive behaviour using skin conductance and HRV. They assisted in the development of this researcher's experimental protocol, designed specifically to test repeat entrepreneurs. A number of tests and protocol refinements and developments were carried out with the help of the Brain Sciences Institute at Swinburne. It was subsequently used to conduct pilot testing of the Cambridge Technopol entrepreneurs.

Ten participants took part in this experiment. Each participant had demonstrated a capacity for intuition with the self-generation of a genuine response to opportunity recognition. In the experimental sessions for the pilot study, each participant was seated in a comfortable chair. A video monitor was located approximately one meter in front of the participant at eye level, and a computer mouse was attached for the participant to click when ready to initiate each trial.

The following hardware was used in the experimental protocol:

The inter-beat Heart Rate and DC skin conductance module (data logger) was designed and constructed by David Simpson from the Brain Sciences Institute (SUT).

The Random Number Generator (RNG) is an Araneus Alea 1, which provides high quality, unbiased and uncorrelated random numbers that pass a number of stringent statistical tests including the Diehard and NIST test.

All recordings were performed using 3M brand Red Dot® ECG Littman electrodes.

DC Skin Conductance (SC) was detected using electrodes attached to the pads of the participant's index and second fingers of the non-dominant hand.

Skin Conductance measurements were performed using current limited 0.5Volts DC excitation.

The ECG was detected using a standard lead-one configuration.

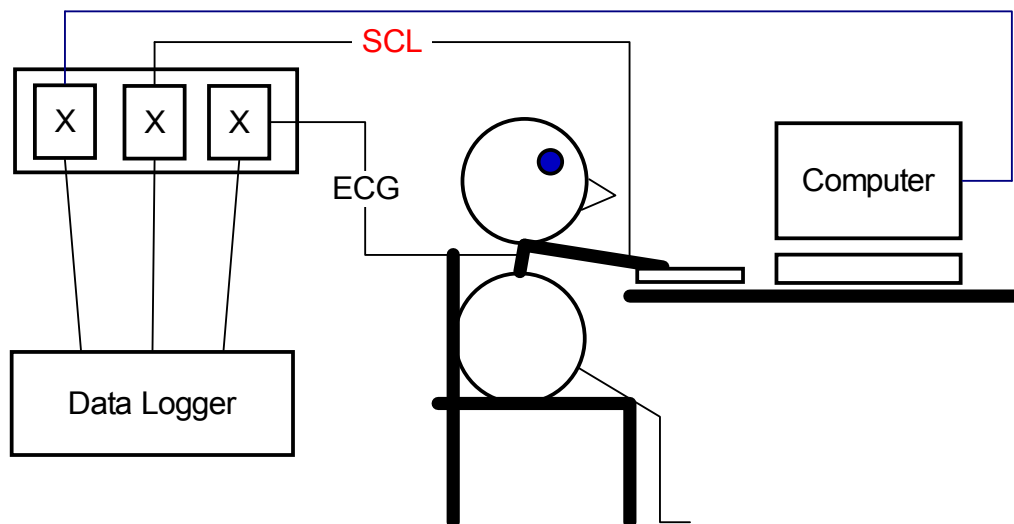
A band-limited differential amplifier detected the QRS waveform of the ECG. All between-beats-heart-rate (BBHR) measurements were timed using a micro-processor based system.

The resultant SC and BBHR measurements were passed to a monitoring computer system via a 6kV isolated RS232 interface (to AS3551:2004).

Participants were told that they were participating in a trial to test their capacity for making reliable investment decisions with minimal data and analysis. Two different stimuli were used in the protocol: a Roulette stimulus to provide a generic, baseline measure of intuitive ability (McCraty and Atkinson 2003), and a Business Case stimulus specifically targeted to measure entrepreneurial intuitive ability in choosing future growth companies (described below).

The experimental protocol was designed to stimulate the creation of non-local information about a future event by having the research participant make an investment decision about a future opportunity (without knowing the future outcome), while continuously recording measures of the participant's psycho-physiological systems activity (PSA).

Figure 3.3 Experimental Set-Up



Source: (La Pira et al 2006)

3.7.2 The Roulette Experiment Protocol

The Roulette Experiment uses the principle of a roulette wheel. The participant chooses an investment amount (bet) and then makes a choice of red or black and compares the result with that generated by a random generated choice. The Roulette Experiment was chosen because it was felt important to provide an experimental test where the participant could not guess the outcome but had to rely on other than logical means to make a choice. It is postulated that non-logical reasoning involves intuition and affects a change in the HRV and skin conductance level.

This experimental test provides the participants with the option of choosing from four investment amounts, ranging from 5 to 50 cents. After they select the start button a screen is displayed providing them with a choice (amount) and the ECG and SCL recordings begin. The sound of a roulette wheel is triggered six seconds after the participant makes a selection, and eight seconds later the result is displayed. The result of each run is tallied on the bottom left-hand side of the screen so that the participant knows whether he or she is winning or losing and by how much. After a cool down period, a message appears asking the participant to repress the button. This experiment was replayed 25 times before the participant moved to the next stage, the company investment experiment.

Figure 3. 4 Format of test protocol (roulette test)

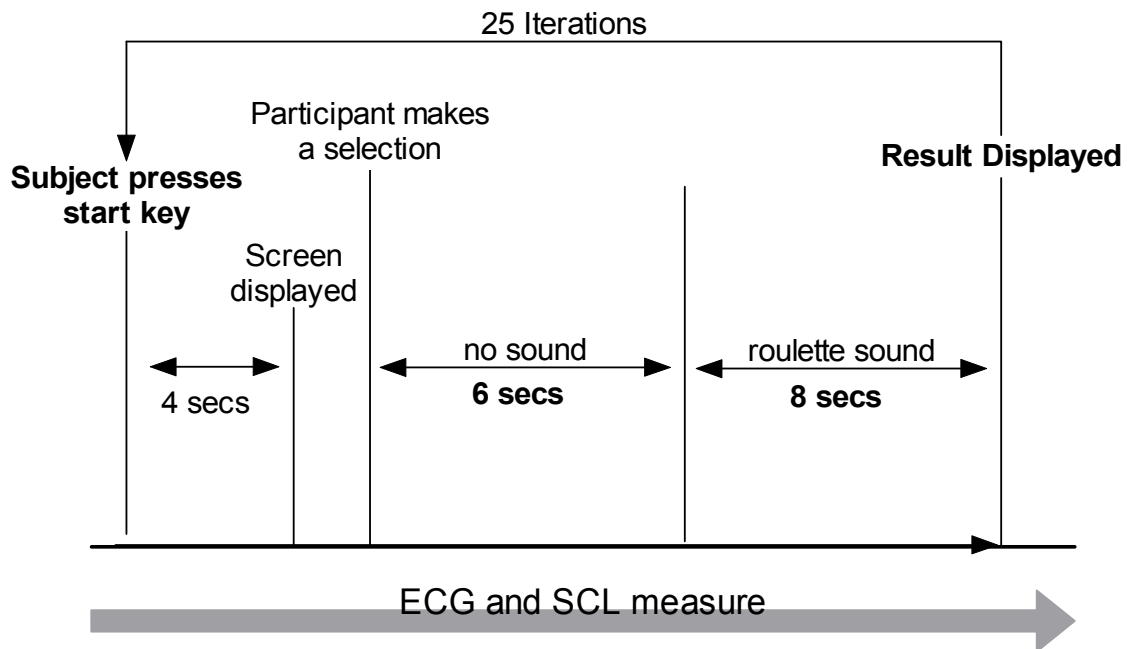
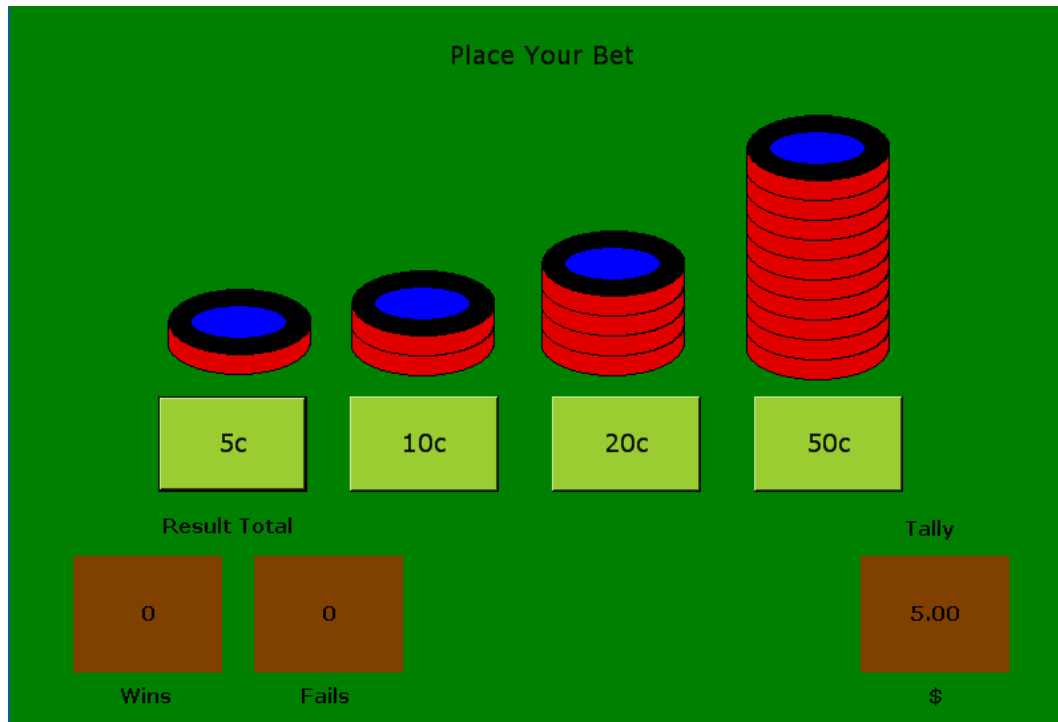


Figure 3. 5 Selection screen for roulette test



3.7.3 The Business Case Experiment

The second half of the protocol involves the participants making a choice on an investment decision in a potential growth company. This Business Case Experiment was chosen to make it pertinent to the nature of their work and the types of decisions that entrepreneurs are most likely to have to make. It was presumed that entrepreneurs regularly make decisions based on limited information (Allinson et al 2000; Dane and Pratt 2007). The aim of this experiment was to simulate those circumstances.

Sixty actual firms were chosen for the investment experiment. Information that was current at the time of selection was stored on a computer. The information stored on the computer indicated whether the firm had succeeded or failed at that time. The performance of the firm, (success or failure) was extracted from various databases and entered and saved on a computer at one point in time. At the time the data was collected 26 of the firms had failed and 34 of the firms had succeeded (see appendix 8 for the database).

Participants received limited clues as to the organisations stored on the database. The purpose of the experiment was to determine if the entrepreneurs could intuit which of

the randomly presented firms, stored on the computer, had succeeded or failed and had to wager an amount of money to support their choice.

Firms were chosen from a range of industries, countries and levels of failures and successes and found in a number of different online business journals, such as *Fortune Magazine*, *The Economist*, and the *Business Review Weekly*. Where possible, mixtures of both successful and failed firms for the same industry were included so that the participant could not presume that a firm in a particular industry was more likely than not to fail or succeed.

The participants were provided with the industry type, according to the Standard Industry Classification (SIC) only, a company name was not provided, so as to ensure the integrity of the selection process. Participant's were also presented with a company profile which had limited information – industry type, ownership, management, and financial resources - enough to interest the repeat entrepreneur, but not enough information to identify the company (as depicted in figure 3.6).

Figure 3. 6 Selection Screen for the investment option

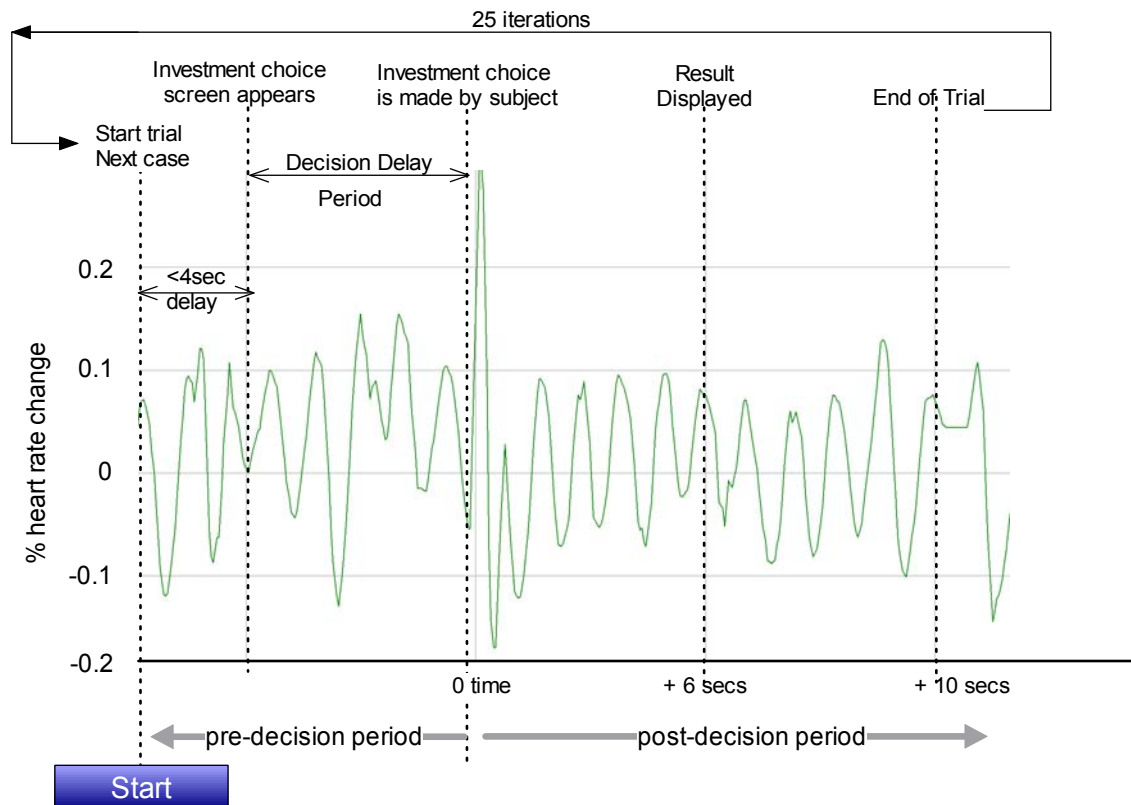


Source: (La Pira et al 2006)

The protocol (figure 3.7) explains how the business experiment works. The participant is presented with a randomly chosen company as depicted in figure (3.6) they then

make a choice as to whether or not they would invest, and the investment amount. This presumes a level of confidence as to the success of the firm. For instance, an entrepreneur investing \$100,000 has the greatest confidence that the firm succeeded, whilst someone who chooses not to invest is of the opinion that the firm has failed. That's why participants have a \$0 box, that is, a choice not to invest.

Figure 3. 7 Pilot study test protocol (business case)



After the participant presses the start button there is a period, usually less than four seconds, before the investment choices screen appears. The participant is provided with four investment choices ranging from \$0 amount to \$100,000 and a randomly selected company. They then chose whether or not to invest, and how much to invest. There is then a delay dependent on the time it takes the participant to decide on whether to invest and how much. After the participant has made his or her choice, the computer confirms the company as a success or failure and tallies the results of the investment.

The subsequent 'Next' button is selected from the 'Result Displayed' point. There is approximately a four second delay before the 'Investment Choice Screen' appears again and the same process continues for 25 iterations. (figure 3.7). Once all the data

was collected, it was analysed with the help of the IHM using a rigorous data analysis method known as Random Permutation Analysis (RPA).

3.7.4 Data Analysis using RPA

The data collected is analysed using an RPA. RPA was used because it controls auto-correlations inherent in physiological signals and their underlying non-normal distributions (Blair and Karniski, 1993). RPA was used to determine the statistical significance of the difference between the win and loss curves during the pre-stimulus period. It was applied separately to each individual's SCL and HRV data. RPA generates one standard deviate (z score) per person, which is the post-choice pre-result win/loss difference (Good 1994). For the RPA, the random distribution was built up over 2,000 permutations.

3.8 Validity and Reliability

The approach taken in the collection of data in this thesis involves case studies, a content analysis of transcribed interviews, a self-report questionnaire and experimental data. A triangulated approach was used as a strategy (test) for improving the validity and reliability of the research or evaluation of findings (Matheson 1988). Matheson (1988) elaborates on this by explaining that, 'Triangulation has arisen as an important methodological issue in qualitative approaches to research because it helps to control for bias and establish valid propositions' (ibid p. 13). Another important benefit of using this approach is that 'it strengthens a study by combining methods using several kinds of methods or data' (Patton 2002).

Validity for this research can be found in the tactics used by the researcher and the pattern matching conducted within this work combined with the result of other works, using the same instrument (CSI) or protocol (McCraty et al 2004a; Radin 2004).

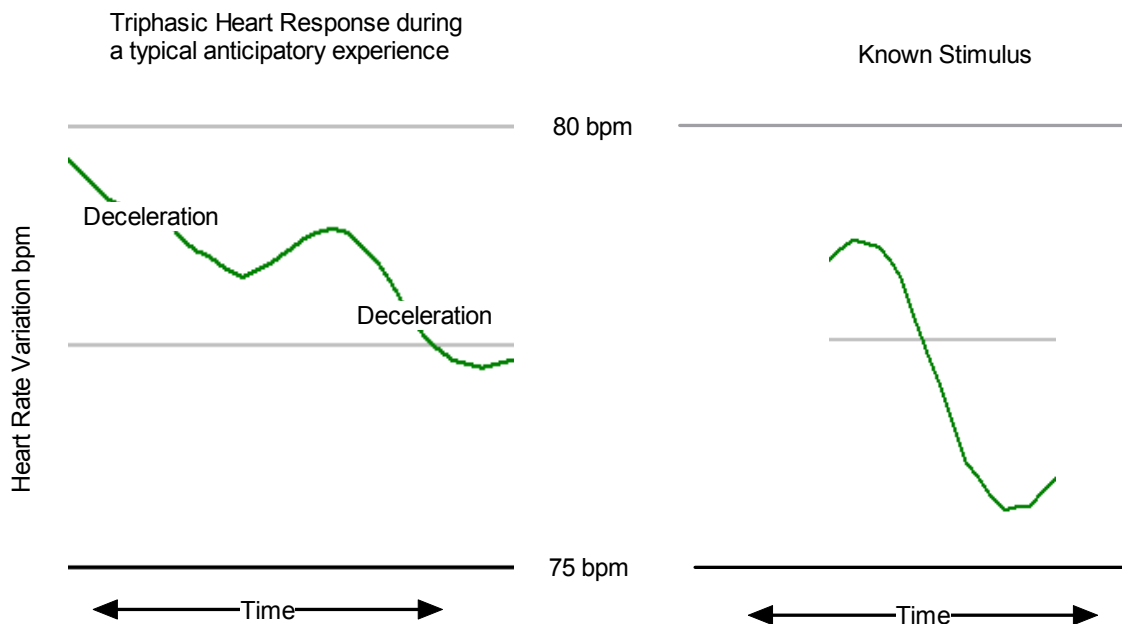
3.8.1 Experimental Validity

The purpose of validity is to ensure that the measurement tools and instruments were appropriate for their particular purpose. As such, a modified protocol used by Radin (1997) and McCraty et al (2004a) involving skin conductance and HRV measurement was used. This approach was found to be valid in previous experiments. The aim was to replicate the experiment as closely as possible to ensure this tests validity.

These measures were also used because ‘they have all been used to index specific aspects of sensory information processing, and can be interpreted according to well-established operational criteria’ (McCraty et al 2004a p.135). To appreciate whether the HRV is a valid measure of intuitive information, it is necessary to consider the interpretation of cardiac deceleration/acceleration in relation to the processing of information.

Researchers have found that when one is in an expectant mode, a triphasic heart response curve is usually observed. An initial deceleration is followed by a small acceleration and then a larger deceleration (LHS of figure 3.8) (Jennings and van der Molen 2002; Lacey and Lacey 1974; Van der Veen et al 2001). For a known stimulant, there is a strong deceleration throughout the period as depicted in the RHS of figure 3.8.

Figure 3. 8 Heart rate acceleration/deceleration responses



Yin (2003) suggests a number of different measures of validity. The following table (3.6) highlights the tactics and the phases at which each tactic should be carried out.

Table 3. 6 Case Study Tactics for Judging Research

Tests	Tactics	Phase of research in which tactic occurs
Construct validity	Use multiple sources of data Establish chain of evidence Have key informants review draft case study report	Data collection
Internal validity	Pattern match	Data analysis
External validity	Use replication logic in multi-case studies	Research design

Adapted from: (Yin 2003 p. 34)

3.8.2 Construct Validity

As previously discussed, repeat entrepreneurs were deliberately chosen so as to eliminate the possibility that their success was due to chance alone. Multiple sources of data were used in this research. The first was the selection of a valid and reliable instrument in the CSI. The CSI was used as a discriminator in the selection of appropriate participants ensuring replication logic. The aim was to work with only those participants whose scores were in the intuitive range to give the highest probable signal level for the pilot experiment to detect.

All of the repeat entrepreneurs who completed the CSI scored within the intuitive range. The purpose of screening entrepreneur participants was to find a cohort who were most likely to have a higher degree of sensitivity to the signal, thereby increasing the probability that a result could be detected using the pilot experiment. The CSI data was also compared with findings from other researchers using the same instrument. After the participants completed the CSI they were interviewed. All the participants agreed to have the interviews recorded, which were later transcribed.

Construct validity involves the initial concept, notion, question or hypothesis that determines which data is to be gathered and how it is to be gathered. Researchers actively cause or affect the interplay between construct and data in order to validate

their investigation, usually by the application of a test or other process. In order to satisfy construct validity one must ensure that the constructs employed are used consistently throughout the research and that they are clearly and unambiguously defined. The multiple elements that constitute intuitive decision making have been used throughout this research and were used in the interview process (see table 3.4).

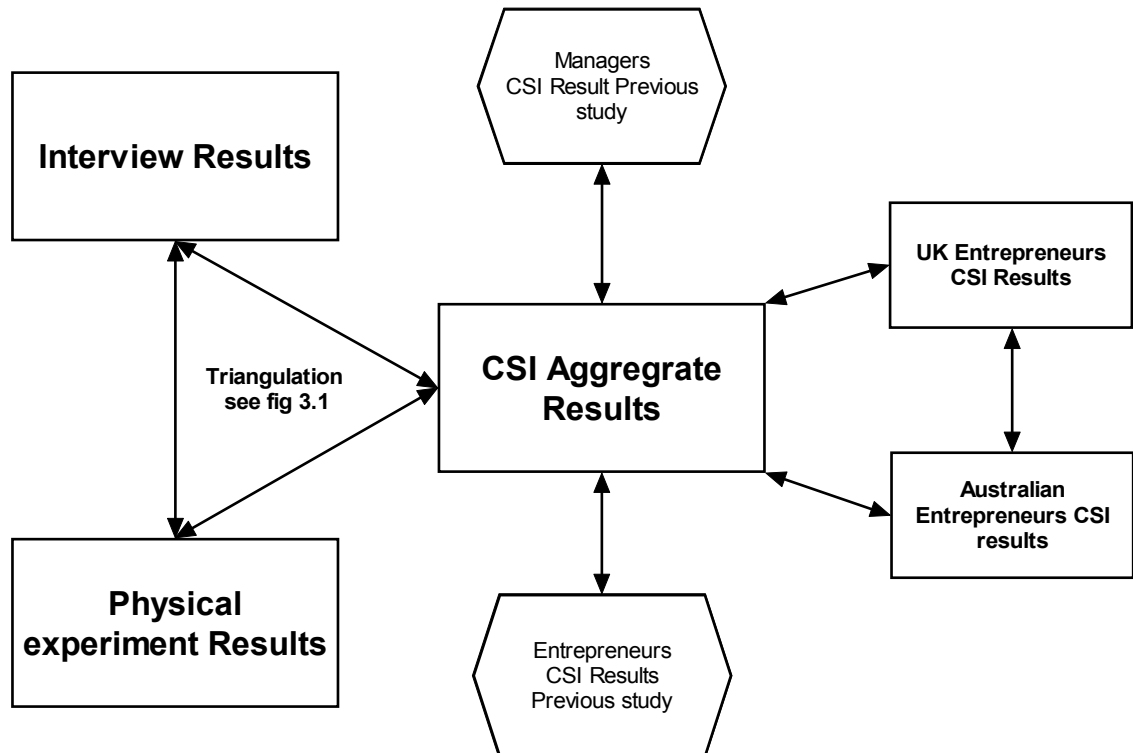
3.8.3 Internal/External Validity

Yin (1993) suggests that case study researchers require rival theories to ensure internal validity. The rival propositions are that entrepreneurs are more inclined to make rational decisions and that intuition is merely learned behaviour. For rational decision making, the approach taken by this research was that all three tests used in the data collection process; the CSI, the interview protocol and the physiological experiment, were designed such that they could indicate a propensity for either intuition or rational decision making. Furthermore, the experimental protocol was designed so that cognitive based decisions would not provide the participant with any advantage in answering the questions. This would also be depicted in the HRV of the participant.

The interviews and content analysis were designed to identify the presence or otherwise of the passionate attentional interest of the entrepreneur. Another approach recommended by Yin (1993) and adopted for this research was that of linking the data to the observations (pattern matching). Because a triangulated approach was used, the data from one approach was compared with the data from another; the results of the CSI were compared to those of the interviews. The CSI data was also compared to the results of the physical experiment and the physical experimental data was compared to the interviews. The findings were also matched with the findings of other intuition research on entrepreneurs and managers using the CSI, such as the results found between the different cohorts of entrepreneurs interviewed, (the UK and Australian entrepreneurs, see figure 3.9).

First, the entrepreneurs CSI results were compared to the CSI results of managers from a previous research study, then the repeat entrepreneurs' results were compared to the results of other entrepreneurs tested using the CSI. Finally, the results of the UK and Australian entrepreneurs were compared. Figure 3.9 depicts the pattern matching that took place.

Figure 3.9 Pattern Matching



3.8.4 Reliability

The purpose of reliability is to a) ensure if another researcher followed the same protocols he or she would achieve the same results, and b) to minimise the errors and biases in the study (Yin 2003). In this regard, two sets of interviews were conducted by the researchers including the author. The tools used in this research were a self-employed questionnaire, an interview protocol, Nvivo®, a content analysis program, and a physical experimental test.

The CSI was used for all the participants and it was self-administered. The entrepreneurs completed it in their own time and returned it to the author who recorded their responses and then overlaid the score key, and provided them with their result (appendices 6 and 7). Hayes et al (2003) found in their work with the CSI that it demonstrates good reliability in respect to internal consistency, and test/re-test reliability.

The interview protocol, as discussed earlier, was designed to provide a guideline for the information sought. The same protocol was used by both Gillin and this author in recording the interviews. All transcripts were analysed by the author. As all interviews were recorded, this can be evidenced in the interview transcripts. Furthermore, the key

attributes that were used to identify intuition or rational decision making in the content analysis, were derived from the CSI and the Literature Review.

NVivo®, the content analysis software, was extremely helpful because it provided a rigorous method of managing qualitative data. It enables researchers to manage, code, analyse and report on data. NVivo® also enables a high level of security because the analysis of a structure, the meaning units, the data analysis and the project database are all stored in a single file which is only accessible to NVivo® thereby providing an easy to follow chain of evidence.

Representative reliability, which addresses the question ‘does the indicator deliver the same answer when applied to a different group?’ (Neuman 1997), was addressed by comparing the CSI findings found in this research to the CSI findings of managers and single venture entrepreneurs. For the experimental protocol, reliability was achieved using the same hardware and software for all participants. With each participant, all of the programmed variables encoded in the software were included in the output of the results sheet so that the researcher could easily check to ensure the parameters for each test were identical.

