Abductive Theory for Thought-Ecologies: Depicting Systems of Conceptions

William Joseph Varey

Bachelor of Jurisprudence
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Master of Leadership and Management

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School of Social Sciences and Humanities
Faculty of Arts, Education and Creative Media
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I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

______________________________________________

William Joseph Varey

September 2012
Abstract

The discipline of sustainability theory now represents a mature and established discourse. Significant sustainability discussions will be occurring at this moment in many locations. These discussions may potentially enact decisions impacting on our local and collective futures. This dissertation is prompted by observations, over many years and in diverse forums, of how the quality of collective thought in such discussions sets the potential for societal developments. This research responds to the specific situation where in intelligent, informed, significant, well-planned and representative sustainability forums the complexity of questions faced may exceed our collective capacity to discover viable sustainability solutions.

The initiating question of this research was: *What is a means by which to disclose the capacity for thought in human social systems?* This dissertation examines the parameters for the depiction of the dynamic capacity of thought-ecologies. The proposition developed is for the use of ‘conceptions’ as a unit of observation. The approach operates much like the use of the organism in the study of complex ecologies in ecological systems theory. A novel contribution is in the discovery of how an ecology of thought requires from us some distinctly different assumptions. This research extends knowledge from the fields of psychology, sociology, ecology and systems theory by a structured multi-disciplinary approach.

An abductive method grounded in Peircean pragmatism is used and a methodological framework is developed from existing research theory specifically for the study of thought-ecologies. The framework comprises nine inquiry phases that build sequentially toward a hypothesis. This sequence of abductive inquiries provides a discrete structure to and methodological rigor for each inquiry phase. The relevant theory, method design, emphasis selection, and research outcomes are set out for each inquiry in separate chapters, with each chapter using a consistent structure.
In summary, the appropriate location for observation is selected using the example of sustainability theory (Chapter One). Conceptual feasibility is established by detecting phenomena from conceptions of health (Chapter Two). Primary propositions are developed from an analogical isomorph in neurobiological autopoiesis theory (Chapter Three). Three inter-related hypotheses are proposed for systems of conceptions (Chapter Four). The viability of the hypotheses is confirmed using five criteria from a panarchy analysis (Chapter Five). Definitions are formulated for the key dimensions proposed (Chapter Six). A comparison of existing measurement modalities provides the criteria for a measurement system (Chapter Seven). The approach to modeling \( n \)-dimensional hypervolumes for systems of conceptions is demonstrated (Chapter Eight). The proposed hypothesis is appraised on principles of explanatory coherence and pragmatism (Chapter Nine). This dissertation concludes with an integrative reflection (Chapter Ten).

The result of this research is to provide a theoretical basis for the depiction of systems of conceptions. The practical outcome achieved is the ability to observe the capacities of thought-ecologies by their depiction in three-dimensions. The significance of the research is to enable forms of social learning to enhance present and future capacities for sustainability thinking.
Accredgements

To my supervision committee, for their individual courage, conviction and contribution in their respective areas of expertise, I say thank you. It is by your own professional work and contributions that a thesis on this topic becomes possible. You also provided me with space and inspiration in ways that contributed to this work beyond what we each could have imagined.

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Finally, to my parents John and Yvonne, from whom I continue to receive wisdom and compassion in equal measures and beyond.
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Introduction

Preamble

This dissertation began in the context of my professional practice in sustainability facilitation. For over a decade I had the great privilege to work with many individuals, communities and remarkable organizations on their enactment of sustainability. By enabling the formation of new understandings I watched sustainability ideals move from vague concepts to concrete applications. This process of emergent sense-making holds, for me, a continual and life-long fascination. It reflects a belief I hold in the willingness of people to engage with their future as a reflection of their present capacity for caring.

Over time, I began to notice different patterns and some recurring anomalies. For example, in open processes collective solutions might be arrived at that were satisfying to no one individual personally. In contrast, I saw instances where clearly agreed outcomes failed in the absence of missed fundamentals. In intelligent, significant, well-planned, representative forums, such results were, based on my experience, perplexing. The commonality from within these occasions was when the complexity of the questions exceeded the capacity for the solutions. In the face of recurrent failures of our best collective efforts our belief in our abilities to enact complex sustainable change can become seriously challenged. I recognized at that time there were humanity-level impacts to these situations.¹

The various frameworks, learning theories, systems models and philosophical premises I had acquired in practice did not provide, at least for me, adequate explanations for what I was observing. This placed me in a position of general unknowing in relation to fields that I was intimate with in terms of know-how, experience and praxis. The sentiment of this dilemma has been clearly expressed by French philosopher, Edgar Morin (2001) who observes:
We find ourselves in a vicious cycle of increasingly multidimensional problems, increasing incapacity to think multidimensionally; the crisis worsens as fast as the incapacity to reflect on the crisis increases; the more planetary our problems, the more they are left unthought. (p. 17)

However, rather than the vicious cycle of the problem, I was interested in the practical application of virtuous sequences in resolution. In previous research I had developed a grounded research theory for generative learning dynamics in organizations (Varey, 2001). This current thesis, a decade of preparation later, examines a similar problem only at a larger scale of complexity. This research considers if it is possible to develop a means to disclose the psychodynamic capacities of sustainable social systems. It looks for a way to see beyond the panoply of forms of thinking into the structures of thought held within these contexts of collective caring.

What question was asked?

Primary Research Question

The initiating research question of this thesis is:

*What is a means by which to disclose the capacity for thought in human social systems?*

With any research proposition there are assumptions inherent in the framing of its primary questions. These explicit assumptions are discussed so that the intention of the question becomes transparent. There are specifics in the forms of asking which change the nature of the answering.

First, the initiating research question establishes an open inquiry. It is permissive, rather than prescriptive, as to the solution required. The question does not propose the answer. The ends to which the means are addressed are ostensibly silent. This is an intentional framing to suggest the more general aim of usefulness without a prescription of the eventual use. The intention behind
the question, as will be discussed subsequently, is that one possible use is the enablement of our collective capacities for sustainable choice and learning.

Second, the initiating question contains the implicit requirement of an action, resulting in a tangible outcome in the form of a disclosure. The use of the term ‘disclosure’ implies the possibility of an observable phenomenon that is temporarily hidden. It may be that the hidden phenomenon is unable to be disclosed, is hidden only to the observer, or is non-existent. The discovery of an absence is, arguably, still a discovery (Ackoff & Emery, 1972). The framing of the question assumes only that there is a valid basis for the investigation, prompting a strategic search, which may reveal nothing. The question also does not pre-empt to whom the disclosure is to be made. This recognizes that while a phenomenon might be existent, evidence of its existence can potentially be unavailable to some and, in particular, to myself as an observer and researcher.

Third, the question directs the focus of the purposeful disclosure to a measureable virtue, being a collective ‘capacity for thought’. This may not necessarily involve quantification. The mere comparison of difference to a first-disclosed condition can show an alteration. Further, in focussing on the capacity for ‘thought’ there is a distinction made between this phenomenon and either ‘thinking’ or ‘thoughts’. Topics not specifically considered by the question are the cognitive capacities of individuals, the forms of thinking of individual minds, or the problem solving capabilities of groups of thinkers. The focus of the initiating research question is on the resultant effects of an intangible phenomenon. This involves a level of precision in the observational focus.

Finally, the focal object of this research has been narrowly selected. The topic of this thesis potentially concerns the vastness of the phenomenon of thought, yet only human social systems are considered. Accordingly, individual psychology, other sentient animals and organisms, systems of artificial intelligence or the capacities of technological networks are outside of its scope. The research topic primarily concerns the narrow situation of people doing something together.
However, the scope of application of the results obtained are wide open. The analysis of ‘human social systems’ might apply to an individual within their perceptual environment, two people in relationship, a small group of people, a team, a community, an organization, a city’s populace, a popular social movement, or a generation of change. Potentially, any scale of human system is considered. This reflects a humanistic bias. The primary research question poses an active inquiry into the limits of possible applications.

**Thesis Proposition**

In this thesis I argue that the disclosure of the dynamic capacities for thought in human social systems is demonstrably possible. Within the discipline of sustainability theory, I believe this finding has significance. It also has a certain level of urgency in terms of the viability of human systems to cope reflexively with rapidly changing complex environments. Presently, we do not know ‘how healthy our thought is’. We also do not know ‘the ways in which it is healthy’. In proposing that there is a means for these assessments different conversations may become possible.

It is suggested that this possibly under-represented dimension of inquiry, being into the societal-level dynamics of our perceptual capacity, might in the future prove to be our highest priority, if only because it is presently an area of great vulnerability. It is, therefore, foreseeable that this field of inquiry may become a primary means of enabling a collective future resiliency.

**How was it answered?**

**What approach was proposed?**

The primary research method used for this thesis is the abductive method (Peirce, 1960). Traditionally, research methods have been divided into three primary domains; *deduction, induction* and *abduction* (Magnani, 2001).
Deduction extends existing assumptions. Induction expands on existing applications. Abduction initiates novel innovations. Each has their specific strengths and limitations. Colloquially, abduction can be considered a method for knowingly approaching the (as yet) unknown. Abductive analysis is explicitly acknowledged as an appropriate method for hypothesis formulation in new research fields (Creswell, 1998).

**Why was this selected?**

Different forms of formal abductive method are already used effectively in a number of fields. These include the cognitive sciences (Magnani, 2001, 2009b), computational theory (Thagard, 1978, 1988), empirical psychology (Haig, 2008b, 2008e; Rozeboom, 1997, 2008) and legal process (Walton, 1995, 2004). Dissertations adopting this research method have also been completed in diverse fields as represented by examples such as: logic programming in artificial intelligence (Aliseda, 1997), belief revision in semantic modeling (Pagnucco, 1996), executive decision making in healthcare (Sukkar, 2008), systemic approaches to cross cultural learning (Turner, 2008), rhetorical strategies for novel writing (White, 1998), and student decision making in mock-senates for climate change policy (Petty, 2001). Specifically, it is the existing applications of abductive theory to the process of thought formation that makes this method directly relevant to the aims of this thesis.

Correspondingly, a ‘Peircean’ approach to the philosophy of abductive method has been explicitly adopted (Peirce, 1960). This is reflective of the pragmatist philosophy of American scientist, philosopher and logician, Charles Sanders Peirce (1839-1914) who emphasized a tripartite approach to the scientific method. In his approach, abduction (hypothesis formulation), deduction (hypothesis testing) and induction (theory extension) are considered equally as three parts of one wider cyclic (and recursive) process of discovery (Rescher, 1978). The two distinguishing features of a Peircean philosophy are an emphasis on scientific pragmatism and the significance placed on research
economy (R. B. Goodman, 2005). The abductive research method promotes selective economy in hypothesis formation to enable subsequent verification and pragmatic application. The chosen approach in abductive method directly supports this thesis in its pragmatic aims.

Additionally, an abductive theory of method is specifically described as being applicable to hypothesis formulation for hidden causal connections (Haig, 2005a). It provides a method “appropriate for the detection of empirical phenomena and the subsequent construction of postulational theories” allowing for rudimentary characterizations of their causes (Haig, 2005a, p. 385). In this way, the abductive method allows for explorations of the unknown with a conscious degree of rigor. Critiques of abduction as a research process (by its proponents) comment on its permissiveness (Romeijn, 2008), the viability of its explanations (Richters & Hinshaw, 1999), the logicality of its perceptions (Hoffman, 1999), the absence of formalizations, limitations and justifications (Plutynski, 2011) and the reliance on organizing heuristics in place of epistemic metalogics (Aliseda, 2007). These limitations are mitigated, however, by formalizations of the processes of its method and the setting of realistic expectations.

**How was the method applied?**

Methodological rigor in abductive research is provided by reliance on the established theory of abductive method praxis (Haig, 2008a, 2008b, 2008c, 2008d, 2008e, 2011). The overall structure of a formalized abductive theory of method (i.e. ATOM) has been specifically outlined by Haig (2005a). This specific approach proposes identifiable and distinct sequential and dependent phases, with cycles of recursion. Each phases has a different research emphasis and prompts a different type of inquiry. For example, five of the overarching phases in this method are: a) problem formulation, b) phenomena detection, c) theory generation, d) theory development, and e) theory appraisal (Haig, 2005a).
This existing theoretical structure for an abductive theory of method proved invaluable in structuring and guiding this research. In the process of its application the five major frames were critically examined, expanded by reference to the abductive theory literature, and refined specifically for the research questions of this thesis. This resulted in an innovative codification of a nine phase abductive method to expand the precision in the methodological rigor for each phase. The benefit gained by this approach was a verifiable process for the generation and development of new theory, while operating within an overarching architecture of an existing research methodology.

What is the framework used?

The framework structure for the abductive method adopted comprises nine distinct phases. This generated nine cumulative outcomes which are reflected in the ordering of the chapters of this dissertation. Each chapter is dedicated to one distinct phase of the abductive method and ordered into a logical sequence. Each phase answers a critical question and provides a different component for the overall process. In overview, the framework for the entire thesis can be summarized into these nine distinct phases and a final integrative reflection (see Table 1.1).

<table>
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This consolidation of the literature on abductive theory and method, together with its specific application to the investigation of psychodynamic systems, I suggest, itself constitutes a novel contribution to knowledge and practice. To enable others to follow and undertake similar inquiries, I have articulated specifically in each chapter the process of the abductive inquiry conducted and the findings that process discovered (see Appendix A).

To explain the abductive method adopted each chapter contains a ‘How was it answered?’ section which describes: a) the abductive theory for that phase of the method, b) the emphasis selected in the abductive approach, and c) the pragmatic means of abductive application used in this thesis research. 5 This highlights the differences in, and significance of, each unique phase of this research process. Each research inquiry considered could constitute a thesis topic of its own, however, the main contribution to knowledge made by this thesis is not gained by their completion- it is by their conjunction.6

What was discovered?

Did the thesis find its answer?

The result of this thesis is an explanatory hypothesis for systems of conceptions. The proposal goes as far as was possible within the practical constraints and limits of this research form. It proposes a theoretical basis by which we might reflexively engage with the ecology of thought.

The primary finding of this thesis was that a theoretical approach to the observation of thought using conceptions as a unit of observation was feasible. More significantly, this thesis proposes a means for verification of the proposed hypotheses of how systems of conceptions function at different scales of
observation. In addition, a process for the three-dimensional modeling of systems of conceptions was developed by using enfolded hypervolumes. A novel innovation offered is the proposal for a different premise for making normative comparisons.

This leads to the potential development of the praxis for an ecological approach to the observation, learning in and development of the dynamic capacities for thought in human social systems. This is expressly intended for use in working on collective solutions to significant sustainability questions.

**Was there novelty (and surprise)?**

The thesis process generated a series of fascinating and stark challenges to my pre-existing assumptions. A more encompassing and nuanced understanding has resulted from an inquiry into recurrent anomalies and frequently seen problems recognized by an immersion in an applied field of practice.

The pleasant surprise was that, with merely small shifts in emphasis and the slightest of turns in orientation, different landscapes, which were previously obscured behind obstacles, became visible, tangible and newly available. For me, it is in these small adjustments to the nuances of perception where the future excitement lies in the application of the discoveries made.

What is novel in this thesis is that it does not primarily offer a different perspective, meta-theoretical synthesis or alternative paradigmatic lens from which to project a view of thought as a unifying representation. Rather it proposes a means to depict the dynamic structures of thought as viewed from many points of vantage.

This is an outcome captured best in the translation from Marcel Proust’s *The Captive (La Captive)* when reflecting on the dramatic power of music to take us out of ourselves. The finding is that in seeking new landscapes sometimes we must generate, not new eyes, travel to new shores, or even develop new ways of
breathing at heights beyond our imagining; but rather the eyes of ‘a hundred others beholding a hundred universes’. The complete passage reads (in translation):

A pair of wings, a different mode of breathing, which would enable us to traverse infinite space, would in no way help us, for, if we visited Mars or Venus keeping the same senses, they would clothe in the same aspect as the things of the earth everything that we should be capable of seeing. The only true voyage of discovery, the only fountain of Eternal Youth, would be not to visit strange lands but to possess other eyes, to behold the universe through the eyes of another, of a hundred others, to behold the hundred universes that each of them beholds, that each of them is; (Proust, 1927, pp. 259-260)

This ambitious aim, of finding a means to portray the continually refreshing aspects of the hundred universes seen in the constellations of thought, is perhaps where one fount of continual renewal in sustainable thinking might lie.

**How should I read this thesis?**

The nature of a formal abductive analysis differs from processes of deduction or induction in style, sequence and premise. To facilitate the ease of engagement with this research each substantive chapter has been written in an identical format. These comprise a report on the results of a sequence of abductive inquiries. Each has a different purpose, a different research question, a different process, a different emphasis in method, and a different form of outcome. Each phase concludes with evidentiary support and a reflection on additional learnings. As a result the development of the hypothesis expands as an unfolding process of engagement. Each chapter contains the following elements:

a) **Introduction** – summarising purpose, method and outcome;
b) **Research Question** – stating the specific question and assumptions;
c) **Existing Understanding** – reviewing literature on present understandings;
d) **Thesis Proposition** – stating explicitly the thesis propositions;
e) **Abductive Method** – explicating the method in theory, design and execution;
f) **Summation of Findings** – reporting on results as a brief set of findings;
g) **Discussion of Discovery** – providing a discussion of the discoveries made;
h) **Evidence in Support** - highlighting the existing evidence in support;

i) **Additional Insight** – containing reflections as first-person observations; and

j) **Chapter Summary** - recapitulating the complete outcomes of that chapter.

These identical (ten) sub-sections for each of the (nine) abductive inquiries constitute ninety components in one integrated sequential structure. This design has been formulated to make navigation of the thesis argument familiar, simple and cogent. ⁷

**Additional Notes on Style**

The following notes are provided as additional guidance for the reader:

a) endnotes are provided for elaboration (and do not form part of the substantive argument);

b) page references to short quotations have been provided additional to the requirements of the referencing style (to allow subsequent readers to find those extracts in their original contexts);

c) gender biased pronouns and terms have (reluctantly) been retained in their original form in direct quotes (reflecting the historical times), however, there are none intended in the original work; and

d) for the quotations from Peirce’s writings the traditional convention of specifying individual paragraphs (e.g. [CP 1.123]) in the *Collected Papers of Charles Sanders Peirce* (Peirce, 1960, 1965) has been retained with additional page references included for the specified volume.

**Summary**

In summary:

- this thesis is located in the discipline of sustainability;
- the research method used is abduction grounded in pragmatism;
- the overall thesis framework has nine sequential phases;
there is one substantive chapter for each phase of that method; and
the unfolding of each research phase provides the basis for the next as a sequence of research questions.

This introduction leads directly into Chapter One. This chapter is the first phase of the abductive method and concerns problem-delineation. The question for this phase of the abductive process is phrased as: Where to look from?
1 WHERE TO LOOK FROM?

1.1 INTRODUCTION

1.2 WHAT IS THE QUESTION?
RESEARCH QUESTION #1
EXISTING UNDERSTANDING
CHAPTER ONE PROPOSITION

1.3 HOW WAS IT ANSWERED?
WHAT IS THE THEORY?
HOW WAS IT APPLIED?
WHAT WAS DONE?

1.4 WHAT WAS DISCOVERED?
SUMMATION OF FINDINGS
DISCUSSION OF FINDINGS
EVIDENCE IN SUPPORT
ADDITIONAL INSIGHT

1.5 SUMMARY
Chapter One – Where to look from?

1.1 Introduction

The aim of this chapter is to consider the preliminary question: What is the place for observation of the phenomenon of thought? This question acknowledges that the observational frame selected will alter the resulting findings. To illustrate possible alternative choices for selection different levels of observation have been identified using the illustrative concept of ‘health’ in sustainability theory.

The abductive method used to answer the research question for this chapter is described as problem-delineation. In this abductive phase limits and boundaries are set around the abductive question. A ‘constraint’ emphasis was selected as the appropriate theory approach.

The outcome of this chapter is that five criteria were set at a specified level of observation to comprise the problem-delineation for the research question. These criteria delineate the otherwise open scope of the primary research proposition (see Introduction) to provide a focus for the subsequent process of phenomena-detection (Chapter Two).

1.2 What was the question?

Research Question #1

*What is the level of observation at which the capacity of systems of thought might potentially be disclosed?*
Each chapter of this dissertation extends, using an abductive process, the primary research question. In this way ambiguities and assumptions are continually refined and defined as part of the research process. Each chapter’s research question is also examined as to its specific framing and explicit assumptions.

The research question for this chapter contains a preliminary assumption. In referring to a ‘level of observation’ it is proposed that the phenomenon of thought can be classified into distinct levels of abstraction. The reason for this is that the use of abstraction is one valid means by which we can make an object of forms of our thought (Quine, 1962). Choosing from within possible alternatives of abstractive logic provides a level of rigor to this research. The act of selection involves determining the abstractive levels appropriate in answering the primary research question asked.