To further ensure reliability and replicability, the software program used for the electrophysiological experiments was designed such that it created a file for each participant, recording the protocols, time of testing, participant number and the result stored together in one file. Furthermore, the electrophysiological test was pilot tested on a number of occasions to ensure its reliability. Nevertheless each test recorded all the data collected so that the tester could later determine if the experimental protocols were adhered to and discover if there was any deviation from the set protocols.

3.8.5 CSI Validity

The CSI was developed with the participation of over 1,000 adults. The aim was to provide a psychometrically sound instrument suitable for application in large scale organisational studies and to confirm empirically the generic intuition-analysis dimension of cognitive style (Allinson and Hayes 1996). It was specifically designed for use with managers and professionals.

The CSI has been subjected to criticism that has questioned its validity as a tool to measure intuition. The issue of concern is that cognitive style is a complex multi-dimensional framework that cannot be predicated on the unitarist conception of the construct (Hodgkinson and Sadler-Smith 2003; Allinson et al 1996). According to Hodgkinson and Sadler-Smith (2003a) rational and intuitive behaviour should not be

placed on the same continuum. They argue that having an inclination towards intuitive decision making does not presume that one is less likely to be rational in their decision making.

Hayes et al (2003a p.8) provided a rebuttal that concludes 'there are compelling theoretical and empirical arguments supporting the construct validity of the Allinson–Hayes Cognitive Style Index'. Evidence of the construct validity for the CSI was provided by support for hypothesised relationships with selected instruments. Five instruments were used to validate the CSI; sixteen PF (Cattell et al 1970), MBTI (Myers 1962), WEPS (Gordon 1973), Learning Styles questionnaire (Honey and Mumford 1982) and finally the Watson-Glaser Critical Thinking Analysis (Watson and Glaser 1991). Results indicated a distribution of scores closely approximating theoretical expectations, excellent reliability in terms of internal consistency and temporal stability and good initial evidence of construct and concurrent validity (Hayes et al 2003b). In the interview process, the focus was not just on the propensity for intuition as depicted in table 3.4, using Nvivo® the content was also analysed for rational decision making elements.

3.8.6 Using Nvivo®

Nvivo® is a simple to use content analysis system that allows researchers to map out a project, set up frameworks, organise ideas and establish a range of queries whilst using a Microsoft Windows type user interface. Coding is relatively easy as one merely highlights key passages and assigns codes. An auto-coding option enables researchers to expedite the process. This is then easily collated for later analysis. Coded data can be easily annotated and memos assigned.

3.8.6.1 Coding Procedure

The following procedure was used in the search and coding:

Develop a meaning for each node;

Describe a list of words appropriate to each node;

Read each transcript and identify passages that relate to each node;

Code the appropriate passages with the appropriate nodes;

Place the document aside and review the codes at a later date to determine congruency with original node.

The meaning unit is synonymous with the use of NVivo® and which NVivo® refers to as a node. The use of the meaning unit comes from the work of empirical phenomenologists. The main idea of empirical phenomenology is that a scientific explanation must be grounded in the meaning structure of those studied (Aspers 2004 p.2).

For the meaning unit to be developed, the participant's subjective perspective is the starting point of the analysis. The second important aspect of meaning units is the assumption that the world is socially constructed, an argument which is generally accepted in contemporary social science (Aspers 2004), and that each person has their own language to structure and understand their meanings. This is especially helpful when a number of participants with different experiences and perspectives are involved in the research.

In order to understand the meanings associated with the language used, one must consider what does understanding imply in practice, and how does one reach it? For instance, some interviewees referred to making decisions based on their 'gut feelings', whilst others said they relied on their instincts. All these terms are synonymous with the concept of intuition. Understanding is accomplished when one understands what the other means (Schulz 1996, ([1932], 1976). Hence, the notion of the meaning unit is crucial in understanding the participant's perspective. Understanding extends to the meaning of passages as well. The following are several examples of how statements that seemingly do not relate to the key meanings are relevant and appropriate in their selection for each node.

Table 3.7 Coding Nodes And Meaning Units

Node (meaning unit)	Related Statement
Intuition	'Every once in a while I come across one of these ideas where I just know it's going to work.'
Risk taker	'I am very much an optimist, very much impulsive, so I generally like to work without too much structure around me.'
Analytical	'I like to work with advisers who can bring you a balanced view of a technology and a market and then relate that to the people.'

Not all statements that are related to meaning units are so vague and difficult to discover. Indeed, NVivo® provides a word search tool where the node (meaning unit) is typed into the search box and NVivo® conducts a search of the transcripts and marks all words found. This is appropriate where the meaning unit itself is used in the discussion. Focussing purely on the nodes in a word search can have its own difficulties. The following statement was elicited from an entrepreneur when asked whether rational decision making was more appropriate for entrepreneurial decision making: 'I don't believe that starting a business can be done purely on an *analytical* basis'. In conducting word searches it is important to consider the context in which the node is used.

Table 3.7 outlines the nodes used for coding. These nodes were derived from the Literature Review and from the CSI index and informed by the results of the interviews so as to provide a list of elements associating decision making style to its elements. Following the content analysis of the interviews the most significant nodes from the literature were determined. The following tables list the nodes used in the content analysis for each decision making style.

The Literature Review found that intuition included emotion, rapid decision making and seeing the 'bigger picture'. A number of writers, including Allinson et al (1996) and Kahneman (2003), included terms such as 'difficult to control' and 'unconscious', giving the impression that the behaviour is spontaneous. Allinson et al (1996) and Bennet (1998) argued in support for risk taking because they suggest that intuitive types make 'daring conclusive leaps'.

Allinson et al (1996) and Behling and Eckel (1991) both agreed that intuitive types are also action orientated, whilst Bradley (2006) argued in support for a passionate attention which he argues infers an entrepreneur who is focussed on a particular outcome. Intuition was also included as a node as a general term for instinct, 'gut feeling', and any other term that the interviewees may use to explain intuition that is not covered in table 3.7.

3.8.6.2 Decision Making Nodes

Table 3. 8 Coding Nodes Intuition

Intuitive decision elements
Emotion based decisions
Rapid decision maker
'Seeing the bigger picture'
Action orientated
Spontaneity
Focus/Vision
Passionate attention
Risk taker
Intuition

The following provides an explanation as to why each element was considered important enough to include it as a node for intuitive decision making.

Intuition – 'Listening to one's heart', 'gut feeling' and 'instinct' were all descriptions of the way entrepreneur's made decisions.

Risk taking – This is an important element of entrepreneurial decision making and therefore intuitive decision making (Allinson et al 2000). Taking an intuitive approach requires a leap of faith and therefore is considered risky by all accounts, because in many instances one is making a decision on little or no supporting information or even contradictory to the evidence before him or her.

Rapid decision making – The literature suggests that intuitive decision making is most likely to be rapid as opposed to considered, well-thought decisions.

Action orientation – Entrepreneurs consider that success is a timely utilisation of resources and therefore they have a propensity for decision making that is action orientated.

Spontaneity – Entrepreneurs who are attuned to their feelings through intuition seemingly make decisions spontaneously because intuitive information cannot be accessed as and when required. Therefore this information is sensed by the entrepreneur unannounced giving the impression that the entrepreneur's behaviour is spontaneous. Bradley (2005) argues for focus/vision because the intuitive decision-maker is focussed on a particular outcome. This focus on the object of interest creates a coherent connection to the object or vision.

Passionate attention - Bradley (2006a) also argues than an individual who achieves a particular outcome has an energetic focus on that outcome; that energetic focus is considered the entrepreneur's passion for the outcome; because it provides the energy that connects the percipient to the object or outcome.

Emotion based decision-maker – This type of decision maker often relates to how he or she feels about a situation which sways the decision maker in some instances to make decisions contrary to available evidence. This is the basis of decisions that felt right or wrong.

'Seeing the bigger picture' – Quite a few of the authors expressed the view that intuitive decision making was holistic. Assagioli (1971) observes that intuition is a function that apprehends the totality of a given situation.

To ensure validity, it was also important to test for the alternate view - rational decision making. The elements of rational decision making were extracted from the literature (Myer's work on the two ways of knowing) and from Allinson et al (1996) CSI. It includes the following nodes.

Table 3.9 Rational Decision Nodes

Rational decision elements
Risk Averse
Detail orientated
Follows rules
Prefers routine
Logical/rational

Risk averse – A propensity to stick to known methods and accepted ways of thinking. There is a level of risk associated with doing things differently and therefore this person is more inclined to be risk averse.

Detail orientation – The focus here is that entrepreneurs have a propensity to focus on the bigger picture. Gartner (1988) and Mitton (1989) propose that this is what distinguishes managers from entrepreneurs.

Rule follower – Entrepreneurs tend to be rule breakers, not in the sense of criminal tendencies, but rather in terms of doing things differently. Some would regard this as the propensity for innovative or creative behaviour (Schumpeter 1975 (1942); Timmons and Spinelli 2003).

Prefers-routine – This type of person is more likely to prefer routine work that does not take them too far out of their 'comfort zone', therefore not having to deal with ambiguity, a manager rather than an entrepreneur.

3.9 Summary of Method Selection

This research was approached as a pilot study, the purpose of which was to determine the validity of the conceptual framework. As a result, a theoretical sample was selected - repeat entrepreneurs. Repeat entrepreneurs were chosen because they have created a number of successful businesses and the presence of intuition was therefore unlikely to be the result of providence.

A triangulated approach was adopted enabling pattern matching and cross-confirmation of findings using generally agreed to elements that constitute intuition. Triangulation helps to control bias and establish valid propositions using data matching. It also strengthens a study by combining methods using several kinds of methods or data.

In this research three different methods were used, a self-report questionnaire, an interview protocol, and a physical experiment. This research adopts a non-linear, qualitative approach, arguing that it is the most appropriate approach given that entrepreneurial behaviour is likewise non-linear. A number of different qualitative methodologies were considered and it was deemed appropriate to use the case study approach.

Following the use of the CSI to discriminate between intuitive and rational decision-makers, a non-directive interview protocol was used to interview the participants. Participant interviews were recorded to ensure reliability and validity. Following the interviews all the transcripts were transcribed for content analysis using Nvivo®, a qualitative content analysis software program.

After the interviews, participants were invited to take part in a physical experiment, ten of the seventeen interviewees participated in the physical experiment. Specifically designed protocols for repeat entrepreneurs were used to discover if physiological evidence of non-local intuition is present in entrepreneurial decision making. The physical experiment involved a two step process, using skin conductance and heart rate variability protocols developed by previous researchers.

Two different stimuli were used in the protocol: a roulette stimulus to provide a generic, baseline measure of intuitive ability (McCraty and Atkinson 2003) and a Business Case

stimulus specifically targeted to measure entrepreneurial intuitive ability in choosing future growth companies.

The experimental protocol was designed to stimulate the creation of non-local information about a future event by having the research participant make an investment decision about a future opportunity (without knowing the future outcome), while continuously recording measures of the participant's psycho-physiological systems activity (PSA).

4.0 Research Findings and analysis

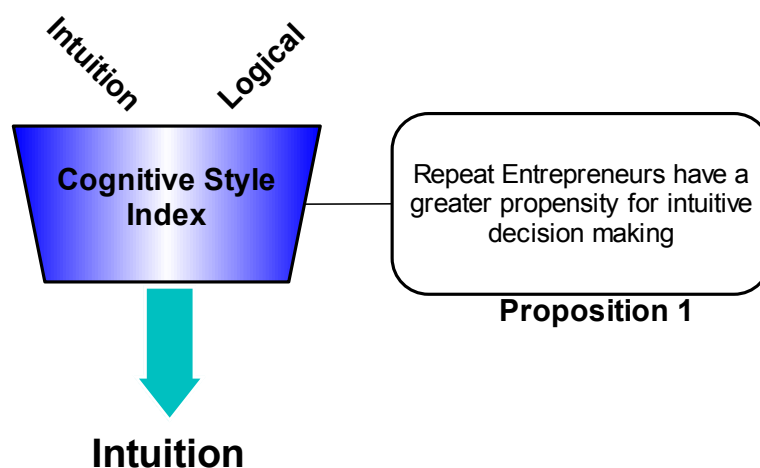
4.1 Introduction

In this section the findings and analysis of the data are discussed in relation to the propositions. The chapter begins with the Cognitive Style Index (CSI) findings, then discusses the content analysis of the transcribed interviews and finally the psycho-physiological experiments. This work links data to propositions and tests for rival explanations; the strategy most applicable to case study research (Yin 2003). This work aims to determine whether or not, a) repeat entrepreneurs are intuitive (through the CSI and interviews), b) the elements of intuition found in the literature adequately represent the factors critical to intuition (through interviews), c) passionate attentional interest provides a greater proclivity for intuitive awareness (through interviews), and d) a physiological measure can detect intuitive decision making (psycho-physiological experiment). Each section commences with a discussion of the findings, and then relates these findings to the proposition which acts as a filter to refine the data in arriving at the final result. Therefore each proposition is linked to a particular data collection stage.

4.2 CSI Findings

Proposition One addresses the results of the CSI.

Figure 4. 1: Proposition One



In Proposition One, repeat entrepreneurs are seen to have a greater propensity for intuitive decision making. The aim of the first proposition is to discern the propensity of intuitive decision making using the CSI index. The CSI findings clearly show that

repeat entrepreneurs have a greater propensity than general entrepreneurs, and that general entrepreneurs have a greater propensity than managers. The results of the CSI supports Proposition One. Repeat entrepreneurs do indeed have a greater propensity for intuitive decision making.

The results depicted in table 4.1 are of the 30 repeat entrepreneurs who achieved a score in the intuitive range (i.e. a CSI score less than 38). The overall mean score was 24.9 for all 30 entrepreneurs. The broken vertical line depicts the mean score for each cohort (figure 2a). Table 4.1 depicts the scores of the Australian and UK entrepreneurs. Whilst the scores were similar, there were two important distinctions between the groups. The majority of UK entrepreneurs had graduate or postgraduate qualifications and were in high technology or bio-technology industries, so they were educated in the natural sciences. The Australian entrepreneurs were equally split between the manufacturing and service based industries. Only two had graduated from university.

Table 4. 1 CSI Score Comparison UK And Australian Entrepreneurs

Country of Origin	Number of participants	Mean score	Standard deviation
United Kingdom	17	24.6	7.8
Australian	13	25.2	7.0
TOTAL	30	24.9	7.2

Another important aspect that distinguished the two groups was that the UK entrepreneurs were part of the same network (Cambridge Technopol) whereas the Australian entrepreneurs were a more eclectic group. Therefore it was considered desirable to distinguish the CSI scores between the two groups.

As depicted in table 4.1, there were seventeen participants from the UK with a mean score of 24.6 and a SD of 7.8, and thirteen Australian entrepreneurs participated with a mean score of 25.2 and a SD of 7. The UK entrepreneurs averaged a marginally lower mean score than the Australian entrepreneurs. The difference between the Australian and UK entrepreneurs and the difference between both of them and the total is considered to be insignificant. The information of table 4.1 is depicted diagrammatically in figures 4.2, 4.3, and 4.4. Figure 4.2 depicts the average CSI score and SD for all participants. Figure 4.3 depicts the average CSI score for the UK

participants, and figure 4.4 depicts the average CSI score for the Australian participants.

Figure 4. 2: CSI results for all entrepreneurs (n=30)

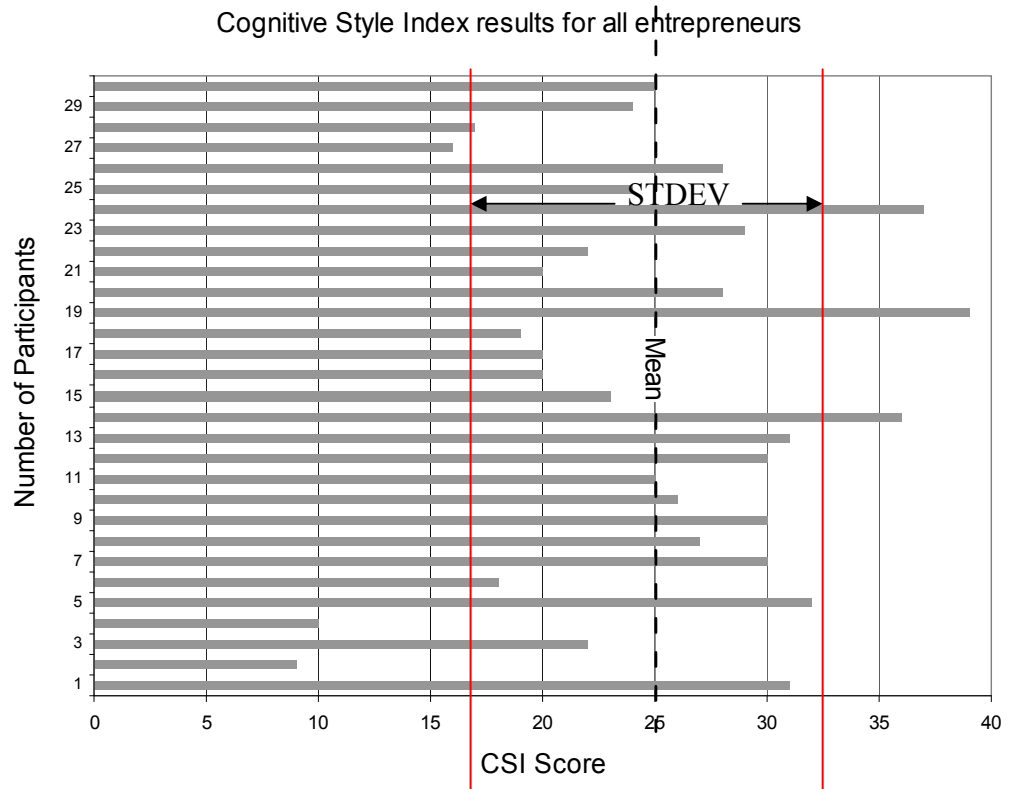


Figure 4. 3: UK entrepreneurs (n = 17)

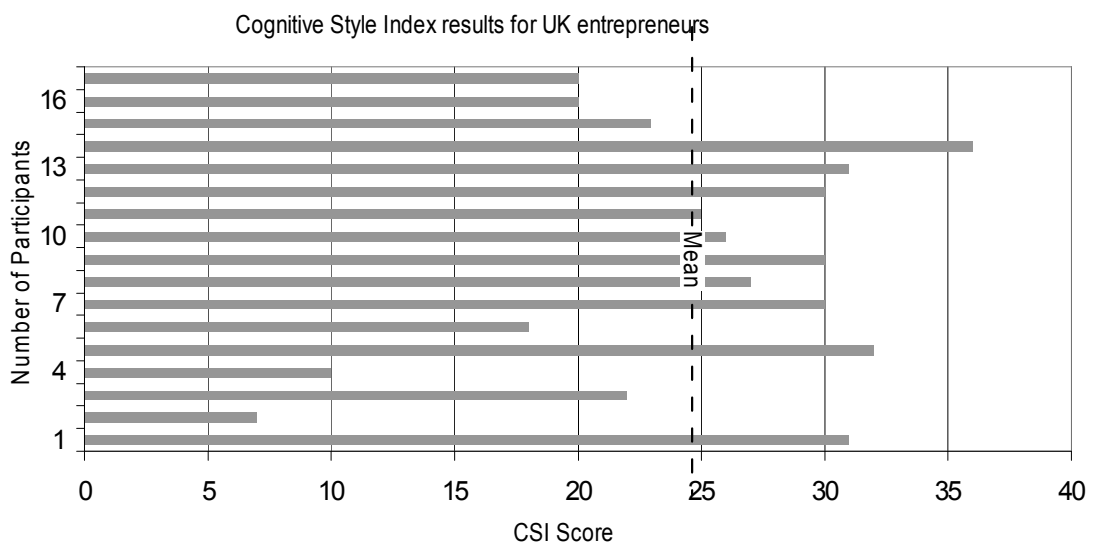
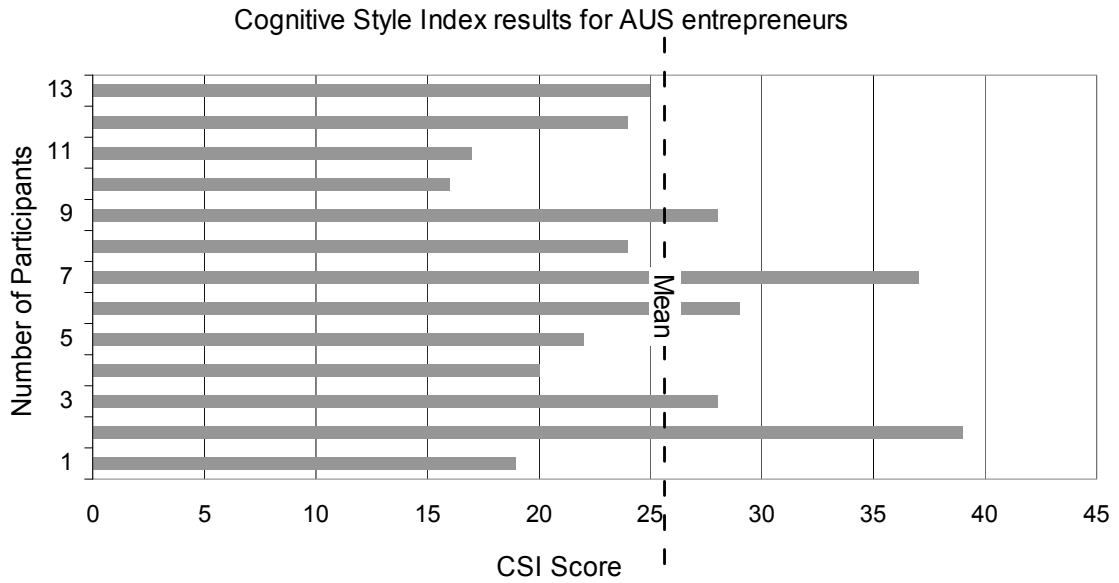
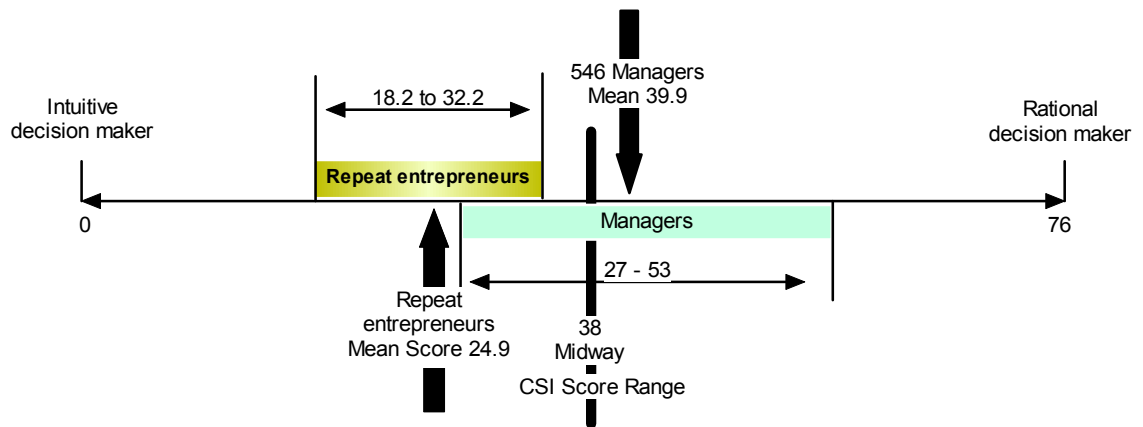


Figure 4. 4: Australian entrepreneurs (n = 13)



The following diagram (figure 4.5) depicts the range of possible scores and the result of repeat entrepreneurs in relation to that of the managers, as determined by Allinson et al (2000).

Figure 4. 5: Repeat Entrepreneurs and managers



As shown on figure 4.5, the score range indicates that a 0 score is for a purely intuitive decision maker to 76 for a purely rational decision maker. One who has neither a propensity for intuition or rational decision making would be in the mid-range of 38. The range on the top left of the figure 4.5 shows that the sample of repeat entrepreneurs tested for this research achieved a mean score of 24.9, within a standard deviation of 7.2. The range on the bottom right hand side is the average score of 546 for managers tested by Allinson et al (2000). They scored a mean of 39.9

within a range of 27 – 53 (SD). Whilst there is some overlap between the managers and entrepreneurs, the average for the entrepreneurs is significantly lower than that of the managers. The significance of this diagram is that the mean score for repeat entrepreneurs is outside the standard deviation range of the managers, which indicates that repeat entrepreneurs are likely to have a greater propensity for intuitive decision making. This finding is supported by Brigham (2007) who also found that entrepreneurs have a greater propensity for intuition than managers.

Table 4.2 is a breakdown of Allinson’s (2000) managers categories, depicted in figure 4.3, and their index score before aggregation. It shows their industries and their scores. 257 managers from diverse industries achieved a mean of 37.5. Construction managers scored higher with 38.98 with brewery managers scoring the highest, with 43.19. SD varied from 12.12 for brewery managers to 14.06 for various managers. The overall mean for the 549 managers was 39.89 with a SD of 13.46.

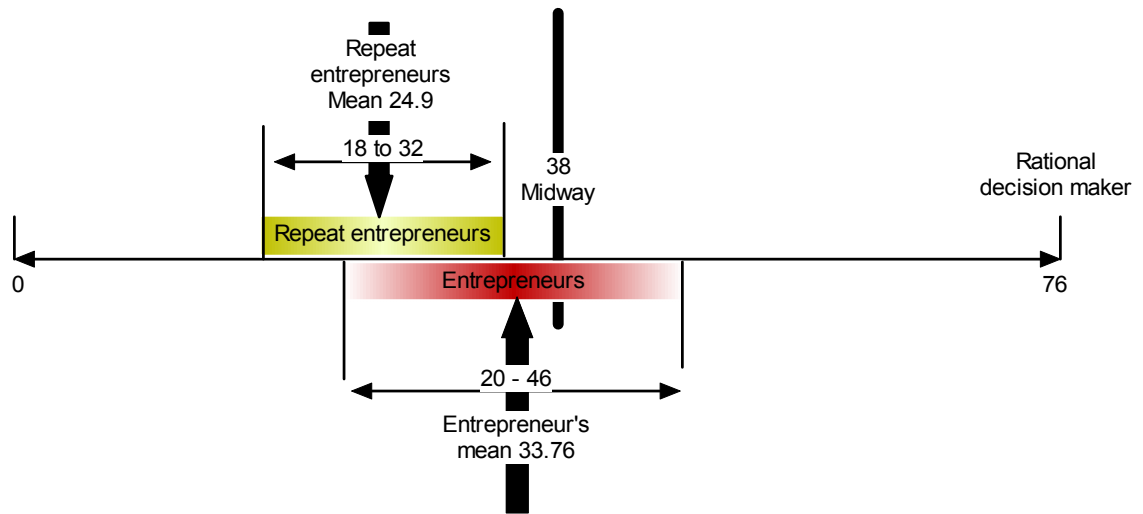
Table 4. 2 CSI Score For Managers

Sample	(n)	Mean	SD
Managers various	257	37.50	14.06
Construction managers	64	38.98	14.20
Brewery managers	225	43.19	12.12
Total	546	39.89	13.46

Source: (Allinson et al. 2000) p.40

Allinson et al (2000, p.40) also tested 156 general entrepreneurs which returned a mean of 34 with a standard deviation of 13.8. Once again, this is lower than the score achieved by managers but not as low as the repeat entrepreneurs.