This question of levels of abstraction in thought was specifically considered in the context of abduction by Peirce, who drew a distinction between two primary forms of abstraction in *The Simplest Mathematics* (Peirce, 1960). These two forms are described as ‘prescissive’ and ‘hypostatic’ abstraction [CP 4.235]. In prescissive abstraction a phenomenon is depicted abstractly by using one of its aspects only. In hypostatic abstraction, the essence of the phenomenon becomes a new conceptual entity, a quality of the thing observed, which can be thought about independently.⁸ As a mathematician, Peirce considered hypostatic abstraction of logical superiority as it enabled expansions in fields of inquiry by higher-order analysis (Boler, 1963). In particular, this form of abstraction avoids the reduction of the essence of phenomenon by misplaced reifications or selective recursions. Specifically, it allows for the theoretical analysis of potentialities at a level connected to, yet not distant from, the data for observation.⁹

This distinction in forms of abstraction was further considered by Alfred North Whitehead in *Science and the Modern World* (Whitehead, 1925). In discussing the process of forming levels of logical observation, Whitehead states that a
valid abstraction is able to “transcend particular concrete occasions of actual happening” without becoming disconnected from them (p.159). This is accomplished by the abstraction being connected to the phenomenon by the relations of the mode of ingression (Whitehead, 1925, p. 159). Whitehead names his clarification of the process of abstraction as the *Translucency of Realization*. Whitehead describes how a valid abstraction of this type is not purely subjective and (when the conceptual object is formed correctly) ostensibly exists as an ‘eternal’ object (E. W. Hall, 1930). Whitehead’s analysis on the utility of abstractions is seen as directly relevant to this inquiry where he explains that:

> Since actual occasions are selections from the realm of possibilities, the ultimate explanation of how actual occasions have the general character which they do have, must lie in an analysis of the general character of the realm of possibility. (Whitehead, 1925, p. 163)

This distinction enables a subtle shift in emphasis within the research question, moving from a generalized description of ‘actual occasions’, to the qualities (i.e. the character) of their possibilities. It is this shift that is the central assumption contained in this chapter’s research question. It potentially enables the observation of the character of thought, without conflation with the content of the occasion of thought.

The importance of this distinction is further explained by Whitehead (1929), who gives the guidance that abstractions should not be used to form theoretical generalizations in the form of exaggerated overstatements. Two forms of this potential mistake are noted. The first is described as the ‘fallacy of misplaced concreteness’, where aspects of actualities are ignored in the use of overly restrictive generalized categories (i.e. classifications that neglect the facts of observation). The second might be called the ‘fallacy of logical rationalism’, where an abstract logical proof is proposed to describe phenomena to which it has no connection (i.e. an abstract proof is argued to represent unobserved phenomenon). As Whitehead describes, “The verification of a rationalistic scheme is to be sought in its general success, and not the peculiar certainty, or
initial clarity, of its first principles” (1929, p. 8). This reflects a desire for a pragmatic outcome to a logical process of inquiry.

The assumption contained in the research question for this chapter is that the choice of abstraction is not arbitrary and requires consideration. Precision will be needed in the choice of level of abstraction to ensure it is sufficiently general to be useful, yet not too far removed from the phenomenon chosen for observation. The challenge is to find a balance between these two aims. While a seemingly complex initial step, this avoids the unintended result of proposing a compelling theory without any method for validity, or a meaningful philosophy that is without any means of application.

**Existing Understanding**

At the commencement of this research an initial problem was identified. This is essentially stated as: If there are as many domains of thought as there are potential phenomenon for observation, how is the research scope of this inquiry to be limited to only what is pertinent? This problem is overcome by the research being focused on a specific category of phenomenon and the appropriate inquiries being constrained accordingly. The aim in method of this chapter is to achieve precision in the specification of that category and the necessary constraints imposed.

Of assistance in this task is to distinguish the many existing ways of approaching the question of how to classify levels of observation of thought. These include distinctions between: a) different scales in the activity of thinking, b) distinct levels of developmental stages of the thinker, c) levels in the organization of the general stages of thought, and d) levels in the evolutionary stages of the mental capacity of thinking humans. Each provides a category of abstract sub-levels from which to classify different phenomena in the field of thought. The category of question proposed by this thesis is revealed in the distinctions made by the extensive work representing existing understandings of this topic.
For the first category of potential abstractions it is easy to imagine levels in different ‘scales of thinking’, as each scale uses a different primary methodology for its observations of the phenomenon of thought. Examples include the observations of neurological process (i.e. neurology) (Freeman, 1997, 1999; Goldstein, 1995), individual reflections in introspection (i.e. phenomenology) (Husserl, 1965, 1980; Husserl & Heidegger, 1964), observations of group problem solving techniques (i.e. social psychology) (Lewin, 1948; Taifel, 1982), the tensions of change and learning in organizations (i.e. organizational psychology) (Argyris, 1993; Argyris & Schön, 1996), the study of traditional or cultural norms in social groups (i.e. cultural anthropology) (Bateson, 1958; Mead, 1964) and inter-generational patterns in cognitive development (i.e. evolutionary psychology) (Pinker, 1989, 1995, 1997). Rather than focus on these ‘scales of thinking’, this research concerns distinctions in different abstract ‘levels of thought’, not restricted to existing actions, timeframes or locations of the specific task of thinking by an individual person (whether solitary or in groups).

For the second category of abstractions concerning 'levels in the thinker', in cognitive theory the skills of thinking have been usefully posited as abstract levels of capacity (Fischer & Bidell, 2006; Fischer, Hand, & Russell, 1984). These are organized into three tiers of representations which contain ten primary levels of development (Fischer, et al., 1984).¹⁰ They include: single representations (Level 4), systems of representations (Level 7), abstract systems (Level 8), systems of abstract systems (Level 10) (Fischer, et al., 1984). As abstract categories of levels of skill in individual abstract thinking, such capacities of an individual (or when collated as a function of a group of individuals) are situational and might apply only to a specific task (e.g. mathematical computation, spatial problem solving, linguistic comprehension). Accordingly, the assessment of the cognitive ability of individuals at skilful abstractions, while it informs this research, is also not the primary phenomena for observation. The actual research question concerns the product of such abstract thinking in the abstract category of ‘thought’, being one step further removed.
For the third category of abstraction we might move beyond the individual thinker and examine abstract categories in the ‘organization of thinking’. In developmental psychology, general stage models propose a sequence of developmental levels in cognitive operational functions that describe more abstract levels of generic organization (Commons, Richards, & Kuhn, 1982; Commons, Richards, Ruf, Armstrong-Roche, & Bretzius, 1984). Rather than empirical measures of psychological processes, these levels of organization represent “ideal sets of task demands” (Commons, et al., 1984, p. 125) and being a geometric model not based in data, “no empirical evidence is necessary to validate its formulation” (Commons, et al., 1984, p. 140). These levels of potential are proposed as an abstract representation for the stages of development of adult thought.\(^\text{11}\) However, this thesis concerns the pragmatics of observing actual phenomena. Rather than placing thinkers within an abstract landscape, it is the abstract landscape of thought occurring that is the proposed focus for observation. Again, these levels of development are informative as generalizations, however being derived from stages of individual thinkers, rather than the observation of thought directly, they cannot easily provide the precise level of observation relevant to the specific research question.

For the fourth category of abstraction, concerning evolutionary capacities, rather than being descriptions of the evolutionary developments of the human neurological system (which represent the aggregation of capacities at the species scale over time), this category concerns the hypothesis of a wider scale of developmental phases in the structures of thought itself that may occur beyond localized social or cultural trends. This category represents developments in human consciousness at the humanity-level of observation. The exemplar theorist for this category is French philosopher, Jean Gebser who predicts the emergence of an aperspectival worldview from his comprehensive cultural analysis in *The Ever Present Origin* (Gebser, 1985). Such patterns have been further generalized into a different interpretation of evolutionary stages in human consciousness by American theorist, Ken Wilber, through a progressively developing body of work (Wilber, 1977, 1981, 2000c, 2000d,
2006). This fourth category moves further beyond the data of the thinker to
generalizations of forms of human consciousness, and so is broader in
description than the focus of this thesis.

Accordingly, these primary and familiar categories of abstraction representing
forms of existing understanding about thought are not a perfect ‘fit’ appropriate
to the research question asked. Accordingly, it is argued that none of these
systems of organization comprise a level of abstraction that provides the precise
level of observation required. Specifically, a focus on individual thoughts, the
specific capacity for abstract thinking, generalizations about the developmental
capacity of thinkers, or broad descriptions of patterns in human consciousness
would not appropriately address the need for a primary locus of inquiry that is
relevant to the purposes of this thesis. While a natural tendency might be to
answer unfamiliar questions using approaches with which we are familiar, in an
abductive process a preliminary question is often used to re-examine the
assumed premise. We can understand from these alternative categories for the
observation of thought as a phenomenon how this tendency can lead to an error
in abstractive logic, in terms of either misplacing the object, or over-
rationalizing the generalization of inapplicable logics.12

The implication from this analysis is that this is not specifically a thesis on the
psychology of individuals (i.e. the thinker); it is also not an empirical study of
neurological processes or a systems analysis of cognition generally (i.e.
cognitive science). This thesis is not focused at the level of aggregation of
individual opinions or the processes of values formation in the collective (i.e.
sociology). Further, because the research question concerns specific observable
phenomena, it is not primarily a discursive philosophical analysis of
consciousness (i.e. metaphysical philosophy). Accordingly, the domains of
cognitive science, sociology, psychology, and metaphysical philosophy as
research disciplines are relevant, but are not primary to this research inquiry,
as they rely on different primary assumptions and ontological propositions. The
precise framing of Research Question #1, while specifically informed by these
other disciplines, indicates explicitly that a novel approach may be potentially required to address the questions asked by this particular inquiry.

Chapter One Proposition

The thesis proposition for this chapter is that there is a distinct level of observation for the phenomenon of the capacity of thought as an abstract potential. The selection of the level of abstraction appropriate for that observation would enable the phenomena of interest to be observed without undue simplification. The implication of this proposition is the recognition that the levels of organization of thought are distinct from (and not easily reducible to) abstract levels of capacities in individual thinkers. The need for this observational level will apparently also not be satisfied by the observation (or extrapolation) of measures of individual thinking aggregated at social scales of organization. The effect of this proposition is a move from a theory of individual cognition to a theory of the formative dynamics of the capacities for thought.

For clarification, it is worth considering the virtue in a logical counter-proposition. The counter-proposition would be that no discernable phenomenon is potentially available for disclosure at this level of abstraction. The argument would be that there is no apparent point to the looking, as there is no phenomenon there to observe. Accordingly, the phenomena of thought would instead be explained biologically by neurology. It can be explained individually by psychology. It can be explained in cultural terms by sociology. It can even be explained behaviorally by abstract systems theory. The counter-argument would be that separately and in combination these (and related) disciplines, when integrated, explain the dynamic potentials of thought as a totality. This reasoned approach represents, potentially, the error of conflation, where the phenomenon of significance is described by its observable effects, only at a different level of organization. Potentially, a simple answer is gained by making the problem of definition and description simpler. We might then fit the description of the phenomena to the observational level adopted, rather than match the observational level to the complexity of the question. This error can
be avoided in an abductive method by not pre-empting the solution by the framing of the question in familiar terms, instead pausing to reconsider the appropriateness of the primary ontological selections.

The proposal of this chapter is to examine this question of how to depict or examine the capacity for thought by examining some potential categories for useful abstraction. In answer to the question: ‘Where to look from?’ the suggestion is that a different approach to observation may yield different insights into ‘the general character of the realm of possibility’. The outcome initially desired is a clear articulation of the potential levels of abstraction for observation and the selection of a location for the inquiry that corresponds closest to that appropriate for the intended observation.

1.3 How was it answered?

What is the theory?

The abductive method adopted for this thesis provides the formal means to answer the research questions derived in sequence. The first phase in the abductive method providing the framework for this thesis is described as problem-delineation. In abductive theory, forms of scientific inquiry are argued to be best depicted as a “problem-solving endeavour” (Haig, 2005a). While an abductive inquiry may be open-ended, ideally it is directed to achieving a specific result (by non-prescriptive means). Therefore, rather than an abductive question being imprecise, open and ill-defined, the aim is to obtain, early in the abductive process, a level of pragmatic precision in the question for discovery.

The difficulty for the abductive researcher is that “the most interesting research problems will be decidedly ill-structured” (Haig, 2005a, p. 383). In forming truly novel abductive questions, even the precise terminology for their framing may not yet be present. Without the pre-conceptions of deductive propositions, an abductive inquiry evokes a disconcerting sense of profound ‘unknowing’ in its
preliminary formulations. This presents the problem of asking for something specific in un-defined terms. However, the complexity of the analysis depends directly on the complexity of the problem context (Ackoff, Gupta, & Minas, 1962).

For this reason, the commencement of an abductive analysis may require as its first step the specific phase of problem-delineation. The theoretical objective of the problem-delineation phase in an abductive method is to define and delimit the problem and what constitutes a satisfactory potential solution (Haig, 2005a). The specific processes of the problem-delineation phase in an abductive research approach enhance what are potentially open-ended inquiries towards an outcome that is pragmatic and specific. The abductive aim in this phase is not to solve a narrow problem, rather it is to identify clearly the potential scope of the complete inquiry (which may provide a solution). In this way, an open investigation within the context of a 'strategic search' results (Simon, 1955). Importantly, in an abductive approach in pragmatism the search involves decision of emphasis and appropriateness. These are made explicitly for each phase of the abductive inquiry. The extent of the researcher’s task in optimizing the scientific method is described succinctly in the following terms:

How to best allocate scarce research resources in problem solving is itself a methodological problem which cannot yet be formulated, let alone be systematically solved. Consequently, an allocation of his resources to the phases of the research must be made by the researcher on the basis of judgment and experience. A knowledge of how he ought to conduct each phase if no restriction existed is necessary for making good estimates of the loss that will be incurred by performing a phase of the research in less than the best way available. (Ackoff, et al., 1962, p. 70)

Significantly, while this process of theory and emphasis identifies one form of a successful outcome to direct the inquiry, a different result entirely can be generated, which may also satisfy the solution demanded equally. It is this the attention to the nuance in emphasis, together with the implications in method, that give an abductive process its potential for higher explanatory and pragmatic value.
How was it applied?

For the problem-delineation phase of the abductive method the primary choice in research emphasis is framed as being between two alternative approaches: a) constrained and b) unrestrained (Haig, 2005a). A constrained approach establishes specific solution-demands and problem-constraints to which an answer is required. An unrestrained approach provides greater permissiveness in the reasons for the theory and the requirements for an outcome (if at all). While an explicitly unrestrained approach provides the permission for open investigations, the constrained approach provides the better prospect for theory utilization. The stated premise of this research is its grounding in the philosophy of pragmatism and this is reflected in the requirement for pragmatic outcomes. Accordingly, a constrained approach was preferred as the emphasis in method for this chapter, recognizing the openness the abductive approach provides.

To achieve the twin aims for precision within openness an abductive method may use the logical device of defining ‘problem-constraint’ relationships. This involves a constraint-inclusion view of problem-delineation (Haig, 2005a). The foundations for this approach derive from cognitive psychology (Simon, 1977) and computational theory (Thagard, 2000; Thagard & Verbeurgt, 1998). Two elements are required, being: a) identification of all the constraints on a desired solution (‘problem-constraints’), and b) the explicit demand that a solution be found (‘solution-demand’).

The ‘problem-constraints’ selected are not merely external pragmatic limitations, but are internal to and ‘constitutive of the problem itself’ (Haig, 2005a). The definition of the inclusion of constraints in the criteria of the problem and its solution in an abductive process ‘serves as a vehicle for bringing relevant background knowledge to bear’ (Haig, 2005a). This generates the defined, yet confined, possibility space that the hypothesis formulation process moves towards. In summary, this enables the research to arrive with ‘an open mind, but not an empty head’ (Creswell, 1998).
The ‘solution-demand’ specifies the utility of the research in terms of the unique problem that it seeks to resolve. It is argued that an abductive research method benefits from specific criteria to direct the inquiry towards a satisfactory resolution of the problem identified. The criteria will then guide the research agenda and provide a focus for what constitutes the category of outcomes desired. This particular feature distinguishes a formal abductive method from a more permissive and open-ended research method, such as a grounded-theory research inquiry (Haig, 2005c; Kelle, 2005; Kinarch, 1995).13

In respect to the first element of identifying the problem-constraints, five elements are proposed as the criteria for an acceptable solution. The criteria clarify that a satisfactory method for disclosure of the capacity for thought would be that it is:

a) **reliable** (i.e. there is a level of potential replication or repeatability in the process and product of the data gathered);

b) **comprehendible** (i.e. that the depiction is in a form accessible or translatable into information that makes sense at face-value);

c) **meaningful** (i.e. that users can make meaningful interpretations from the disclosure, particularly to enable the possibility of shared learning);

d) **updatable** (i.e. that the information is not a static typecasting but is dynamic and able to be refreshed to enable a noticing of difference); and

e) **scalable** (i.e. that the data represented can work for an individual, a small team, a community, or to the scale of the population of a large city).

These criteria as constraints on the solution are defined with reference to the primary research question. They reflect the explicitly stated wider aims of enabling system-level learning for the health and sustainability of the psychodynamic capacities of social systems at a range of scales (as described in the discussion of the primary research question).
For the second element of ‘solution-demand’, this thesis raises the logical proposition that, contemporaneously with changes in the ecological, sociological, and economic environments, it is likely that there will be (or are already occurring) corresponding changes in human psychodynamic environments. It can be argued from an environmental psychology premise that our physical and social worlds do not change around us without our psychological capacities also being correspondingly affected (Homer-Dixon, 1999; Russel & Ward, 1982; Schmuck & Schultz, 2002). This thesis does not, however, claim that predicted changes to external environments will cause either a decline, or an increase, in the psychodynamic capacity of any particular human social system (or for humanity as a species in general). The corresponding changes might be adverse when compared to present capacities, facilitative of new emergent capacities, or merely represent a complexity of transitional forms (Booth, 2006; Gallopin, 2006; Homer-Dixon, 2006). What is asserted is that, at this point in time, we do not have the means to definitively know. This need to know, with reference to the potential for reflective learning, informs the specifics of the ‘problem-delineation’ for this thesis and necessitates this research. Finding a means to know the status of ‘how thought is’ constitutes the ‘solution-demand’, which is reflected in the primary research question.

Given these requirements that provide explicit and permissive criteria, the next step is to identify the specific level of phenomenon that, by its observation, will enable the problem-constraints to be potentially met and to also fully meet the solution-demand. This accordingly leads to a pragmatic, rather than arbitrary, choice of observational form.

**What was done?**

Given the complexity of the question, a simple process was used to constrain the inquiry to a specific level of observation. The presumption made was that if the capacity for thought can feasibly be organized into levels of abstraction, distinctions in these levels should be apparent. By selecting one idea, within one field, with sufficient complexity to represent the types of inquiry potentially
available, distinct levels of abstraction should, in theory, be easily identifiable. In adopting a pragmatic emphasis this process of classification would then be completed based on the specific problem-constraints and solution-demand set.

Consistent with the aims of this thesis, the single idea selected was ‘health’. For reasons of personal significance (and future practical relevance) the field selected was ‘sustainability theory’. This represents a specific focus on a vast topic within a finite (yet sufficiently complex) field of inquiry. The data search was made using a broad sampling of the artifacts, literature, processes, models, frameworks, paradigms, policies, principles and research programs from the sustainability field. The focus on ‘health’ in sustainability theory narrowed that field significantly. Selections of indicative forms from the broader array of materials are provided as illustrative examples in the following sections.

The result was a practical test of the viability for the classification of different abstractions in thought. Using ‘health in sustainability’ as the example of a form of thought that operates in multiple levels of abstraction, different abstractive levels could be easily identified from within the broad range of material available. This also provides one specific illustration of how abstract levels of observation for ‘thought’ might be defined in a way meaningful to the solution-demand for any particular abductive inquiry.

1.4 What was discovered?

Summation of Findings

In examining the conception of health in the field of sustainability, six distinct categories of observation were identified. These were initially given the narrative descriptions of:

a) Health conditions ‘at’ sustainability locations;

b) Health concerns ‘as’ sustainability observations;
c) Health concepts ‘in’ sustainability explanations;
d) Health constructs ‘of’ sustainability evaluations;
e) Health conceptions ‘for’ sustainability contextualizations;
f) Health conceptualizations ‘from’ sustainability idealizations.

These initial categories of observational abstraction were refined by using the principles of logical categories of types and subsequently confirmed by correlation to logical levels of abstraction in learning and communication theory (Bateson, 1972). This resulted in the categories summarized in Table 1.2.

**Table 1.2 – Levels of Abstraction and Logical Types of Learning**

<table>
<thead>
<tr>
<th>Health Forms</th>
<th>Distinctions in Categories</th>
<th>Unit of Observation</th>
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</tr>
<tr>
<td>Localizations</td>
<td>Health ‘at’ locations</td>
<td>Cases</td>
<td>Factual Data</td>
</tr>
</tbody>
</table>

The conclusion reached was to select the level of observation that potentially enables satisfaction of the problem-constraints. This corresponded with the gaining of Learning III outcomes (see Table 1.2). This level of abstraction represents the category of phenomena that is between ‘constructs’ and ‘conceptualizations’. It is to this precise category (i.e. the level of observation that generates ‘conceptions’) that the problem-constraint and solution-demand were then focused (see Chapter Two).

**Discussion of Findings**

Each of the distinct categories of abstraction identified are explained by a statement of their defining propositions, together with some key examples sufficient to draw clear distinctions between each of these categories as potential levels of observation. Additionally, the level-specific forms of (prescriptive) abstractions are identified as types of ‘within level’ recursions. In
this way, a clear distinction is made between the primary 'hypostatic' levels of abstraction and any 'prescissive' (or meta-level) recursive formulations.\textsuperscript{14}

\textit{a) Health Conditions ‘at’ Sustainability Locations}

The first level of observation comprises the pure data of health \textit{conditions}. This level includes all the direct measurable impacts on different types of health cases as represented by statistics in sustainability theory, primarily recording the factual status of health of the Earth’s people, its environments and localized economies.

Examples include population estimates, numbers of deaths, disease incidences, contamination levels, acres of habitat loss, millimetres of rainfall, tonnes of toxic emissions, degrees of temperature, current debt levels, commodity costs, essential service charges, and currency exchange rates (International Monetary Fund, 2012; OECD, 2012; World Health Organization, 2012; World Wildlife Fund International, 2012).

Abstractions within this level of observation generate meta-data where the status of local conditions are aggregated in scales (e.g. calculation of regional pollution levels, estimates of the total human population, global averages of the atmospheric concentrations of greenhouse gases) which extend ultimately to provide global-level data sets (Millennium Ecosystem Assessment Program, 2005; United Nations Statistical Commission, 2007; World Health Organization, 2008).

\textit{b) Health Concerns ‘as’ Sustainability Observations}

The second level of observation relates to categories of health \textit{concerns}. This includes all the categories of health forming classes of sustainability conditions. Specifically, these include classes of environmental concerns, social equity concerns and economic viability concerns.

Examples include; for the \textit{physical} environment- water contamination, food toxification, soil degradation, land salination, marine acidification, radioactivity
contamination, grassland desertification, carbon sequestration, waste accumulation, retreating glaciation, ozone depletion, and ecoservice disruption (Intergovernmental Panel on Climate Change, 1996, 2007; Millennium Ecosystem Assessment Program, 2005); for social sustainability - inadequate sanitation, disease transmission, life expectation, inaccessibility of education, transport limitations, rural relocations, infant immunization, refugee migration, family dislocation, unplanned urbanization, race segregation, cultural denigration, religious persecution, and gender discriminations (V. A. Brown, 2005; Last, 1998); and in economic terms – income disparity, comparative affordability, economic poverty, health care exclusivity, insurance availability, wage inequality, capital depreciation, commodity overproduction, currency hyperinflation, trade deficit escalation, materials consumption, market globalization, human monetization and security fictionalization (Sachs, 2005; G. D. Smith, 2003).

Abstractions within this level of observation generate meta-patterns, where specific concerns are renamed as major sustainability topics or trends (e.g. species extinction, cultural homogenisation, global recession) (L. R. Brown, 2006, 2008, 2009; Elkington, 1985, 1998; Suzuki, 1993).

c) Health Concepts ‘in’ Sustainability Analyses
The third level of observation relates to health concepts in sustainability theory. This level includes all attributions of a ‘health status’ as one conceptual criterion in the application of a sustainability analysis.

Examples include the concepts; in environmental sustainability of ecological stewardship, species preservation, land conservation, habitat protection, renewable-energy generation; in social sustainability of intergenerational equity, intra-generational equality, population explosions, socio-spiritual exclusion (Berkes, 2008; V. A. Brown, 2005; Ehrlich & Ehrlich, 1970, 1990); in economic sustainability theory of inter-generational poverty, cross-cultural aspirations (e.g. affluenza) (Graaf de, Wann, & Naylor, 2002; Hamilton & Denniss, 2005; McMurray & Smith, 2001), economic medical hegemony
(O’Connell, 2010); and also the cross-domain concepts of climate-change refugeeism, natural and social (and psychological) capital conservation and psychosocial restoration (e.g. biophilia, solastalgia) (G. Albrecht, et al., 2007; G. A. Albrecht, 2005; Kellert & Wilson, 1993; E. O. Wilson, 1984).

Abstractions within this level of observation generate meta-theories where health ideas as abstract forms become distinct sustainability sub-disciplines (e.g. ecosystem health, community resiliency, socio-economic vulnerability) (Folke, Berkes, & Colding, 1998; Fraser, 2003; Rappaport, 1990).

d) Health Constructs of Sustainability Assessments
The fourth level of observation comprises health constructs as sustainability assessments. This level includes every situation where 'healthy' is defined by a sustainability framework as a normative concept.

Examples include: biophysically (as in ‘healthy ecosystems’) (Craik & Zube, 1976; Rapport, 1989, 1999), sociologically (in terms of ‘healthy communities’) (Roseland, 1997; Roseland & Connelly, 2005), economically (in the ‘healthy lifecycle’ of production processes) (Courville, 2003), structurally (for the built urban form in ‘healthy cities’) (Takano, 2003), psychologically (i.e. for the good life as ‘healthy lifestyles’) (Karma, Karma, & Centre for Bhutan Studies, 2004; Roseland, 1997) and for strategic foresight in sustainable futures (i.e. achieving ‘healthy futures’ (Robertson, 2007).

Abstractions within this level of observation generate meta-systems, where health assessments reflect sustainability aims at the community, city, regional, national and global levels (e.g. the Millennium Development Goals for the United Nations) (Glenn, Gordon, Millennium Project, & American Council for the United Nations University, 2000; McGillivray, 2008; United Nations Development Group, 2003; United Nations Human Settlements Program, 2006).

e) Health Conceptions for Sustainability Evaluations
The fifth level of observation concerns the evaluation of the health of the assumptions inherent in different conceptions of sustainability assessment. This level includes the evaluative sustainability frameworks by which sustainability constructs and assessment indexes and policies are assessed.

Examples include evaluation of the health of the application of sustainability principles, which (like a human body) may be described as being indicative of ‘weak’ or ‘strong’ sustainability forms. These evaluations of assumptions use abstract ideological measure of ‘robustness’ such as the degree of integration in the apparent separation of sustainability capitals (Neumayer, 2010). Specifically, a ‘strong’ sustainability conception is determined by the non-substitution economically for natural or social capitals in the creation of equivalence in human wellbeing, recognizing the principle that manufactured capitals are ‘unlikely to substitute for living things or the conditions for life itself.’ (Victor, Hanna, & Kubursi, 1998). Similar examples include evaluations of the degree of sustainability integration in the design of assessment processes (Pope, Annandale, & Morrison-Saunder, 2004; Pope & Grace, 2006; Varey, 2004), assessments of the health of ecosystem health evaluation (Waltner-Toews, 2004), the evaluation of the principles for formation of sustainable city indicators (Keiner, Zegers, Schmid, & Salmerón, 2004), the assessment of developmental levels in individual sustainability practitioner’s forms of praxis (B. C. Brown, 2011), the evaluation of the health of green-taxation policy and initiatives for social wellbeing outcomes (Romstad & Folmer, 2000), the comparative effectiveness of levels of corporate sustainability (van Marrewijk & Werre, 2003) and the stages of sustainability maturity for organizational sustainability policies (Dunphy, 2000; Dunphy, Griffiths, & Benn, 2003).

Abstractions within this level of observation generate meta-paradigms, where comparative evaluations are made of the relative health of different sustainability theories and conjunctural paradigms of analysis (e.g. ecological, holarchical and integral sustainability meta-analyses) (Bunge, 1972; Edwards, 2010).
e) Health Conceptualizations from Sustainability Ideals

The potential sixth level of observation concerns the health of our ‘health’ conceptualizations represented by the ideals informing sustainability evaluations. This brings into question the actual premise of ‘sustainability’ idealism and the health of the underlying concepts derived from an evaluation of humans and humanism. From this level of observation the health of sustainability ideas involves a reconsideration of the human ethos. At this level the consideration of sustainability enters a different category again. It not only applies a normative health evaluation to physical, biological, conceptual and socio-cultural objects, but applies a form of circular logic to those healths from the idealisms of the ethos maker as an evaluation of the humanity-level ethic. This level includes all the evaluations of the health of the human species collectively with reference to our attempts at conceptualizations of sustainability.

Examples include; characterizations of human ethos as hominids being the parasitic passenger (Odum, 1993), humans as the problem animal in Eden’s garden (Livingston, 1994), man (i.e. gender specific) the despoiler, mankind (i.e. less gendered) the exploiter (Osborn, 1948), women as the rebalancer (i.e. gender affirming) (Birkeland, 1993), human society as a ‘symptom’ of structural cultural pathology (Swift, 1974), the naked-ape as super-species (Suzuki & Dressel, 2004), the post-human as a future survivor (Miah, 2008), the role of our ‘healthy’ humanness as the wise gardener (Kheel, 1993), the self-interested eco-manager (Maddox, 1972), and the far-seeing navigator as a spaceship steerer (Lorraine & Rumsey, 1972).

Abstractions within this level of observation generate humanitarian meta-ethical discussions, which call into question the health of all human philosophies and ethics and a human role in a spiritual cosmos (e.g. trans-humanist ethics and some spiritual traditions) (Panikkar, 1995; Sri Aurobindo, 1971; Teilhard de Chardin, 1964; Wilber, 1981).
f) **Summary from Abstraction Analysis of ‘Health’ Investigations**

From these classifications, six discernable categories of abstraction were identified in terms of the examination of 'health' and its relationship to sustainability. These are:

a) *Health Cases* – (i.e. required responses to immediate health events);

b) *Health Classes* – (i.e. classes of concerns as categories of health cases);

c) *Health Concepts* – (i.e. theories or narratives identifying health classes);

d) *Health Constructs* – (i.e. frames ordering explanatory health concepts);

e) *Health Conceptions* – (i.e. contexts for health assessment constructs);

f) *Health Conceptualizations* – (i.e. reconsideration of health conceptions).

From these discrete categories of description it can be seen how the health conditions at specific locations, enable the classification of topics of health concerns as observations, which generate health concepts in sustainability explanations, that provide the component assessments of healthy sustainability evaluations, revealing the health hoped for by different sustainability formulations, contextualized within the intended health from sustainability expectations.

This sequence of abstractive contingency operates equally as a constraint (i.e. in reverse) where; idealized expectations, derive formulations, containing evaluations, relying on explanations, of observations, for specific conditions, at identifiable locations; confirming the abstractive sequence.

These classifications of levels of abstractions for health in sustainability theory then provide possible alternatives for levels of observation. The research aim is to select the narrowest category set that potentially contains the widest possible sample of the phenomena of interest. Ideally, the appropriate level of observation for the purposes of this thesis is the one that enables examination
of the capacity for corrections in systems of sets of the alternatives for sustainability choices (i.e. the domain of potentials).

In terms of the categories of 'health in sustainability' this outcome corresponds with the observation of 'conceptions' (i.e. category e. – Health Conceptions). That particular level of observation is definable as the level that classifies the phenomena of thought as 'systems of conceptions'. The primary research question therefore has as its objective to find a means for disclosure of the capacity of systems of conceptions. This is the result of the process of selection satisfying the aim of this chapter (see Appendix B).

**Evidence in Support**

In an abductive process a rhetorical justification is not required. The abductive conclusion does not need to be argued for, as it has only the validity of a tentative possibility. However, the abductive process is described as an evaluative process of continuous inference (Fann, 1970). Accordingly, a sound process step is to examine for supportive evidence that might confirm or qualify the potentiality of the abductive inference at each stage of its formulation.

From the premise of the observations made, the categories of abstraction identified can be usefully linked to the logical categories of types in communication and learning (Bateson, 1972). A confirming correlation occurs between the levels of abstraction identified and pre-existing categories of abstraction in generative learning theory describing the development of the potentials of abstract thought. This provides some evidence in support of the abductive conclusion gained for the specified research question.

The observation of forms of thought by means of levels of abstraction is a valid (although difficult) process in logical philosophy. Alfred North Whitehead and Bertrand Russell (1927) established in *Principia Mathematica* the axiological
principles by which valid classes can be derived from propositional functions. They propose (expressed primarily in mathematical notation) that:

*20.15 ... i.e. two classes are identical when, and only when, their defining functions are formally equivalent. This is the principal property of classes;...
*20.31... i.e. two classes are identical, when, and only when they have the same members. (p. 189)

The effect is that distinctions between first and second-order relations (and subsequent abstractions) rely on the propositional functions of each class independently. For logical validity a class depends only on consistency with its own defining functions and rules of membership. This maintenance of distinct logical categories of types of classes enables complex concepts to be represented by concise forms of symbolic abstractions (Spencer-Brown, 1969).

Building from this work, anthropologist and systems theorist Gregory Bateson (1972) innovatively applied the rules of logical philosophy to make similar distinctions in the forms of learning and communication. His own logical categories were clarified and summarized in these:

**Learning 0** – the ‘specificity of response’, which ‘is not subject to correction’;
**Learning I** – a ‘change in the specificity of response by correction of errors of within a set of alternatives’;
**Learning II** – a ‘corrective change in the set of alternatives’ from which a Learning I choice is made, or ‘in how the sequence of experience is punctuated’;
**Learning III** – a ‘corrective change in the system of the sets of alternatives from which [a] choice is made’ (i.e. a change in the process of Learning II);
**Learning IV** – a change in the learning entity resulting in a corrective change to the set of potential learning systems (i.e. a change in Learning III systems of sets) (Bateson, 1972, p. 293).

These levels of observation for learning define distinct contexts of thought within levels of abstraction representing different propositional functions. Each
level of learning has exclusivity in its content and involves a corrective change in a discrete logic set represented by the content of each former level of abstraction. This same structure is represented in the derived abstractions for ‘healths’ in sustainability theory, in a manner consistent with Bateson’s premise for learning and communication theory.

This logical structure accordingly provides a means of confirmation (or qualification) of the distinctions in the categorizations of levels of observations as derived from the many ‘healths in sustainability’. The following table contains a comparison of those categories with levels of observation in the logical categories of types for abstract forms of learning.15

To confirm the analysis we can use Bateson’s formulation, applying the correlating categories as distinctions enabling selection. For example, this thesis is not primarily concerned with the detection of sustainability facts (Learning 0). It does not intend to examine the capacity for generating choices in response to those sustainability facts (Learning I). It also will not consider the capacity for change in learning about the sustainability choices in terms of forms of coping (Learning II). Significantly, this thesis also does not focus on corrective changes in the identity of the ‘learning entity’ of humanity in its ontogenetic influence on its phylogeny as a species (i.e. Learning IV)16. This research is instead primarily interested in disclosing the capacity of systems of thought based on how they (and we) presently might be (i.e. Learning III). This approach potentially leads us into the informed questioning, of not what, but how we might become.

This meta-analysis highlights one key distinction of significance between this research and other existing theories. Rather than compare the capacity held within conceptions, the level of observation enabled by this thesis is to observe the capacity for choice that results from the dynamics between conceptions as dynamic systems of relations. This clarification leads to a reflection on the next research task, which Bateson raised in expressing qualifications about the total
universality of his levels of learning and communication as abstractions. In recognizing the limitation of his own classifications, Bateson (1972) stated:

It follows that a next task will be to look for examples of learning which cannot be classified in terms of my hierarchy of learning but which fall to the side of this hierarchy as learning about the relation between steps of the hierarchy... it is not clear whether direct explanatory relations exist between separate levels... [as] ideas collateral to the hierarchy of types remains unexamined. (p. 308)

The intention is that, based on what is potentially enabled by this research, the outcomes may facilitate further learning about the relations between 'levels of organization' (as opposed to 'levels of observation') in forms of human learning, in furtherance of Bateson's invitation to extend our understanding of the dynamics of the relations within the 'ecology of minds' (Bateson, 1972).

**Additional Insight**

One of the reasons for the selected topic of this thesis derives from the frequent observation of how easy it is for 'thought' (as a system) to become confused on matters of apparently great significance. This can sometimes lead to a point of desperation, as evidenced by the self-defeat of hopes, ambitions and deeply held and expressed humanitarian intentions. The additional insight gained from this chapter is that, within the patterns of distortion, within the beautiful noise, and the great confusions, extremely rich information resides primarily as the 'news of difference' (to use Gregory Bateson's phrase) in the unity of mind and nature (Bateson, 1979).

From over a decade of observing sustainability conversations, in personal practices, policy formation, stakeholder consultation, community development, strategy analysis and sustainability theory contexts, I developed a great personal intimacy with the complexity of ideas and the confusion of constructs. This experience, for me, alludes to the expansiveness of the idea contained in Bateson's indefinable phrase 'the ecology of minds' (Bateson, 1972, 1978, 1979, 1991). The complexity in forms of thought reflects something unique and
remarkable about the collective human capacity for sense-making and the recurrent patterns that are apparent in our many expressions of human caring.

This background led to a significant insight in relating Bateson’s work to the complexity of sustainability theory. A premise of logical philosophy is when working in systems of abstraction the distinction between each particular category and its content must be logically maintained (Whitehead & Russell, 1927). Bateson (1972) describes the effects of vitiation of the integrity of conceptual structures in logic theory, informed by this rule:

Lastly, the theory asserts that if these simple rules of formal discourse are contravened, paradox will be generated and the discourse vitiated. The theory, then deals with highly abstract matters and was first derived with the abstract world of logic. In that world, when a train of propositions can be shown to generate a paradox, the entire structure of axioms, theorems, etc. involved in generating that paradox is thereby negated and reduced to nothing. It is as if it had never been. (Bateson, 1972, p. 251)

The effect of vitiations in human communicative systems is, I suggest, possibly Bateson’s most significant contribution on this topic. Bateson undertook a unique inquiry (as reflected in the processes of this chapter) to accurately apply Whitehead and Russell’s (1927) theory of the logical categories of types. He did this while also recognizing the true humanism involved in the processes of learning and cognition. Bateson was able to identify that, unlike formal logic, in the human world of phenomenal experience, human (and animal) meaning exists in time and space. Ilogical paradox, once it occurs, does not vanish and instead must be reconciled (Bateson, 1972). In human systems of meaning-making concepts do not disappear (i.e. as if they had never been) when they become illogical. The implication of this fact is that, in human systems of thought, the rules of formal logic are bent, divided and broken continuously to give the meaning-made ‘in the moment’ some form of efficacy (Fauconnier & Turner, 2002). This makes the phenomena of human thought extremely messy and intensely interesting.

French philosopher, Edgar Morin (2008) in writing On Complexity examined what might be the ‘vault key of a whole system of thought’ (p. 34) and
recognized that we are in a ‘constant dialogue with discovery’. He describes the central problem of description as involving the mediation between the randomness of ‘complete incoherence’ and the rigidity of ‘complete coherence’. To face complexity we need a sufficient level of definition for representation and communication, without the simplifications of reduction or disjunction. Morin proposes the solution that in ‘observing the observed system’ this “requires not only that the observer observe him or herself observing systems, but also that he or she make the effort to know his or her knowing” (Morin, 2008, pp. 108-109). This requires an inquiry into the relationship between ‘the organization of knowledge and the knowledge of organization’ (Morin, 2008). These apparently tautological statements reflect that to think coherently about thought we first need to think about our thinking and its organization. Hence, the acknowledged formalization of this first inquiry as a necessary process step in a more encompassing process for a formal logic of abduction.

However, Bateson claimed that the frequency of logical paradox in human meaning-making by the failure to maintain logical categories in learning and communication is not ‘mere carelessness or ignorance’ on our parts. He proposed, instead, that it is by the engagement with and the recognition of these tensions that communication, and more significantly learning and evolution, becomes viable.\(^{17}\) The significance of this observation is that using the same concept (e.g. either ‘health’, ‘sustainability’, or (even) ‘thought’) in two levels of abstraction as one form of communication does not vitiate meaning. This is because our patterns of thought have informal rules for sense-making held within meta-communicative structures. There are apparently structural logics to the patterns of our conceptions. As Morin describes it (echoing Bateson): “Fragmentation and compartmentalization of knowledge keeps us from grasping ‘that which is woven together’ (Morin, 2001, p. 19). This means to appreciate the organization of levels of thought fully, we must include (not exclude) the conflation and confusion between levels of thought, as this is what makes learning about our learning actually possible.
The insight from this first abductive inquiry is to recognize that the complexity of thought, and the propensity for its confusion, is not a problem to be remediated, fixed or transcended. Rather, this is an aspect of the creativity and complexity of human thinking that is to be recognized, embraced and accepted. In the study of thought, this confusion is precisely the phenomenon to be observed.\textsuperscript{18} To truly understand the capacities of thought, the conclusion reached is this fact of complexity needs to be lived with, rather than negated. The level of observation selected (and the process of its derivation) reflects this conclusion.