Figure 4. 6: General entrepreneurs verses repeat entrepreneurs



In figure 4.6 the repeat entrepreneurs (top left) achieved mean of 24.9 within a range of 18 to 32. General entrepreneurs (bottom left) achieved a mean of 33.76 and their scores ranged from 20 to 46. This supports the argument that repeat entrepreneurs were the appropriate sample for this research. The mean score for both groups of entrepreneurs are in the intuitive range of the index with the SD for repeat entrepreneurs being lower for repeat entrepreneurs (7.2) than general entrepreneurs (13.8). The trend indicates that entrepreneurs, whether repeat or general, have a lower index than managers. This supports the proposition that entrepreneurs have an enhanced capacity for intuition. Allinson et al (1996) also tested managers in various job functions to determine whether their job function had an effect on their scores.

Table 4. 3 CSI Scores For Five Job Functions (Miscellaneous Managers)

Job Function	(n)	Mean	Standard deviation
Finance	13	45.46 *	13.06
Production	17	40.59 #	9.89
Information technology	40	38.28	12.09
Personnel	15	31.07	12.49

Source: (Allinson and Hayes 1996)

It appears that the more linear job functions such as finance* and production # have a greater propensity for logical decision making. A varied age group of entrepreneurs

was involved in this data collection, four females and 26 males. The average females' CSI result varied by four points from that of males. The females' average score was 21.25, whilst the males' average score was 25.4 with a difference in SD of 3.3 (females 3.4 and males 7.7). This result is consistent with Myer's (2002) view that women are more intuitive than men. The following data (table 4.4) depicts the importance of age in the CSI results as a determinant of an entrepreneur's propensity for intuition. The data shows the average scores for each age group. The ages varied from 33 to 67 years of age.

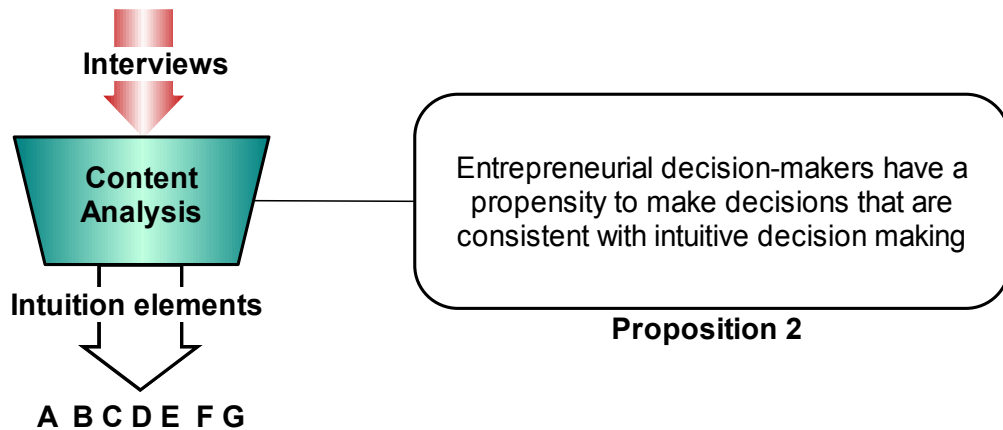
Table 4. 4 The Average Aggregate CSI Results According To Age

Cognitive Style Index (n=30)			
Range	Number of # Participants	Average CSI Score	SD
30-39	4	23.33	6.7
40-49	10	26.11	4.1
50-59	10	24.91	9.1
60-69	6	22.6	9.0

The number of participants in each group is shown in the second column. Whilst the sample for the 30-39 age group is small, the difference between the average score at the 30-39 and 60-69 year age bracket is negligible at 0.7, with a SD difference of 2.7. Whilst the CSI score is trending down, the SD is trending up which renders the difference in propensity for intuitive behaviour between the age brackets insignificant. However, the aggregate score for all of the participants is 25.2, which is not considerably different from the average score for each age category.

4.3 Interview Findings

Figure 4. 7: Proposition Two

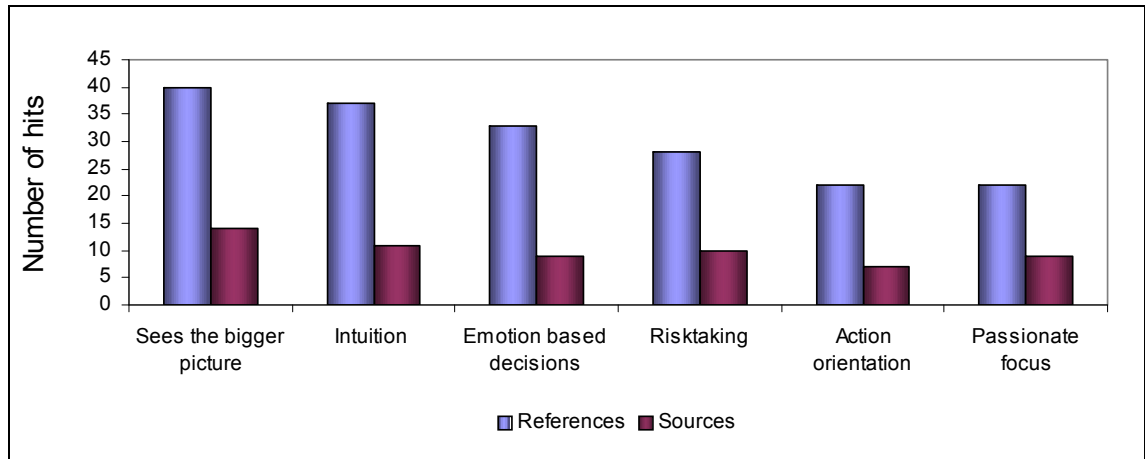


Whereas Proposition One used the CSI to determine the samples propensity for intuition, Proposition Two tests the validity of Proposition One and uses the interviews to determine if the entrepreneurial decision makers use the same decision making cues as intuitive decision makers. The findings from the content analysis of the interviews supports the CSI findings, demonstrating that entrepreneurs do indeed use their intuition in making decisions. However, not all the elements that were considered important to intuition or rational decision making were evidenced in the content analysis. Spontaneity and rapid decision making did not reach a level of discrimination for intuition. Detail orientation, a preference for routine, and rule following did not achieve a level of significance for rational decision making. Passionate attention did achieve a significant result, but it was not the most important element of intuition. This indicates that passionate focus is significant in intuitive decision making and does influence the entrepreneur's decision making.

The case study interview transcripts were analysed in order to code for emergent themes. Due to the use of qualitative techniques, it was important to allow themes to emerge naturally while analysing the data, rather than to attempt to impose a preconceived set of ideas (Krippendorff 1980). This approach ensures that any unanticipated themes are given the opportunity to emerge from the data and that no undue credence is given *a priori* to any preconceived ideas.

Using NVivo®, a computer based qualitative software program, the transcript data was analysed thematically and examined in light of the elements and themes drawn from the Literature Review. Figure 4.8 is the result of the content analysis of the interviews.

Figure 4. 8: Support for intuition nodes



The X axis represents the number of hits for each intuition element, whilst the Y axis represents each node. The node which attracted the most support was ‘seeing the bigger picture’, followed by intuition, emotion based decisions, risk taking, action orientation and passionate focus. Figure 4.8 also illustrates the importance of each node overall. Nodes with less than ten percent hits¹ were not included. It is noteworthy that speedy decision making did not receive any hits since deciding is not the same as intuiting.

4.3.1 Intuition Nodes

The Bigger Picture – ‘Seeing the bigger picture’ (holism) was found to be the most important element of intuitive decision making. Several of the entrepreneurs commented, ‘why do I spend my money in this area, because I think it will be for the common good,’ and ‘there is really genuine belief here that we are contributing, and a real sense that this is a golden opportunity to keep this region strong.’ Another entrepreneur felt that, ‘the public isn’t always right and not all those influences are wholesome and dealing with that is an issue because I do think that [what we do] will ultimately save the planet,’ and yet another commented that ‘it’s fundamentally about being fair, about doing what is right whilst being firm in negotiating but not screwing someone over’. Support for the importance of ‘seeing the bigger picture’ comes from

¹ The 10 percent hit ratio was based on the number of hits as a percentage of total number of hits for each decision making node. .

Mitton (1989). He gives this notion central significance in entrepreneurial behaviour. He argues that, 'entrepreneurs can see the forest as well as the trees and they put environment, people, events, information and technology into an understandable perspective' (Mitton 1989 p. 11). It is this ability more than any other that sets the entrepreneur apart from other business owners. According to Vance et al (2007), holism is an important aspect of intuition.

Intuition – 'Listening to one's heart', 'gut feeling' and instinct were all descriptions of the way entrepreneur's made intuitive decisions. Some entrepreneurs, however, did not use any of those terms. Instead one entrepreneur used these terms: 'every once in a while I come across one of these ideas where I just knew it was going to work'. Another example came from one of the UK interviewee who commented 'the greatest hiring mistakes I've made have been when I hired someone who looked right on paper but didn't feel quite right'. Another participant who purchased a business that had gone into receivership for \$A18m after only two days of consideration said, 'I can tell you within an hour what is wrong with a business, without giving me any facts and figures just give me a trading PandL and an hour and I'll go for a walk and I'll tell you, that comes back to part gut instinct, part experience ...gut instinct will lead me where to look first'. This entrepreneur's approach supports Vance's proposition (2007 p.69) that effective decision making requires both linear and non-linear thinking styles.

Risk – Risk taking was found to be an important element of intuitive decision making (Allinson et al. 2000). As one entrepreneur said, 'I encourage the people who work for me to make decisions, do it, and get on with it, and if their wrong they just need to pick themselves up, dust themselves off, and make another decision'. Another participant, who was a founder of one of the biggest telecommunications company in the USA, said 'so many people thought that we were mad, [but] I think part of being an entrepreneur is being willing to take risks'. Another entrepreneur felt that it was simply part of who he was, explaining 'I put myself out on a limb as far as my personal and my professional life, I just enjoy the challenge'. Most definitions of entrepreneurship include some reference to risk, in terms of either risk management or risk taking (Hisrich and Peters 2002). Therefore it is not surprising that entrepreneurs have a proclivity for action orientation. Whether taking or managing risk, both approaches require entrepreneurs to take action and it is this action that they argue is important.

The literature on entrepreneurship suggests that entrepreneurs consider that success requires a propensity for action (Timmons and Spinelli 2003)). Bygrave and Zacharakis (2008) suggest that action orientation (the doer) is one of the ten most important characteristics of an entrepreneur. The interviewees supported this with statements

such as; 'we take more risks and have a go at most things' and, 'you cannot analyse things for weeks on end...you have to make a decision, even if it's the wrong decision you just press on'. Another entrepreneur concurred, saying 'it's easy to get caught in thinking [something] is insurmountable, most things are achievable if you just start doing them'.

Emotion based decisions – Fourteen of the sixteen entrepreneurs referred to intuitive decision making as either a sense, emotion, or feeling that a particular course of action 'felt wrong' or 'felt right'. One offered his experience, saying 'if I like the product, and I like the people, and I think I'm going to have a lot of fun, and I'm not going to lose a huge amount of money, I think I can protect my downside, then... I will go on my gut'. Whilst relying on 'his gut' this entrepreneur also considers the negatives, so a component of rationality is present in his decision. Conversely, a participant who had entered a new industry said, 'I haven't done any market research at all, I just know that it will be a seller, why, because I can feel it'. Another entrepreneur who became involved in a second business said, 'I was doing something where my heart wasn't in it, the head was there but not the heart. I cannot continue if it feels wrong'. This may explain why passionate focus is important for entrepreneurs to engage fully.

Passionate Attention – Whilst the node of passionate focus achieved significance, it was found to be the least important of the significant elements in the content analysis of the interviews. For one of the female entrepreneurs, 'passion was the key, to create, to complete and to succeed'. She felt that it was her organisation's 'crazy enthusiasm that could be contagious and even extend to [her] customers', which she said was critical to her success. Another repeat entrepreneur attributed his multiple successes to the fact that he could 'get interested and passionate about all sorts of different products and services'.

Four of the Cambridge entrepreneurs felt that it was important to be passionate about entrepreneurship and were working with the Cambridge Enterprise Centre's nascent entrepreneurs because they said that, 'it's important to share that passion'. In the pursuit of one's passion some entrepreneurs said they would often forget what the time was. The following comment is representative of this: 'The day can finish at five o'clock at night or it can finish at midnight, on many occasions I've looked at my watch and it's a quarter to ten and I've forgotten to go home'. Another entrepreneur said one must be 'tireless' in one's commitment to business, 'just because you have a hiccup you shouldn't run away with your tail between your legs, it's very much about tackling'. Another added, 'It's very easy to walk away if you're not serious about success, most things are achievable if you just start doing them', and 'once you're in the middle of it

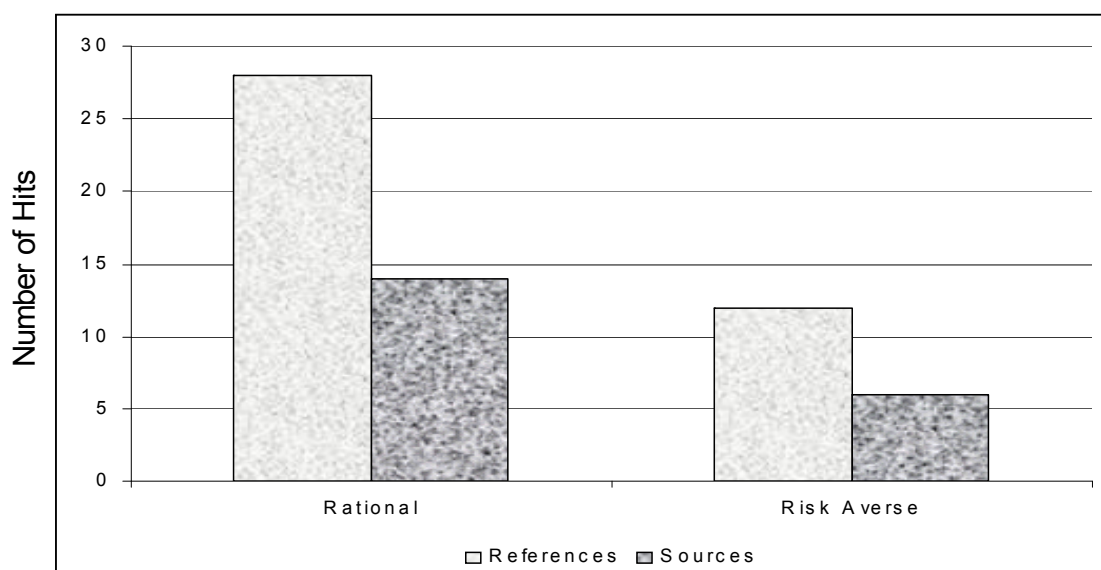
sometimes you'd be so busy working on the challenge that the magnitude of the problem wouldn't occur to you'. These findings are consistent with Mitton's (1989 p.12) view that entrepreneurs 'make a total commitment to their cause', because they have a strong sense of mission and tackle their roles with unrelenting zeal.

Whilst intuition appears to be an important aspect of entrepreneurial decision making, entrepreneurs do not ignore rational considerations of the issues and this also has an impact on their decision making. The following section discusses the importance of rational decision making, in order to provide the opposing perspective.

4.3.2 Rational Decision Nodes

The content analysis strategy which was used to test for intuitive nodes was also employed to test for rational decision making. The content analysis found only two nodes to have significant support.

Figure 4. 9: Support for rational nodes



Rational elements achieving significance

The meaning units found in the lexicon of rational decision making language were logical and analytical. These terms were considered interchangeable. An example of an interviewee who preferred this style of decision making said, 'I think, primarily, one has a model of the world as to what one thinks is useful and where things are going to fit'. When told that intuition seems to be a critically important element of successful decision making, an entrepreneur retorted, 'I think in many ways, people who do that

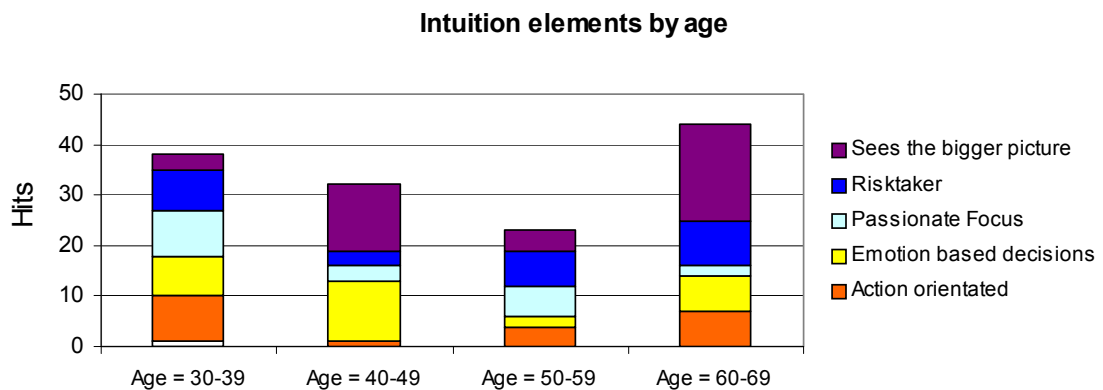
are fortunate with their timing. I have in my mind a model. It is a complex network of ideas and things and how they interrelate’.

Risk aversion – A number of interviewees demonstrated a propensity to stick to known methods and accepted ways of thinking, because ‘there’s a level of risk associated with doing things differently’. The following responses were received when asking interviewees if they were risk takers: ‘I go into the detail when necessary because I like to take the risk out of any equation’ and ‘you can’t just make many of those decisions flying by the seat of your pants, you’ll come unstuck if you do, there are too many people that have tried and haven’t lasted’.

4.3.3 Age and Decision Making

From the content analysis, figure 4.10 provides some clarity as to what elements are most important to entrepreneurial decision making at each age category.

Figure 4. 10: Significance of intuition references for each age group



The most striking effect is that factors which influence entrepreneurial decision making change over the life of the entrepreneur. ‘Seeing the bigger picture’ is most important in the oldest age category, and least for the youngest category. Action orientation is the most important for the younger entrepreneurs and least important for the 40-49 age category. The overall importance of intuition decreases with age and then increases dramatically for the oldest entrepreneurs. The source of this dramatic increase is the focus on ‘seeing the bigger picture’.

4.3.4 Entrepreneur Cohorts and Decision Making

Whilst the aforementioned results depict the significance of each decision making node, the following figures provides an appreciation of the importance of each node to each cohort of entrepreneurs.

Figure 4. 11: Significance of intuition elements AUS and UK entrepreneurs

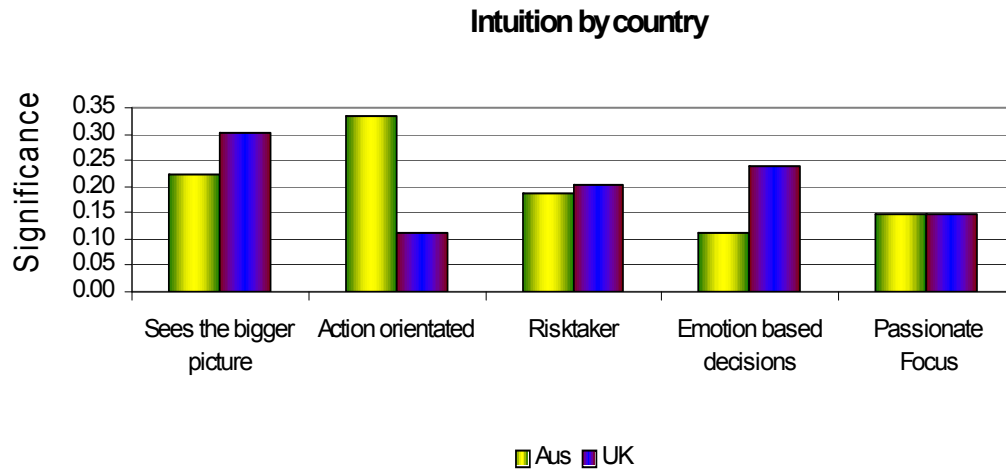
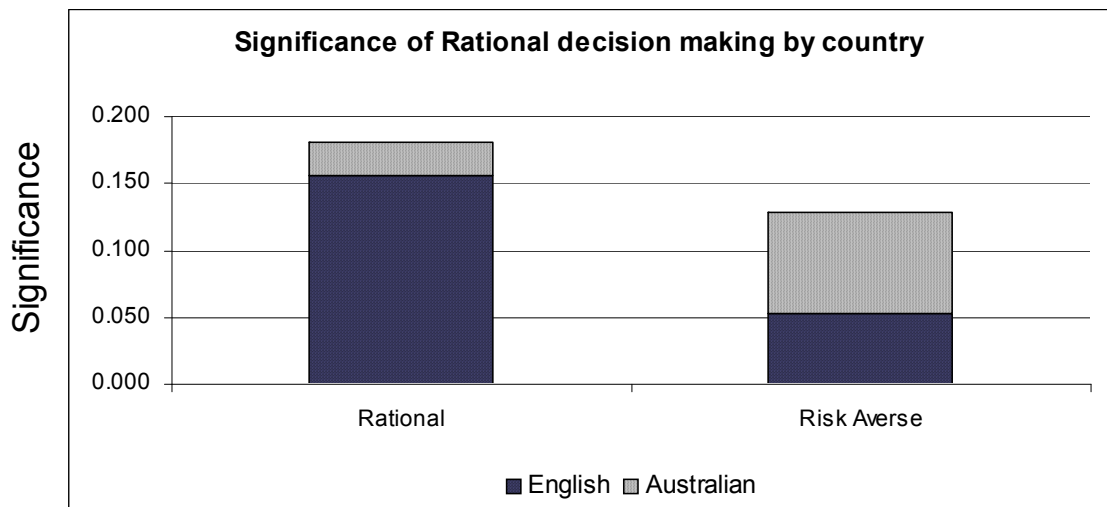


Figure 4.11 depicts the important intuitive elements as a percentage of the total elements for each group. This approach of measuring the importance of each cohort was adopted because five Australians and eleven English people took part in the interviews. The major difference between the two groups was in action orientation, emotion based decisions and 'seeing the bigger picture'. The Australian entrepreneurs were significantly more inclined to action; whilst the English entrepreneurs demonstrated a greater inclination to make emotion based decisions and to look at the bigger picture.

Figure 4. 12: Rational decision making by cohort (UK and Aus)



Rational Nodes

While there was an equal importance placed on risk aversion by the English and Australian entrepreneurs, there is a distinct difference between the groups in rational decision making, with the English placing more importance on rational decision making. This is consistent with the findings on intuition in which the English entrepreneurs showed a lower propensity for action orientation. Thus far the findings have been discussed in terms of the significance of each decision making element relevant to age and country and CSI scores. But what did the participants have to say and how did they respond to the questions? The following expands that discussion so that the reader may gain an appreciation of the participants' experience in their own words.

A real estate developer commented, 'I don't do very much analysis ... I look at a property and make a decision in five minutes as to whether or not I'm going to buy that particular property'. Another interviewee said, 'regardless of the business one needs to get a feel for it [because] one should have an innate sense of where it should be'.

It can be seen that some of these comments imply an inclination towards risk taking. Many of the entrepreneurs regarded risk taking as an important aspect of action. Quite a few entrepreneurs expressed the view that you must take action, regardless of the risk because; 'you can't stop and study every single part of every single thing [otherwise] you'll never get to make a decision,' and 'you have to make a decision, even if it's the wrong decision'. This was found to be a significant aspect of Australian entrepreneurs (figure 4.12). One Australian entrepreneur said, 'I'm not very considered about it... I just get out there and I put myself in situations'. Another said; 'I do not think

that you should get into paralysis by analysis. Taking any action is a risk, we take more risks and have a go at most things’.

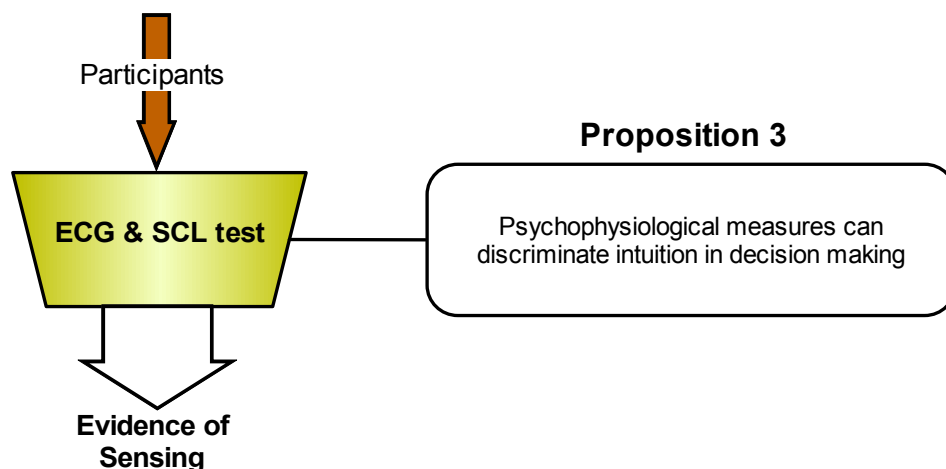
What inspires entrepreneurs is change, new ideas and new opportunities. Some of the participants responded with comments such as, ‘Oh yeah, I get bored easily, I like the freedom to follow different paths and do different things’, and, ‘I like to build companies, but once their up and running I get bored, I like to try something different’.

In the next stage, the experimental tests aim to determine whether this passionate attentional focus does indeed create an information channel to quantum level information and whether or not this produces a measurable effect.

4.4 Experimental Test Results

This proposition differs from Proposition Two on the basis that the passionate attentional focus creates a channel of communication which can have a measurable physical affect on the entrepreneurs’ HRV and skin conductance.

Figure 4. 13: Proposition Three



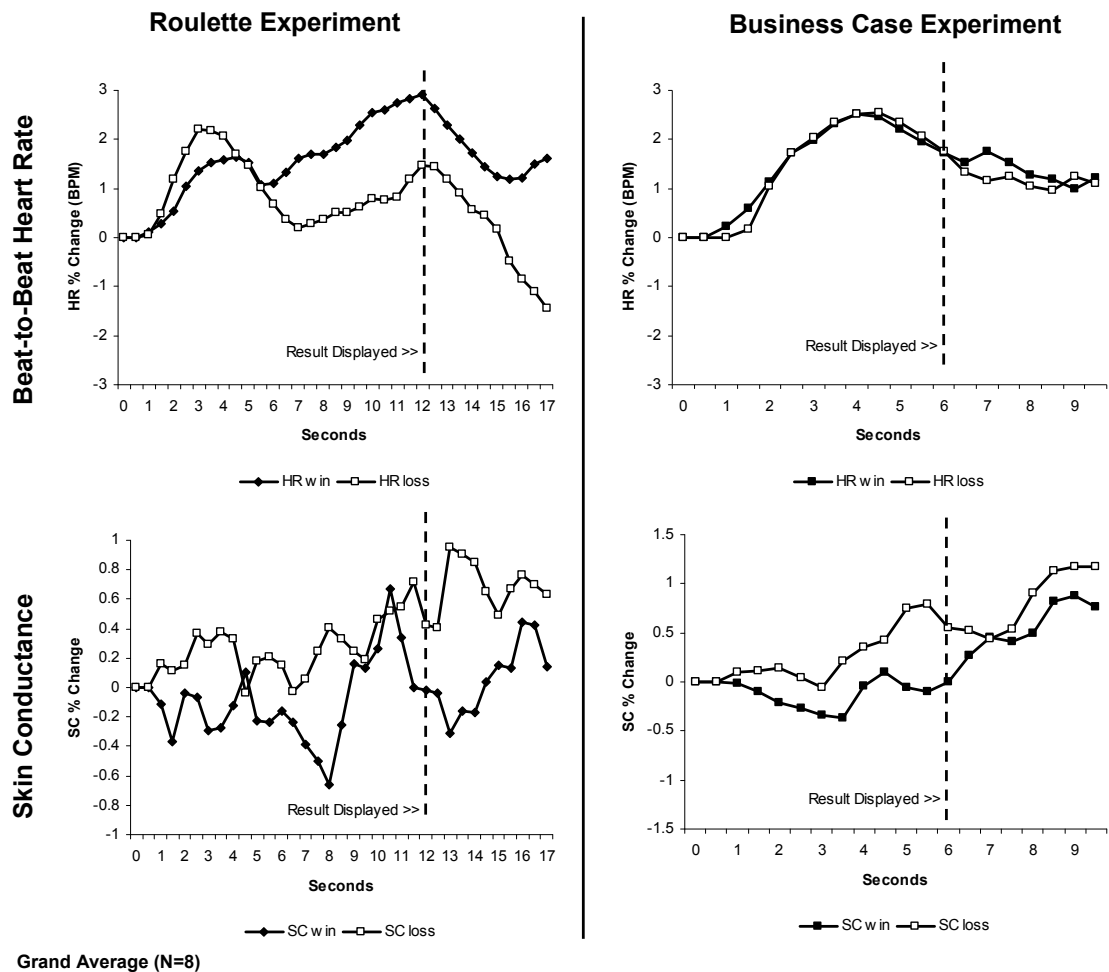
While the experiment was able to detect the physiological differences between wins and losses, the evidence of intuition at the aggregate level for both samples was inconclusive. In Sample One, at the individual level, only two subjects (S17 and S19) had results that approached significance, and two were marginally significant (S18 and S20) in predicting future outcomes. There was only one entrepreneur whose cognitive awareness of the future outcome matched his autonomic systems prediction of the future outcome. The results indicate that psycho-physiological measures can discriminate intuition in decision making however no one participant achieved results whose odds were against chance. Two groups of repeat entrepreneurs (17n) were

recruited for this aspect of the pilot study. The first sample (Sample One) of eight subjects were older (mean age, 53 years), more experienced entrepreneurs who participated in the study during April of 2006.