1.5 Summary

This chapter concludes that for Research Question #1:

- the appropriate level of observation is one that enables a Learning III approach to ‘conceptions’;
- the solution-demand requires a depiction of the capacity of thought enabling the assessment of ‘how thought is’;
- the problem-constraint set will be met by the satisfaction of five criteria:
  - reliable;
  - comprehensible;
  - meaningful;
  - updatable; and
  - scalable.
- the assumption of validity of this approach involves maintaining distinctions between the ‘thinking’, the ‘thinker’, and ‘thought’.

The selection of the appropriate level of observation and the delineation of constraints for the solution direct us to the next inquiry of defining the phenomenon of significance. This enables the transition from problem-delineation to phenomena-detection. This is more directly phrased by the Chapter Two abductive research question: \textit{What to look at?}
## CHAPTER TWO – WHAT TO LOOK AT?

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Chapter Two – What to look at?

2.1 Introduction

The aim of this chapter is to propose the appropriate unit of observation for this research. The unit examined is the ‘conception’ which corresponds to the level of observation selected (see Chapter One). Beginning from a working definition, three defining features of conceptions are derived from the study of conceptions of health.

The abductive method used to answer the research question for this chapter is described as \textit{phenomena-detection}. In this abductive phase broad patterns are detected from an immersion in phenomena. A ‘generative’ emphasis was selected as the appropriate abductive theory approach. The viability of the collation, coding and depiction of systems of conceptions is demonstrated.

The outcome of this chapter is a demonstration of the viability of the use of the ‘conception’ as a unit of observation. The generation of phenomena specifically relevant to the primary research question provides substance to the problem-delineation (Chapter One) and provides a basis for theory-generation (Chapter Three).

2.2 What was the question?

Research Question #2

\textit{Can conceptions be used as a unit of observation to depict systems of relations in the phenomenon of thought?}

The primary assumption contained in the research question for this chapter is that a conception (as an ontological unit) can be studied. Within the context of an abductive method this assumption raises the initial question of epistemic
primacy. The epistemic primacy argument is that one cannot look for something (e.g. an object, a solution, a possibility) until one knows what that thing is. The premise of epistemic validity is to be solely derived from the acceptance of ontological pre-givens. In an abductive approach this conundrum, of only finding what is already known, is resolved by reliance on the validity of the process of investigation (i.e. not the fact of the investigated). The mitigating factor to the necessary uncertainty is that the researcher must withhold any assumption of the inevitability of discovery for the phenomena sought.

The particular framing of the research question for this chapter resolves the question of epistemic primacy in a practical sense by requiring a demonstration of the fact of observation. This reflects the use of a logical premise in a pragmatic philosophical approach (Peirce, 1960). The answer to the question of ‘can’ something be done- is to attempt it. This recognizes that the primary purpose of undertaking the investigation at this stage of the abductive process is to explore the landscape of potential anomalies, difficulties and conceptual problems. The main aim is, not proof of a fully formed theory, but rather an exposure to the full extent of methodological difficulties. Hence, the research question is intentionally framed to adopt a stance of ontological naivety. This reflects that in the process of the formation of abductive propositions the first step towards an appreciation of the question is phenomena-immersion.

To provide one example, in the field of factor analysis in psychology, Raymond Cattell (1978) speculates that, rather than verbal theorizing, the traditional hypothetico-deductive method requires an interplay of theoretical hypothesis and experimentation, stating:

For no one but a lunatic makes hypotheses out of thin air. There are always some previous inductive, even if unconscious, reasonings from scattered observations... which generate the hypothesis. Scientific work begins with data observation and returns to data observation, though the first encounter may be unsystematic... But in the actual history of science at least equal credit must be given, in terms of ultimate fruitfulness, to the initial inductive synthesis, whether from casual observation or more systematic data gathering, which gave birth to the theory. (pp. 9-10)
The assumption in the framing of the research question for this chapter is that rather than premising the research in reliance on understandings, speculations or personal intuitions from previous ad hoc perceptions, the formulation of valid theory requires one to undertake a formal process of exploration. The purpose of the research question for this chapter is to prompt that investigation. This is done for the level of observation that would satisfy the pragmatic aims of the problem-constraint and solution-demand (see Chapter One). Essentially, one discovers whether there is something there to discover by formally going and looking. This chapter reports on the design and execution of that process.

**Existing Understanding**

The task of examining the practicality of depicting systems of conceptions, being the phenomenon of focus at the selected level of observation, could be advanced by seeing if this specific investigation has already been conducted. A theory using a different term that describes the same phenomenon may already have been developed for exactly the proposed inquiry. An existing study might also provide guidance on (or a short-cut to) the desired outcome for the proposed research inquiry.

Various researchers have proposed a diversity of theoretical forms depicting ontological divisions within the broader phenomena of thought. As general descriptions these abstract objects can appear to be similar to ‘conceptions’ as the proposed unit of observation. However, at this stage of the research the unit of a conception is imprecisely defined. Therefore, it was initially useful to draw clear distinctions between conceptions, as the primary research focus selected for this thesis and other theoretical forms. Examples of a few of the ontological objects considered as alternatives provide an illustration of their potential relevance to and distinct difference from the proposed inquiry.

At the level of individual psychology, there is the immensely useful concept of ‘topological fields’ (Lewin, 1917, 1935, 1936), which provides a conceptual
landscape similar to those of a conception, but using descriptions that are mathematically based within discrete situations. The testing of the idea of generic 'belief-systems' (Rokeach, 1956, 1960, 1967, 1979) provided a measure of openness for frames of mind beyond individual opinion, however this formulation represents a discrete measure of dogmatism, rather than a theory of broader structures of composition. In a similar light, the proposition of 'conceptual-systems' (Harvey, 1966; Harvey & Clapp, 1965; Harvey, Hunt, & Schroder, 1961) has similarities to the description of conceptions, but is primarily formed by the states of mind applicable to specific individuals. This idea is closely related to the dynamics of anticipation within 'personal-constructs' (Kelly, 1955, 1970) which is theoretically similar to a conception, but limited due to its theoretical reliance on psychological rationality. Each of these psychological forms provided conceptual structures, only at the observational level of the 'individual-psychological'.

In abstractions of individual development, there are many different stage models that provide useful distinctions, each with their own specific focus and forms of relevance. These include 'logical-relations' (Piaget, 1928, 1972), 'positional-structures' (Perry, 1999), 'object-relations stages' (Kegan, 1982, 1994), 'dialectical-schematas' (Basseches, 1980, 1984), 'ego-stages' (Cook-Greuter, 1990, 2000; Greenspan, 1989; Loevinger & Blasi, 1976) and 'action-logics' (Torbert, 2000). In these theories descriptions of categories of formation of conceptual capacity are clearly articulated for the infant, child, adolescent, young adult, adult and adult learner. These established fields of research specifically explain individualized 'concepts' or 'constructs' formulated within personal capacities over developmental sequences, yet also reflect a primarily different level of observational abstraction to that of 'conceptions' (Carey, 2011).

At the sociological level, one candidate for analysis was the 'social meme' (Dawkins, 1976), which maps the transference of ideas as units of information, but does not explain the conceptual causes of transmission for that unit of selection. Alternatively, the 'culture-gen' (Lumsden & Wilson, 2005) provides a
genetic-level unit of transmission and its means, but does not describe the content of that vehicle. More empirically and abstractly, there was the potential use of ‘agent-based models’ (Reynolds, 1987) which have predictive and descriptive strength, but also require substantial assumptions not fully reflective of real-world problems in complex social systems. In a reflection on learning there are generated ‘outcome spaces’ (Marton & Booth, 1997) for maps of conceptions, which primarily examine the content of individual conceptions and not their dynamic relations. Then there are the language informed ‘mental spaces’ (Fauconnier, 1994) and ‘cognitive poetics’ of metaphor and metonymy in cognitive linguistics (Dirven, 2005). More universally, there is the sociological device of ‘ideal-typicals’ (M. Weber, 1949) which provides an idealized exemplar to enable comparisons of values, but uses rhetorical forms that are otherwise non-existent. Various language based contexts, such as ‘forms of life’ (Wittgenstein, 1968) provide the context for language games, but operate more as non-theoretical in-situ constructions. Alternatively, there is the autopoietic ‘social system’ and ‘psychic system’ (Luhmann, 1995) which explains meaning as process, only in the form of radical constructivist depictions. In broader descriptors of major psychosocial strata there is the often used hierarchy of ‘motivational-values’ (Maslow, 1959a, 1959b), however these structures rely heavily on generalized pre-potencies as universalized human ‘needs’, not synonymous with the nuances of values-biased conceptions.

At the systems level, of illumination of the potential for dynamic complexity was the explanatory power of cybernetics. This generates Jakob von Uexküll’s cybernetic ‘world-spaces’ for the Umwelten of animals and men (von Uexküll, 1957), Geoffrey Vickers ‘appreciative system’ as a schemata of realities (Vickers, 1968), Robert Rosen’s ‘anticipatory systems’ derived from mathematical biological modeling (J. Rosen & Kineman, 2005; R. Rosen, 1988), Russell Ackoff and Fred Emery’s ‘purposeful systems’ (Ackoff & Emery, 1972), Andras Angyal’s abstracted ‘holistic systems’ (Angyal, 1939, 1967), and Francisco Varela’s ‘embodied minds’ (Varela, Thompson, & Rosch, 1993) representing the process of enactive cognition. Each of these theorists provides their own unique depiction of the processes of perception, only at scopes and levels of
observation (e.g. animal cognition, individual perception, expectation formation, belief justification, personal autonomy, and neuro-phenomenological functions) that are, supplementary to, yet distinctively different from the specific research question posed by this thesis.22

At the more abstract level, there are various forms not related to specific individuals, communities or observable systems, being abstract philosophical objects less constrained by data, such as the temporalized ‘unit-idea’ (Lovejoy, 1964), the hierarchical ‘holon’ (Koestler, 1967), the locatable ‘perspective’ (Wilber, 2000c, 2000d), situational ‘levels of existence’ (Graves, 1970a), cross-cultural ‘V-Memes’ (Beck & Cowan, 1996), respective ‘space-time relations’ (Gebser, 1985), and perceptual ‘ecoscapes’ (Backhaus & Murungi, 2006). The familiarity with these characterizations provided useful generalizing orientations and classifying descriptions, but were found to be too isolated to forms of interpretation contained within their discrete wider systems of narrative depiction.

This leads to considerations of more universalist propositions, such as those of David Bohm’s description of ‘thought as a system’, which contains (unnamed) mutually interdependent parts that rely on each other for ‘their meaning and for their existence’ (Bohm, 1994, p. 19). While there is a similarity with the phenomena of meaning formation described in dialogue processes (Bohm & Nichol, 2004), the descriptions given are too imprecise to satisfy the present need which requires actual depiction (as opposed to embodied representation). An alternative is to rely on philosophically abstract forms, such as Wittgenstein’s (1968) ‘family resemblances’ (i.e. Familienähnlichkeit), yet being caught in the imprecision of the language it adjudicates, it is unclear if its relations derive from causality or mere similarity, making its application to ‘conceptions’ impractical. Similarly, at the level of the cosmological, Whitehead’s ‘superject’ entities forming in the concrescence of occasions provide a unique and encompassing abstract conceptualization of thought in creation, yet such entities are not potentially observable (or measurable) and so did not meet the
pragmatic requirement of a directly perceivable form of phenomenon (Whitehead, 1927, 1929).

Looking at these examples and at the specific research focus of this thesis, the idea of a conception as an ontologically discrete entity is apparently not without precedent or analogical parallels. Accordingly, this wider body of work informs this thesis immensely (and is referenced in subsequent chapters specifically). However, the necessary conclusion reached from that review was that the examples given are, not so much different conceptualizations of the proposed unit of observation, but rather they reflect the same broad category of phenomenon, only observed and described at different levels of observation and scales of operation without necessarily delineating the specific ‘location’ of observation in ways useful to the primary research question (see Chapter One). Units of observation, like those described, may have historically been considered too imprecise, complicated or contradictory to provide a valid premise for an observational theory of thought. Yet, these forms collectively represent invaluable aspects as relative contributions that indicate “the limitations and the dignity of human knowledge.” (Bertalanffy, 1968, p. 248) One aim of this research is to draw from, and then unite elements from these diverse descriptions with increased (and more contemporary) levels of precision. Accordingly, a fresh approach to this often intuitively described form of observation is proposed.

Chapter Two Proposition

The thesis proposition for this chapter is that an appropriate unit of observation to examine the dynamics of ‘thought’ to facilitate Learning III scenarios is potentially identifiable. Given the specifics of the research outcome and the vast range in the existing understandings of the topic, for the purposes of this research the proposed unit is the ‘conception’. The distinction offered is that conceptions constitute an intangible and abstract conceptual form of phenomena. As abstract forms, they are difficult to examine empirically. The proposition of this chapter is that this difficulty can be overcome. The
implication of this proposition is that conceptions are distinguishable from other forms of thought, such as concepts and conceptualizations. They are the resultant of discretely identifiable dynamics. Accordingly, if they are identifiable, then they will have defining features. The purpose of this chapter is to gain clarity and insight into the definitive characteristics of conceptions. This proposition informs the specific focus of the proposed research observations.

The counter-proposition is that, while in terms of discrete levels of abstractions conceptions (or other related ideas) can be notionally identified, they are mere figments of mind, constructions in semantics, or are better quantified by other secondary empirical referents (e.g. cognitive complexity scales, measures of IQ, neuro-imaging data, etc.). The argument would be that, they are not identifiable as discrete phenomenon. Accordingly, the argument would be that it is more worthwhile to change the research question (rather than maintain the proposed object of focus). This potentially represents the error of prescription, where in defaulting to a presumed answer to a question any data generated is actively interpreted to support a pre-existing proposition. Essentially, the pre-existing frame of reference means the data does not get an opportunity to speak, with what it potentially says being already ‘pre-scripted’. This error can be avoided in an abductive method by generating phenomena specifically relevant to the exact research question specified and the solution-demand required.

The proposal of this chapter is to develop a working definition and then, using actual data in the form of conceptions, to discern in-common definitive characteristics. In answering the question: ‘What to look at?’ the suggestion is to use one specific example of a conception at the level of observation selected as an example trial. The outcome desired is the discernment of the defining features of conceptions and to conduct a preliminary test of the workability of this form of inquiry.

### 2.3 How was it answered?
What is the theory?

The proposition of this chapter can be effectively tested using the existing processes of an abductive method. The second phase in the abductive method providing the overarching framework for this thesis is described as *phenomena-detection*. Haig (2005a) explains that the process of phenomena-detection produces important new constraints on formative explanations. The relevance of this phase in an abductive method is that “until the relevant phenomenon, or phenomena, are detected, one will not really know what the explanatory problem is”. (p. 383). This approach uses phenomena to determine the explanatory theory, rather than the theory pre-empting the phenomena.

This highlights the unique role of data in an abductive inquiry and the unconventional place of data (or rather phenomena) analysis at the commencement of the inquiry (Haig, 2005a). The premise of an abductive inquiry is that an explanatory theory (i.e. a hypothesis) is to be developed.24 At the early stage in method no ‘data’ in support of that new theory exists. However, the underlying phenomena to be disclosed may already be present. The difficulty of the researcher is the discovery of the means of its recovery. In this second phase the primary focus is the generation of relevant phenomena from available data that is meaningful to the specifically asked research question.

To clarify this potentially unfamiliar approach, Haig (2005a) makes clear distinctions in the abductive process between data, phenomena and theory. In deductive research, data is seen as being empirical and observable making it accessible and open to public verification. An existing *theory* supports this contention. This is to be contrasted with the role of ‘data’ in an abductive analysis, which is characterized as contextually unstable and circumstantially specific, primarily because it was not generated with a specific hypothesis in mind (Haig, 2005a, 2005c). Phenomena, on the other hand, is an abstraction derived from a reductive process and, in terms of explanatory worth in an abductive process, is said to be *more* stable and generic, operating across
contexts and bridging isolated circumstances (Haig, 2005a). This use of data can be contrasted with a grounded theory approach which generates observations and general insights from the ‘local’ and the ‘unique’ (Richardson & Kramer, 2006). For this reason, the primary starting point in an abductive analysis is the generation of ‘phenomena’ from an exploration of available data leading to theory-formulation. The unique theoretical premise of the abductive process generates the specific design criteria for the methodology selected. It is then argued that an abductive method (in examining dynamic complexity within more generic frames) establishes theories of a wider scope of applicability.

Unlike a hypothetico-deductive study where data is specifically generated in service of the assumptions of a pre-existing hypothesis (Hughes & Sharrock, 1997), in an abductive inquiry data collection the place of data collection appears earlier in the sequence of the research process, being prior to the formation of the hypothesis and potentially even definition of the phenomena for observation (Coffey & Atkinson, 1996). For data to reach the status of phenomena of significance a process of generation as exploration is required (Creswell, 1998). This exploration of generalized data to derive meaningful phenomena is what informs the design of the subsequent process for phenomena-detection.

**How it was applied?**

For the phenomena-detection phase of the abductive method the primary choice in emphasis is framed as being between two alternative approaches a) *consequentialist* and b) *generative* (Haig, 2005a). A consequentialist approach to research will justify its knowledge claims by reliance on what has transpired as a consequence (i.e. a result). A generative strategy approach to research justifies its knowledge claims by reliance on the processes that produce the consequences (i.e. the causes). Each therefore entails a different emphasis on the object of research (i.e. resultants or causal dynamics). In the context of abductive method, Haig (2005a) argues that consequentialist strategies reason by retrospective justification to the data, in contrast to generative strategies
which reason forward from emergent patterns to rudimentary theories. The constraint on this research is that, unlike the fields of empirical psychology, developmental psychology or social theory, data on the specific phenomena of conceptions does not exist in sufficient detail, reliability or sample volumes to generate clear and justifiable indications leading to predictive results. A primary research aim of this thesis is the development of theory that leads to a methodology to produce exactly such forms of data for the future. While both approaches are equally valid, given the emphasis in this thesis on developing a methodology for generating reliable data, the *generative* approach is preferred as the basis for valid theory-formulation.

Fortunately, within the field of empirical clinical psychology clear steps in an abductive method have been proposed to guide the researcher in the process of phenomena-detection using a generative approach (Haig, 2000, 2005a). In a consequentialist approach (where data exists) formalized procedures can be strictly followed. In a generative approach (with data ambiguity) processes are used more for generic guidance. The suggested processes include: a) the initial screening of data on criteria of quality; b) intuitive exploration using appealing forms of description and display; c) cross-validation through close replication by re-sampling to confirm if apparent patterns are stable and potentially meaningful; and d) constructive replication across different circumstances to test the initial limits of applicability by looking for any ‘significant sameness’ (Haig, 2005a).

These four, of many potential possible methodological sub-phases, can be described succinctly as achieving: a) *data quality*, b) *pattern suggestion*, c) *pattern confirmation*, and d) *pattern generalization* (Haig, 2005a). They reflect a formalized abductive approach to exploratory factor analysis which provides an effective method for abductive hypothesis formation when faced with large amounts of non-specific data (Bandalos & Boehm-Kaufman, 2009; Haig, 2005b; Rozeboom, 1997). These sub-phases, once adapted in a manner consistent with the form of data for this research, were used to frame the phenomena-detection process.25
To commence that process only a working definition was necessary to enable preliminary identification and detection of the phenomena from within the source data. To inform that search, the foundational statement of the Greek philosopher, Aristotle, is noted in providing a distinctive definition, describing ‘conceptions’ (being translated from *definendum* ~ i.e. the thing to be defined) as “the finding of a universal definition of the indivisible whole as one concrete totality” (Aristotle, 1952, p. 133). From this historical basis, a *conception* is initially defined, for the purposes of the method used in this phase of the research, as follows:

> A conception is the resultant abstract form that prescribes the totality of the phenomenological experience that asserts it, the social construct that confirms it, and the empirical referents that evidence it.

To limit the scope of data considered within this working definition a single topic of focus was selected. The topic selected for the comparison of conceptions (consistent with the aims of this thesis) was the conception of *health*.

The inspiration for this approach was taken from a previous case study of an abductive approach specifically designed for the detection of conceptions. In a study of biopsychosocial systems conducted by psychologist, Clare Graves (2002) an abductive approach was adopted to reconcile the contradictory theories of human motivation using adult conceptions as phenomena.

In that particular study Graves sought to examine “the confusion and contradiction, the conflict and controversy” in the theories of psychology (Graves, 2002, p. 5). To do this, he proposed a novel approach in method. His initial research was to collect from individuals ‘conceptions’ (in the form of short essays) describing a ‘*psychologically healthy mature adult human being*’ (Graves, 2002). Rather than avoid the apparent complexity or dismiss the confusion in psychological theory as undecipherable, he instead used that plurality to generate the diversity of information necessary for a wider integrative explanatory theory (Graves, 1971c, 2002, 2005). In Graves own
words, his motivation (for what became a 34 year research project) was to work with the full scope of the data and its apparent inconsistencies, to then simply let the data speak:

I finally arrived at the idea that if I took some area of human behavior about which there is confusion, one in which there was a great deal of controversy, and one in which the different points of view conflict with one another, I could possibly begin to get the kind of information with which I was concerned. (Graves, 2002, p. 7)

The aim of this research has a similar open-stance (albeit at a slightly different level of observation). The topic of ‘health’ (in a way similar to the topic of ‘sustainability’) contains the diversity necessary to enable the aims of the desired abductive inquiry. In honor of Graves’ pioneering approach to this field, a similar method has been used, only in a more contemporary research context.

**What was done?**

The procedure used to generate, delineate and investigate the selected phenomena comprised a sequence of steps in four sub-phases:

1. **Data Quality**: First, using the working definition of a ‘conception’, a single category of data objects for observation was selected. To delimit the possible field the focal concept of ‘health’ was chosen. Once the overall scope of the search was defined a broad range of data objects were compiled of a specific quality (i.e. primarily academic source materials). For each conception that was identified a ‘data-object’ was created as a recordable artifact (i.e. a short source quote or definitive statement). A total of 135 conceptions covering a period of over 2000 years and multiple theoretical disciplines were compiled (see Appendix C).

2. **Pattern Suggestion**: Second, the compiled representative conceptions of health were reviewed as a complete data set. From this review three primary emergent patterns were identified as potential categories for description or
delineation. These were further qualified by identifying sub-categories and sub-delineations within those categories. Based on these distinctions a coding rubric was prepared (see Appendix D).

3. **Pattern Confirmation**: Third, a generic table of the conceptual set of potential categories of conceptions was extrapolated from the initial patterns detected and coding categories identified (see Appendix E). Examples of conceptions representing the remaining categories were located and included. Each conception was comparatively scored using the coding rubric and the results were tabulated.

4. **Pattern Generalization**: Fourth, the entire set of health conceptions (as coded, collated and tabulated) were reconstructed as spatial co-ordinates. Utilizing a three-dimensional depiction, this compilation of data (405 spatial points) was then used to generate a single visual interactive 3D model (see Figure 2.1). Being able to view this model from multiple angles and manipulations enabled the exploratory analysis of possible generalized relationships, pattern confirmations and anomalous conjunctions (see Appendix F).

**Figure 2.1 – Sample Screenshot of Exploratory Model**
Fig. 2.1: Sample screen shot of interactive 3D depiction of data set of 135 coded conceptions. The x-axis represents coding for inclusion of domains. The y-axis represents coding for extension of context. The z-axis represents coding for the category of direction.

The combined objective of this abductive exploratory process might be described as ‘trying to see what needs more seeing, so as to explain what needs explaining’. This year-long process generated initial exploratory observations, which raised new questions and prompted generalizations of potential patterns. These are reported on in summary in the following section.

2.4 What was discovered?

Summation of Findings

The findings from the phenomena-detection process comprise: a) first-order observations from the data, b) second-order abductive inferences from the phenomena, and c) third-order generalizations from the abductive exploration of that phenomena.

First Order - Observations from Data (Dimensions)

There were three first order observations. These relate to rarity, diversity and (assumptions of) category.

The first observation was that ‘health conceptions’ are relatively rare as compared to health perspectives, health opinions, health evaluations or health descriptions. Conceptions of health potentially operate at the Learning III level by describing coherently the self-recognition of a ‘system of sets of alternatives from which choice is made’ for a particular concept, theory or circumstance (Bateson, 1972, p. 293). The recognition from the data search was that, rather than conceptions being synonymous with individual constructions or broad categories of developmental stages, this category of phenomena represented its own distinct level of organization. Gradually, over time, a certain level of precision in identification was gained.
The second observation was that, as content, the idea of health is used to
disparately describe a vast diversity of conceptual objects. There are (for
example) healthy bodies, healthy minds, healthy foods, healthy communities,
healthy businesses, healthy play, healthy challenges, healthy choices, healthy
attitudes, healthy planets, healthy discourses and (even) healthy futures (Varey,
2010a). Three useful distinctions were developed to assist in recognizing the
phenomena of health conceptions, being the separate identification of the (often
implicit) focal health object (i.e. the topic of focus), the health definition (i.e. the
normative conception), and the health condition (i.e. the evaluative appraisal).
This formalized analysis assisted in the process of categorization (Varey,
2010a).

The third observation was that the composition of conceptions comprised three
primary dimensions. These were initially defined as: a) degree of integration of
biopsychosocial considerations, b) extent of systemic span of situational factors,
and c) relative position on a bimodal continuum of diminishing disease
orientation or expanding health orientation. The sub-categorizations of these
primary distinctions are discussed subsequently with reference to the visual
observations made of the data using a variety of exploratory depictions.

The conclusions made from these first-order observations (which potentially
represents a contribution to knowledge within the narrow topic of ‘health’) were that:

a) identification of conceptions at the specified level of observation was
   practical and feasible;
b) depiction and representation of a system of conceptions was
   theoretically viable;
c) the workability of the thesis proposal was found to be pragmatically
demonstrable; and
d) the process of depiction lacked precision and definition, representing
   limitations restricting any greater detailed empirical modeling analysis.
Second Order - Characteristics from Phenomena (Delineations)

The second-order observations were that from an exploratory analysis of the entire data set three discrete characteristics were apparent. These applied to the entire set and those distinctive characteristics could be used to form the defining features for identifying discrete conceptions. These are summarized as:

i. Autonomy: representing a distinct form of compositional uniqueness;

ii. Boundary: representing implicit and explicit limits of inclusions; and

iii. Centrality: representing a focal location so as to reference variations.

These three defining features, together with illustrative indicative examples, are discussed in more detail in the following sections.

Third Order - Generalizations from Explorations (Definitives)

The third-order observations related to the generalized patterns apparent from exploration of the spatial depictions of the entire data set. These are:

a) for the Autonomy criterion: single domain or fully integrative domains were less frequently represented than composite combinations;

b) for the Boundary criterion: there were fewer cases of multiple recursions of contexts compared to those with a finite descriptive span; and

c) for the Centrality criterion, there was a general clustering in the coding of conceptions adopting directionalities that favored normalization.

It is noted that these third-order observations may be idiosyncratic to the dataset or the particular modes of depiction. Within the sample selected they may merely indicate anomalies in terms of frequency, in what would otherwise be a generally distributed continuous pattern. With the limitations of the
method these are simply noted. Being preliminary observations in the process of emergent abductive theory generation process, these observations were not discarded until their significance (or irrelevance) could be explained adequately.28

Discussion of Findings

It is not possible (or necessary) to fully recount the detail of the data explorations within the constraints of this thesis. However, a few illustrative examples are given of the artifact quotes of some of the more illustrative conceptions to provide a sense of this type of phenomena. The full data set is appended in substitution for the experience of immersion (see Appendix C).29 This discussion of the findings made is limited to the identification of the three defining features of conceptions as derived from the data set analysis. These three categories of definitive characteristics from the second-order observations are each discussed separately, using the defining features of:30

A. Autonomy,
B. Boundary; and
C. Centrality.

A. Conceptions as Compositional Inclusion (Autonomy)

The initial delineation drawn from the compiled set of conceptions was a conventional classification of each conception as having predominantly either a physiological, phenomenological, or sociological epistemological premise. One example of each of these primary classifications demonstrates the clear difference in their primary composition.

For physiological conceptions of health, a classical example is provided by the conception of German pathologist, Rudolph Virchow, here describing a conception of health focussing on the physical conditions of a disease:
Scientific medicine, for its part, has as its object the investigation of those altered conditions which characterize the diseased body or various ailing organs, the identification of abnormalities in the phenomena of life as they occur under specifically altered conditions, and, finally the discovery of means for abolishing these abnormal conditions. It presupposes therefore a knowledge of the normal course of the phenomena of life and the conditions under which this course is possible. (Virchow, 1958, p. 27)

For psychological conceptions of health, a contrasting conception is provided by social analyst, Richard Eckersley, who described a conception of health based on subjective wellbeing, confronting the dominance of physiological criteria:

Subjective well-being is not a single construct, but comprises three distinct and to some extent independent dimensions: a cognitive aspect; life satisfaction; and pleasant and unpleasant affect (moods and emotions) ... It differs from the concept of ‘health’ in excluding physical health and in including positive emotions; it is thus less focused on illness and disease (both physical and mental). (Eckersley, 2001, p. 61)

For sociological conceptions of health, health is described as a social (and to some extent, professional) construct based on the cultural formation of health ideals, as seen in this example provided by distinguished epidemiologist, Professor Mervyn Susser, when reflecting on the social definition of health status:

I shall argue that any definition of health incorporates values that bear on ethics, and that these definitions vary as values vary. The definition of health depends on who is defining it. I aim to show also that the search for the components of health definitions is not a mere exercise in speculative metaphysics. The values that underlie different health definitions do indeed provide a code, or rationalization, for the conduct of health professionals, and hence for the differing content and quality of health services they provide. (Susser, 1981, p. 94)

These delineations, however, represent only the grossest level of division. More commonly, the conceptions of health taken from the data set comprised composite conceptions, coherently bridging together multiple domain intersections. An example of this form of composite composition is provided by medical philosopher, H. Tristram Engelhardt (Jr.), when incorporating the 'lived experience of the physically ill' into a description of social expectations and cultural normalizations:
There is not one sense of illness, disease, or sickness... The reality of illnesses, the presented senses of physical or mental deficiencies, themselves a family of different sense, become further constituted as realities through theoretical and social expectations. To be seen as ill, to experience oneself as ill, is to have a lived experience of a state of "deficiency-or-abnormality-likely to-be-due-to medical-causes-and warranting-a-sick-role." (Engelhardt, 1982, p. 142)

These four examples (of the entire data set) being segmented artifacts from more complex articulations, represent how the structure of conceptions are not so easily forced into physical, psychological or sociological categories of constructions. For the purposes of coding the data and reflecting its complexity sixteen sub-categories were then identified representing possible combinations of these three primary domains and the different presumptions of primacy in their epistemological emphasis (see Annexure E).

This nuanced approach to the generalized observation of conceptual meaning is supported by George Rousseau (Rousseau, Haycock, & Gill, 2003) when examining the trans-historical cultural framings of ‘disease’, by the recognition that it is at the edges of conceptions, rather than their central focus, where the understanding of composition is primarily defined. Rousseau states:

Hence frames are also contexts without which meanings can never be derived. So long as interpretations continue to be made frame interaction will occur: the juncture of meanings happening at the point where the competing interpretations exist or eventually will be contested. But frames are not secure objects. No matter how seemingly durable their material contexts – whatever is inside the frame – they are tested at the point where image (the picture) meets the frame’s border. (Rousseau, et al., 2003, pp. 2-3)

The conclusion reached on this first characteristic was that each conception has its own compositional autonomy. The implication is that merely because a conception concerns a particular field of content does not necessarily prescribe the features of composition of the conception. This would be a finding consistent with the distinct level of observation adopted (i.e. composition of form beyond the originating discipline of content). This first definitional feature of conceptions is labeled as: autonomy.
B. Conceptions as Contextualized Complexity (Boundary)

The second main observation from the data set was that the scale of inclusion for conceptions differed. This was apparent even when the focal topic was the same. The initial delineations had identified that conceptions of health situated a health object in a health context. Examples of contexts include: a) a cell within biomedical disease condition, b) a human body, c) a feeling person, d) a community health situation, e) the current public health policy legislation, f) or future global pandemic planning for containment and mitigation. While delineation of different scales of content within conceptions is to be expected, the observation made relates to the boundary of the context as a feature of the conception itself. The finding was that context delineation was independent of the health object considered. This concerns variation in the boundary of the contextualizations for distinct conceptions.

From the data it was apparent that some conceptions with a specifically localized health object (e.g. a sick person) included expansive sets of health contexts as distinct boundaries for the conception. Alternatively, some conceptions with expansive health objects (e.g. global environmental degradations) contained narrowly defined conceptual contexts. The common defining feature of each conception was delineation of its own boundary of inclusion. Two examples illustrate this in-common feature of boundedness in distinctly different conceptions.

The first is taken from the classical Greek source of health conceptions, being the writings attributed to Hippocrates, specifically in *Upon Air, Water and Situation*, contextualizing the health object (i.e. epidemic disease) in an expansive, yet bounded, context:

> Whoever wishes to pursue the science of medicine must proceed thus. Therefore on arrival at a town with which he is unfamiliar, a physician should examine its position with respect to the winds and to the risings of the sun. For a northern, a southern, an eastern, and a western aspect has each its own individual property... Through these considerations and by learning the time beforehand, he will have full knowledge of each particular case, will succeed best in securing health, and will achieve the greatest triumphs in the practice of his art. (Hippocrates, 1923, p. 71)
For comparison, a second more contemporary example of boundary delineation is provided by the work of human ecologist, Morteza Honari, in describing multiple scales of contextual inclusion:

I would like to restate my definition: health is defined here as a sustainable state of total well-being, within sustainable ecosystems within a sustainable biosphere. The creation and maintenance of healthy homes, within healthy communities, within a healthy world is the major objective of human ecology. (Honari, 1999, pp. 21-22)

In these examples, we see how a conception may make explicit its own implicit boundary of limitation. This observation of the conceptual boundaries of inclusion is supported by German sociologist, Niklas Luhmann's (1989), who describes in *Ecological Communication* how the language domains of social systems theoretically indicate the limitations of their environmental conception. The recognition he makes is that any conceptualization of the environment that is ‘within language’ and can be communicated within a social system demarcates the limitation of that conception from a wider reality available for perception (Luhmann, 1990). Definition of the environment as content indicates the definitive limits of the conception as its form of contextualization.

The conclusion reached on the second defining feature was that each conception has its own contextual self-definition described by its limitation of inclusions. The implication of this is that the expansiveness of a conception is not synonymous with the scale of conceptual complexity of the focal subject. This is a finding consistent with the level of observation adopted (i.e. structure beyond content). This second definitional feature of conceptions is labeled as: *boundary*.

*C. Conceptions as Normative Stability – (Centrality)*

The third observation from the data set was that each conception expressed differently the desired outcome (in this case, ‘health’) with reference to a desired state. Conceptions were distinguishable by their focus on intentional outcomes representing either restoration by the absence of disease or on
achievement of the presence of wellbeing. The nuance within this analysis of the
data set was that the primary emphasis was on attainment of a normative
condition (rather than a fixation on the elimination of illness or the actuation of
wellness). An example is the conception of humanistic psychologist, Eric Fromm
(Fromm, 1941), in connecting societal role fulfillment with ideals of personal
growth in terms of normalcy. For Fromm, normalcy is seen, in this example, as a
state of growth:

The term normal or healthy can be defined in two ways. Firstly, from the
standpoint of functioning society one can call a person normal or healthy if he is
able to fulfil the social role he is to take in that given society – if he is able to
participate in the reproduction of society. Secondly, from the standpoint of the
individual, we look upon health or normalcy as the optimum of growth and
happiness in the individual. (Fromm, 1941, p. 138)

Of even greater interest, is that within the diverse graduations of conceptions of
health being related to a change in condition, there is occasionally a reflection
on the change in this feature of the conception itself. An example of this shift in
the location of the reference point of ‘normalcy’ is provided by former clinician,
Richard Moss, when writing on conceptions of healing:

When I was a traditional physician, I was content to regard healing as the
restoration of health. But today I know that healing is far more than a return to
former condition. True healing means drawing the circle of our being larger and
becoming more inclusive, more capable of loving. In this sense, healing is not for
the sick alone, but for all humankind... Healing, wherever and however it occurs,
brings each person and humanity as a whole toward a more inclusive, more
unobstructed relatedness to all that is emerging in this adventure of life. (Moss,
1989, pp. 36-37)

This observation of the tendency of conceptions to fluctuate around positions of
changing normalcy is confirmed by Russian born sociologist, Pitirim Sorokin
(1975) in his observation of the ‘incessant variation’ within patterns of
normalization in social change, refuting assumptions of strictly cyclical, linear,
unicist, or static characterizations of development, when stating that:
The valid conception is that of an “incessant variation” of the main recurrent themes, which contains in itself, as a part, all these conceptions, and as such is much richer than any of them. (p. 675)

The conclusion reached on this third characteristic was that each conception has its own centrality of reference. The implication is that expressions of the conception may reflect a definitive characteristic of directionality, which may change from time to time, relating to a desired and intended (even if unattainable) state of conceptual normalcy. This would be a finding consistent with the level of observation adopted (i.e. direction beyond intentions). This third definitional feature of conceptions is labeled as: centrality.31

Conclusions for Health Conceptions

Because the content of the data set is not inconsequential, the observations made on the three defining features also generate conclusions for the data-set itself. This results in three observations from the exploratory analysis of the data set generated that are content specific to the topic of ‘health’ (i.e. not abductive generalizations for conceptions). While not specifically relevant to the abductive research question, these are included as supplementary propositions. These are:

1. that physiological, psychological and sociological descriptors of human health are frequently represented by alternative priorities in the multiple combination of those domains;

2. that health conceptions contain limitations of situational complexity which are distinct from the conceptual size, scale or scope of the focal health object;
3. that health conceptions have potentially distinguishable orientations, with 'health' not being a single normative concept, rather it has multiple dimensions and widely differing normative assertions.

Given these general (and specific) findings from the phenomenon-detection phase, the next step in the research method is to see what propositions (if any) can be generated to explain the in-common characteristics of the phenomena now defined, which is the central topic of Chapter Three.

Evidence in Support

In making abductive observations about the defining features of conceptions generally, it is worthwhile to consider if these features are also evidenced specifically. The definitive features proposed as patterns of autonomy, boundary and centrality might potentially apply to many forms of conceptions. By way of confirmation of the analysis, one particularly well-known (and sufficiently complex) example of a health conception may provide support for these observations. This is the biopsychosocial conception of health proposed by George Engel (Engel, 1962, 1977, 1980). From this example, the conclusions reached are seen reflected in the formation, interpretation and changing conceptions of Engel’s model itself.

In 1977 George Engel published in Science his paper calling for a new biomedical model of health, to promote his 'biopsychosocial model' (Engel, 1977). That paper has since been academically cited over 5000 times, with Engel being said to have had more influence "on the philosophy of medicine in the United States than any other person, physician or philosopher" (Lewis, 2008, p. 328). While the biopsychosocial idea was originally developed by neurologist, Roy Grinker (1956), it was independently modified by Engel based on his own experience in dealing with psychosomatic and psychoanalytic medicine (Ghaemi, 2010). Engel’s original research work was not as a psychiatrist, but as an internist interested in gastro-intestinal disease. In
particular, he identified that health and disease were dynamic concepts that “do not easily lend themselves to simple definition”, not because they were in definitional terms too complex, but because the disease response itself varied dramatically in different systemic contexts (Engel, 1962, p. 240). A premise in his work was that: “Life itself involves a series of adjustments within the environment, and therefore health and disease may be seen as phases of life.” (Engel, 1962, p. 240). In particular, the etiological nature of disease, rather than a reification, was instead seen as a natural pattern with the outcomes being distinctly different in different environmental, mental, social and cultural contexts (Engel, 1962). The classical statement of Engel’s conception is evidenced by the following quote:

But the existing biomedical model does not suffice. To provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he lives, and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physician role and the health care system. This requires a biopsychosocial model. (Engel, 1977, p. 132)

By applying the conclusions reached to this definitive conception the potential utility of those distinctions is apparent. The autonomy of the conception is reflected by its composition, with particular reference to the primary role of Engel’s biomedical and psychosomatic descriptions. The boundary of the conception is reflected by its hallmark extension, of moving the focus on the disease to include “how the disorder is experienced by the patient, by the environment [i.e. social settings and cultural groups] and the physician” (Engel, 1962, p. 247). The centrality of the conception is reflected in Engel’s description of how disease is seen as corresponding to “failures or disturbances in the growth, development, functions and adjustments of the organism as a whole or any of its systems” (Engel, 1962, p. 240) with the intention of direction being a return to a naturally adaptive and responsive state.