The second sample (Sample Two) of nine participants were younger (mean age, 32 years), less experienced, repeat entrepreneurs, and they participated in the study during November of 2006. The first priority was to determine if a signal measure of HRV and SCL using a testing protocol could successfully discriminate between future decision outcomes, as the post-choice pre-outcome electrophysiological measures of PSA (pre-stimulus activity) correctly predicts the win/loss outcomes of investment choices.

The aggregated analysis for all participants in Sample One (figure 4.14) and Sample Two (not shown), produced no significant findings for either sample as a group. This is not surprising given the high degree of variation in the physiological measures, the small sample sizes involved, and the highly statistically conservative nature of the Random Permutation Analysis (RPA).

Figure 4. 14: Average (All Subjects S1) of Physiological Recordings During Post-Intervention Choice Period



Grand Average (N=8)

Figure 4.14 presents the grand average of the physiological recordings for the eight participants with complete and usable data during the post-choice pre-outcome period for Sample One, (the more experienced repeat entrepreneurs). The two graphs in the top half of the figure show the mean pattern of the recordings for beat-to-beat heart rate for the Roulette Experiment and the Business Case Experiment. Evidence of measurement discrimination can be seen in the separation between the win/loss curves in the mean heart rate pattern for the Roulette Experiment that begins at about six seconds prior to the outcome result being displayed. However, the mean heart rate curves for wins and losses in the Business Case Experiment are virtually the same and show little evidence of measurement discrimination.

The two graphs in the bottom half of figure 4.14 show the curves for the mean pattern of skin conductance recordings for each experiment. Across all subjects, the mean

skin conductance curves in the Roulette Experiment show a pattern of diverging and converging separation in which the curve is somewhat greater for losses than that for wins prior to the event occurring, especially around six to seven seconds before the outcome result is displayed. For the Business Case Experiment, a small separation between the curves for wins and losses is apparent in the pattern of skin conductance change during the post-investment period. Overall, there appears to be stronger evidence of measurement discrimination in the Roulette Experiment than in the Business Case Experiment.

To evaluate the protocol's discriminant validity, a statistical analysis was conducted both at the collective and individual level. This was carried out in order to ensure that patterns of separation between investment win/loss curves are evident and also consistent across the total and individual data.

Table 4. 5 Performance Analysis (Chi-Square) Of Wins And Losses By Subject (S1)

Sub#	Roulette Experiment					Businesses Experiment				
	Win	Lose	Win ratio	χ^2	$p =$	Win	Lose	Win ratio	χ^2	$p =$
S3	13	12	52%	0.04	0.841	13	12	52%	0.04	0.841
S5	15	10	60%	1	0.317	NA	NA	NA	NA	NA
S16	12	13	48%	0.04	0.841	14	11	56%	0.36	0.549
S17	9	16	36%	1.96	0.162	17	8	68%	3.24	0.072*
S18	15	10	60%	1	0.317	15	10	60%	1	0.317
S19	12	13	48%	0.04	0.841	17	8	68%	3.24	0.072*
S20	14	11	56%	0.36	0.549	10	15	40%	1	0.317
S21	15	10	60%	1	0.317	12	13	48%	0.04	0.841

Chi-Square

Max	60%	Max	68%
Min	36%	Min	40%

The results of the performance analysis for the eight useable cases are shown in table 4.5, the Chi-squared significance test to identify a win/loss ratio beyond the threshold of chance. The data in the table 4.5 shows the degree to which each subject's intuitive Roulette bet and Business Case investment decision was successful once the decision outcome was known. The maximum observed win/loss ratio was 60 percent in the Roulette Experiment (Subjects 5, 18, 21), and minimum win/loss ratio was 36 percent (Subject 17). For the Business Investment Experiment, the maximum win/loss ratio was 68 percent (Subjects 17 and 19) and the minimum was 40 percent (Subject 20). While no participant's win/loss ratio exceeded the odds against chance in Roulette Experiment, the experiment was able to detect the physiological differences between wins and losses. In the Business Experiment, two subjects (Subjects 17 and Subjects 19) had a win to loss ratio that approached significance ($p = 0.072$ for both subjects).

Subject 18 on both Roulette and Business Case Experiments had 60 percent win/loss ratio. As can be seen in the recordings of the physiological measures for this person (table 4.5/ figure 4.15), there was a clear separation of the wave forms for the skin conductance data during the post-choice pre-result period in both the Roulette Experiment and the Business Case Experiment.

The performance analysis results of Subjects 19 and 20 show that while the cognitive win/loss ratio Subject 19 was at chance level (48 percent) in the Roulette Experiment, it was 68 percent – marginally significant ($\text{Chi}^2 = 3.24$, $p = 0.072$) – in the Business Case Experiment.

4.4.1 Random Permutation Analysis (RPA)

To reduce the possibility of false-positive findings, a deliberate decision was made to use randomised permutation analysis, because it controls for auto-correlations inherent to physiological signals and their underlying non-normal distributions (Blair and Karniski 1993). RPA was used to determine statistical significance of the differences between win and loss curves during the pre-stimulus period. Applied separately to each participant's SCL and HRV data, RPA generates one standard deviate, or z score, per person, which is the post-choice pre-result differential value – i.e. the win/loss difference (Good 1994; Radin 1997b). For the RPA, a random distribution was built up over 2,000 permutations.

The results of the RPA by individual participants are more promising, and show that the experimental procedure using the physiological instrumentation has identified five instances involving four (Subjects 17, 18, 19 and 20) entrepreneurs (depicted in table 4.6) in which the physiological measures of entrepreneurs had significant or marginally significant predictive power in discriminating future outcomes. In short, there is clear evidence that the physiological measures were able to detect intuitive perception of a future outcome in four of the eight entrepreneurs.

Table 4. 6 Results Of RPA Of Physiological Measures By Subject

Roulette experiment

	Beat-to-Beat Heart Rate			Skin Conductance		
	Observed	z	p =	Observed	z	p ~ ^α
S3	-30.49	-0.68	0.247	-5.56	-0.14	0.446
S5	16.75	0.96	0.170	NA	NA	NA
S16	0.38	-0.09	0.466	5.73	0.40	0.346
S17	73.35	2.06	0.020 *	15.59	1.08	0.141
S18	8.30	0.30	0.381	-9.81	-0.25	0.400
S19	8.41	0.35	0.362	-71.52	-1.39	0.082 †
S20	NA	NA	NA	16.17	0.66	0.256
S21	19.73	1.08	0.141	NA	NA	NA

α Based on 2000 random permutations.

Business case experiment

	Beat-to-Beat Heart Rate			Skin Conductance		
	Observed	z	p =	Observed	z	p ~ ^α
S3	-16.84	-1.15	0.125	-2.42	-0.40	0.345
S5	NA	NA	NA	NA	NA	NA
S16	16.19	0.96	0.169	0.33	0.14	0.445
S17	-1.77	-0.34	0.367	-12.69	-2.08	0.019 *
S18	-4.85	-0.27	0.395	-13.53	-1.46	0.073 †
S19	-6.22	-0.52	0.302	17.48	0.77	0.221
S20	NA	NA	NA	-17.51	-2.06	0.020 *
S21	7.56	1.16	0.123	NA	NA	NA

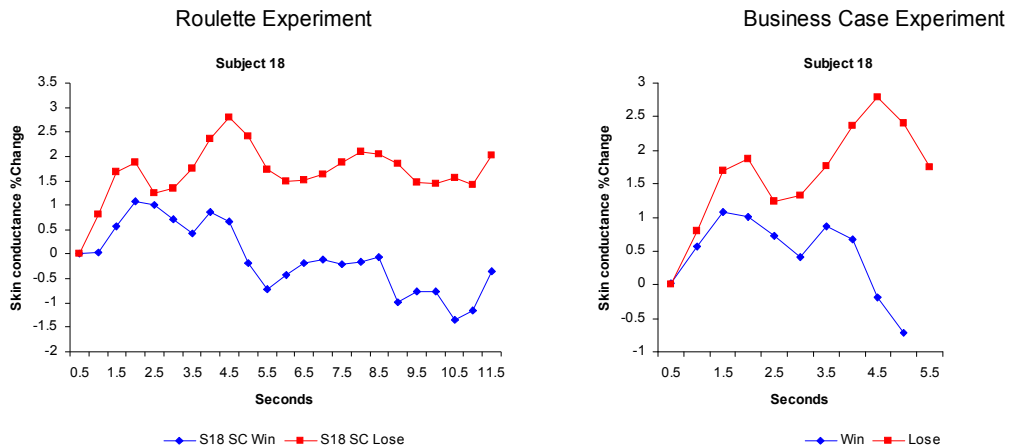
α Based on 2000 random permutations.

* p < 0.05

† p < 0.1

In the Business Case Experiment, for Subject 18 (table 4.6) the separation of the skin conductance waveforms was marginally significant (z = -1.46, p = 0.073). Given the extremely rigorous statistical requirements of the RPA method, these results are promising. For this subject, the HRV results (z = -0.27, p = 0.395) did not show discriminatory ability to predict future win/loss outcome.

Figure 4. 15: Subject 18 skin conductance results (S1)



An even more intriguing situation is evident for Subject 17. The results of RPA indicates that the HRV waveforms significantly predicted the future win/loss outcome during the Roulette Experiment ($z = 2.06, p = 0.02$), but the skin conductance measure did not ($z = 1.08, p = 0.141$). However, this entrepreneur’s cognitive win/loss ratio was 36 percent, (table 4.5) which is nearly significant, but in the wrong direction. In the Business Case Experiment this entrepreneur’s skin conductance significantly predicted the future outcome ($z = -2.08, p = 0.019$), while the HRV did not ($z = -0.34, p = 0.367$). This was the only instance in which an entrepreneur’s cognitive awareness of the future outcome matched his/her autonomic system’s prediction of the future outcome.

Interestingly, the physiological processes of Subject 19’s ANS was predicting the opposite outcome to that reflected by this subject’s cognitive choice, in that his or her skin conductance was marginally significant ($z = -1.39, p = 0.082$) in the Roulette Experiment, but not in the Business Case Experiment ($z = 0.77, p = 0.221$). The HRV results for this subject did not show any discriminatory ability to predict future win/loss outcomes in either experiment ($z = 0.35, p = 0.362$, and $z = -0.52, p = 0.302$, respectively).

In contrast, Subject 20’s cognitive win/loss ratio was 56 percent, and in the right direction in the Roulette Experiment, at 40 percent, but in the wrong direction in the Business Case Experiment. Neither result was significant. While the skin conductance result for the Roulette Experiment ($z = 0.66, p = 0.256, n.s.$) did not show a discriminatory ability to predict future win/loss outcome, there was a significant result for the Business Case Experiment ($z = -2.06, p = 0.020$). This suggests this subject’s physiology was correctly predicting the future outcome, even though his or her cognitive choice was in the wrong direction. Unfortunately, the HRV data for this

subject was not available as this was one of many cases for whom technical difficulties occurred in the data collection.

Subject 16's cognitive win/loss ratio on the Roulette Experiment was close to chance (48 percent), and his or her physiological responses showed little predictive power. In the Business Case Experiment, his or her win/loss ratio was slightly improved at 56 percent and his or her HRV waveforms show clear separation, yet it did not exceed the threshold of chance ($z = 0.96$, $p = 0.169$).

4.4.2 Sample 2

The electrophysiological recordings were gathered during two periods in each experiment during the initial testing of the protocol for Sample One: the post-choice pre-outcome period, and the post-outcome result period. However, as it was thought likely that there could be significant pre-stimulus activity (PSA) reflecting an intuitive pre-decision response before the participant had made an investment decision, it was decided that for Sample Two, the physiological recording would begin even earlier in the pre-choice period. The experimental protocol involved a two step process. Firstly, the participants were subjected to a Roulette Experiment followed by a Business Case Experiment, following the operational sequence shown in table 4.7.

Table 4. 7 Operational Sequence For Each Experiment

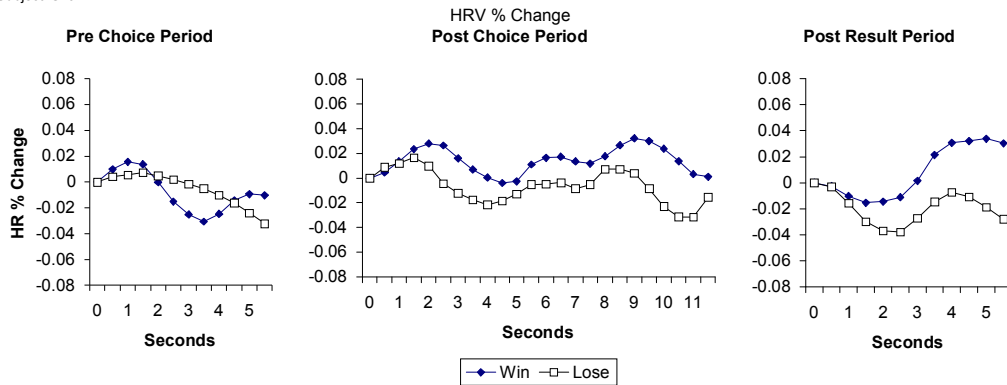
Roulette Experiment	Business Case Experiment
Press 'Start' button	Press 'Start' button
Pre-Choice Period – 5 seconds	Pre-Choice Period – 5 seconds
'Betting' prompt appears	'Company Profile' prompt appears
Select bet amount (5c, 25c, 50c, or \$1) and Choose 'Red' or 'Black' for a 'Win'	Choose 'Not Invest' or 'Invest' and Select investment amount (\$0 – 100,000)
Post-Choice Pre-Outcome Period – 11 seconds	Post-Choice Pre-Outcome Period – 11 seconds
'Win/Loss' Outcome and Total \$ Won/Lost displayed	'Successful/Failed' Company outcome and Total \$ Gained/Lost displayed
Post-Result Outcome Period – 5 seconds	Post-Result Outcome Period – 5 seconds
'Repeat' button appears (experiment repeats 25 times)	'Repeat' button appears (experiment repeats 25 times)

The results of the grand average of the physiological recordings for the nine participants with usable data for the Roulette Experiment for Sample Two are not shown. The unacceptably high number of artefacts in the electrophysiological data from the Roulette Experiment for the sample prevented an RPA by individual for the HRV data and also for the skin conductance data.

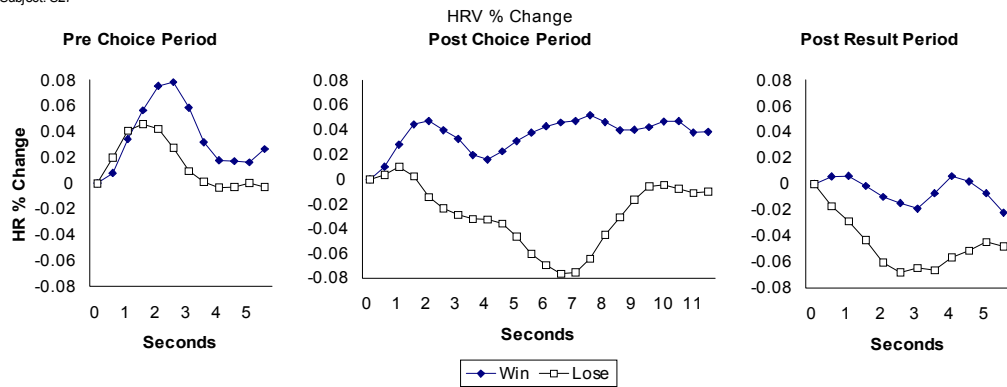
However, a visual inspection of the individual results reveals that the separation between the win/loss curves are likely to be close to or within the range of statistical significance in seven instances involving four entrepreneurs, three instances for skin conductance and four for HRV. Three of these instances (figure 4.16) involve a clear separation between the win/loss curves; one (Subject 27) in the pre-choice period before the entrepreneur has made an investment decision and two in the post choice period (Subjects 26 and 27).

Figure 4. 16 Data from Subject 26 and 27 (S2)

Subject: S26



Subject: S27

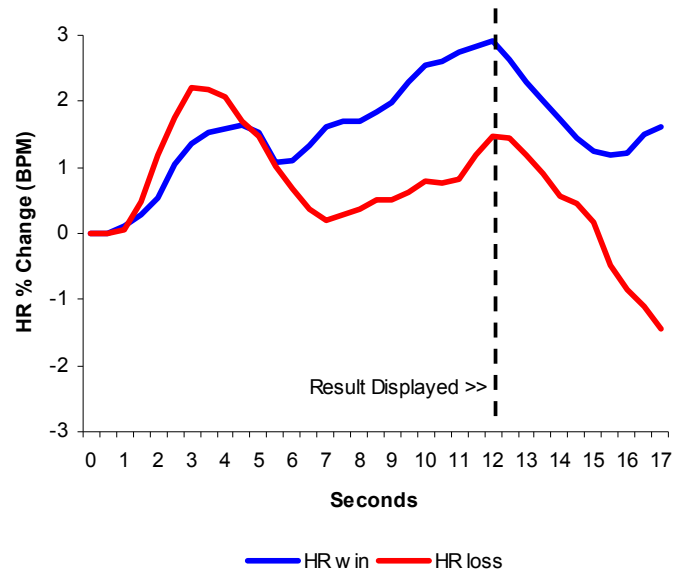


4.4.3 Psycho-physiological Results

Although the CSI and content analysis results were unambiguous, this was not the case with the psycho-physiological experiments. In Sample Two the results revealed little evidence of measurement discrimination and therefore are not included or discussed. The following discussion considers the results of Sample One only.

Figure 4.17 depicts the HRV aggregate score for the Roulette Experiment which differs marginally (1 percent) between wins and losses.

Figure 4. 17 HRV % change average all participants (Roulette Experiment S1)



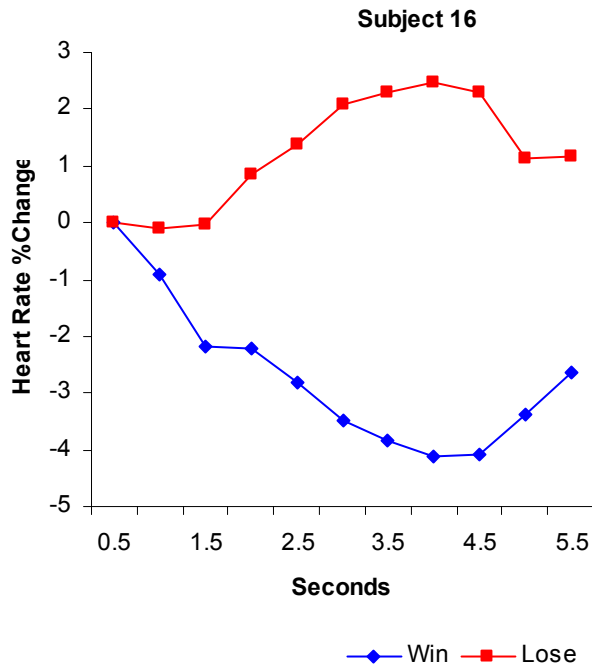
In Sample One's Business Case Experiment, there was no discernable difference in the HRV and skin conductance between wins and losses, and thus this is not depicted here.

Whilst the aggregate scores for the psycho-physiological experiment provide little evidence of an effect for intuition, much more significant effects were detected at the individual level. Five of the seventeen participants, four from Sample One and one from Sample Two (Subjects 16, 17, 18, 20 and 27) involved in the experiment test achieved some discrimination². Three of the results showed some effect for HRV and two for skin conductance.

For Subject 16 (figure 4.18) the most notable difference between wins and losses was in the HRV for the Business Case Experiment. There is a significant diversion in HRV between wins and losses with a six percent difference at the extremities.

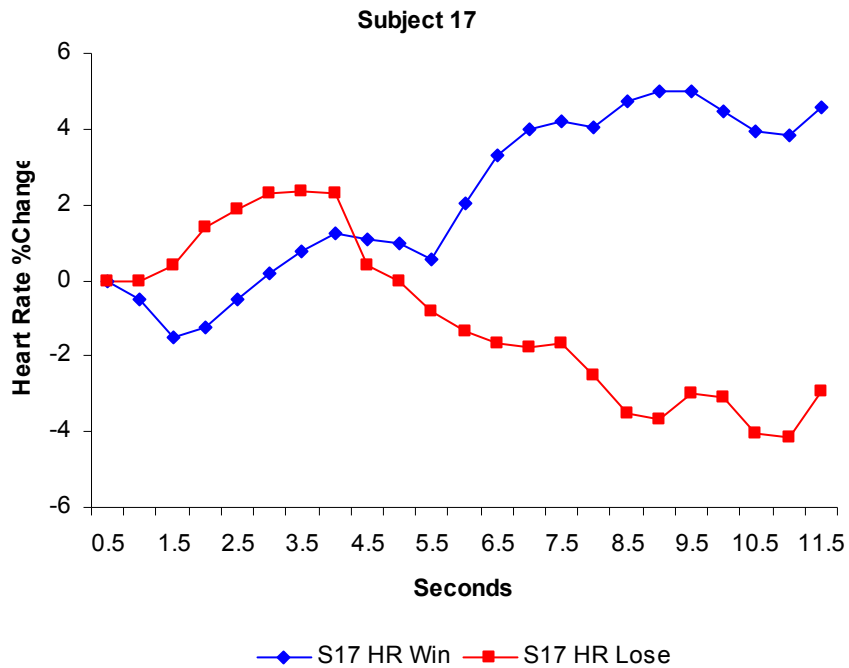
² The entire results for S16, S17, S18 and S20 can be found in Appendix 8

Figure 4. 18: Business experiment S16



For Subject 17 there was a difference in the HRV win and loss curve in the Roulette Experiment, but this did not occur until 4.5 secs into the experiment.

Figure 4. 19: Roulette Experiment S17



S18 shows a difference in skin conductance between wins and losses for both the Roulette and Business Case Experiment.

Figure 4. 20: Skin conductance results for S18

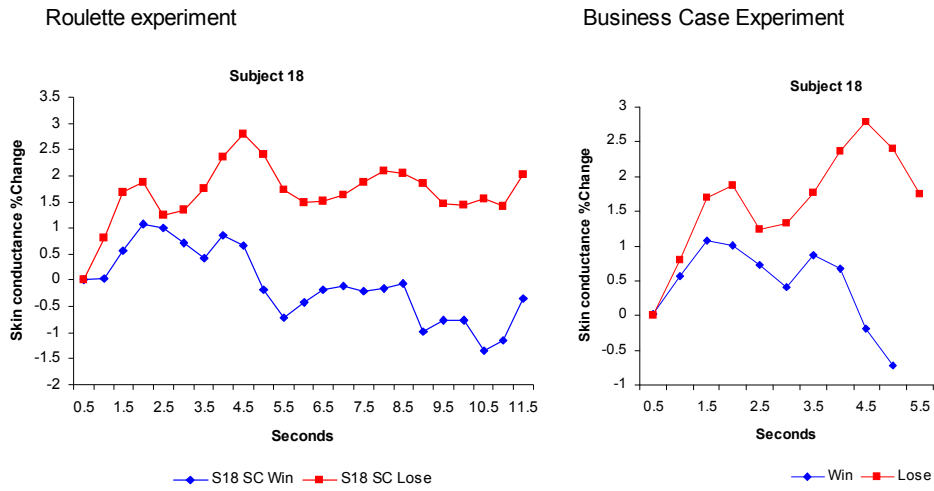
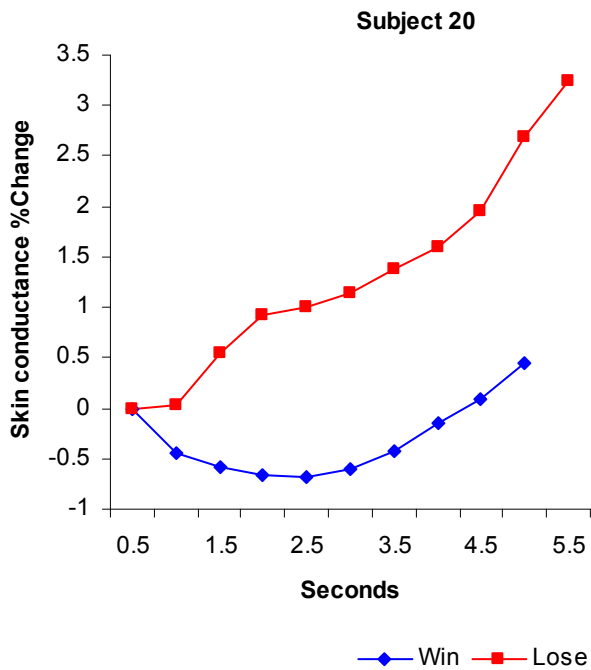


Figure 21 likewise showed some discrimination between wins and losses in skin conductance but only in the first 5.5 secs, as depicted.

Figure 4. 21: Skin conductance Business Case Experiment S20



5.0 Discussion

The purpose of this pilot study was primarily methodological; testing the measurement system and the protocols. As this pilot study took a multi-method approach, the data is presented from three different perspectives: the Cognitive Style Index (CSI), interviews of repeat entrepreneurs, and the physical experiment which was developed in conjunction with the Institute of Heartmath. The findings indicate that intuitive types have some common characteristics with entrepreneurs: they tend to be self-sufficient and trusting of their own judgment (self-efficacy); they are able to live with ambiguities and uncertainties; and they are confident to take action with the little information they have at hand because they are action-orientated.

Intuition is a method of making decisions that is both holistic and non-linear. In general, scholars feel uncomfortable with this conceptualisation because of the nebulous nature of the construct. This type of decision making is problematic because the concept is ill-defined and poorly understood. Mitchell et al (2005) further adds that there are too many factors that influence one's intuition, such as the environment, brain organisation, experience, training and accessibility (not necessarily available when one needs it). Myers (2002), declares that there is consensus amongst psychologists as to what differentiates rational and intuitive decision making and, like Mitchell et al (2005), offers a model of intuition that is learned behaviour, despite the lack of empirical evidence to support this view.

This research found an entrepreneur's proclivity for intuition changed very little through the different age categories, yet there was no proportional increase in rational decision making suggesting the intuition and rational decision making may not be on the same continuum. This is in contrast to Allinson and Hayes' (1996) proposition that Cognitive Style is a unitary construct. Thus, entrepreneurs can be both intuitive and rational in their decision making approaches. Vance et al (2007) support this view, arguing that in today's highly competitive and turbulent environment, effective decision making requires both linear and non-linear thinking.