This example conception, when seen with these parameters as defining features, is clear, articulate and precise. Specifically, the indicative feature of the model is its three components (i.e. bio-psycho-social) which are an articulation
of three *layers* of surrounding contexts of the focal object (i.e. the disease), being: a) the context of the patient's state of mind, b) their family circumstance and c) the practical relationships within the medical system (including with the physician). However, the 'concept' of the 'biopsychosocial' is commonly interpreted outside of the originating context of Engel's conception. The emphasis of the originating conception is shifted by different conceptions out of a biomedical context and into different disciplines by removal of the 'concept' from its originating conception. The conception (as modified) then becomes a tool for (and a threat to) other existing conceptions. The result can be a chain-reaction in conflicting interpretations; of the concept, its context and the conception itself.53

In an astute review, Lewis (2008) reasons that the failure of the integration of different conceptions, even when derived from the same source or for the same aims, is due to different language domains operating at the biological, psychological and sociological levels of analysis. The biopsychosocial model involves multiple contexts each requiring differently structured language-based formulations. The model itself, as a conception, is then subject in re-interpretation to errors of conflation. The three levels of context are confused with an invitation to permissiveness in epistemological domain biases (i.e. conflagrations of compositional autonomy and contextual boundary). The biopsychosocial model becomes, in the mind of the interpreter, a description of a conception of health as already held or, alternatively, an object of contrast and challenge to their own conception. This demonstrates, firstly the significance of making distinctions in levels of observation (see Chapter One) and secondly, how the definitional features of conceptions can be uniquely distinguished by an analysis of their composition (i.e. autonomy), contextualization (i.e. boundary) and orientation (i.e. centrality).

This observation, of the dynamics of formation and the effects of interactions of conceptions, is confirmed by analogy at a different level of observation by organizational psychologist, Donald Schôn (Schôn, 1963) in his dedicated
treatise on the formation and extension of concepts, which provides the
counter-part to a dynamic theory of conceptions:

This chapter has sketched a kind of process essential to the formation of new
concepts; a way of treating the new as old, neither comparison or error, nor the
application of concepts to instances, but a displacement of old concepts to new
situations resulting in extension of the old. I have aimed at a view of the
formation of new concepts which neither denies them nor makes them
mysterious. Its analogy to biology is most striking... The function of the notion
of displacement of concepts is to approach an evolutionary theory of new
conceptual forms. (p. 34)

The re-interpretation of this one famous conception of health illustrates how
confusions in the content of conceptions can be clarified by the identified
defining features of conceptual autonomy, bounded complexity and self-
affirming centrality. Notwithstanding the detailed history of a conception's
formation and the unique views of its originators, there is always a potential for
the alteration, transformation, mis-description and (importantly) novel
innovation of any conception. It is these forms of complex interactions
(sometimes representing decades of conflict or critique) that can be seen, in
abstraction, when one combines over a hundred distinct conceptions on a topic
into a single model of dynamic relations. Definition provides one step to this
modality of depiction.

**Additional Insight**

The additional observation in this phase of the research presented itself to me
as a challenge to assumptions held. My first-person reflections recall the
expectation, that in collecting and coding conceptions of health, what would
form would be an already familiar pattern. To organize the compilation of the
data set I had prepared a sorting matrix. This was designed to collect and collate
the various conceptions based on my existing understanding of various
developmental theories, in history, sociology, psychology and philosophy. At the
end of the collation period I found the rubric empty, as very few of the items of
phenomena-detected fitted into my own pre-conception without actively
reformulating or re-characterizing the phenomena.34
I recognized at this point that I had been holding a narrative that suggested that the patterns of conceptual development of human thought follow teleological assumptions. Those assumptions might include that over time the formation of thought generates a pattern that is more integrative of knowledge domains, operates in increasing scales of complexity, which will enable greater human wellbeing and the potential for human flourishing. It is, in fact, the holding of these assumptions that makes the gradual societal uptake of the fundamental conceptions proposed by sustainability theory so personally perplexing.

While the existing narratives of evolutionary development of human knowledge, the sociological narrative of the histories of ideas, and the humanistic narrative of the potentials for individual capacity in developmental psychology might be consistent with and support these assumptions, at the level of observation of the patterns contained within conceptions these narratives were directly challenged by the observation of the phenomena. In examining the composition of conceptions (rather than the content of their concepts) the observations of structures as they applied across the entire data set were, not so much counter to, but rather unrepresentative of, these assumptions.

To demonstrate this, I had as part of the analysis generated a normalized model to show the theoretical progression of a perfect correlation between the three coding dimensions used (i.e. where all parameters in each dimension increase equally in direct causal relationship with each other indefinitely). This would in theory graphically depict the assumptions of a developmentalist-conjunctural-evolutionary paradigm. This trend-line would represent a posited preliminary hypothesis that as conceptions of health become more ‘developed’, the general pattern demonstrated would be that conceptions would become more integrated in their scope of considerations, more expansive in their scope of situational complexity, while also moving increasingly away from a disease orientation and increasingly towards a desire for healthier states and outcomes. This normalized projection is depicted by the solid line (Annotation: α) in Figure 2.2.
**Figure 2.2 – Normalized Developmentalist Conception**

Fig. 2.2: The complete data set of coded conceptions is represented together with a normalized line representing a perfect correlation between the three coded dimensions extending infinitely (marked α). This line represents where x, y, and z values are perfectly equal.

From the exploratory analysis, I discovered that this normalized line did not indicatively represent the data in any of the three dimensions, or for that matter the median of the data across all dimensions. One conclusion to draw from this reflection is that, in one way, each conception represents a ‘health ideal’ as a normalization of its own content. The normalized line was therefore simply a representation of another type of ‘health’ conception. It is not more, or less, valid merely, in a representative sense with respect to the data, another part of the overall data set content. In this instance the mapmaker has revealed himself in the landscape of his own map. An additional conception reflecting this form of health assumption was then added to the data set of conceptions as an isolated data point.

The additional insight gained was that in maintaining the focus of this research, within the method of the research, my own developmental lens was irrevocably challenged. This, perhaps more than any other fact, affirmed the utility of the
abductive approach adopted. It also led to the additional insight that a viable
type of conceptions would not be reducible to theories of cognition, concepts
or consciousness. This necessitated a change to the premise of my research
proposal to recognize that, for this particular category of phenomena, an
abductive theory approach might require that new knowledge be generated
from first principles. Whether this was the case or not, the recognition of an
anomaly in contrast to initial expectations supported the premise of an
abductive method of investigation. It seemed that the formal process of
‘phenomena-immersion’ had the desired effect of ‘assumption dispersion’. It
was from this platform of disequilibrium that the design of the next stage of the
research inquiry was appropriately framed.

2.5 Summary

This chapter concludes that for Research Question #2:

- the identification and depiction of systems of conceptions is possible;
- the three characteristics that make conceptions definable are:
  - autonomy;
  - boundary; and
  - centrality.
- this mode of depiction needs greater precision and resolution to satisfy
  the problem-criteria and solution-demand (i.e. as specified in Chapter
  One).

The identification of three defining features for conceptions within the specified
level of observation enables the next research question. This involves
formulating tentative propositions for the phenomena-detected to inform the
process of theory-generation. To initiate the next phase of the research process,
Chapter Three asks the abductive question: What does it look like?
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Chapter Three – What it looks like?

3.1 Introduction

The aim of this chapter is to develop theoretical propositions for the phenomena-detected. These propositions provide one means of exploring possible causal relations of significance. Three formal propositions are generated using the defining features of conceptions (Chapter Two) as a basis.

The abductive method used to answer the research question for this chapter is described as theory-generation. In this abductive phase principles are derived for the new phenomena from existing understandings. An ‘analogical’ emphasis was selected as the appropriate abductive theory approach. The foundations of autopoiesis theory provided the analogical isomorph used for comparison.

The outcome of this chapter is the formulation of tentative propositions that describe the phenomena of conceptions. The three principles derived provide a generalized structure that extends the local phenomena detected (Chapter Two) so as to enable more extensive theory-formulation (Chapter Four).

3.2 What was the question?

Research Question #3

What propositions characterize the defining features of the phenomena detected?

This question contains an assumption that reflects an underlying principle of abduction. This relates to an assumed capability for an astute human inquirer to use abductive methods to propose principles from descriptions which are more likely to be consistent with the phenomenon than randomly selecting from an infinite range of possibilities. In essence, in approaching a question and asking
'What does it look like' the assumption in abduction is that we will, more usually than not, locate an ostensibly correct (or at least potentially useful) category of descriptive principles.

This assumption is not without a philosophical foundation. The process of abduction as scientific method was, for Peirce, primarily an economic initiative to further inference and study (Peirce, 1960). It provided a process of logic to identify a potentially expedient, pragmatic and common sense approach to the logical and methodologically conclusive investigation of critical, yet unanswerable, questions. Specifically, for Peirce, abduction provided a pragmatic and ‘perfectly definite logical form’ to the process of scientific serendipity (Walton, 2004). However, understanding how the blend of logical process and intuitive discovery join pragmatically is a central difficulty in accessing Peirce’s description of a sound scientific process.35

Peirce (1960) speculated that the efficacy of an abductive process was due to the acquired evolutionary habit of successful selection as guided by human intuition, noting that 200,000 years is not “a hundred thousandth part of the time” [CP 5.172] that humans have been searching for scientific theories (p. 107). His logical analysis of probability theory informed a belief that, rather than a process of infinite randomness, the task of deriving pragmatic explanations of natural phenomena was one to which humans were perfectly suited. He states:

The manner in which he comes to have this knowledge seems to me tolerably clear. Certain uniformities, that is to say certain general ideas of action, prevail throughout the universe, and the reasoning mind is [it]self a product of this universe. (Peirce, 1957, p. 244)

Peirce, as a mathematician, believed it too unlikely that of all the random possibilities available for the generation of theories there was not a naturalistic human tendency to derive correct explanations, stating:

It is somehow more than a mere figure of speech to say nature fecundates the mind of man with ideas which, when those ideas grow up, will resemble their father, Nature. (Peirce, 1957, p. 238)
To qualify this naturalistic assumption, Peirce also acutely recognized that the primary limitation of this argument was that of all beliefs “none is more natural than the belief that it is natural for man to err.” (Peirce, 1957, pp. 238-239). Peirce’s proposition was that an evolutionary predisposition of mind towards discovery meant the discernment of what was important, different or recurrent in the patterns of phenomenon, if combined with a formal process of logic, might increase the natural likelihood of success, rather than a normal capacity for error. Abduction could, therefore, be considered the conscious and logical process of increasing the probability of the discovery of the unknown.

The assumption inherent in the framing of the research question is that in forming propositions to characterize the phenomena detected, the theorist might appeal to a tendency to find explanations which, even if unfamiliar to the observer specifically, are familiar in terms of phenomena generally. The addition of a logical method to support this process significantly increases the chances of pragmatic success. When working with a significant number of unknowns, such processes provide an attractive economical alternative to processes of trial and error, using random assertions and repetitive testing.

**Existing Understanding**

The defining features of conceptions identified from the observations in Chapter Two were described as the three attributes of: a) *autonomy*, b) *boundary* and; c) *centrality*. The research question of this chapter is potentially advanced by determining what we already know about processes reflecting similar attributes and comparing these specifically to the dynamics of conceptions. One theoretical discipline that reflects similar descriptions to the features of conceptions is the theory of autopoiesis as applied to neurobiology (Maturana, 1970b, 1980b) and neurophenomenology (Varela, 1981, 1999a, 1999b).

The theory of autopoiesis has a developmental history that reflects, in its own unique biography, the patterns of origination, modification and enactment seen in
the formation of a novel conception. The theory has an originating context in the
research work in neurophysiology by Humberto Maturana (Maturana, 1970b)
and his studies on the process of visual perception and cognition (Maturana,
Lettvin, McCulloch, & Pitts, 1960). The subsequent recognition (in the English
language) of the theory developed corresponded with a joint publication with
Francisco Varela of its foundational terms and concepts (Maturana & Varela,
1973). This resulted in further refinements and restatements of the basic tenets
by its founders (Maturana, 1980a, 1981; Varela & Maturana, 1972; Varela,
Maturana, & Uribe, 1974). Following this, there were extensions of these
concepts by the originating authors (Maturana, 1981; Maturana & Varela, 1987;
Varela, 1981; Varela, et al., 1993), progressions in adoptions and adaptations by
peers (Bitbol & Luisi, 2004; Jantsch, 1981; Luhmann, 1995, 1996; Zeleny, 1980a,
1980b, 1981) and subsequently extensions of the theory into other unrelated
fields (Clarke & Hansen, 2009; Zeleny, 1980b). Autopoiesis theory has now been
applied to chemical systems (Luisi & Varela, 1989), social systems (Luhmann,
1995), organizational systems (Seidl, 2003), information systems (Mingers,
2001) and systems for artificial intelligences (Clarke & Hansen, 2009) – but not
previously to ‘conceptions’ (as that term is used in this thesis).

Maturana recalls how in forming the word autopoiesis, he was taken by a
friend’s comparison with Don Quixote’s dilemma of “whether to follow the path
of arms (praxis, action) or the path of letters (poiesis, creation, production),”
selecting the stem poiesis for the initial concept of self-production, replacing his
previous term ‘circular organization’ with autopoiesis (Maturana & Varela,
1980, p. xvii). This eventually led, through Maturana’s subsequent research
questions, into a theory of sensorimotor perception and explanations of how
praxis (action) co-enacts the external and the internal environments of an
autopoietic system (Mingers, 1995). By definition then, an autopoietic system is
a system that is (literally) self-producing (i.e. from the Greek poiesis; a making,
taken from poiein; to make). Systems are autopoietic when the structure of their
components are organized in “such a way that their processes produce the very
components necessary for the continuance of these processes” (Mingers, 1995,
p. 11). From this premise the autopoietic system was carefully distinguished by
Maturana and Varela (1973) from *allopoietic*, or (literally) ‘other producing’ systems such as the natural phenomenon of a river, and *heteropoietic*, or (literally) ‘other produced’ systems such as a manufactured object like a car. An autopoietic system is also to be correctly distinguished from an *autocatalytic* self-promulgating chemical or biological reaction, which is operationally unbounded. Importantly, autopoietic systems (by definition) need not be physically existent or biologically organic forms (Luisi, 2003). This allows for the possibility of an autopoietic theory of abstract systems of concepts (Mingers, 1995). This makes the comparison of autopoietic systems principles to those of autonomous conceptions not only illustrative, but also potentially valid.\footnote*{36}

More recently, there have been reflective recapitulations on the extended effects of the original propositions and their contributions to knowledge (Luisi, 2003; McMullin, 2004; Mingers, 1995). It is noted though that, notwithstanding the lineage of this research and its continual development, the notion of autopoiesis cannot be said to be well known or well cited in the mainstream biological or social sciences (Luisi, 2003). This is possibly due in part to the fact that the original source work requires a particular interpretative stance, involving both neologisms (e.g. autopoiesis, structural-coupling, operational-closure) and familiar terminology (e.g. cognition, entity, boundary, relations) used unconventionally within an entirely different (yet coherent) paradigmatic context (Luisi, 2003). Consequently, the source literature on autopoiesis, once applied to different domains (such as social theory and phenomenology), becomes problematically diluted in its many interpretations and formulations (Mingers, 2003). For example, there is now in the literature a tendency to use the term ‘self-organizing’ synonymously with ‘self-producing’ in reference to autopoietic systems (Jantsch, 1980, 1981; Varela, et al., 1993).\footnote*{37} This highlights a problem relating to the role of the observer negating the specific benefits of this otherwise generally useful concept. This effect can euphemistically be described as the ‘observer-problem’.

The observer-problem, as it applies in developing a theory of conceptions, is framed as, that to the extent explanations are dependent on observations from
within a conception (as opposed to an explanation that operates independently of the attribution of descriptions) the theory must include its own conception within that theory. One of the unique benefits of autopoiesis theory is that it does not rely on descriptions from an observer as the primary source of its explanations. While descriptive principles are a necessary part of the explanation of any theory, they do not constitute the source of the phenomenon in the original formulation of autopoiesis. In this way, autopoiesis theory identifies how an autopoietic entity could come into existence independently of the mind of the observing describer. The relevance of this to a theory for the explanation of the formation of conceptions, in terms of not requiring a particular conception as the basis for descriptions as the premise of existence, is significant. The significance of this distinction (which is easily explained) needs to be maintained to gain the full abductive benefits from this complex field.

By way of explanation, in autopoiesis theory a semantic complication occurs in a tendency to assert facts about an entity in the form of observations by an observer external to the autopoietic entity itself. This is a description from within a conception formed in the mind of the observer (being itself an autopoietic entity). For example, when observed by an external observer who posits there is an entity situated in an environment (being really descriptions in the autopoietic system of the describer, not of the entity described) it will appear to that observer that an autopoietic entity responds to changes in the environment. The actual principle in the original formulations of autopoiesis theory is that responsive changes in the entity are determined by the entity's internal structure, and are not enacted by the external environment, such responses being only triggered (not caused) by the external environment (Mingers, 1995). The semantic error reveals that the entity, rather than its autopoietic functions and processes, is what is being described as a form of reification. A familiar descriptive indicator for this view is that when the autopoietic entity is described as ‘self-organising’ (being an observer based attribution of ‘order’) rather than ‘self-producing’ (the fact of existence being a fact of the entity, independent of its observation), or the entity’s condition represents ‘order’ or ‘disorder’ (being normative descriptions of an observer).
Specifically, in autopoiesis theory, the pattern of response from within the autopoietic entity does not require, nor involve, the perception of an environment, the coding of information, or cognitive choices as attributions of purpose to the entity, making its responses an observer-independent process of ‘embodied enactment’ (Thompson, 2007). Importantly, the contribution provided by an autopoietic perspective highlights that the environment is not the cause of changes in the autopoietic system, it being the composition of the structure of the entity and its homeostatic capacity to resist environmental perturbations that mediates and determines the self-enacted change. Maturana specifically anticipates this form of epistemological error in descriptions by an observer of the attributed motivations of autopoietic entities in saying any such a description "not intended as mere metaphor, is intrinsically inadequate and fallacious” (Maturana, 1999, p. 158). Essentially, a theory of description is not a theory of independent explanation of causation. It is this epistemological premise, relating to the role of the observer, which makes this comparison so relevant for the explanation of conceptions (i.e. in terms of not requiring a meta-conception for explanation as meta-description).

Essentially, in terms of conceptions (as that term is used in this thesis) we do not have at this time a similar explanatory theory of causation. A conception is a phenomenon in the category of ‘thought’ not connected with any particular cognitive entity. It represents a different level of organization (i.e. not derived or extrapolated from studies of individual minds). This type of phenomenon requires different presumptions of observation and potentially a novel epistemological premise. The benefit from our existing understanding of how ‘bio-logical’ perception and cognition occurs in autopoiesis theory is that many of the questions asked in this discipline are recapitulated in the category of questions being now asked about the phenomena of conceptions. It is argued that great progress can potentially be made by a parallel return to theoretical first-principles, drawing deeply on our existing understandings.
Chapter Three Proposition

The thesis proposition for this chapter is that, as conceptions are identifiable as discrete phenomenon (see Chapter Two) and appear to have definitive characteristics in common (i.e. autonomy, boundary and centrality), then potentially generalized principles may describe the different forms of composition of conceptions as the function of in-common processes. The implication of this proposition is that to the extent that principles for composition can be found, this may possibly lead to explanations for formation. The purpose of this chapter is to provide a discussion of the phenomena of conceptions from within its discrete conceptual frame as an emergent discipline.

The counter-proposition is that a theory of observer-based description (even with unverifiable causes) is more than sufficient, provided it enables predictability and reliable expectancy in the mind of the observer. The counter-argument that might be made is, if we know 'what something does', we do not need to know 'why it is'. This potentially represents the error of presumption, where a phenomenon is explained (and justified) by reference to a presumed natural effect or cause (i.e. the naturalistic fallacy; Moore, 1903). This error also occurs when an effect (e.g. the attribution of 'life') is described as an epiphenomenon that emerges as a result of unknowable causes specific to an unrelated level of observation (i.e. the fallacy of emergence). The effect of the error is that new or interesting phenomena may be then explained using the inappropriate or inapplicable presumptions held within incorrect, yet familiar, characterizations (Peirce, 1960). This error can be avoided in an abductive method by critically examining the foundation principles used when describing the phenomena of interest, working out how these might be similar to those for other phenomena, and how they might need to be formulated differently.

The proposal of this chapter is to change the presumption from describing what thought does to examining 'why thought is', using principles for the composition, formation and reconfiguration of conceptions as the premise for
observations of significance. In answering the question: ‘What it looks like?’, the suggestion is that foundational principles can be derived from a comparison to similar phenomena about which more is known. The outcome desired is a set of principles that identify the primary features of interest in an explanatory theory specifically for conceptions.

3.3 How was it answered?

What is the theory?

The third phase in the abductive method providing the framework for this thesis is described as theory-generation. A useful broad distinction is made between the abductive phases of theory-generation, theory-construction and theory-appraisal (Haig, 2005a). Theory-generation precedes theory-construction, which enables subsequent theory-appraisal. Each phase involves the processes of an abductive inquiry, although the form of abduction used will be subtly different in each case (Haig, 2005a). Each phase is ideally guided equally by problem-constraints and solution-demands. Accordingly, rather than being a linear and segmented process, each of these primary stages operate recursively, with the points of commencement and completion explicitly kept in mind (Haig, 2005a). This chapter enables future theory-construction (Chapter Four) by first focusing on theory-generation and using appropriate abductive methods.

In a Peircean (Peirce, 1960) philosophical approach to scientific research, abduction primarily consists of “studying the facts and devising a theory to explain them” (p. 90) [CP 5.145]. Haig (2005a) also observes that, while the insights derived from phenomena-detection are an important type of scientific discovery in their own right (see Chapter Two) the real value from that study is to prompt an understanding of underlying causal mechanisms. It is the seeking of an explanation, not mere description, that leads to verifiable theories for previously unexplained effects. In the theory-generation phase of the abductive method the focus is directed towards formation of tentative propositions as
direct inferences for the explanation of puzzling facts (Haig, 2005a). This enables the proposition of dispositional theories that “provide us with oblique characterizations of the properties we attribute to things by way of their presumed effects under specified conditions” (Haig, 2005a, pp. 378-379). The theory-generation phase therefore involves the initial investigations necessary to form ‘merely plausible’ theoretical propositions. These propositions are subject to subsequent development and appraisal.

A grounding in Peircean philosophy means the abductive process derives its validity (and economy) from the combination of a “host of heuristics, rules, and principles that govern what counts as good explanations” (Haig, 2005a, p. 377). The methodological assumption is that by making conscious and pragmatic choices during the process of theory-generation the likelihood of forming better hypotheses is increased, leading to enhanced theories of explanation. The framing of those choices, making distinctions where there are otherwise none, is what enables the investigatory advantage of the abductive process.

**How was it applied?**

For the theory-generation phase of this abductive method the primary choice in emphasis can be framed as being between two alternative approaches: a) **existential abduction**, and b) **analogical abduction** (Thagard, 1988, 1992). Existential abduction postulates the existence of previously unknown objects, such as the existence of an unseen planet based on gravitational effects (Thagard, 1988). Analogical abduction involves a new hypotheses being formulated by relying on a former hypothesis that has worked in similar situations, such as possibility of an elliptical orbit for one planet based on the patterns of observation of the orbits of similar planets (Hanson, 1965).

Essentially, the difference is in the result, being either the discovery of a ‘novel theory for a new thing’ or the ‘appreciation of a new situation’ to which existing theory (with modifications) might apply.\(^{38}\)
Each of these two approaches in method has its own precautionary limitations. Existential abduction involves the risk of irrealist assertions of non-existent forces (N. Goodman, 1978). This risk is mitigated by the gathering of empirical evidence that directly demonstrates a single finite (if unknown) cause (Hanson, 1965). Analogical abduction involves the risk of making inappropriate associations. This risk is mitigated by ensuring there is clarity in the criteria for comparative similarity and the aptness of the comparisons drawn. To a significant extent the choice of either approach is mostly dependent on the quality of information presently available from existing observations. Strong data with an absence of theory suggests existential abduction. Weak data with strong theoretical comparisons suggests an approach in analogical abduction.

In the present case, at the conclusion of the phenomena-detection phase of this research and having generated a novel representation of data, nothing was directly known about the phenomena observed. Where there is an absence of causal information for observed phenomena it is valid in an abductive method to generate propositions by an analogical comparison to another system about which more is already known (Schurz, 2008). The purposes for using analogy are different in the distinctive phases of an abductive method. These may include: discovery, development, evaluation and exposition (Holyoak & Thagard, 1996). All four of these analogical processes are used in this thesis. For the theory-generation phase, the purpose of the analogy is novel discovery. The process of abductive analogical comparison for the purposes of discovery provides a dual advantage in that logical inconsistencies as differences can be just as informing as close analogical consistencies (Haig, 2005a). The action of comparison, rather than the presumption of consistency, provides new information in an unknown field, which leads directly to robust theory-generation. For these reasons, the analogical abduction approach was preferred in this instance for this research.

It is worth explicating on the use of analogy as a process of abductive logic and how this is contrasted with the use of descriptive or illustrative metaphors as a tool of rhetoric (Lakoff & Johnson, 1980). Rather than figurative or imaginative
similarity, the abductive analogy is based on a structural comparison (Schurz, 2008). To develop an effective abductive analogy, two stages are required, a) selection of the source analogy, and b) the isomorphic mapping of structural relations (Holyoak & Thagard, 1996).

First, the initial choice in the selection of a source analogy is primarily based on considerations of aptness (Haig, 2005a). To evaluate the aptness of any analogy it is methodologically worthwhile to consider the extent to which the source (i.e. the existing theory) and subject (i.e. the present inquiry) are alike, unlike, or merely neutrally associated (being where information is unavailable or irrelevant to the level of comparative abstraction) and any constraints in terms of similarity, structure and purpose (Holyoak & Thagard, 1996). An inappropriate analogy is one that is not ‘apt’.

Second, the efficacy of an abductive analogy relies on the correspondence of structural relations in higher-order abstract forms between the source and target (Holyoak & Thagard, 1989, 1996). These isomorphic structures of abstract comparison need to be identified specifically (Schurz, 2008). An analogy that is structurally incomparable will not generate propositions that are pragmatically useful (even though they may be figuratively simple). Peirce (Peirce, 1965) usefully framed a logical syllogism to explain the logical process of an analogical abduction (distinguishing this from unconscious inference):

A well-recognized kind of object, M, has for its ordinary predicates P[1], P[2], P[3], etc., indistinctly recognized. The suggesting object, S, has these same predicates, P[1], P[2], P[3], etc. Hence, S is of the kind M. [CP 8.64]

This logical process provides the structure in method for forming a valid analogy (that is not merely metaphor) by determining the predicates for mapping the source theory (i.e. M) to the target situation (i.e. S) (Holyoak & Thagard, 1996). The effect is to bring forth new relations of parallelism by creating a symbolic representation allowing new concept formation (Sørensen, Thellefesen, & Moth, 2007). From this grounding in theory, the application of the abductive process to the specific research question requires selection of an apt
source analogy and specification of the isomorphic predicates for the comparative analogy.

**What was done?**

The first step taken was to select the source analogy. In abductive theory, the locating of a source analogy may occur in at least four ways: *noticing, retrieving, compiling and constructing* (Holyoak & Thagard, 1996). Basic similarities may be noticed (e.g. sounds waves and ripples in water). The source or target may be retrieved from an earlier memory (e.g. a ‘snake-like’ circular Benzene ring). It may be compiled from evidence (e.g. breeding in artificial selection as a form of evolution). It can also be consciously constructed (e.g. the human mind as a model for computational theory). In this case, the process for locating the analogy came from noticing basic similarities, specifically around structure and purpose, and retrieving from memory one specific reference to a form of parallel inquiry.

In examining the possibilities for appropriate analogies to the phenomena-detected, I recalled the account of Chilean biologist, Humberto Maturana in the preface to his foundational essay in 1970, *The Biology of Cognition* (Maturana, 1980b). In that introduction Maturana describes how, when teaching medical biology, he could enumerate clearly a list of the descriptive features of the ‘consequences of life’. These included criteria such as reproduction, heredity, growth, and irritability. These descriptors used concepts such as adaptation, evolution, development and differentiation loosely tied together by the principles of natural selection. However, Maturana found that, despite the extensiveness of the established discourse, he could not answer the simple question: “*What was the invariant feature of living systems around which natural selection operated?*” (Maturana & Varela, 1980, p. xiii). He found that he could use the observations of scientific biology to talk about ‘how life is’ descriptively, but had no ability to identify ‘what life was’ definitionally. Significantly, he also had no real basis to explain ‘why life is’ theoretically, other than by using the terms of its historical (and present) descriptive explanations.
To answer his unique question Maturana innovatively proposed an alternative epistemological perspective, enacting a paradigmatic shift in the then existing premises of neurophysiology and neuroanatomy (Mingers, 1995). His innovation, in conjunction with Francisco Varela (2009), was to re-define the locus of observation, moving away from the identification of the entity within a descriptive criteria set by the researcher and relying instead on the autonomy of the living system as a unity for the primary source of our knowledge and understanding (Maturana & Varela, 1980). This involved a cognitive shift in the assumed primary source of the phenomena used in defining a living system’s distinctive operations. Maturana recalls the moment of formation of a coherent theory of autopoietic self-reference as a paradigm of observation in these terms:

Thus, eventually, I made a distinction between what I called self-referred and allo-referred systems, a distinction that separated systems that could only be characterized with reference to themselves, such as living systems, from systems that could only be characterized with reference to a context. (Maturana & Varela, 1980, p. xiii)

This approach to the inquiry into ‘why life is’, relying on seeing the organism as an autonomous entity and knowing it by means of reference to its self-referent nature, reflects structurally some of the difficulties of the ‘observer-problem’ in describing the phenomenon of conceptions without reference to a context. To answer similar questions it is recognized that any limitations faced are, not due to problems with our processes of our thinking, rather they are instead a function of the assumptions in our processes of looking.

Consequently, a direct methodological comparison can be drawn with the research questions of this thesis and those faced in the development of neurobiological theory over forty years earlier when examining a different ontological object. Because of the similarities between these research aims (i.e. the analogy of the formation of organisms to the formation of conceptions) the principles of autopoiesis theory in neurobiology potentially provided a directly relevant analogical comparison. The premise then adopted was that, if comparative principles can be derived from the research into the ‘formation of
the biological’, this may inform the formation of principles that contribute to the formulation of a counterpart theory for the ‘causation of the conceptual’. The only difficulty was in not generating a conception of autopoiesis theory applicable to conceptions, but rather to use the principles of autopoiesis theory for the purposes of analogical comparison.

For the second component, being the mapping of the isomorphic structures, the analogy of neurobiology also provided a close structural ‘fit’. A foundational principle in the formulation of an abductive theory is its reliance on parsimony and economy (Sober, 1987). This is achieved by introducing the minimum number of propositions necessary to develop explanatory sufficiency. This follows the abductive principle “one should not postulate the existence of something unless such postulation is necessary to explain one’s observations” (Sober, 1987, p. 217). Peirce stresses this principle in his own pragmatist approach to scientific theory-generation:

Thus, in metaphysics, the maxim called Ockham’s razor, the effect that more elements must not be introduced into a hypothesis until it is absolutely proved that fewer are not sufficient, is a sound economic principle which ought to guide the scientific metaphysician. (Peirce, 1960, p. 363) [CP 6.535]

From this premise, the three definitive characteristics derived from the observations of phenomena detected (see Chapter Two) were used as the basis for the predicates for comparison. Those predicates were: a) autonomy; b) boundary; and c) centrality. The question for the abductive analysis was how do the predicates of autopoiesis theory compare to these specific observations in the tentative development of a theory for conceptions? In undertaking this process it was recognized that the utility in this approach is that whether there is a direct correlation between source and target or only a limited basis for comparison, useful information is always potentially gained by the act of critical examination. Importantly, the process of analogical evaluation provides the potential for similarity and (more importantly) the possibility for the recognition of (anomalous) differences (Bateson, 1979).
3.4 What was discovered?

Summary of Findings

The results of the abductive process of theory-generation were that the three definitive features derived from the phenomena of conceptions generated a set of three propositions as tentative principles for explanations of causation.

The three definitive features of conceptions were identified and described: as a) autonomy (i.e. self-defining), b) boundary (self-limiting) and centrality – (self-normalising) (see Chapter Two). These were compared by way of analogy to three theoretical principles in the theory of autopoiesis, being: a) autopoiesis (self-production), b) homeostasis (self-containment), and (by extension) c) praxogenesis (self-enactment).

The primary finding was that it is plausible to describe a conception as an autopoietic (or autopoietic-like) entity and (to the extent of that analogy) useful analogical propositions can be derived from the principles of autopoiesis in development of an equivalent theory for the formation of conceptions. The results of these comparisons are set out in Table 3.1.

<table>
<thead>
<tr>
<th>Minimal Cell</th>
<th>Propositions</th>
<th>Conceptions</th>
<th>Comparisons</th>
<th>Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autopoiesis</td>
<td>Self-Production</td>
<td>Autonomy</td>
<td>Self-Definition</td>
<td>Flow</td>
</tr>
<tr>
<td>Homeostasis</td>
<td>Self-Containment</td>
<td>Boundary</td>
<td>Self-Limitation</td>
<td>Flex</td>
</tr>
<tr>
<td>Praxogenesis</td>
<td>Self-Enactment</td>
<td>Centrality</td>
<td>Self-Normalization</td>
<td>Flux</td>
</tr>
</tbody>
</table>

Three new propositions for conceptions were derived as a result of these comparisons. These constitute tentative principles for the formation of conceptions. They are most easily known by the shorthand descriptors of: a) flow, b) flex and c) flux.
The process by which possible principles for conceptions were derived is explained by a detailed comparison between the analogical principles for the formation of autopoietic entities and their application to the formation of conceptions. These analogical comparisons, together with their implications for a theory of conceptions, are discussed with reference to the source literature in the following sections as three distinct propositions.

**Discussion of Findings**

The early work of Maturana and Varela (Maturana, 1980a, 1981; Varela & Maturana, 1972; Varela, et al., 1974) focuses on the autopoietic characteristics of the ‘minimal cell’, which provides the clearest concrete application of the principles applicable to any similar ‘autopoietic entity’. While Maturana’s original research work has subsequently been extended from biological organisms, to human individuals (Varela, et al., 1993), to social systems (Luhmann, 1995), organizations (Bakken & Hernes, 2003) and the phenomena of cognition in living systems generally (Thompson, 2007; Thompson, Lutz, & Cosmeli, 2005), and has generated extensive research in neurophenomenology and autopoietic systems theory (Jantsch, 1981; Luhmann, 1990; McMullin, 2004; Thompson, et al., 2005; Varela, 1999a), it is the original descriptions (as modified by Maturana personally) for the minimal level of cellular organization that are primarily relied on in this section. This is simply to ensure the accuracy of the analogical comparison at the selected scale of the isomorphic abstraction. This makes the dimensions examined conceptually simpler, theoretically more abstract, and potentially much more exacting, in the comparisons derived.

For the purposes of analogy, it is only the comparative similarities between the principles for formation of the minimal autopoietic entity and the preliminary differentiations identified for characteristics of conceptions that are relevant. This analysis involves the return to first-principles for a defined theoretical context. Accordingly, preference is given to the source concepts and original language (in all its complexity). Some precision is required in the analysis and the source literature is quoted from appropriately to facilitate this.
First Proposition – Autopoiesis (Flow)

The first analogical predicate is the principle of autopoiesis. This is used to understand the definitional characteristic of ‘autonomy’. Maturana (1999) provides the basis for the autopoiesis approach (in a 1974 conference paper) identifying that in this view autonomy is the defining feature of a living system. The way in which autonomy as a characteristic of an autopoietic system occurs is described in the following terms:

...a living system is properly characterized only as a network of processes of production of components that is continuously, and recursively, generated and realized as a concrete entity (unity) in the physical space, by the interactions of the same components that it produces as such a network. (p. 149)

In this innovative definition Maturana identifies how the ‘state-determined system’ (i.e. an autopoietic entity) can change structure while retaining identity by virtue of alterations in its internal relationships of components (Maturana, 1999). This distinction between structure and organization is fundamental to the theory of autopoiesis (Mingers, 1995). The implication is that in autopoietic theory the focus is on the continuously forming ‘processes of production of components’ that, as a result, define organization. In this way, the analysis of the dynamics of composition are defining of autonomous identity, rather than relying only on observer attributions of static form as a basis for description. Existence is not a function of observation; it is a fact of composition.

The primary feature of an autopoietic system relevant to an understanding of its composition is relational concatenation (Maturana, 1980a, 1980b). This is how the relations of the components in a chain of causation form a coherent structure of organization. In an autopoietic system, this pattern is one of ‘self-production’, which occurs simply by virtue of the unique configuration of the structure of its processes as components of its form. This emphasis on the relations of components in producing an entity generating its ‘factibility’ is explained as follows:
...the establishment of any system depends on the presence of the components that constitute it, and on the kinds of interactions in which they may enter; thus, given the proper components and the proper concatenation of their interactions, the system is realized... The establishment of an autopoietic system cannot be a gradual process; either a system is an autopoietic system or it is not. (Maturana & Varela, 1973, pp. 94-95)

The relevant analogical principle is that an autonomous entity forms by the coherence of the operation of the relations of its components, without the requirement for observer attributions. The entity occurs by virtue of the formative dynamics of the composition of it parts (i.e. self-production). If this principle were applicable to conceptions, within a broad class of conceptions it is likely there would be a generalized pattern of uniquely different compositions of essential fundamental forms of components. Conceptions which are existent would be those with internally coherent relations of composition. Such was the pattern described by the first category of the detected phenomena: autonomy. The conclusion is that establishment of compositional sufficiency is not dependent on the observer; it is a fact of composition of the conception. This conclusion can be labelled as the principle of: self-definition.

Proposition: To the extent conceptions are (or are like) autopoietic systems, the distinguishing feature of self-definition occurs when there is compositional coherence. This is represented by the concept of flow.

Second Proposition – Homeostasis (Flex)

The second analogical predicate is the principle of homeostasis. This is used to understand the definitional characteristic of ‘boundary’. Homeostasis, in neurobiology, has a unique meaning and refers to the self-regulation of the internal environment of an autopoietic entity to maintain a dynamic equilibrium in self-producing processes. The definition given is that, for an autopoietic entity, homeostasis is the “structure that determines the particular perturbations it can suffer without disintegration, and hence the domain of interactions in which it can be observed.” (Maturana & Varela, 1973, p. 81).
From the observer perspective, homeostasis results in an appearance of (literally) 'standing-still', being the maintenance of an autonomous identity notwithstanding the disturbing perturbations. From the autopoietic entity's perspective, homeostasis is a resultant property not of stasis, but of change. The important fact of the autopoietic definition of homeostasis is that identity is maintained by a reconfiguration of processes between components. This is described by Maturana and Varela (1973) in connection with their foundational definition of an autopoietic system (building on the concept of autonomy):

What makes this system a unity with identity and individuality is that all the relations of production are coordinated in a system describable as an [sic] homeostatic system that has its own unitary character as the variable that maintains constant through the production of its components. (p. 92)

Therefore, the unique meaning of homeostasis in autopoiesis theory becomes a central definitional component in determining the presence of autopoietic identity. This too utilizes the distinction between structure and organization, where the organizational result of relations remain constant, even though the components of structure might alter (Mingers, 1995). The original wording of this distinction is worth quoting for absolute clarity:

Therefore, an autopoietic machine is an [sic] homeostatic (or rather a relations-static) system which has its own organization (defining network of relations) as the fundamental variable which it maintains constant... Since the relations of production of components are given only as processes, if the processes stop, the relations of production vanish; as a result, for a machine to be autopoietic, its defining relations of production must be continuously regenerated by the components which they produce. (Maturana & Varela, 1973, p. 79)

In this clarification it is explained that autopoiesis and homeostasis are equally necessary for the continued existence of the autopoietic entity. The flow between components and the flexibility in the relations of organization of those components contribute equally and it is this combination that leads to a resultant feature; being the characteristic of boundary.

The concept of boundary is also precise in autopoiesis theory. The relational concatenation (to use Maturana's phrase), being the chain of causation between
components, creates a unique pattern as the entity's *relations of production* become localized. This is described as the “neighbourhood of relations” (p. 91) of the processes of the autopoietic entity (Maturana & Varela, 1973). The proximity of these relationships then defines the “topology of the autopoietic organization” (p. 90-91). The topology of the entity becomes, in effect, its physical boundary operating as a dynamic recurrence. To the observer this ‘boundary’ appears static (or even pre-existent). To the entity, the boundary is the result of a continuous process of its ‘relations of components’ operating in momentary coherence. In this sense, the autopoietic entity is described as being ‘operationally closed’, in that it needs no other components for its existence, while being ‘functionally open’ in thermodynamic terms, in that it remains in a continuous process of exchange with its environment (Thompson, 2007).

Significantly, the autopoietic entity can maintain homeostasis while still changing all of the configurations (i.e. the pattern of *flow*) of its internal processes.