Conversely, Mitchell et al (2005) proposed that intuition could be valuable to entrepreneurs in the opportunity recognition process. The interview data revealed that repeat entrepreneurs make many decisions in the course of running their businesses, such as forming strategic alliances, employing new staff, and choosing a particular strategy, not just for opportunity recognition. The interview data clearly showed that the sample entrepreneurs interviewed used their intuition in many decision making

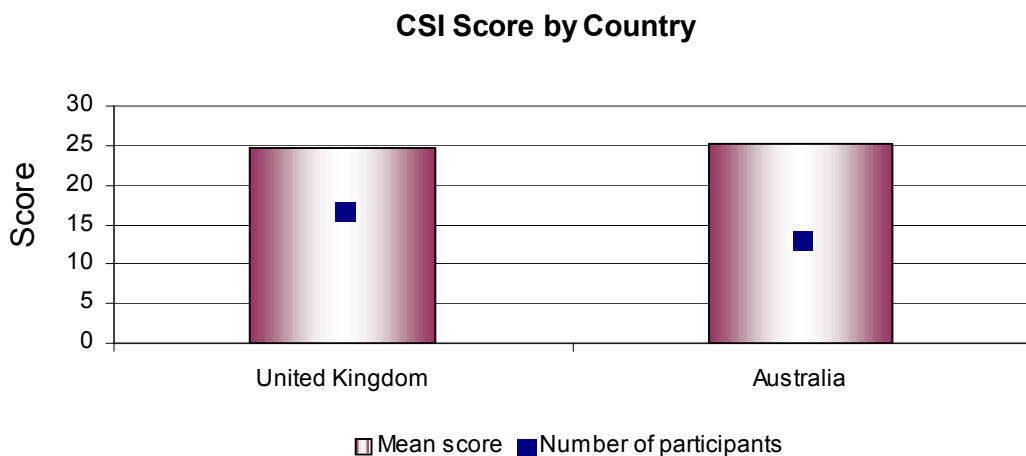
situations, not just opportunity recognition. First, the CSI interview findings will be discussed.

5.1 Cognitive Style Index

The CSI results show that the cohort of repeat entrepreneurs chosen for this study had a clear propensity for intuitive decision making. The repeat entrepreneur's mean score was significantly lower than managers and lower than that of general entrepreneurs, thereby supporting the choice of repeat entrepreneurs as an appropriate sample for this research

The entrepreneurs involved in the CSI data collection were from the UK and Australia. Their ages ranged from 33 to 67. Their CSI scores were analysed for age, country of origin and gender. There were only four females in this group. Even though the sample size was too small to offer any definitive arguments based on gender, those who participated had an average score lower than their male counterparts, which is consistent with the work of other researchers which shows that women are likely to be more intuitive than men (Bierman and Scholte 2002; Myers 2002; Radin 1997b). The following table depicts country of origin and the average CSI Score.

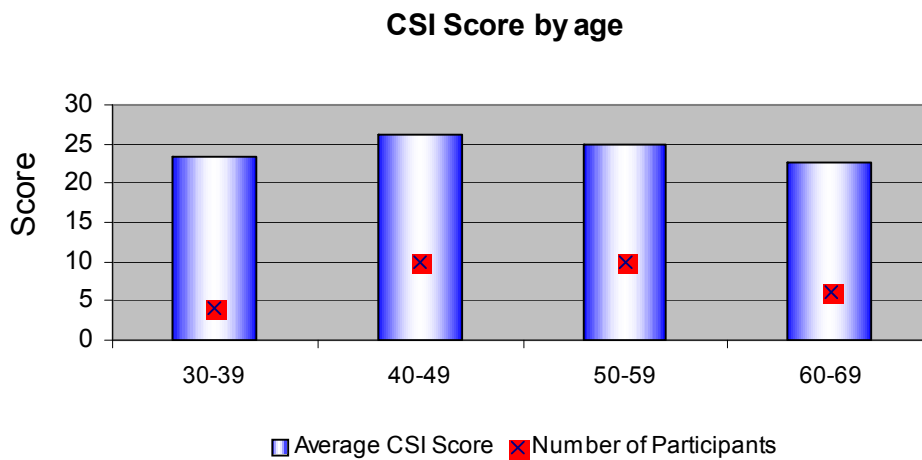
Figure 5. 1 CSI By Country



Whilst there were four more English than Australian entrepreneurs, the average CSI score was almost identical for both cohorts. The difference in variation of the CSI score according to age was also insignificant. The greatest variation in mean scores between the different age groups was between the 30-39 and 40-49 age group. There

was only a 2.8 point difference in mean and a 2.6 difference in SD. The greatest variation to be expected if learned behaviour was a significant factor should have been between the youngest and the oldest group. Yet the difference was 0.6 in the mean and a 3.7 difference in SD, indicating that there was no real significant difference in the propensity for intuition between the age groups. This brings into question the learned behaviour model (Mitchell et al 2005; Myers 2002) of intuition figure 5.2.

Figure 5. 2 CSI Score By Age Range

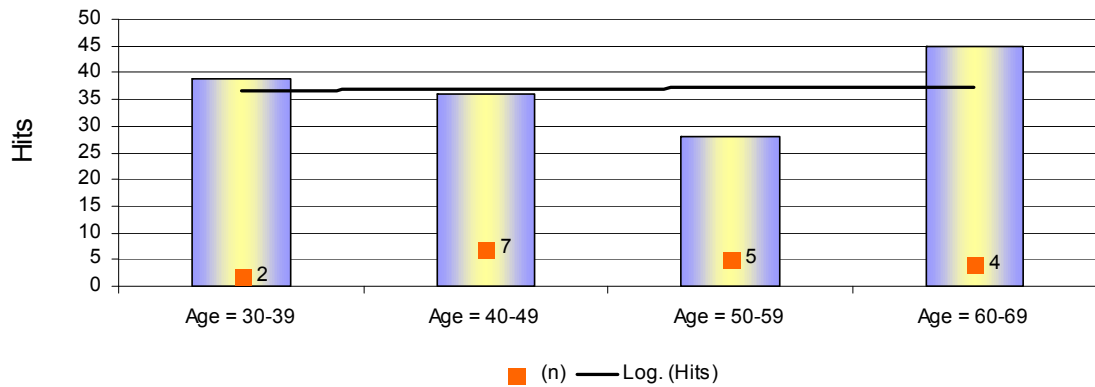


This provides support to the argument that learned behaviour may not be a significant element to a repeat entrepreneur's propensity for intuitive decision making. With age comes experience, and according to the learned behaviour model of intuition, a greater propensity to make intuitive decisions is gleaned from experience. However, the content analysis found a difference in the significance of intuition according to age.

5.2 Content Analysis of Interviews

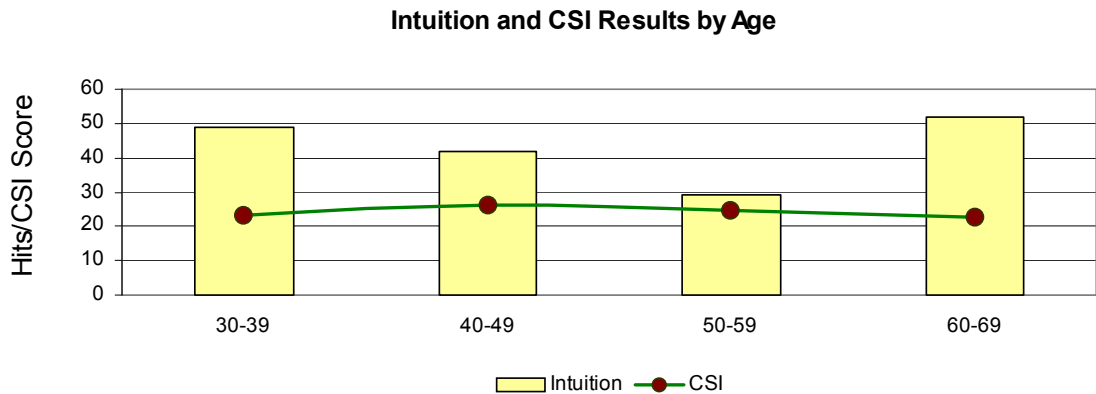
The following diagram depicts the difference between propensity for intuition according to the content analysis of the interviews.

Figure 5. 3 Intuition By Age Category And Population



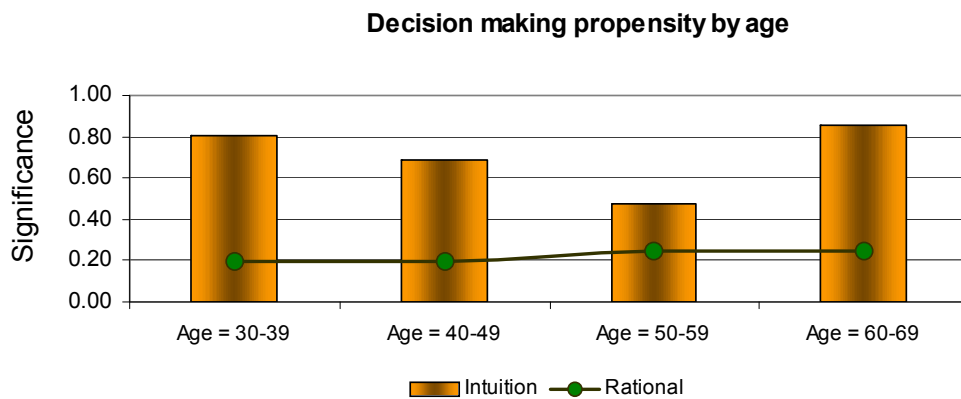
Whilst there is a difference between the intuition elements detected in the content analysis and the CSI, this may be attributed to a number of factors. The sample size between the CSI and the interviews varied. 30 entrepreneurs completed the CSI, whilst only eighteen entrepreneurs took part in the interviews. The content analysis involved in-depth interviews considering all aspects of intuitive behaviour. The CSI is a self-report questionnaire which assumes that decision makers are either intuitive or logical, because Allinson et al (1996) regard that logic and intuition are on the same continuum. As discussed earlier, if that was so one would expect that those entrepreneurs who rated lower on the intuition scale should have rated higher on logic. This was not evident from the content analysis. Rational decision making remained constant over the different age categories even though there was a variation in the level of intuition. Finally, a logarithmic trend analysis (figure 5.3) over the different age categories remains constant. Figure 5.4 indicates some congruency between the CSI scores and the responses to the content analysis. With the higher number of hits for intuition there is a marginally lower CSI score. Therefore the propensity for intuition is trending the same way.

Figure 5. 4 A Comparison Of Intuition CSI Scores By Age, With The Significance Of Intuition Elements From The Content Analysis



The content analysis of the interview data was analysed at the individual level, age groups and country of origin. Nvivo™ also enabled some data mining to provide a richer, more in-depth understanding of the decision making process, taking into consideration both the elements of intuition and rational decision making.

Figure 5. 5 Age Of Entrepreneurs Comparing Intuition And Rational Decision Making Elements From The Content Analysis



The measure used in figure 5.5 depicts the percentage of total decision making hits for each age category and style. 80 percent of all the references for the 30-39 age categories refer to intuitive decision making, while the remainder (depicted by the line graph) are rational decision nodes. Rational decision making remains relatively stable over the different age categories, whereas intuition decreases dramatically and then doubles in significance for the older cohort. One of the challenges for this argument is the smaller number of participants at the 30-39 and the 60-69 age brackets. The

results thus far indicate that entrepreneurs do not adopt an 'either/or' approach. Whilst there is a propensity for intuitive decision making, entrepreneurs realise that a rational, risk-averse approach is appropriate and should not be ignored. The aggregate result for the interviewees had 'seeing the bigger picture' as the most significant element, followed by: intuition, emotion based decisions, risk taking, action orientation, and passionate focus.

5.3.1 Seeing the Bigger Picture

Intuition has been described as an holistic approach to decision making. Evidence from the content analysis of the interviews showed this element to be the most significant aspect of intuitive decision making. One entrepreneur said, 'I believe in another dimension, in the interconnectedness of humanity', whilst his partner added, 'Silicon Valley entrepreneur's understand this, people collaborate, not compete. That's why they've been so successful'. At the recent unexpected passing of Jeffrey Timmons, Babson College reported that Timmons believed, 'the entrepreneurial process is not just about new companies, capital, and jobs. It's also about fostering an ingenious human spirit and improving humankind'.

5.3.2 Emotion Based Decisions

Emotionality has become a significant issue for management scholars. There is an acknowledgement that managers' and entrepreneurs' decision making is affected by how they feel about particular situations. Entrepreneurs in particular operate in highly dynamic environments, and this type of environment can be very challenging as many entrepreneurs have to 'make it up as they go along' (Baron 2008). Furthermore, emotions and feelings have been shown to exert a strong effect on creativity the *sine quo non* of entrepreneurship (ibid).

The content analysis of the interviews found many instances where feelings or emotions motivated entrepreneurs to make decisions. Interviewees commented, 'unless I feel comfortable with a person I won't do business with them,' and 'fear can be an incredible motivator because [as the owner] you know that if you don't do something about your problem there's no one else to fall back on'.

5.3.3 Risk Taking

Risk taking was found to be an important aspect of intuitive decision making. There is a number of reasons why this is so. In order to appreciate the risk taking propensity of the repeat entrepreneurs, the following factors should be considered. According to Mullins and Forlani (2000), risk is a multi-dimensional construct which includes the following: (a) potential losses; (b) the significance of those losses; and (c) the uncertainty of those losses. All of the entrepreneurs interviewed were repeat entrepreneurs, with as few as three successful ventures or as many as seventeen. Entrepreneurs with a history of success will have developed a level of self-efficacy and expertise in creating and managing firms, so that their potential losses are likely to be less, as many of the entrepreneurs were talking with the benefit of hindsight and a healthy bank balance. The significance of potential losses would not have the same impact on a first time entrepreneur and likewise their uncertainty of losses would not affect them to the same extent. As one entrepreneur said, 'it is important to protect your downside' and 'it's not only important to know when to get in but also when to get out'.

Whilst entrepreneurs appeared to be risk takers, this was only the case because they had a history of success and experience to call on. It is also important to remind the reader that although the sample had a propensity for intuitive decision making, rational decision making was also significant, in particular risk aversion. Many of the repeat entrepreneurs spoke about their failures as well as their successes. As one commented, 'I took over as CEO of company with 3,500 employees. When I left, there was only fifteen of us'.

5.3.4 Action Orientation

Being a risk taker implies that entrepreneurs are likely to be action orientated because in the process of making decisions they must take action which will expose them to risk. 'It's ok for me to be impulsive', one entrepreneur said, 'after all it's my money'. Another said, 'you cannot study every single part of everything, otherwise you'll never make a decision and never be successful'.

5.3.5 Passionate Focus

Many of the entrepreneurs spoke of the need for commitment and focus as keys to success. A number of interviewees spoke of encountering 'hard times', when it would

have been very easy to 'walk away', but it was the fear of failure and the desire for success that drove them to persevere. 'You need to be passionate about your business if you want to succeed,' one entrepreneur explained. Bygrave (2007) argues that 'passionate commitment' is what differentiates successful entrepreneurs from unsuccessful entrepreneurs.

5.4 Intuition and the Role of the Heart

The traditional psychological view assigns the brain an exclusive role in information processing. Radin (2004, 1997b), Bierman and Scholte (2002), and Spottiswode and May (2003) all used brain activity (EEG¹ and MRI²) and skin conductance to measure presentiment in their experimental subjects. This research used Heart Rate Variation (HRV) instead of brain activity because it is well established that emotions can and do affect HRV. As this work was testing for an emotional effect, the way people think affects HRV through the sympathetic and parasympathetic system which is easily measurable.

This impacts upon one's thoughts, and subsequently upon the decisions he or she makes. If the heart is playing such an important role in intuitive perception, then learning to attune ourselves to how we feel - acknowledging our heart promptings by being aware of inattentional blindness - could help to increase our ability to draw on our intuitive awareness (Bradley 1996; Childre 1998; Gillin et al 2007b). But what is truly surprising, according to McCraty, 'is the fact that the heart appears to play a direct role in the perception of future events... It implies that the brain does not act alone.' (McCraty et al 2004a, p. 141).

The heart has been regarded as a conduit for wisdom beyond our normal awareness by virtually all human cultures, ancient and modern. McCraty et al (2004a), Bradley (2006a) and Gillin (2007b) all believe that the greatest significance of this field of research is the finding that the heart is directly involved in the processing of intuitive information.

In conjunction with other studies (Bradley 2006a; Gillin et al 2007b; Gillin et al 2007a; McCraty et al 2004a; Radin 1997b), this work further explores new understandings that suggest intuition may be considered a system-wide process involving at least both the heart and the brain working together to decode intuitive information. If the heart plays such an important role, how can it be known that the HRV is a reaction to information

¹ Electroencephalograph

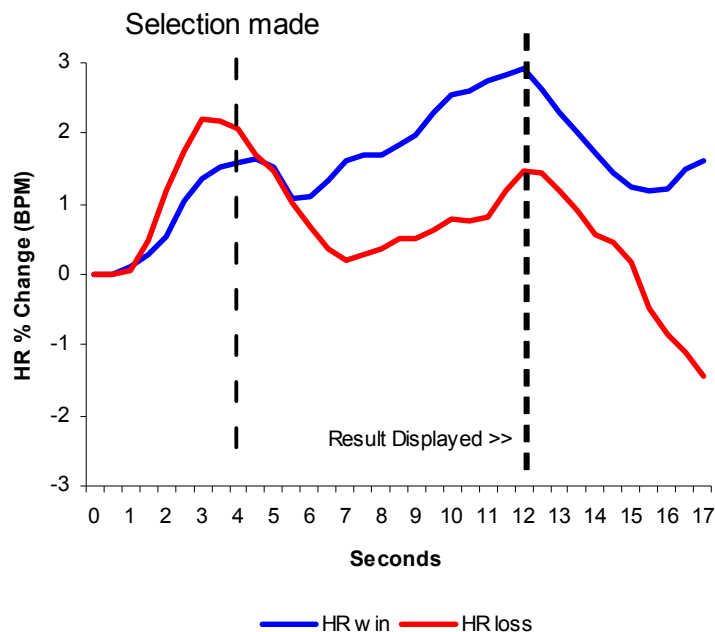
² Magnetic Resonance Imaging

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outside conscious awareness and not some other anomaly that has yet to be understood? Previous studies of HRV data (Jennings and van der Molen 2002; Van der Veen et al 2001) found that during an anticipatory period by the subject the so called pre-stimulus period, a triphasic heart response curve is usually observed as an initial deceleration, followed by a small acceleration and then a larger deceleration when the individual is in an expectant mode. When there is a strong initial deceleration component without the accelerative component it is indicative of a known stimulant, indicating that the body processes the unknown stimulus in the same way it does when the stimulus is known.

The aggregate result of all participants (figure 5.6) in the Roulette Experiment demonstrates this effect. The HRV for both wins and losses decelerates following selection and before the result is displayed, with the loss depicting greater deceleration. This is consistent with evidence which suggests that information is being processed as a known stimulant, thereby reducing the likelihood of a participant anticipation effect.

Figure 5. 6 Aggregate Results For All Participants In Roulette Experiment S1 (N8)



The results of the HRV, when considered with the result of the CSI and content analysis, shows that in these pilot experiments repeat entrepreneurs do make decisions based on intuition in the absence of other available information.

As discovered in the content analysis of the interviews, and through the observation of the participants during the experimental test, entrepreneurs would resort to cognitive based decisions when the information was made available to them. They did regard making decisions intuitively as risky, yet they have a proclivity for action inspired decision making, regardless of the outcome. The general consensus amongst participants interviewed supported Lieberman's (2000, p. 109) view that 'intuitive decisions may lead to better outcomes than those derived from deliberation'. However, some of the participants were very clear that it was not an 'either/or' in regards to entrepreneurial decision making. The best example that demonstrates this observation was made by one of the Australian entrepreneurs, who said, 'I don't believe that starting a business can be done based purely on an analytical basis or by just relying on intuition, there's a place for both'.

5.5 Intuition as Sensing or Expertise

Whilst intuition is a common experience that is amenable to scientific analysis, the non-local proposition proffered in this work been regarded as highly controversial and is often categorised, along with PSI studies, an area regarded as taboo, in the academic community (Radin 1997a). Another criticism has been that the effect is very small. Nonetheless, it is real and therefore valid (ibid). This research posits two approaches to an understanding of intuition, that of intuition as expertise (learned behaviour) and intuition as sensing (non-local).

Learned behaviour is recalling information stored in the subconscious, whereas appreciation of one's subtle feelings is not necessarily information stored in the subconscious but information within the quantum potential. Non-local intuition stresses the importance of an emotional connection, and this focus creates biological energy activated in one's emotional connection to the object of interest. For entrepreneurs, this could be a quest for a new venture or strategy, or merely finding a new employee.

The elements that are generally agreed to define intuition as expertise are also pertinent to non-local intuition, yet the factor that differentiates cognitive based intuition from intuition as sensing is the emotional component. The content analysis provided the information that emotion based decisions and passionate focus are significant aspects, indicating that there was an association between feelings and intuitive decision making.

There is a hypothesis that supports the view that the body receives information outside of the five senses. Tiller et al (2001) suggests that our acupuncture points could be

likened to an antenna array receiving information from the surrounding quantum potential. This view supports the proposition that our whole body could be involved in processing information. From a purely cognitive based perspective, this creates a dilemma because many of us have had experiences (such as the telephone ringing after one had been thinking of a friend) that cannot be explained away by learned behaviour model of intuition. In this research, three of the participants interviewed pursued opportunities in industries where they did not have any previous experience or specific knowledge, and did so on the basis that 'it seemed the right thing to do', or 'it felt right'. One example is the entrepreneur who decided to develop a small and faster chip for mobile phones who knew nothing about the IT industry, and had no knowledge of integrated circuits when he embarked upon his remarkable effort to beat Intel in the creation of a cheaper and faster chip. He said he believed that he could do it because 'it felt right'. In this case he clearly had no experience to recall.

Many of the entrepreneurs expressed the view that having faith in one's own ability and idea was critically important. This is very important to intuition as sensing because it overcomes inattentive blindness. A musical analogy may be appropriate here. If one has the ability to discern between different tones, there is a likelihood that that person may become a good musician due to this ability. The suggestion here is that if one has a propensity to listen to their emotions when making a decision, with practice and experience they may be able to detect even more subtle feelings that may provide them with a much more acute intuitive sense. These feelings may be experienced in the heart. Biophysicists have found that the heart is a powerful electromagnetic generator that generates a field which is affected by our emotional state (Stamp 2000). The body's psycho-physiological systems generate numerous fields of radiating energy which interpenetrate with wave fields of other person/objects energy:

- A channel of communication is created between the two wave fields when a harmonic resonance occurs. Simply put, humans are interconnected to the environment through the intermingling of energy fields (Bradley 2006b).
- The perception of things remote in time or space, or non-local communication, is viewed as involving processes of energetic resonance connecting the body's psycho-physiological systems to the quantum level of the object of interest.
- Quantum holographic theory assigns a key role to the body's mental and emotional state in establishing an energetic means of connection to external energy fields (Bradley 2006b).

5.6 Quantum Holography

Most physicists accept quantum mechanics as a valid theory because there is empirical evidence to support it. Hawking (1989) adds, 'it has been one of the most outstanding successful theories which underlies all of modern science and technology'. Whilst there is some controversy regarding quantum holography, it is important to consider whether it meets the requirement of a good theory. For a theory to be good, it must satisfy two requirements. It must accurately describe a class of observations on the basis that it contains only a few arbitrary elements, and it must make definite predictions about the results (Hawking 1989).

Quantum holography's arbitrary elements build upon three scientific developments (Bradley 2007) on which there's general consensus. The first is the discovery of the hologram, specifically, the principle of distributed organisation, and the second is the discovery of non-locality, or the idea that everything in the universe at the subatomic level is interconnected (Aspect et al, 1982; Tittel et al, 1998). Finally, the third is the discovery of quantum coherence, the idea that subatomic emissions from macro-scale objects are not random, but exhibit coherence at the quantum level, reflective of an object's material organisation and event history (Schempp, 1992). Quantum holography has made predictions, in that it explains how information is transmitted beyond time and space. Quantum holography, however, like many other theories before it, builds on existing theories but it is nonetheless provisional and could in time be falsified or disproved (Popper).

Quantum holography can be aligned with the physics and the psycho-physiology of the information processing involved in intuitive perception because it attributes a high degree of importance to the emotional aspect of decision making. Two validations in support of quantum holography are to be found. The first is that of non-local interaction. J.S. Bell (1964) published a theorem that demonstrates that nature does in fact provide strong evidence for a non-local form of interaction. The second is emotional connection. The psycho-physiological tests carried out by Bierman (2000) McCraty et al (2004a and b), Radin (2004; 1997b) and Spottiswoode and May all used emotionally arousing picture tests, whereas Wildey (2000) used audio arousing sounds. Yet, they all found a strong correlation between emotions and intuition which supports an emotionally based connection to intuitive decision making.

Building on HeartMath's core proposition of the key role of the heart and positive emotions in creating a channel for intuition (Childre and McCraty 2001; McCraty et al 2006; Tomasino 2007), the quantum-holographic theory provides an understanding of

the physical and psycho-physiological processes through which entrepreneurial intuition occurs (Bradley 2006, 2007b). The purpose of the experimental protocol was to test for this information processing and to determine if indeed there was psycho-physiological effect that could be attributed to quantum coherence.

5.7 Experimental Evidence of Intuition

The experimental protocol was designed with the assistance of the HeartMath Institute, who were successful in measuring intuition in non-entrepreneurs. The efficacy of this system of measuring intuition is that it can provide empirical evidence in support of the proposition. This approach provides a higher degree of credibility to the findings because the HRV reacts according to whether information is anticipated or known.

Although technical difficulties were encountered with the collection of electrophysiological data, four of the individual results show a clear difference in either SC or HRV between wins and losses. There was no convergence between the SC and HRV. This lack of convergent validity between the skin conductance and the HRV results is consistent with the findings of prior research (McCraty et al 2004a and 2004b), and likely reflects different sensitivities to different energy frequencies of information processed by the psycho-physiological systems in attuning to, receiving, and decoding information from non-local sources. Nevertheless, the results achieved from skin conductance or HRV, trend in the right direction, in that the participants were able to sense information non-locally.

The individual results show sufficient evidence of discrimination in the separation between the win/loss curves to consider a further study under controlled laboratory conditions. Controlled conditions will be necessary to eliminate some of the artificial errors when conducting the test in a participant's environment. Modifications to the experimental protocol will also be necessary to ensure technical difficulties do not reoccur. The aggregate electrophysiological results suggest that informational input was received by the psycho-physiological systems some six to seven seconds before the outcome of the investment choice was known. This was evident in the electrophysiological recordings of individual entrepreneurs. This result is consistent with previous findings from a rigorous experiment, involving non-entrepreneurs in a controlled laboratory setting (McCraty et al 2004a and 2004b).

An important observation from the data collected in this pilot study was that there does not appear to be any correlation between an entrepreneur's cognitive decision (win/loss

ratio) and the physiological predictors of the future event, namely, the post-choice pre-result outcome. This is also consistent with previous studies and is likely due to a combination of factors, such as an individual's cognitive bias to distrust feelings in decision making as well as the lack of attention paid to sensory input from emotions when making decisions. It is well established that we only perceive what we attend to.

This research found a link between the decision making propensity of entrepreneurs and spiritual intelligence. The next section provides a discussion on the propensity for repeat entrepreneurs for spiritual intelligence and how it relates to intuition.

The poor results may have been partly caused by the entrepreneur's cognitive bias to distrust feelings and a lack of attention to sensory input from emotions when making decisions. According to Gillin et al (2007a), we only perceive what we attend to, an effect referred to as inattentional blindness. Thus, if one does not attend to the signals from the body they will not be perceived and have little chance of being integrated into cognitive level decisions. Whilst previous evidence shows that entrepreneurs do rely on intuition, the question at the heart of this research may not be whether entrepreneur's are intuitive, but rather they do not listen to their intuition?

6.0 Conclusion

'The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.' —Albert Einstein

The purpose of this research was to a) evaluate the propensity of entrepreneurs to use intuition, and b) to serve as a pilot study whose aim was to test a psycho-physiological experiment so as to develop an empirical basis for intuitive decision making in repeat entrepreneurs. The underlying reason why this topic was chosen was to shed some light on why some entrepreneurs seem to make better decisions in recognising opportunities, and acquiring resources than others. Opportunity recognition, according to Shane and Venkataraman (2000), is the central pillar of entrepreneurship. Whilst a great deal has been written about the process of finding and evaluating new opportunities, very little work has considered how entrepreneurs choose one opportunity over another, or the decision making process.

In the Academy of Management Journals, over 580 articles have been published on all facets of decision making. However, during the same time period only six articles addressed the role and importance of intuition to management or entrepreneurs. Furthermore, most accounts have limited themselves to its phenomenology. For instance; the thinker arrives at an answer with little or no awareness of the process by which he or she reached it (Myers 2002). This provides little value and understanding as to what constitutes intuition.

This thesis provides a framework by which one can appreciate the factors affecting the decision making process and arrive at an understanding of whether the decision taken was rational or intuitive, and why. This provides a greater understanding of why entrepreneurs take a particular course of action. This research has found that repeat entrepreneurs have a greater propensity for intuition than do general entrepreneurs, and that general entrepreneurs are more intuitive than managers. Also, it appears that intuition and rational decision making are not on the same continuum, in that the decrease in one way of knowing does not automatically assume a greater propensity for the other decision making style.

This research found that the propensity for intuition does not change with age, suggesting that intuition may not be learned behaviour, or a cognitive based method of information processing alone. While the aggregate result for the psycho-physiological tests was inconclusive, the individual results supported the view that information is received by more than just the five senses. Evidence from the individual tests showed

a difference in skin conductance and Heart Rate Variation (HRV) between wins and losses and this was supported with the use of a conservative procedure for data analysis - the random permutation analysis.

6.1 Proposition One

Proposition One: Entrepreneurs have a greater propensity for intuitive decision making.

The result of the CSI and the interviews provides clear and unambiguous supports for Proposition One: repeat entrepreneurs do indeed have a propensity for intuition. The response to Proposition Two supports Proposition One. Entrepreneurs do have a proclivity for intuitive decision making. There were a number of elements evident, and some elements were found to be significantly more important than others.

6.2 Proposition Two

Proposition Two: Non-local intuition elements are evident in an repeat entrepreneurs intuitive decision making.

The content analysis of the interviews was the source of evidence for Proposition Two. Significance was found for six of the nine elements of intuition. The elements that achieved significance were: 'seeing the bigger picture', intuition, emotion based decisions, risk taking, action orientation and passionate focus. The other elements (enjoys change, dislike of routine and spontaneity) did not achieve significance.

'Seeing the bigger picture' and emotion based decisions were found to be strongly significant in the content analysis of the interviews. However, relying on one's feelings alone to make a decision is inherently risky because we, as humans, are inculcated with the belief that rationality and logic in decision making is supreme. Therefore, it is not surprising that risk taking was found to be a significant aspect of this cohort of entrepreneurs. Furthermore, with a history of success, resources and networks, repeat entrepreneur are more likely to be adventurous in their decision making strategies. The fourth aspect of intuition which achieved significance was action orientation. One of the Australian participants summed it up best when he said, 'business is about taking risk and taking risk comes about because one has to make decisions and those decisions involve action.' Finally, passionate attentional focus also achieves significance. As one entrepreneur commented, 'success requires passion'. Bygrave (2008) encourages nascent entrepreneurs who wish to succeed to 'find their passion', because 'the world is full of examples of people who turned their passion into a lifetime of fulfilling work'. Even though passion drives the intuitive entrepreneur, it alone will not

make a firm successful and this was evident in the significance of rational decision making to entrepreneurs. 76 percent of the references in the content analysis were linked to intuition with the remaining 24 percent were associated to rational decisions. For rational decision, making only two of the five elements achieved significance: logical decision making itself and risk aversion.

The results indicate that whilst entrepreneurs have a propensity for intuitive decision making they will not totally ignore available information or experience. One of the experimental test participants said, that he couldn't ignore his experience and therefore wouldn't invest in some industries regardless – which raises the issue of inattentive blindness. The electrophysiological test found evidence that entrepreneurs were making decisions contrary to their physiological responses. There was no correlation between the correct selection of wins and losses and the physiological results.

6.3 Proposition Three

Proposition Three: Psycho-physiological measures can discriminate intuition in decision making.

The aggregate result of the electrophysiological experiment was inconclusive. The individual results however were promising and are consistent with previous research (Bierman and Radin 1997; McCraty et al 2004a; Radin 1997b; Spottiswoode and May 2003). This pilot study, five of the entrepreneurs' physiological measures showed an ability to detect intuitive perception of a future outcome. This was evident in the divergence of waveforms between wins and losses. Three participants achieved divergence in HRV and two achieved divergence between wins and losses in skin conductance.

6.4 Random Permutation Analysis

To reduce the possibility of false-positive findings, random permutation analysis was used because it is a conservative procedure for data analysis. It was used to determine statistical significance of the differences between win and loss curves. It was applied separately to each participant's SC and HRV data. It provided statistical support in the five individual cases that the HRV and SC waveforms predicted the future win/loss outcome in this pilot study.

6.5 Limitations

There were several limitations in this pilot study, particularly in the physical experiment. Technical problems were encountered in the data acquisition of the physiological measures. The equipment used to collect the data did not allow for the raw data to be monitored in real time as it was being recorded. This led to excessive amounts of missing data due to either improper electrode connections or artifact.

Another important factor of the physical experiment that may have contributed to the high number of artifacts was that the physical tests were conducted at each entrepreneur's location. Even though field experiments are much more effective at capturing authentic responses, this requires equipment (hardware and software) that is robust, and built for the purpose of transportation.

A larger sample of individuals is required in order to assess the robustness of the protocol. Also, a control group could be added in the next iteration, such as accountants or software developers, and participants who are employed in roles where rational decision making, such as systems, processes and procedures, are predominant in their day to day work practices.

Another problem that is being address for the next iteration of the protocol is that many of the participants included some cognitive component in analysing the business cases. Some had a pre-existing view on particular industries if they had knowledge or experience in that industry. This seemed to influence their decision of whether or not to invest.

Similar to the work of McCraty (2004a and b) and Radin (1997b, 2004), who used emotionally stimulating pictures to create an emotional connection in order to evoke some emotional response, a reward system was also introduced in this pilot study. To create an emotional attachment to the outcome, participants were provided with a sum of money to invest, therefore they were rewarded for correct choices and penalised for wrong choices. The purpose was to make the experimental protocol simulate business experience as closely as possible. It is unclear as to whether or not this created the emotional attachment required, and this needs further consideration.

6.6 Implications

The implications of the interconnected nature of all things is currently being felt worldwide with organisations, regions and countries now taking seriously the impact

their communities and regions are having on their ecosystems and environments. As a result of the impact the human race has had on this planet, it is reasonable to state that we are inextricably linked to our environment and everything around us. Therefore the importance of this research extends beyond the boundaries of entrepreneurship and business. This pilot study is one of only two that used the HRV as a physiological measure to investigate intuition in entrepreneurs. The results from this study provide tentative evidence that physiological measures are predictive of future outcomes.

Whilst the nebulous nature of non-local intuition proposed may seem challenging, scientific progress is not only achieved through the continuous accumulation of knowledge but also by paradigm shifts. These shifts are often necessitated by anomalous findings that cannot be incorporated into accepted models (Walach and Schmidt 2005).

Quantum theory forms a pillar in what has become the new physics and provides the most convincing evidence that consciousness plays an essential role in the nature of physical reality; in that the observer and observed are inextricably interconnected (Davies 1990). Quantum theory has caused us to reconsider the cause and effect model of the world.

The validity of non-locality and the findings of previous researchers is beyond doubt, as is the evidence that the body's psycho-physiological system receives and processes information about a future event before the event actually happens (Bierman and Radin 1997; McCraty et al 2004a). This has implications on the way entrepreneurs should view new opportunities, strategies and even day to day decisions. This is a fertile area of research that requires further investigation. The implications here are clear for entrepreneurship educators. Novice or nascent entrepreneurs should not be discouraged from conducting research, but neither should they be discouraged from taking actions based on their feelings about a particular course of action. As the evidence provided here suggests, using intuition as a component of decision making is totally appropriate and congruent with entrepreneurial behaviour.

A number of areas relating to this research need further exploration and could make a significant contribution to the practice of entrepreneurship. The first area that needs further exploration which may be of value to entrepreneurs is that of meditation. The two groups involved in the controlled experiments in McCraty (2004a) and Radin's (1997) work were individuals that practiced meditation regularly. There are many physiological benefits of practicing meditation. One affect may be that it raises the sensitivity level of the individual to intuitive information.

Entrepreneurship pedagogy could benefit by encouraging students or nascent entrepreneurs to consider how their venture ideas or opportunities are going to contribute to the development and growth of their community given the importance of 'seeing the bigger picture' and 'giving back' to the decision making practices of repeat entrepreneurs. Another opportunity for entrepreneurship pedagogy is to recognise the importance of 'seeing the bigger picture'. Passionate focus implies that the entrepreneur has a single laser focussed view of what they desire, and this therefore may be another fruitful area of investigation. As rational decision making appears to be a significant factor for entrepreneurs, a new tool is required to measure both intuition and rational decision making propensity separately, as it was determined that they are not on the same continuum.

6.7 Future Research

As mentioned earlier, the technical issues limited the amount of data collected, so some further work needs to be completed in order to refine and resolve some of the problems that inhibited the data collection. The skin conductance test was found to be of little value in the three cases mentioned. McCraty (2004) and Radin (1997) also found the same. The focus in future will be to refine the HRV protocol and in particular the Business Case Experiment. The Roulette Experiment will remain as is.

The following changes proposed for the next stage of the research are:

- The experimental protocol will be conducted under controlled conditions;
- An increase in the sample size of entrepreneurs will include general entrepreneurs as a separate category;
- Inclusion of entrepreneurs in various age categories to test for any changes in intuition according to age;
- A group whose profession requires logical/rational approach to day to day decision making will be used as a control group. This group could be computer programmers, accountants or technicians;
- A larger group of female entrepreneurs will be included;
- A number of subgroups will be created. The CSI will be used to categorise participants as intuitive or rational so some further data analysis using the experimental protocol could be conducted;

- Interviews of entrepreneurs will also be included because the content analysis gave a richer, more in-depth understanding of the entrepreneurs' decision making styles;
- A final, more intensive approach could be adopted to understand how entrepreneurs proceed through their opportunity recognition, creation and growth. This would entail a staged, longitudinal study, during which entrepreneurs are interviewed and tested using an electrophysiological experiment during various stages of the firms lifecycle.

The aim is to broaden the application of this approach to research intuitive decision and action within the business and general entrepreneurial community, and ultimately extend it to intuitive behaviour in other groups of professions, such as health professionals and teachers. The aim is to open the door to a new and more fruitful understanding of how energetically encoded information about the future is received and processed by the body's psycho-physiological systems and how it informs intuitive behaviour.

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Appendix 1

Tiller's theory of EM information transmission

One theory that may explain the communication of intuitive information is Tiller's theory of EM information transmission. Tiller (1999) proposes a theory of magnetic wave information transmission which is based on the time space dimensionality underlying relativity theory and holographic theory. It was developed to explain person to person telepathic communication (Tiller 1999). This theory is based on an extension of wave-particle duality which proposes information transmission through zero point energy fields of the quantum vacuum using EM carrier waves, which he calls R-space.

According to de Broglie's proposition every particle has a pilot wave envelope enclosing it and moving at the particles velocity. As nature expresses itself simultaneously via its wave and particle aspect, Tiller (2001) suggests in order to formally express the wave/particle duality we can regard distance-time (D-space) as a satisfactory coordinate system for describing the behavior of this aspect of a substance. We have also used this coordinate system for describing wave motion even though the waves, our cognitive experiences, are merely modulations of particle fluxes in space time. As the de Broglie wave is thought to be a waveform of a much more continuum nature than particle modulation waves. A more appropriate coordinate system for describing waves is reciprocal space (R-space). This keeps the particle aspect (D-space) and the wave aspect (R-space) separate. Since the two aspects cannot interact with each other because of relativity theory, it is necessary to invent the presence of an additional substance that is not constrained by relativity theory because these particles do indeed interact in de Broglie's wave/particle picture. Simply put R-space is the region in which information travels in an alternative dimension beyond physical space and time (D-space).

According to Tiller (1999), if one meditates the human mind propagates EM waves into R-subspace; which are modulated and encoded by the information content of the sender's mind. This radiates from the meditator at great speed. Thus providing a physical means by which human intention, emotion, and other characteristics of mind are encoded and transmitted at much higher speeds through R-subspace (up to twice the speed of light) (Bradley 2006a)

Appendix 2

Institute of Heartmath

The Institute of HeartMath[®], a nonprofit 501(c)(3), is a recognized global leader in researching the critical link among emotions, heart-brain communication and cognitive function. IHMs 15 years of research, with the insight of founder Doc Childre, into heart intelligence is the foundation of our practical, scientifically validated solutions. These solutions are aimed at empowering people to reduce stress, fine-tune performance in all areas of their lives and foster greater health, well-being and their innermost sense of self.

This newfound empowerment is a result of their ability to access a greater portion of their heart's intelligence which is the purpose of our solution set. Improved accessibility of heart intelligence prepares individuals to connect better with others and co-create a more coherent environment in the classroom, the workplace, the home, and ultimately, our planet.

IHM Research includes research on emotional physiology and heart-brain interactions, the physiology of learning and performance and clinical studies. Our research validates Heartmath's stress and performance solutions and the tools, techniques and technology we employ in those solutions.

NEW: The Global Coherence Project and Global Coherence Monitoring System Click Here.

New Images of The 'Brain In The Heart' Click Here.

Scientific e-Book – 'The Coherent Heart: Heart-Brain Interactions, Psychophysiological Coherence, and the Emergence of System-Wide Order'

<http://www.heartmath.org>

Appendix 3

Interview Questionnaire Guide

Rather than come up with some clear questions the approach taken was to have some themes around which we can seek answers. I have taken a semi-structured interviewing approach.

General Questions

Decision making processes

Theme - decision making

The questions are only a guide whose aim is to provide answers for questions 2 - 4. It was not only necessary to understand the prevalence of intuitive decision making but also to understand under what conditions an entrepreneur relies on their intuition. This helps to determine if the elements identified in the literature are indeed critical to intuition and helps to validate the construct.

Why did they go into business?

Why this particular business/industry?

How much time did they spend researching the industry, competitors etc, before entering the market?

How is the business performing?

How long did they consider the industry, business opportunity before they entered the market? This is associated with the speed of decision making and Spontaneity

Was the decision to enter this market a serendipitous event? This is associated with automatic, implicit or difficult to control information gathering

Did they experience a feeling about the industry/business they were about to enter, ie: 'felt good' or 'felt wrong'

Obviously it would be better if our entrepreneurs created a number of businesses in diversely different industries. This is why repeat entrepreneurs are quite useful for this research. Particularly if they've entered into a business they knew very little about. The aim is to understand why they chose this business?

Intuition question - responses to look for.

According to the literature the following factors are considered critical to intuitive decision making and are things to look out for or to press for.

Speed of decision

Emotion associated with the decision 'felt good' or 'felt wrong'

Spontaneity

Intuition is Automatic, implicit, difficult to control

Here we are also looking to determine the amount of rational analysis that has gone into their decision making strategies. It is also important to looking for a clear process or system that they maybe used in making decisions.

Appendix 4

Qualitative research methods

Ethnography

Ethnography is time consuming and creates a great deal of disturbance for the participants. The ethnographic approach seeks to understand the experience of the group and aims to understand the culture that affects the interrelationships and behaviors in the group. There are a number of issues that impact adversely on the participants of this type of methodology, particularly in an organizational setting. In order to gain a perspective of intuitive decision making a researcher employing this method would need to follow the subject of this research on a daily basis so as to be with the subject during critical periods. Because the enquirer needs to be present when the phenomenon is being used, this could take an extended period of time, effort and inconvenience on the part of the participant under investigation as well as the researcher who would have to dedicate an equally significant amount of time using this approach. As such this methodology was considered inappropriate.

Phenomenology

Phenomenological research emphasizes the experience from the participant's perspective. Importantly, phenomenology refers to a person's construction of the meaning of a phenomenon, as opposed to the phenomenon as it exists (Leedy 1997) p.161. Attention to experience and intention to describe experience are the central qualities of phenomenological research (Volkman 1992) p.88. What is unique to this approach is that the researchers have a personal experience of the phenomenon and aim to heighten their own awareness of the experience whilst simultaneously examining the experience through the eyes of their participants (ibid).

Phenomenology's aim is to gain an understanding of the meaning of the experience to the research participant; this approach does not contribute to the intent of this research.

Grounded theory

Glaser & Strauss (1967) developed grounded theory because they were primarily concerned with the discovery of theory through data rather than literature – it is the development of theory through a comparative analysis approach (Glaser and Strauss 1967/1999). Grounded theorists begin with a broad question that provides freedom and flexibility to explore the phenomenon in depth. They use multiple stages of data collection and refine the categories of information as they progress (Leedy 1997). An important assumption in grounded theory is that all the concepts pertaining to a phenomenon have not been identified, or they are poorly understood or conceptually underdeveloped (Strauss and Corbin 1998).

This research began with a specific focus, that, 'repeat entrepreneurs have a greater propensity for intuitive decision making' data was gathered from a variety of sources (multiple cases) using multiple methods. Grounded theories main focus is on theory development, whilst this research is focused on theory testing.

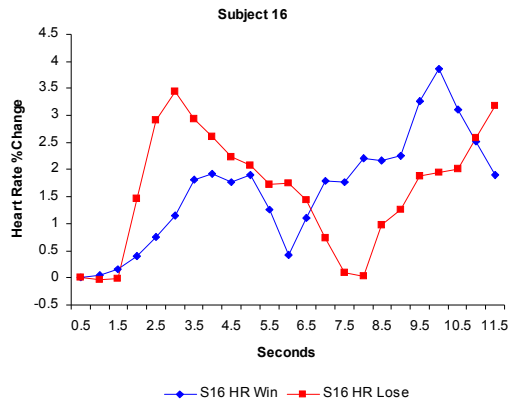
This research favors a case study approach because it requires a description of the process of decision making as well as the development of an explanation that discusses the phenomenon. Whilst data collection and analysis is crucial to both grounded theory and the case study approach, case studies encourages and supports

the gathering of information from many different sources, not only for the purpose of theory development.

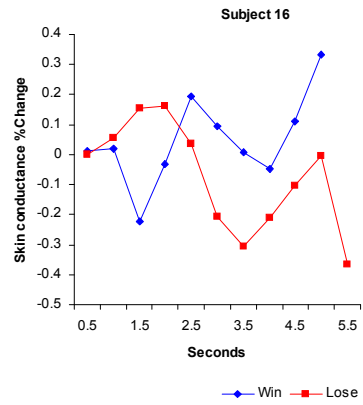
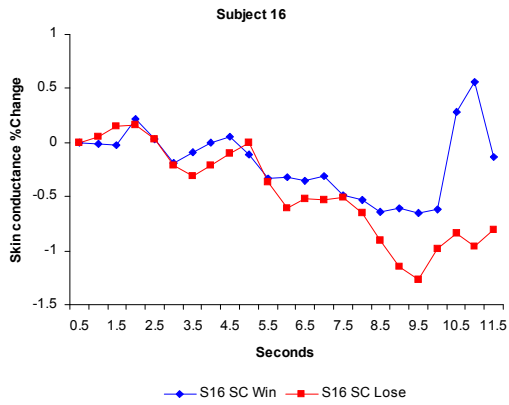
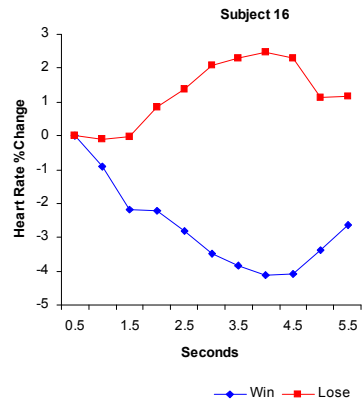
Appendix 5

Data from subject S16 (S1)

Roulette Experiment



Business Case Experiment



Appendix 6

Cognitive Style Index Questionnaire

NAME.....AGE.....

OCCUPATION.....SEX.....

People differ in the way they think about problems. Below are 38 statements designed to identify your own approach. If you believe that a statement is *true* about you, answer T. If you believe that it is *false* about you, answer F. If you are *uncertain* whether it is true or false, answer ?. This is not a test of your ability, and there are no right or wrong answers. Simply choose the one response which comes closest to your own opinion. Work quickly, giving your first reaction in each case, and make sure that you respond to every statement.

Indicate your answer by placing an X in the appropriate box opposite the statement:

T True ? Uncertain F False

	T	?	F
1. In my experience, rational thought is the only realistic basis for making decisions.			
2. To solve a problem, I have to study each part of it in detail			
3. I am most effective when my work involves a clear sequence of tasks to be performed.			
4. I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.			
5. I am careful to follow rules and regulations at work.			
6. I avoid taking a course of action if the odds are against its success.			
7. I am inclined to scan through reports rather than read them in detail.			
8. My understanding of a problem tends to come more from thorough analysis than flashes of insight.			
9. I try to keep to a regular routine in my work.			

10.	The kind of work I like best is that which requires a logical, step-by-step approach.			
11.	I rarely make 'off the top of the head' decisions.			
12.	I prefer chaotic action to orderly inaction.			
13.	Given enough time, I would consider every situation from all angles.			
14.	To be successful in my work, I find that it is important to avoid hurting other people's feelings.			
15.	The best way for me to understand a problem is to break it down into its constituent parts.			
16.	I find that to adopt a careful, analytical approach to making decisions takes too long.			
17.	I make most progress when I take calculated risks.			
18.	I find that it is possible to be too organised when performing certain kinds of task.			
19.	I always pay attention to detail before I reach a conclusion.			
20.	I make many of my decisions on the basis of intuition.			
21.	My philosophy is that it is better to be safe than risk being sorry			
22.	When making a decision, I take my time and thoroughly consider all relevant factors			
23.	I get on best with quiet, thoughtful people.			
24.	I would rather that my life was unpredictable than that it followed a regular pattern.			
25.	Most people regard me as a logical thinker.			
26.	To fully understand the facts I need a good theory.			
27.	I work best with people who are spontaneous.			
28.	I find detailed, methodical work satisfying.			
29.	My approach to solving a problem is to focus on one part at a time.			
30.	I am constantly on the lookout for new experiences.			
31.	In meetings, I have more to say than most.			

32. My 'gut feeling' is just as good a basis for decision making as careful analysis.			
33. I am the kind of person who casts caution to the wind.			
34. I make decisions and get on with things rather than analyse every last detail.			
35. I am always prepared to take a gamble.			
36. Formal plans are more of a hindrance than a help in my work.			
37. I am more at home with ideas rather than facts and figures.			
38. I find that 'too much analysis results in paralysis'.			

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Appendix 7

Cognitive Style Index scoring key

	T	?	F
1. In my experience, rational thought is the only realistic basis for making decisions.	2	1	0
2. To solve a problem, I have to study each part of it in detail	2	1	0
3. I am most effective when my work involves a clear sequence of tasks to be performed.	2	1	0
4. I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.	2	1	0
5. I am careful to follow rules and regulations at work.	2	1	0
6. I avoid taking a course of action if the odds are against its success.	2	1	0
7. I am inclined to scan through reports rather than read them in detail.	0	1	2
8. My understanding of a problem tends to come more from thorough analysis than flashes of insight.	2	1	0
9. I try to keep to a regular routine in my work.	2	1	0
10. The kind of work I like best is that which requires a logical, step-by-step approach.	2	1	0
11. I rarely make 'off the top of the head' decisions.	2	1	0
12. I prefer chaotic action to orderly inaction.	0	1	2
13. Given enough time, I would consider every situation from all angles.	2	1	0
14. To be successful in my work, I find that it is important to avoid hurting other people's feelings.	2	1	0
15. The best way for me to understand a problem is to break it down into its constituent parts.	2	1	0
16. I find that to adopt a careful, analytical approach to making decisions	0	1	2

takes too long.			
17. I make most progress when I take calculated risks.	0	1	2
18. I find that it is possible to be too organised when performing certain kinds of task.	0	1	2
19. I always pay attention to detail before I reach a conclusion.	2	1	
20. I make many of my decisions on the basis of intuition.	0	1	2
21. My philosophy is that it is better to be safe than risk being sorry	2	1	
22. When making a decision, I take my time and thoroughly consider all relevant factors	2	1	0
23. I get on best with quiet, thoughtful people.	2	1	0
24. I would rather that my life was unpredictable than that it followed a regular pattern.	0	1	2
25. Most people regard me as a logical thinker.	2	1	0
26. To fully understand the facts I need a good theory.	2	1	0
27. I work best with people who are spontaneous.	0	1	2
28. I find detailed, methodical work satisfying.	2	1	0
29. My approach to solving a problem is to focus on one part at a time.	2	1	0
30. I am constantly on the lookout for new experiences.	0	1	2
31. In meetings, I have more to say than most.	0	1	2
32. My 'gut feeling' is just as good a basis for decision making as careful analysis.	0	1	2
33. I am the kind of person who casts caution to the wind.	0	1	2
34. I make decisions and get on with things rather than analyse every last detail.	0	1	2
35. I am always prepared to take a gamble.	0	1	2
36. Formal plans are more of a hindrance than a help in my work.	0	1	2

37.	I am more at home with ideas rather than facts and figures.	0	1	2
38.	I find that 'too much analysis results in paralysis'.	0	1	2

Appendix 8

Database of successful and unsuccessful firms used in the electrophysiological experiment.

Case JK personnel.

Personnel company

Privately Owned

Managed by the entrepreneur

Self-funded

On the Friday I had a dispute with my employer on the Monday I was sacked. At the time it was the most devastating thing that ever happened to me. Everybody I had worked with approached me and said do it yourself. So I started my own personnel company in competition with my employer, and now we are the most successful business in our industry/region, with over \$5m a year revenue and over 300 people on our books.

Industrial Optical Scanners

Visual Technology

Privately Owned

Professional management team

Investor funding

'I started a company in Singapore in the late 90's using visual technology to solve industrial production problems.' The system we developed was used to check whether circuit boards were accurate within 4/1000 of an inch. Initially it was done visually, and they were failing to do so. The technology David and his team came up with was a new technology of charge injection cameras and a computer system to process those images. They eventually sold the company to Fairchild industries for quite a few million dollars it was a lot of money in those days.

Alphamosaic

Graphics Technology

Privately owned

Professional management team

VC funding

Steve graduated from Emmanuel college in 1982 with a first in Electrical sciences and won a prize as a young engineer. In 1978 Steve along with some co-founders attended the 2000 CfEI summer School, which gave them the networks and confidence to start a business themselves. In 2001 we started Alphamosaic to develop advanced mobile imaging, multimedia and 3D graphics technology for use in cellphones and other mobile devices. Arthur Anderson helped us attract some VC funding. They got a big break when they joined up with Samsung and subsequently the business was sold for over \$120 million

Apricot Computers

Computer technology

Privately owned

Entrepreneur owner/manager

Self-funded

Chris Curry, my partner and I started Acorn Computers with a hundred pounds. We never put more than a hundred pounds into that company.