The resultant effect of the process of maintenance of the constant relations of the components of an autopoietic system is the ‘autopoietic space’ (Maturana & Varela, 1973). The autopoietic space can be described by an observer, however, this localization of processes is in fact “curved and closed in the sense that it is entirely specified by itself, and such a projection represents our cognitive relation with it, but does not reproduce it” (p. 92). It is the physical (or conceptual) space as defined by the ‘neighbourhood of relations of production’ that gives the autopoietic system its topological unity; not the definition of ‘boundary’ by observation (Maturana, 1999). Accordingly, any concept of ‘environment’ for an autopoietic system is an understanding held only by attribution by the observer, not the autopoietic entity itself (Maturana, 1970a). Maturana, while introducing the concept of cognitive niche, sets out these two perceptions explicitly, for both entity and observer, to prevent conflation of this important distinction:  

The niche is defined by the classes of interactions into which an organism can enter. The environment is defined by the classes of interactions into which the observer can enter and which he treats as a context for his interactions with the
observed organism. The observer beholds organism and environment simultaneously and he considers as the niche of the organism that part of the environment which he observes to lie in its domain of interactions. Accordingly, as for the observer the niche appears as part of the environment, for the observed organism the niche constitutes its entire domain of interactions, and as such it cannot be part of the environment that lies exclusively in the cognitive domain of the observer. (Maturana, 1980b, p. 10)

The significance of this distinction is more clearly understood when the autopoietic entity sustaining homeostasis is a human social system as constituted by the semantic forms of its use of language. The foundational principle is stated as: “The domain of discourse is a closed domain, and it is not possible to step outside of it through discourse.” (Maturana, 1980b) (p. 39). This principle does, however, enable multiple perceptual ‘environments’ to be enacted by different autopoietic entities, differently, in differing degrees of inclusivity through recursion (Maturana, 1999). The effect is that each autopoietic domain of description has its own integrity, or incongruity, and while closed operationally, is in its internal configurations, open infinitely (Thompson, 2007). In this way, perceptions and conceptions of the environment can (to use Maturana’s phrase) be both bounded and infinite. The conclusion is stated (with reference to descriptions as forms of autopoietic relations) as:

This domain is both bounded and infinite; bounded because everything we say is a description, and infinite because every description constitutes in us the basis for new orientating interactions, and hence, for new descriptions... The cognitive domain of the observer is bounded but unlimited; he can in an endless recursive manner interact with representations of his interactions and generate through himself relations between otherwise independent domains. These relations are novelties which, arising through the observer, have no other (and no less) effectiveness than that given to them by his behavior. (Maturana, 1980b) (p. 50-51)

In this way, progressive descriptions by semantic autopoietic systems, which are coherent in their components of composition, enable increasing approximations of the ‘environment’ from within the autopoietic systems. New concepts, in new relationships, using new word forms, can enact increasing domains of meaning. From this recognition an enhanced understanding of how evolution and learning possibly occurs was subsequently developed (Maturana, 1980a, 1999; Maturana & Varela, 1987; Varela, 1993).
The significance of this principle in the study of conceptions is that not only is the social construction of the ‘environment’ able to be expanded indefinitely in the formation of novel human conceptions, the conceptual construction of the conceiver can also be increasingly known (although recursively). Maturana expressly makes this link of the application of an isomorphic principle, from biology to cognition, in his originating essay:

Furthermore: if such an observer through orientating behavior can orient himself towards himself, and then generate communicative descriptions that orientate him toward his description of this self-orientation, he can, by doing so recursively, describe himself describing himself ... endlessly. (Maturana, 1980b, p. 29)

The analogical principle is that homeostasis in autopoiesis provides for the formation, confirmation and subsequent expansion of the boundaries of the environment of perception while maintaining consistent the identity of the autopoietic entity (i.e. self-containment). If this principle were to apply to conceptions, the pattern that would be apparent in a broad class of conceptions would be to find different definitional contexts of specifically defined environments that are operationally-closed, and potentially the creation of these in infinite spans of recursion. Such was the pattern described by the second category of the detected phenomena: boundary. Within the boundary of operational closure, the environment of a conception can be reconfigured infinitely without altering its identity. This conclusion can be labelled as the principle of: self-limitation.

Proposition: To the extent conceptions are (or are like) autopoietic systems, the integrity of identity requires effective environmental self-containment, which can be structurally recursive. This is represented by the concept of flex.

**Third Proposition – Praxogenesis (Flux)**

The third analogical predicate is the principle of praxogenesis. This is used to understand the definitional characteristic of ‘centrality’. The principle of
praxogenesis is a new proposition to consolidate principles from autopoesis theory in their application to conceptions (Varey, 2009a, 2011a). This principle derives from and is an extension of the process in autopoesis theory described by Maturana (Maturana, 1970a) and Maturana and Varela (1973) by which neurobiological systems historically develop through embodied action. This process of the genesis of formation of identity by reflexive engagement with a fluctuating environment is known by the term ‘structural-coupling’ (Maturana, 1999). In its original formulation, Maturana (1999) explains how the recurrent maintenance of the autopoietic entity’s organization, as determined by its structure of operations, so as to enable homeostasis under conditions of perturbation, means an internal-external pattern of relations is formed over time. The descriptor ‘praxogenesis’ is proposed to encompass the orientation of this temporal sequence of relations. The proposition is that origins of the unique and definitive structures of an autopoietic entity are dependent on the historical patterns of its embodied first actions (i.e. originating praxis). To ensure the accuracy of the foundational meaning for this interpretation, it is worth quoting the source of the original explanation:

The result of establishment of this dynamic structural correspondence, or structural-coupling, is the effective spatio-temporal correspondence of change of state of the organism with the recurrent changes of state of the medium while the organism remains autopoietic. (Maturana, 1999, p. 156)

This description highlights that ‘spatio-temporal correspondence’ occurs as a direct function of the autopoietic entity’s structure. This occurs in relationship with the ‘medium’ in which the entity is interactive. The pattern of ‘recurrent changes’ creates in the entity a structural correspondence in time (and over time). Where these patterns are recurring this generates, over time, a normalized state, which becomes a location of ‘centrality’ for the autopoietic identity.

In neurological autopoietic entities (i.e. those with a nervous system) the neurologic function “continues and elaborates the biologic of autopoesis” (p. 46). In this way ‘thought’ enacts the autopoietic structure reciprocally, and ultimately, the environment structurally. In summary, the proposition made is
that the unique identity of the organism is reflective of, and dependent on, the structural-coupling of the entity with its environment as a result of conditions at the time of self-production (and thereafter) (Maturana, 1988, 1990, 1999). This is demonstrated by reference to Maturana’s original proposition:

That the autopoietic state[s] that an organism adopts are determined by its structure (the structure of the nervous system included) and that the structure of the organism (including its nervous system) is at any instant the result of its evolutionary and ontogenic structural coupling with the medium in which it is autopoietic, obtained while the autopoiesis is realized. (Maturana, 1999, p. 149)

The implications of this conclusion are significant. The environment, as it were, is taken to be a neutral factor in autopoietic theory. The structure of the autopoietic entity (as opposed to its pattern of organization, which remains constant) changes in receptivity to particular environmental triggers. To the autopoietic entity the perceptual environment (in its totality) simply ‘is.’ Consistent with the theory, it is the self-producing functions of organization in the autopoietic entity that causes a response, not the contextual environment, which provides merely the ‘context’ for its realization. To the extent there are repeating patterns to that response causing recurrent cycles of changes in the autopoietic entity, for the autopoietic entity the perceptual environment subsequently ‘becomes’ and is by repetition so enacted. It is necessary to quote Maturana (in translation from the original De Marquinas y Sees Vivos) and highlight specific concepts to navigate past the dilemma of inaccurate re-descriptions:

Therefore, the nervous system defines through the relative weights of the patterns of interactions of its various components, both innate and acquired through experience, which relations will modify it at any given interaction. [Cf. Maturana 1965]. Or, in general, the organization and structure of a living system (its nervous system included) define in it a ‘point of view’, a bias or posture from the perspective of which it interacts, determining at any instant the possible relations accessible to its nervous system. (Maturana, 1980b, p. 21)

Maturana explains in this quoted passage how the entity structure and the ‘point of view’ embodied ‘in it’ predispose the autopoietic entity to ‘possible relations accessible to its nervous system’ from its environment. When there are perturbations in the environment, constituting triggers within the usual range
of responses required to maintain homeostasis, multiple states in the autoopoietic entity may be enacted from those made possible, at that time, by the dynamic potentials of the entity’s structure, including the boundaries of recursions. The continuation of a state of autopoiesis leads to enactions of an embodied structure suitable for the environment that maintains that organization (Mingers, 1995). The enaction of embodied actions is where recurrent perceptually guided action produce consistent cognitive anticipations and structures (Varela, et al., 1993). Maturana expands on the significance of expectation and prediction in this description of the ‘reciprocity of receptivity’:

Moreover, since the domain of interactions of the organism is defined by its structure, and since this structure implies a prediction of a niche, the relations with which the nervous system interacts are defined by this prediction and arise in the domain of interactions of the organism. (Maturana, 1980b, p. 21)

Therefore, it could be said that, in autopoiesis theory, an autoopoietic entity does not exist in an environment, but enacts itself within the predictive niche of a domain of potential interactions. This approach is described as ‘organism-environment co-determination’ where “organism and the environment construct each other in development and evolution” (Thompson, 2007, p. 294). This leads to the inference that the third element in an autopoietic system is that the formation of identity, leads to a centrality of normality, which enables responsive selections from the total environment of potential interactions. When this occurs, the autoopoietic entity is not only existent, it becomes enactive. The entirety of this process as patterning has been is described by the term praxogenesis to represent the reciprocating effect of the historical origins of embodied enaction in the present enactment of each future moment of continued autopoietic functioning.

The analogical principle relevant to conceptions is that the principle of praxogenesis proposes that autoopoietic entities, as well as having compositional coherence and operational closure, by their attunement to environmental opportunities create possibilities for entity-medium environmental co-development (i.e. self-enactment). If this principle were applicable to conceptions, the pattern that would be apparent within a broad class of
conceptions would be to find a propensity to orientate towards situations of historically identity-defined normalcy, notwithstanding environmental triggers to the contrary. Such was the pattern described by the third category of the detected phenomena: *centrality*. The unique history of each entity creates an autopoietic proclivity for environmental receptivity, which manifests as a normalising recurrent stability in reciprocating co-enactions. This conclusion can be labelled as the principle of: *self-restoration*.

*Proposition*: To the extent conceptions are (or are like) autopoietic systems, reciprocal co-enactions enable recurrent normalcy as a centralization within the dynamics of perturbation and fluctuating change. This is represented by the concept of *flux*.

**Three Propositions - Summary**

The first proposition is the descriptor of ‘autonomy’ reflects, by analogy, the principle of compositional sufficiency (i.e. self-production). The conclusion is that conceptions have an autonomous existence by the fact of the coherency of their composition (not by an observer’s attribution). The implication of this is that ‘self-definition’ is one proposition for the causation of conceptions – the resultant of which is autonomous formation.

The second proposition is the descriptor of ‘boundary’ reflects, by analogy, the principle of configurational redundancy (i.e. self-containment). The conclusion is that conceptions have operational boundaries, which in turn have reflexive boundaries in patterns of sublimated recursion. The implication of this is that ‘self-limitation’ is a second proposition for the causation of conceptions – the resultant of which is structural inclusion.

The third proposition is the descriptor of ‘centrality’ reflects, by analogy, the principle of directional reciprocity (i.e. self-enactment). The conclusion is that conceptions have reflexive normalizations, being responsive to the effect of enactment within a context. The implication from this is that ‘self-restoration’ is
a third proposition for causation of conceptions – the resultant of which is recurrent normalization.

Conjunctively, the first principle of autopoietic composition (poiesis), and the second principle of homeostatic configuration (stasis), combines with the third principle of praxogenic co-enactment (praxis). In this way, poiesis, stasis and praxis are co-joined as three components of one process that generate autopoietic phenomena, such as the formation of conceptions.

It is proposed that the three co-joined principles of self-production, self-containment and self-enactment from autopoiesis theory have theoretical correlates for conceptions. These are the principles of self-definition, self-limitation and self-restoration. In this way conceptions, as autopoietic-like entities, establish compositional sufficiency, configurational redundancy and directional reciprocity as a dynamic process. These three distinct dynamics are represented by the concepts of: flow, flex and flux. The semantic distinctions are summarized for convenience as a statement of conclusions in Table 3.2.

### Table 3.2 – Comparison of Analogical Principles

<table>
<thead>
<tr>
<th>Existing Principle</th>
<th>Conception Principle</th>
<th>Abductive Criteria</th>
<th>Resultant Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Production</td>
<td>Self-Definition</td>
<td>Compositional Sufficiency</td>
<td>Autonomous Formation</td>
</tr>
<tr>
<td>Self-Containment</td>
<td>Self-Limitation</td>
<td>Configurational Redundancy</td>
<td>Structural Inclusion</td>
</tr>
<tr>
<td>Self-Enactment</td>
<td>Self-Restoration</td>
<td>Directional Reciprocity</td>
<td>Recurrent Normalization</td>
</tr>
</tbody>
</table>

In summary:

a) the concept of flow is that a conception is formed by the relations of its components (i.e. self-definition);

b) the concept of flex is that a conception is contained by the boundary of its inclusions (i.e. self-limitation); and

c) the concept of flux is that a conception is located by the centrality of its normalizations (i.e. self-restoration).

These three principles, as derived from the foundational logic of autopoiesis theory, are more easily understood as propositions applicable to the
phenomena of conceptions in terms of tentative principles of causation – and can be known simply as the principles of \textit{flow}, \textit{flex} and \textit{flux}.

The conclusion from this analysis is that these tentative principles characterize the conjunctural dynamics enabling the formation of the phenomena detected in compilations of conceptions. It is argued that these principles can be then used to provide a basis for the development of a hypothesis for the formation of conceptions (see Chapter Four).

\textbf{Evidence in Support}

There is confirmation for this conclusion anecdotally within autopoiesis theory itself. This provides support for the application of autopoiesis theory to the autopoietic-like entity that is a conception. Notably, Maturana and Varela (1973) come to a similar formulation in the description of how cellular autopoiesis operates at the molecular level.\(^{47}\) They describe how production of:

\begin{itemize}
  \item[a)] the ‘relations of specifications’ (i.e. the composition of components) determine existential identity;
  \item[b)] the ‘constitutive relations’ (i.e. the structure of relations) determine topology and boundary; and
  \item[c)] the ‘relations of order’ (i.e. the sequence of responses) determine rates of production and fluctuations in constancy.
\end{itemize}

These three features represent the \textit{flow}, the \textit{flex} and the \textit{flux} of a living system. Essentially, the individual autopoietic entity is seen as a continuously repeating variable appearing constant, as reflected in the description of the summation of the theory:

\begin{quote}
What makes this system a unity with identity and individuality is that all the relations of production are coordinated in a system describable as an homeostatic system that has its own unitary character as the variable that it
\end{quote}
maintains constant through the production of its components. (Maturana & Varela, 1973, p. 92)

By analogy, a conception may exist in ‘its own unitary character’ notwithstanding that its specific content may alter, and might do so continuously, provided it remains coherent with central integrity as an organized entity. It is the combination of a conception’s constitutive components, the topology of its boundary defining its operational environment, and the historical patterning of its structural-coupling within its forms of enactment that provides its unique character. The proposition in support is that this apparent constancy might adapt and change over time without diminishing existential integrity, provided the three essential conditions for identification of a conception continue to be present. The analogical implication for systems of conceptions is that thoughts may change, beliefs and their structures may alter, yet the conception, as an identifiable entity, remains.

What is of even greater interest is that this combination of features was seen by Maturana and Varela (1973) as enabling the autopoietic formation of “a dynamic physical topological unity” that endures in “three dimensional autopoietic space” (p. 92). In this way, it is not the content of the minimal cell and its description that defines its existence, as this composition may alter. Instead, it is the dynamics of its enduring organization which becomes an existential fact independent of the attributions of the observer.48 As Maturana and Varela (1973) express, only the configuration of relations is required to constitute the cell and “the only thing that defines the cell as a unity (as an individual) is its autopoiesis.” (p. 93).49

The significance for a theory of conceptions of this conclusion is that the analogy with autopoietic entities has the implication that there is potentially a landscape of topography for ‘thought’ that necessarily involves the fact of representation in ‘three-dimensional space’, the existence of which is not dependent on an observer’s conception. This fact would constitute a discovery. However, it would do so only in the same way that an existent species, which has taken thousands of millennia to form in an ecology of co-existence, is
'discovered' by an astute abductive explorer entering into that landscape for the first time with the appropriate equipment so as to enable detection. The purpose of this thesis, is to enable that exploration.

Additional Insight

The additional insight gained from this chapter came from the reflection on the most recent advances in the evolution of autopoiesis theory and its origins as one unique ‘species’ of thought. The metaphor is intentional, as autopoiesis in explaining the fact of life has implications for the prediction of evolutions in thought. Its application to systems of conceptions raises significant questions for the future of thought as an evolutionary system. This has particular significance to the way we form and frame sustainability questions and their solutions.

Speaking metaphorically, like many new forms of life, having survived initially perilous conditions in the political turmoil of Chile at the time, the theory itself then took on a life of its own (Varela, 2009). More than a meme, the conception of autopoiesis as its own species, evidenced by the fact of its existence in a unique niche, found in travelling to other domains of interaction new potentials for adaptation (Zeleny, 1980a). Like islands in the Galapagos archipelago, different features of the theory had evolutionary adaptive advantage for the many fertile grounds on which they landed, whether it be art, law, environmentalism, computation, communication or love (Luhmann, 1996, 1998, 2000a, 2000b; Maturana & Bunnell, 1999). With development over time, and re-descriptions in other observer’s mind, the resultant forms of autopoiesis as a conception may have become only faintly reminiscent of the origins of its first formation (Jantsch, 1981). Diversity resulted as offspring of the ‘concept’ struggled through their own formation, evolution and communication. The immense work in this field, with the benefit of ‘field glasses’ that can see far through the trees of entanglement, is seen as a delight of colour and variation by a naturalistic observer of the phenomenon of thought (McMullin, 2004). The harder task, of course, is to put down the glasses from aboard one’s own visiting
vessel and learn what it means to ‘swim to other islands’ totally unencumbered (Maturana & Varela, 1987) and originate one’s own form of novel application.

Illustratively, the enactive paradigm based on biological autopoiesis (Varela, et al., 1993) shifts evolutionary theory from the observer-based description of organisms gradually adapting to design problems posed (or imposed) by an independent environment, towards an understanding of an ecological evolutionary perspective. This evokes questions of the ‘fit’ between each organism and its co-enactive autopoietic niche (Thompson, 2007). Evolutionary ‘fitness’ is then seen not as an invariant quality of continued survival, but rather as situational expressions in a wide range of potentialities (Thompson, 2007). In biological life, the diversity of its many successes (and the redundancy of its even greater number of failures) suggests that no one particular structural form, other than those that endure and are living, are relatively superior to any others (Thompson, 2007). Evolutionary success on the basis of enactive evolution and structural-coupling is then, not based on the optimality of design to an environment described by an observer, but “viability in the face of an unpredictable or unspecified environment” interacted with continuously by an entity (Thompson, 2007, p. 208). The capacity of the autopoietic entity for life is then the ability to stay within a ‘zone of viability’ in situations of increasing unpredictability with anticipation of recurrent changes and unanticipated perturbations (Thompson, 2007). The context for this viability is “mutual co-definition” where “we are intrinsically interdependent and mutually defined by what we do” (Varela, 1993, p. 104)

The insight gained is that by the application of autopoiesis theory to systems of conceptions evolutionary assumptions of the ‘fitness’ of thought, generally, but more poignantly, our own ideas specifically, must be contextualized into the near future of past patterns of praxogenic habits. In advancing an existing theory we are not necessarily ‘evolving it’, so much as repeating it. The following of a ‘path laid down while walking’ (Varela, et al., 1993) may not necessarily be enabling knowledge, only continuing it. In the embodied co-enactment of a discourse the environment of thought becomes its own
autopoietic island. The success of sustainability theory will ostensibly be the success of the system of its conceptions, as each conception continues in its own direction.

The implication for me, in this research, was that by a self-enforced reading of the back-story of the foundational premises of autopoiesis theory I had to specifically exclude from my analysis the work I was primarily interested in, relating to cognition, phenomenology, perception, embodied action, semantic communication, consciousness evolution and social organization (Bakken & Hernes, 2003; Bitbol & Luisi, 2004; Bourgine & Stewart, 2004; R. Kay, 2001; Luhmann, 1990; Varela, 1981). The reason for this was that while an analogy can be extended indefinitely ‘conceptions’, as abstract entities, have no mind, experiences, sensations, bodies, conversations, recorded histories or purposeful communities. The autopoietic theory of cognition as it applies to individual humans was therefore not directly applicable to the structural dynamics of conceptions. This involved the learning of unlearning, the re-reading of the already read, and the listening to the listener in ways that were unfamiliar.

This highlighted for me the role of praxis in research, being the lived and embodied experience of analysis, where the autopoietic system of the formation of one’s own conception is guided by our own prior patterns of recursion, reciprocation and repetition. The implication of this recognition is that the researcher must have explanations of their explaining. In later essays, Maturana (Maturana, 1988, 1990) speaks to this and explores autopoiesis at the human scale, proposing that for individuals there are ‘operational coherences’ in the form of explanations that occur when we are functionally open to experiences, yet ‘operationally closed’. The effect he proposes is that there are, for individuals, as many cognitive domains as there are ‘domains of adequate actions’ (Maturana, 1990). Maturana’s explanation, for explanations, is that the kind of reality that we live in ‘as praxis’ is a domain of explanatory propositions, which reflects at any moment the flow of our interpersonal relations and ‘what sort of co-ordinations of actions we expect to take place in them’ (Maturana, 1990). I learned from this process the difficulty, and the possibility, of a
conscious change in conceptual trajectory. This is the practice of ‘unknowing’