Acorn Computers were almost an overnight success. We were the first company in Britain to go from zero to hundred million pounds, in revenue. 'There was just no doubt in mind that we were going to manufacture a world class micro processor. I had this belief in our team. I knew that the people who worked for Acorn were just the brightest people in the world, We now produce as many ARMs (advanced risk machine), as Intel produces Pentium in a year. ARM has become the world's most successful 32 bit processor - the standard for mobile phones.

Lexus Mentoring and Coaching

Business services

Privately owned

Self funded

Entrepreneur owner/manager

Kerry had a passion for business, good business. Kerry had been a successful CEO, after selling out of her business she saw a gap in the market and decided to setup Lexus to provide coaching and mentoring to SME's with an income stream between \$2m - \$20m. After operating for 12 months and growing very slowly she decided that she needed a partner to help her ramp up her growth. Syd had strong sales and coaching experience and had a successful consultancy in his own right. However, Kerry's husband was independently wealthy and Kerry had no need to work. With this lack of commitment, no marketing strategy and no leadership Lexus couldn't gain enough interest in the marketplace and it subsequently became insolvent.

Internet technology

Privately owned

VC Funding

Entrepreneur owner/manager

Ray Anderson the founder has been involved in 4 companies one of his most profitable was IXI. IXI developed the industry standard network Graphic User Interface and shipped the first commercial web browser. IXI was sold to a US company for £25 million, merged with another company and was floated on the NASDAQ

Inca Digital printers

Digital printers

Privately owned

Self funded

Professional management team

In 1987 Bill Baxter explored the opportunity of developing inkjet technology for industrial applications. A team was formed and Inca Digital Printers was spun out of Cambridge in 2000 to manufacture inkjet printers using the emerging Piezo inkjet printhead technology. Inca became profitable from its third year and was sold in May 2005 for £30 million.

The Technology Partnership

Business consulting service

Privately owned

VC Funding

Professional management team

Gerald Manson co-founded TTP plc in 1988 with some former colleagues. TTP has grown into a highly successful business employing over 300 employees and generating a further 600 jobs in companies. TTP was floated on the London Stock Exchange in the year 2000.

Element 14

ComputerTechnology

Privately owned

VC funding

Professional management team

In 1999 Stan Boland and some former Colleagues from Acorn Computers founded Element 14 a fables semiconductor company specialising in high density DSL chipsets. Sixteen months later he sold the company to Broadcom for \$640m

Innovia Technology

Business Consulting services

Privately owned

VC funding

Professional management team

Geraint Davies with some associates self-funded Innovia Technology in 1999 because they wanted more self-determination and control over their own destinies. Innovia focussed on supporting technical innovation with an understanding of the psychology of the consumer market and marketing that drives product need. Innovia has grown to 20 people since its beginning and is turning over £2m.

Trigenix

SoftwareTechnology

Privately owned

Self funded

Professional management team

Stephen Ives is a serial entrepreneur that has been involved six companies in the field of software development. In 2000 Stephen set up Trigenix with three co-founders. Trigenix was ranked 24th in the Sunday Times Fast Track 100 and also won the Sunday Times award for the Best Management Team in 2004. The business was acquired by Qualcomm Inc in 2004.

Officeshopper

Internet & application software

Privately owned

Self funded

Professional management team

Micahel Ledzion, is a manufacturing engineer graduate from Cambridge University. He co-founded office shopper which grew sales to \$2.5m in the first year. They spun out an application software business and both companies were sold within 2 years for \$15.5m.

Polight Technologies

New Technology

Privately owned

VC funding

Professional management team

In 2001 Michael Ledzion took control of a Cambridge University Spinout. He raised \$8.1m in institutional venture capital finance developing a team and identifying its first global customers. However the technology failed to live up to its promises so the company was closed down after almost 3 years.

Domino Printing Sciences

Printing Technology

Privately owned

VC funding

Professional management team

Graeme Minto spun Domino Printing Sciences out of Cambridge Consultants in 1978 to exploit some of its proprietary technology and built the company into a major force in the specialist markets of industrial coding and marking and commercial overprinting. Domino went public in 1985 and now employs 1800 staff with sales of £178m in 120 countries.

Cantab pharmaceuticals

Pharmaceuticals

Privately owned

VC funding

Professional management team

Dr Alan Munro spent most of his life in the field of immunology working in the department of Pathology. After 30 years as an academic, he left Cambridge University in 1989 to co-found Cantab Pharmaceuticals along with Abingworth, a UK Venture capital fund. Cantab listed on the London Stock Exchange in 1991.

Ionica

Telecommunications

Privately owned

VC funding

Professional management team

In 1991 Nigel founded Ionica, a national telephone network licensed to compete with British Telecom in the last mile of the residential market using microwave technology and re-allocated national radio spectrum. Ionica grew rapidly to employ 1200 people. They raised \$1bn in nine funding rounds: \$600m in Equity and \$400m in Debt. The company floated on the London and New York stock exchange in 1997 but their success was short lived.

Zeus Technology

Internet Technology

Privately owned

Self funded

Entrepreneurs/owner managers

Damian Reeves co-founded Zeus Technology with Adam Twiss in 1995. Zeus didn't need venture capital to 1998. The funding enabled the company to grow from 4 – 110 people to take advantage of the 'hot space for internet commerce'.

Signal processors

Communications

Privately owned

VC funding

Professional management team

Robin Smith-Saville spent 13 years at CCL as its director of Electronics. In 1982 he spun out Signal processors (SPL) and built it into a specialist supplier to the satcomms market, launching a stream of innovative products for satellite ground stations. SPL was sold to Applied Cellular Technology in the USA in 1997.

Xaar

Printing technology

Privately owned

Equity funding

Professional management team

Steve Temple co-founded Xaar together with a group of colleagues. They invented the inkjet technology on which Xaar was founded. Xaar is now on the London Stock exchange specialising in the manufacture and sale of high specifications printheads for digital printing in the specialty graphics, industrial and packaging print markets.

Sphere medical

Health Diagnostic technology

Privately owned

VC funding

Professional management team

Gavin Troughton and Stuart Hendry spun Sphere Medical out of Generics as a result of a consultancy project for Siemens to develop and market a new generation of

monitoring and diagnostic products for critically ill patients, based on cutting edge micro and nano technology. Sphere medical has raised in excess of £5m in venture capital and grant funding and currently employs 12 people.

nCipher

Internet security

Privately owned

VC funding

Professional management team

Alex and his brother Nicko van Someren founded nCipher in 1996. Nicko is a widely published author on internet security and a frequent speaker on computer security and cryptography nCipher develops internet security products. nCipher was listed on the London Stock Exchange in 2000.

Cambridge Positioning Systems (CPS)

Location technology

Privately owned

VC funding

Professional management team

Chris Wade came to Cambridge after spending 14 years in North America. Chris is the current CEO of CPS. Under his leadership CPS has grown into a global organisation that has become a leader in the provision of high accuracy mobile location technology. CPS is now regarded as the standard for the GSM market worldwide and has been integrated into solutions provided by Nokia, HP and Logica. CPS has raised an additional \$50m in venture capital funding.

Photon Group

Marketing/Advertising consultants

Privately owned

Self – funded

Professional management team

Siimon Reynolds is one of the most recognised names in Marketing. He has been awarded almost every major prize for marketing creativity. The Photon Group was founded by Siimon Reynolds. It is a consortium of 18 marketing companies which recently listed on the Australian Stock Exchange. Siimon's agencies operate in four countries with 500 fulltime staff and is valued at \$180m.

Destra corporation

Internet business communications

Publicly owned

IPO

Entrepreneur management

Domenic and Anna Carosa founded Destra in 1996. Domenic was 23 years old in the year 2000 when the company was listed on the ASX (Australian Stock Exchange). Destra provides online consumer entertainment and internet business communications. Destra owns www.mp3.com.au. Destra employs 80 people and operates in 5 countries around the world.

Jim's Mowing

Home Services

Franchise

Self funded

Entrepreneur owner/manger

Jim Penman began his mowing business in 1982 part time whilst attending University. In September 1988 he decided to expand the business and by June 1989 he had accepted his first franchisees. In 1994 Jim realised that he had developed some expertise in Franchising and decided to diversify. Twenty-two years later he has 2600 franchisees in Australia, New Zealand and Canada.

Action International Business Coaching

Business consultancy

Franchise

Self - funded

Entrepreneur owner/manager

Brad Sugars started Action International in 1993, 10 years later it is 16th in the top 100 fastest growing franchises with over 700 offices in 20 countries. Action International business coaching is quickly becoming the leading business coaching business in the world.

Eagles Boy Pizza

Fast Food

Franchise

Self-funding

Entrepreneur owner/manager

Tom Potter left school at the age of 15. Despite having no money, no education and no mentor he established his first pizza restaurant in regional NSW in 1986 at the age of 23. He concluded that the best way to grow his business was through franchising.

With some clever marketing strategies he has expanded his business and now runs an empire with over 160 stores Australia Wide and \$100m turnover.

Les Mills fitness

Fitness industry

Self-funded

Privately owned

Entrepreneur Owner/manager

Philip Mills was involved in track and field specialising in hurdles. He was awarded a track scholarship to the University of California (UCLA) where he graduated in philosophy. Whilst in the US he developed a keen interest in the emerging fitness industry and the aerobics boom. Upon returning to NZ in 1980 he developed a series of popular exercise to music programmes. Philip created a franchise arm which licensed the programmes to gyms in Australia and NZ. Today almost 10,000 fitness clubs in 55 countries license one or more of the 7 Les Mills programmes.

Two hands wine

Wine Makers

Privately owned

Self funded

Entrepreneurs/owner/managers

Michael Twelftree and his business partner Richard Mintz are passionate wine collectors. This passion inspired them to start their wine export business in 1998. Their passion inspired them to expand the business and make the best shiraz based wines. They started with 17 tonnes of grapes in 2000 in just 5 years they are now crushing over 500 tonnes of wine. In their short time in the business they have won a steady stream of awards including best wine produces 2003/4 and with seventeen staff they have revenues of \$8m

Nudie

Food industry

Privately owned

VC funding

Professional management team

Tim Pethicks experience and qualifications prepared him well for his business Nudie. Tim was marketing Manager of Microsoft Australia, he served as GM of Village roadshow and CEO of Looksmart. In 2002 Tim decided that he wanted create something new and different and to satisfy his craving for fruit. He started Nudie. Within 12 months Nudie was selling 16,000 bottles per day and last year was voted as one of the top ten most recognisable brands in Australasia.

Apex-pal

Restaurants

Privately owned

Self-funded

Entrepreneur/owner/manager

Within one year of completing his business degree at RMIT Douglas Foo began his first restaurant business. Apex-pal is one of the fastest growing food groups in Singapore. Apex pal now runs a diverse group of restaurants, a franchise, and have exclusive distribution rights to some unique food products. Within 6 years of starting Douglas listed his company on the Singapore Stock Exchange. Apex-pal has been listed as the 50th fastest growing company in Singapore.

EzyDVD

Entertainment

Privately owned

Self funded

Entrepreneur/owner/manager

Jim Zavos recognised the opportunity for DVD's before they were launched in Australian in 1996. In 1999 Jim pioneered the introduction of DVDs into Australia by launching his business EzyDVD online. EzyDVD was a booming business with 3 retail stores. In 2002 he decided to franchise the business and now has 42 stores Australia wide.

One.tel

Telecommunications

Privately owned

Investor funding

Entrepreneur/owner/managers

Jodie Rich and Brett Keeling met at University. They both had checkered business careers. In the late 90's they got together for their new venture One.tel. They convinced Rodney Adler to contribute \$475,000 to this new venture startup. They managed to entice James packer on board who in turn enticed Lachlan Murdoch to contribute. At first the business looked promising its share price increasing substantially because of the Packer families involvement. But despite Packer and Murdoch's involvement, One.tel was very poorly managed, with no systems, strategy and eventually it went into debt to the tune of \$300-400 million dollars.

Enron

Resource industry

Publicly owned

Investor funding

Professional management team

The company displayed early signs of a dysfunctional corporate culture. Enron always had to run faster to keep up with itself-endlessly replicating its trading model in new markets. In 2000 Jeffrey Skilling CEO of Enron argued they had a strategy appropriate for a dinosaur, and they would adopt a strategy of letting assets work for people. However, the ballooning costs of that strategy led CFO Andrew Fastow to devise ever more complicated means of hiding debt. They developed a cosy Texas country club culture, where regulators, advisers and gung-ho executives schmoozed each other. The failure of Enron was due to culture that had developed which resulted in bad investments, complex hedging vehicles, and conflicts of interest.

Excite@home

Internet technology

Publicly owned

Investor funding

Professional management team

Blame it on a lethal combination of management missteps, clashing egos, and old-fashioned greed. In the end, the cable companies that backed Excite@Home and took more than \$1 billion from investors to finance it decided to walk away, leaving public investors to pay the price. It all came to an end in August 2001, when Patti S. Hart made a last-ditch effort to save Excite@Home. The chief executive set up a videoconference call with top executives from AT&T, which had a controlling stake in Excite@Home. She told AT&T CEO and Excite@Home board member C. Michael Armstrong and other AT&T officials that they had \$100 million less in cash than her execs had told her. Armstrong said a cash infusion was out of the question. AT&T says the idea that it drove Excite@Home into bankruptcy is ludicrous. After all, its execs point out, the long-distance giant paid \$3.5 billion for its controlling stake in the company--then lost all its money.

Rubbermaid

Manufacturing

Publicly owned

Investor funding

Professional management team

When Joseph Galli took the helm of Newell Rubbermaid in 2001, he was seen as a marketing wizard whose success at Black & Decker and Amazon.com made him the next 'can't miss'

CEO. But Galli did miss -- badly. On Oct. 17, Newell's board announced his resignation 'by mutual agreement' after 10 quarters of sliding sales. Galli struggled to reposition Newell's myriad product lines as strong brands worthy of premium prices. He poured millions into marketing. That worked for higher-end lines such as Calphalon. But it was a costly mistake with commodity items like Rubbermaid containers. In September, Galli backtracked, closing a third of Newell's factories and laying off 5,000 workers.

Delta Airlines

Transportation

Publicly owned

Investor funding

Professional management team

9/11, the war on terror and the increasing competitive nature of the airline industry have all contributed to Delta's decline. Delta Air Lines Inc., which employs 3,530 people, is sliding toward bankruptcy after \$10 billion in losses over the past four years. Over 500 former staff have taken early retirement contributing to the already depleted funds. The Bankruptcy court was very critical of the creative accounting system used by Delta's finance department to hide their financial affairs as well as the exorbitant pilot salaries.

iFulfill.com

Online distribution

Privately owned

Self funded

Entrepreneur/owner/manager

Paul Purdue was the president of iFulfill.com, a fast-growing e-commerce shipping company in Maumee, Ohio. The installation in February of a new wireless inventory system led to widespread confusion and missed orders. As chaos mounted, morale sank among iFulfill's 38 employees. Customers defected. Debt soared. Purdue, who had financed the startup on personal credit cards, saw the balance on his cards top \$150,000. The company owed even more to shipping giant UPS. Attempts to refinance fell through. So on the morning of July 25, the 43-year-old Purdue shut the seven-year-old iFulfill.com. 'I went to work at about 5 a.m.,' he says, 'and started firing people as they came in.'

Adelphia communications

Telecommunications

Privately owned

Self funded

Professional management team

Vanessa A. Wittman, who for the past two years has served as chief financial officer for scandal-ridden cable operator Adelphia Communications Corp. That role has placed the onetime investment banker at the epicenter of one of the most complex corporate reclamations ever -- the aftermath of the financial morass left by founder John Rigas and son Timothy, convicted of looting billions from the Adelphia. Adelphia, filed for federal bankruptcy protection in June, 2002, with \$19 billion in debt, it is expected to announce by mid-April that it will sell its systems, which pipe cable TV into 5.2 million subscribers' homes from West Palm Beach, Fla., to Los Angeles.

Micro Warehouse

Distribution

Privately owned

Self funded

Professional management team

Micro Warehouse - computer warehouse business was founded in 1988. They were able to fulfill orders cheaper than retailers. The companies greatest growth was during the mid 90's when sales soared from \$776 million in 1994 to \$2.1 billion in 1997. It's failure arose from not evolving from a cataloguer to a direct marketer. The problem with selling computers to consumers is that repeat business isn't there. The commoditization of computers has caused a consolidation of the industry and Mirco warehouse with its plummeting sales has been acquired by a major competitor for a mere \$22million, \$14 m in inventory and \$8m for its database.

Brobeck, Phleger & Harrison LLP

Business consulting service

Privately owned

Self-funded

Professional management team

Shortly after 2 p.m. on Jan. 30, staffers in the New York office of the law firm Brobeck, Phleger & Harrison LLP received an e-mail telling them to "please plan on attending" a firm-wide videoconference they were told a merger with Morgan, Lewis & Bockius LLP had broken down and that Brobeck would be folding. It was a tragic ending for what had been until quite recently one of the most successful law firms in the country. Founded in 1926, Brobeck had spent decades building a well-balanced practice. But when the technology boom hit, the San Francisco-based firm chucked the tried-and-true conservatism and made an aggressive bid to become a national powerhouse. Tower Snow Jr., joined the firm in 1995. He came armed with an impressive roster of clients, including Apple Computer, 3Com, and Bank of America, and a magnetism that charmed Brobeck's troops instantly. Within three years of his arrival, Snow was elected chairman of Brobeck's seven-person policy committee. In addition to pushing for new offices and the TV advertising campaign, he led an expensive hiring blitz that resulted in Brobeck's legal team more than doubling, from about 450 attorneys in 1998 to more than 900 at its zenith in 2000. They made the classic mistake of assuming [the high-

tech bubble] would go on forever. When the tech party suddenly stopped, the firm stayed on its growth course--refusing to lay off attorneys or dump excess real estate. As a result, 1,100 people were put out of work and Brobeck will likely go down in history as the worst legal meltdown.”

Conseco

Lending institution

Public company

Investor funding

Professional management team

Having failed to shore up its floundering finance businesses and reeling under its \$6.5 billion in debt, Conseco filed for Chapter 11 on Dec. 11. With \$52 billion in assets, Conseco is the third-largest bankruptcy ever, topped only by WorldCom and Enron. The bankruptcy is a final blow to the reputation of Gary Wendt, who quit on Oct. 3. The ex-CEO of General Electric Capital was brought in to rescue Conseco in June, 2000, with a \$45 million signing bonus. He got a further \$8 million bonus in July, 2002, a month before Conseco defaulted on its debt. The company says that its insurance units are not part of the filing and that policyholders will not be affected. Finance operations such as the risky mobile-home loan portfolio will be sold off during the restructuring. What is likely to emerge will be a life- and health-insurance company with an investment arm.

Toy Specialists

Retailer

Private company

self-funded

Entrepreneur owner/manager

Toy Specialists shuttered after 21 years, its inventory auctioned at its 11th Avenue location and online. Toy Specialists founder Bill Tesar cited declining recording budgets as the primary culprit. The industry's widespread migration to digital audio workstations, in which hardware-based processing equipment is often replaced by software, was another factor. The market has changed significantly from where Bill set up his business and he wasn't able to keep up with the changes.

Unique Recording Studios,

Entertainment industry

Private company

Self-funded

Entrepreneur owner/managers

Unique Recording Studios another New York mainstay, shut down after 26 years. In a clear sign of the profound changes in commercial recording, Unique had replaced its custom Neve 8068 (analog) console with a Pro Tools HD3 DAW system with Digidesign/Focusrite Control 24 user interface. But high-end Pro Tools rigs are common in home and commercial studios alike.'Many producers and artists feel that if you get a \$30,000-\$50,000 budget to make a record, a home studio is a better investment,' Unique co-owners Bobby and Joanne Nathan told Studio Monitor. 'If the record flops, at least you still have a home studio.' To survive in such a difficult and competitive climate, many commercial studios and content creators found strength in numbers, forming alliances to provide the most comprehensive array of services possible, not a strategy that Bobby and Joanne pursued.

Powerball International.

New fuel technology

Private company

Private investors

Entrepreneur owner/manager

Powerball International the small Salt Lake City outfit that claimed to have the key to the fuel cell conundrum? A year after made headlines all around the country Powerball International, inventor of a supposedly cheap, safe way to deliver hydrogen, the firm blew up. The Securities & Exchange Commission sued President William Freise, alleging that he altered bank statements to conceal fraud. Though Powerball isn't officially out of business, it has no employees and no revenues. Freise insists the technology and science is sound but admits others doubted whether it could be used economically to power automobiles and become a standard. Freise maintains that the SEC suit is being resolved

Perkins Coie

Legal firm

Private company

Self-funded

Professional management team

Seattle based law firm Perkins Coie has become the latest in a string of foreign firms to scale back its presence in Asia. As first revealed by Lawyer News Weekly last Wednesday the firm is shutting the doors of its 12-year-old Hong Kong office. Perkins Coie's decision to close its Hong Kong practice was triggered by the continuing economic downturn in the region as well as the outbreak of Sars. According to a wellplaced source, the move will result in all of Perkins Coie's Hong Kong staff, including 15 lawyers, being made redundant

Volare Airlines.

Transportation industry

Privately owned

Investor funding

Professional management team

Last week, Volare board members acknowledged their inability to secure bailout funding. An estimated 60 million euros (\$78 million) was needed to buy time. Volare Airlines robust but uncontrolled traffic growth and low yields in the last few weeks exacerbated Volare's financial weaknesses, leading to the company's demise. Volare's failure is attributed to the Network carriers who are successfully slashing operating costs on short-haul routes and launching aggressive campaigns to counterattack low-cost 'predators.'

Iridium Satellite phones

Telecommunication Technology

Publicly owned

investor funding

Professional management team

Seizing on the idea, the can-do crowd at Motorola ran Bertiger's idea up the corporate flagpole. The leviathan effort would cost billions, but CEO Robert Galvin figured that by spinning it off and teaming with a host of worldwide partners, it just might work. More than a decade and \$5 billion later, Iridium's network of 66 low-flying satellites was finally launched in 1998. 'The potential uses of Iridium products are boundless,' Iridium's then CEO Edward Staiano decreed. Yet Iridium's brick-size phone was a far cry from the tiny cellphones flooding the market. Even worse, users had to be outdoors to make the line-of-sight connection needed to communicate with its satellites. With fewer than 50,000 subscribers by 2000, the company declared bankruptcy.

Sirius Diamonds

Jewellery distribution

Privately owned

Investor funding

Professional management team

Sirius Diamonds, the company that cut the first stones mined in Canada and gave us the iconic Polar Bear Diamond, was the last to fall. Arslanian Cutting Works ran into trouble earlier this year and was bought out by a Montreal company, and Deton'Cho Diamonds, now Canada Dene Diamonds, faltered out of the gate in 2002. Sirius was forced to declare bankruptcy this summer after the territorial government called in an \$8-million loan. The high cost of labour--not to mention the costs of operating in the North--make it extremely difficult for companies to compete with places like China and India

University Avenue Balanced

Investment company

Publicly owned

Investor funding

Professional management team

Balanced funds (which hold mixtures of bonds and stocks) are supposed to be conservative instruments offering relatively stable returns. However, the University Avenue Balanced fund--purportedly suitable 'for investors with a medium risk tolerance'--somehow managed to achieve a recent one-year return of -89%. The Ontario Securities Commission raised concerns about some of UAML's practices during a compliance review sometime before April 2003. During the 1990s, their funds generally performed well, but they entered a tailspin in early 2000 and never recovered. Investment decisions made by UAML exposed unitholders to unusual risks. The funds had a penchant for buying highly illiquid securities. University Avenue's motto was 'Invest With Experience.' The experience provided was nerve-wracking. UAML changed ownership several times since 2000 through a series of Byzantine transactions; key executives frequently left or were replaced during the past four years, with little or no explanation offered. Unitholders started selling en masse and UAML was declared bankrupt

Interstate Bakeries

Retailer

Privately owned

Self-funded

Professional management team

Interstate bakeries has been delivering sliced bread and other products since the 1930s. They claim they've have fallen victim to the low-carb craze. At least that's the idea Interstate Bakeries (IBC), the maker of those iconic products, put forth on Sept. 22, when it filed for Chapter 11 bankruptcy protection. Like the quaint nostalgia that its core brands evoke, Interstate had continued to inhabit an outdated world that consumers had moved out of. In its bankruptcy filing, Interstate cited liquidity issues resulting from declining sales, a high fixed-cost structure, and increased costs for ingredients and power. It obviously didn't help that its antiquated bakeries consumed too much energy. Overriding all this was Interstate's seeming inability to innovate that's a death sentence. Mired in its past glory, Interstate never really reinvented itself. Interstate had more than 50 bakeries and about 34,000 employees nationwide with annual sales of \$3.5 billion

Penthouse magazine

Entertainment

Publicly owned

Investor funding

Professional management team

Penthouse magazine, circulation has dropped from 5 million to 400,000. Private equity investor Marc Bell, who bragged to the media that he had taken control after foreclosing on a reported \$41 million debt, announced plans to tone down the mag. The handover was delayed after the current owners, whom Bell had financed, sued, alleging bankruptcy fraud and other mischief. Bell denies their claim that he threatened Penthouse's aging founder, ex-Forbes 400 member Robert C. Guccione. The contents of Guccione's 70-acre Hyde Park, N.Y. estate--which he lost after a loan default--were set to be auctioned on Sept. 4

Trump Hotels, Casino & Resorts Inc

Tourism industry

Privately owned

Owner investor

Entrepreneur owner/manager

On Aug. 9 Trump announced that he will file Chapter 11 bankruptcy protection for one of his companies, Trump Hotels & Casino Resorts Inc., to help pay down \$1.8 billion in debt. Donald Trump whose worth is estimated at \$2.5 billion, will remain chairman of the board but will lose his CEO title and see his company share cut from 56 percent to 25 percent. Still, Trump remains as unflappable as his hair. 'By the way, that company is less than 2 percent of my net worth.' He says.

Joseph-Beth Booksellers,

Booksellers

Privately owned

Self funded

Entrepreneur owner/manager

Joseph-Beth Booksellers in Shaker Heights opened in the fall of 2000. A second Cleveland area Joseph-Beth bookstore, located at Legacy Village in nearby Lyndhurst, opened last October. Joseph-Beth at Shaker Square had struggled for much of its tenure. In the beginning, it encompassed 36,000 square feet of space, including a large children's area and a bistro. Although *business* was strong the first year, sales dropped and the store shrunk in size. First, the children's wing closed; the music section was the next to go; and the bistro closed down last January. When the store shut its doors for good on Sunday, July 11, it was down to 12,000 square feet of retail space and 12 employees. Most of those employees are being transferred to the 28,500-square-foot Lyndhurst location. In a letter handed out at the cash register to customers on the store's last day, Joseph-Beth Group owner Neil Van Uum cited the lack of vitality at Shaker Square as a major factor in his decision to shut down this Joseph-Beth location.

Beyond Words Bookshop

Booksellers

Privately owned

Self-funded

Entrepreneur owner manager

Founded in 1978, the 2,100-sq.-ft. store specialized in books on inner development and had been doing fine economically. But in another example of the importance of succession planning, when the Krauths were ready to move on, they were unable to find a buyer. 'Twenty-five years is a really long time,' Jeff Krauth said. Despite the store's fiscal health, Jeff Krauth noted that the economics of independent bookselling did play a role in the decision to close. 'We're working at least as hard as ever, and it's stressful,' he said. 'We didn't start a store to run a Web site, have events, get every penny out of co-op and watch what chain's opening next.' Three years ago, the Krauths, who own their building, cut their 4,000 square feet space in half and began renting to several complementary businesses.

Forstmann Little

Investment company

Privately owned

Self-funded

Entrepreneur owner/manager

There was a time when there was no more colorful character on Wall Street than Theodore 'Teddy' Forstmann. Along with his longtime rival Henry Kravis--and a few others--Forstmann had helped create a radical new way to acquire companies: the leveraged buyout. His firm, Forstmann Little, had made billions on a series of high-profile LBOs. Forstmann Little had raised more than \$8 billion over 21 years in six funds--and every fund had made its investors money. Indeed, the average equity fund racked up annual returns of almost 60% for its (mostly) corporate pension fund investors. Most astounding of all, with rare exceptions, never lost money on the individual companies it took private in LBOs. It transformed companies that the rest of the leveraged-buyout pack was convinced were headed for the trash heap. He bought Dr Pepper for \$150 m and sold it for \$365. He bought out Gulfstream for \$636m and sold it for \$3.1b

DVI

Health Industry

Publicly owned

Investor funding

Professional management team

DVI in 2003, had \$1.8 billion outstanding in securitizations, the last of which had been offloaded just three months earlier, when Merrill Lynch underwrote a \$450 million offering of securitized loans on behalf of DVI. When Michael O'Hanlon, the company's former chief executive, joined the public company in 1993, he started doing deals with dicey health clinics that missed interest payments. But, instead of classifying the loans as delinquent after 180 days and writing them down, he replaced existing clinic operators with new management, rewrote the contracts and thereby declared--without

any real change in the economic facts--that the loans were miraculously unimpaired. DVI (once known as Diagnostic Ventures) also became 'addicted' to securitization. DVI sometimes recapitalized the loans by rewriting or recycling their contracts, thereby concealing losses. As contract delinquencies worsened, DVI again transferred the loans in 1999, to yet another new borrower: OnCure/USCC, an entity controlled by a friend of O'Hanlon's who paid more than twice the value of the clinic as 'a favor,' Today DVI is in the process of liquidation.

Broadway Cinema's

Entertainment

Privately owned

Investors funding

Management team

Black-owned theater that opened in 1999 in the West End, the city's most populous black neighborhood, Broadway was the brainchild of three city leaders - the partners hoped to create a profitable *business* that would serve as the economic anchor in its neighborhood. They invested \$1.5 million of their own money and borrowed nearly \$2.6 million from four lenders, led by Republic Bank. In 2000, its first full year of sales, the *business* reportedly posted revenue of about \$1.3 million and a loss of \$194,000. In retrospect, feasibility studies the partners provided for the banks hint at what would go wrong. In the studies, Broadway's owners noted that they would break even if only a modest number of the seats were occupied on a daily basis. Critics now say the partners--busy with their other professional commitments--never made marketing the theater a priority. 'I know people who should have been customers who never went because they didn't hear anything about it,' says Steve Trager, Republic Bank's CEO. Broadway rarely hosted special screenings or community events. Judith Egerton, the Louisville Courier-Journal's film critic, recalls that her paper had to seek out the owners to do an article when Broadway first opened. 'They didn't seem very savvy about getting the word out,' she says, adding that she 'went to Broadway quite a bit because it was never crowded.' Failing to market the independent neighborhood theater aggressively was a crucial mistake, according to Jeffrey Thomison, who follows entertainment for Hilliard Lyons, a local brokerage

TechTarget

Marketing solutions

Privately owned

Investor funding

Management team

TechTarget publishes integrated media that enable information-technology (IT) marketers to reach targeted communities of IT professionals and executives in all phases of the technology decision-making and purchase process. Founded in late 1999, TechTarget has more than 2,500 advertisers include the leading IT companies in the world. The company has reported a 51 percent increase in revenues relative to the same period in 2004, with record revenues and profit in each line of business—online,

events, and print. 'TechTarget's investments strategy has set the standard for success in the industry,' said TechTarget CEO Greg Strakosch.

Tesco

Retailer

Publicly owned

Investor funding

professional management team

Amidst the splendour of Mayfair's Claridge's Hotel, one company swept the board as the most admired company in the UK: Tesco. It finished in the top three of seven categories, winning five awards. Its chief executive, Sir Terry Leahy, won (by a mile) Most Admired Leader. Tesco sells everything from clothing to groceries, and from insurance to holiday packages. In the year ended 26 February 2005 Tesco made a pre-tax profit of £1.962 billion on turnover of £33.974 billion (the widely publicised headline profit of 'over £2 billion' was 'underlying profit' before certain accounting adjustments). Across all categories, over £1 in every £8 of UK retail sales is spent at Tesco. Tesco was founded by Jack Cohen, who sold groceries in the markets of the London East End in 1919, today it employes over 240,000 people.

Appendix 9

List of successful and failed firms used in the experimental protocol

Failed firms in red

Success

Failure

Case #		Case Name	34	26
		% of total cases	57%	43%
1	1	JK Personnel	~	
2	2	Industrial Optical Scanners	~	
3	3	Alphamosaic	~	
4	4	Apricot Computers	~	
5	1	Lexus Mentoring and coaching		~
6	5	IXI	~	
7	6	Inca Digital Printers	~	
8	7	The Technology Partnership	~	
9	8	Element 14	~	
10	9	Innovia	~	
11	10	Trigenix	~	
12	11	Office Shopper	~	
13	12	Polight Technologies	~	
14	13	Domino Printing Sciences	~	
15	14	Cantab Pharmaceutical	~	
16	15	Ionica	~	
17	16	Zeus	~	
18	17	Signal Processors	~	
19	18	Xaar	~	
20	19	Sphere Medical	~	
21	20	nCipher	~	
22	21	Cambrige Positioning systems	~	

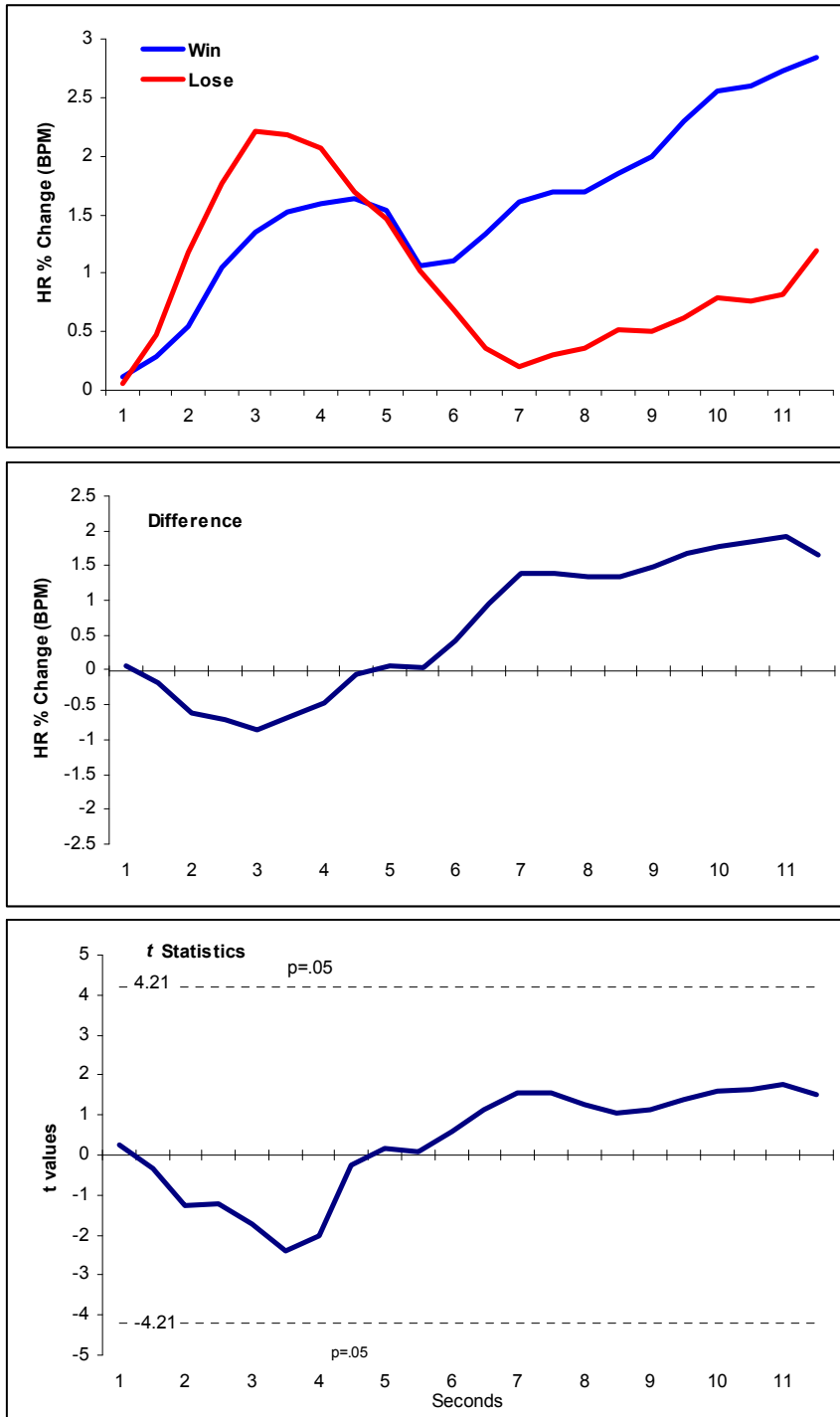
23	22	Photon group	~	
24	23	Destra	~	
25	24	Jims Mowing	~	
26	25	Action International	~	
27	26	Eagle Boys	~	
28	27	Les Mills	~	
29	28	Two Hands Wine	~	
30	29	Nudie	~	
31	30	ApexPal	~	
32	31	Ezydvd	~	
33	2	Onetel		~
34	3	Enron		~
35	4	Excite@home		~
36	5	Rubbermaid		~
37	6	Delta airlines		~
38	7	ifullfil.com		~
39	8	Adelphia Communications		~
40	9	Micro warehouse		~
41	10	Brobeck, Phleger & Harrison		~
42	11	Conseco		~
43	12	Toy Specialists		~
44	13	Unique Recording studios		~
45	14	Powerball international		~
46	15	Perkins Coie		~
47	16	Volare Airlines		~
48	17	Iridium Satellite phones		~
49	18	Sirius Diamonds		~

50	19	University Avenue Balanced		~
51	20	Interstate Bakeries		~
52	21	Penthouse Magazine		~
53	22	Trumps Hotel Casino & resorts		~
54	23	Joseph Beth Booksellers		~
55	24	Beyond Words Books		~
56	32	Forstmann Little	~	
57	25	DVI		~
58	26	Broadway Cinemas		~
59	33	Techtarget	~	
60	34	Tesco	~	

Appendix 10

Data Results physical experiment Sample 1

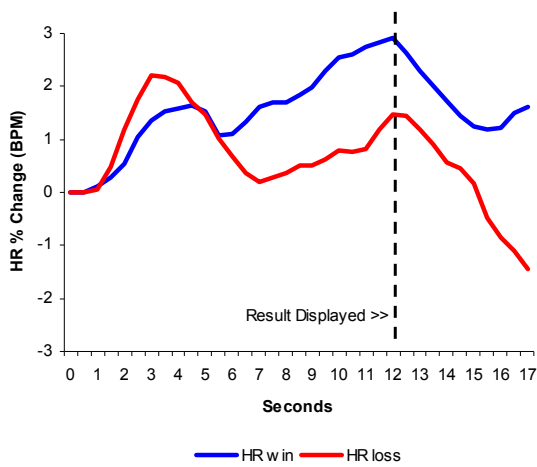
Random Permutation Analysis of Roulette Experiment All Subjects Beat-to-Beat Heart Rate Signals



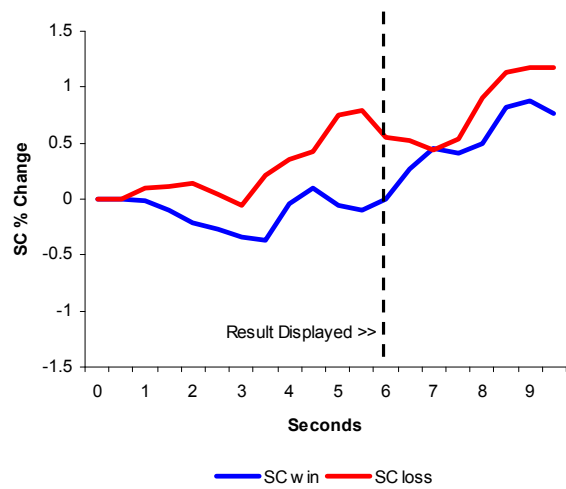
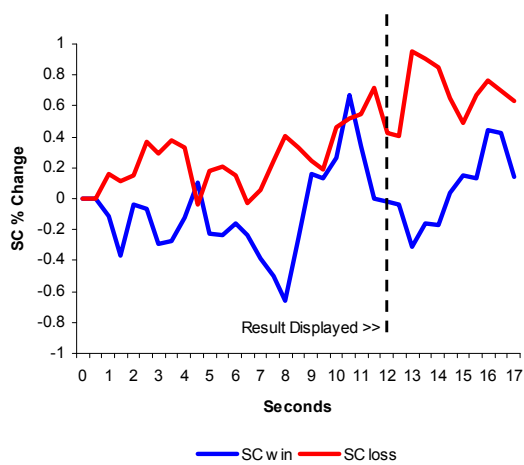
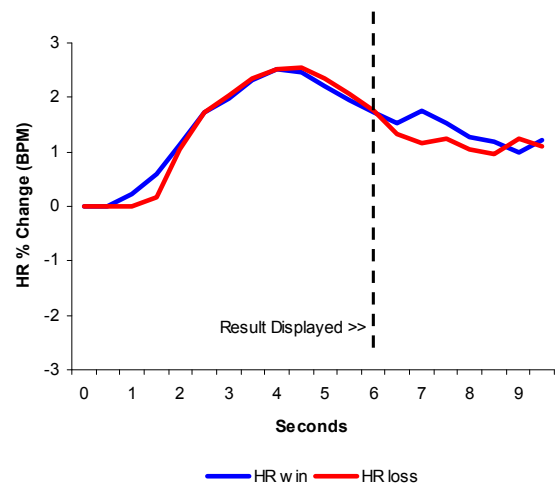
	Value	$p=$
Win vs. Lose $t_{ sum }$	25.84	0.278
t_{max}	2.39	0.348

All Subjects N=8

Roulette Experiment



Business Case experiment

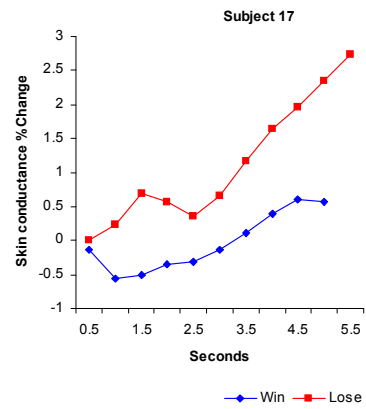
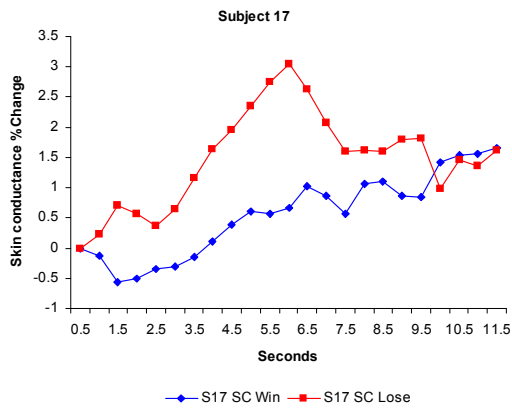
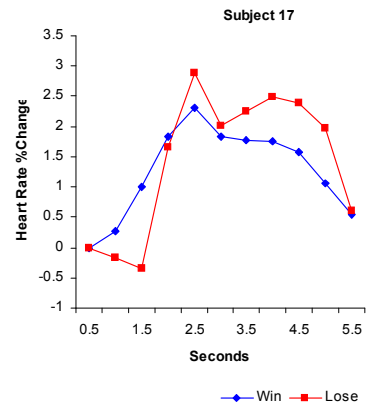
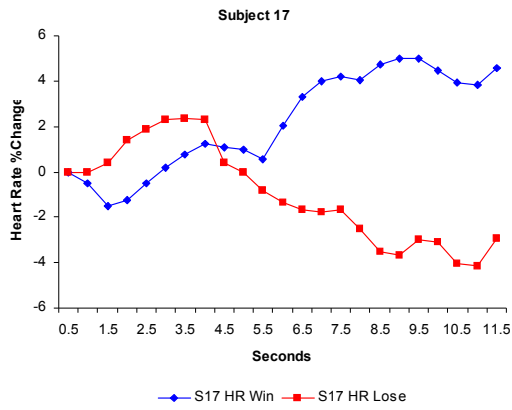


Appendix 11

Subject 17's results

Roulette Experiment

Business Case experiment

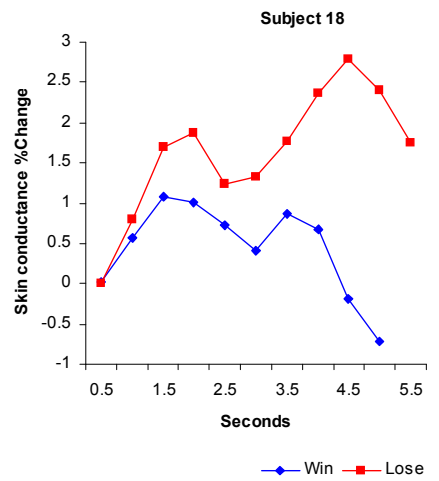
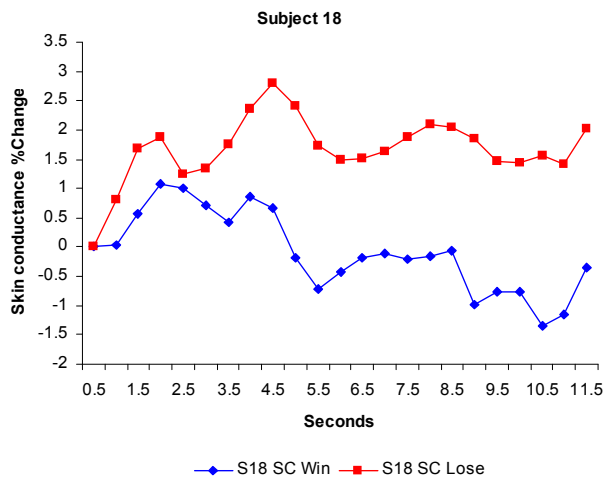
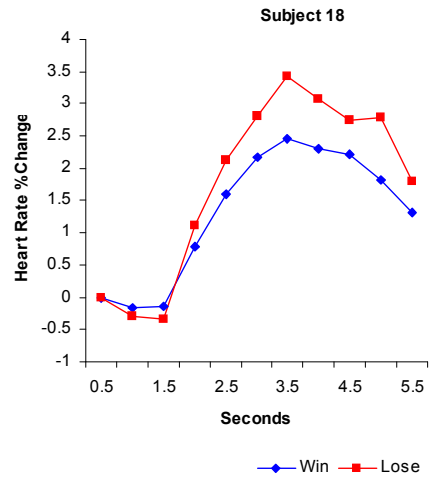
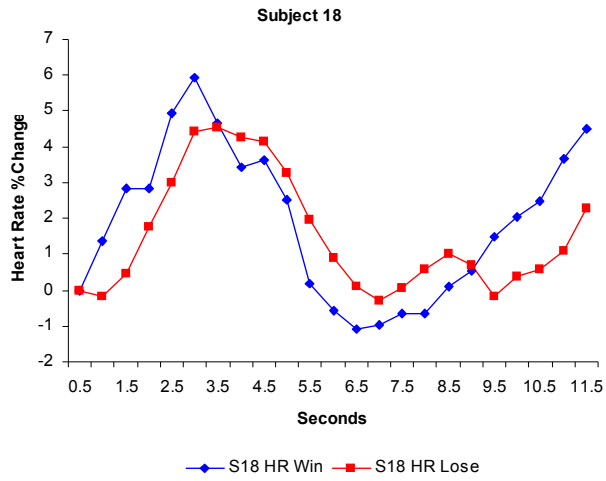


Appendix 12

Subject S18's results

Roulette Experiment

Business Case experiment



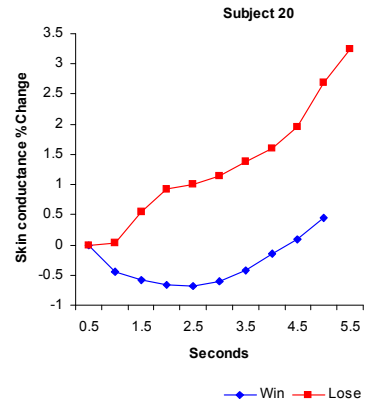
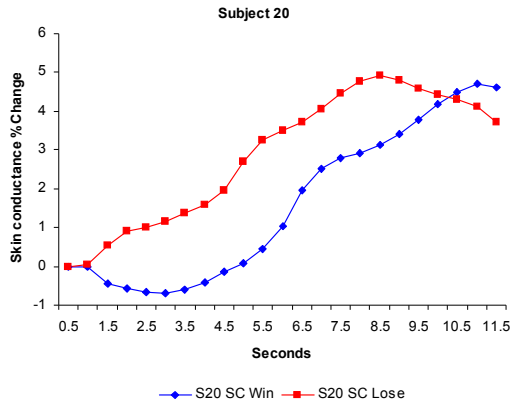
Appendix 13

Subject S 20's result

Roulette Experiment

Business Case experiment

Due to a technical problem the HRV tests failed therefore there is no data for this part of the test



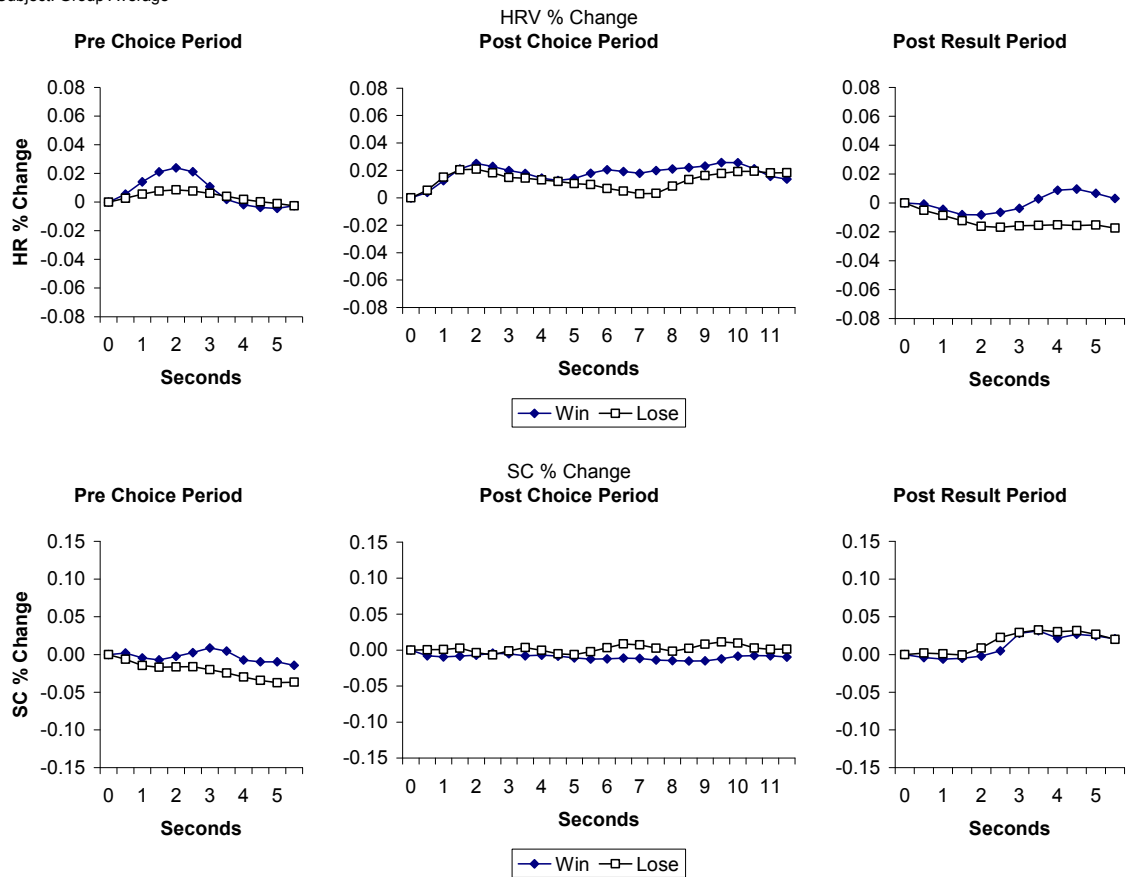
Appendix 14

Physical experiment results sample 2

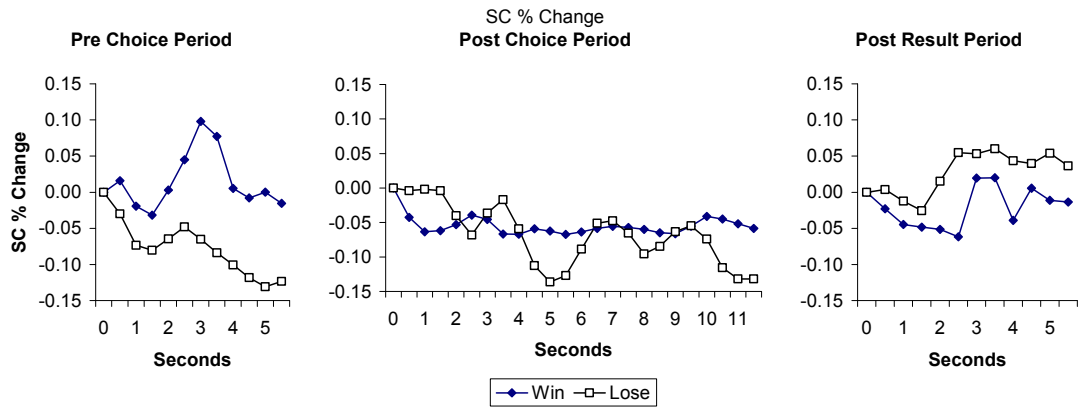
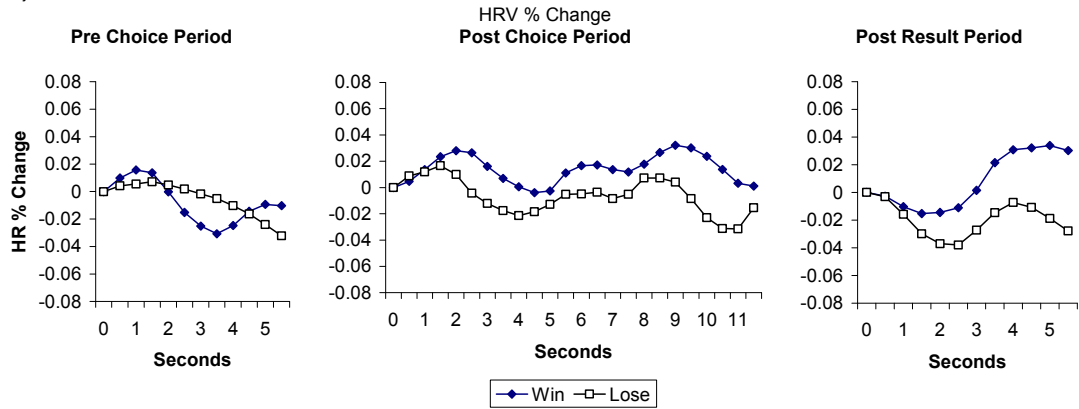
Included are the group average and individual results.

Sub#	Win	Lose	Win ratio
S26	13	12	52%
S27	9	16	36%
S28	11	14	44%
S32	12	13	48%
S33	12	13	48%
S34	10	15	40%
S36	12	13	48%
S37	10	15	40%

Subject: Group Average



Subject: S26



Subject: S27

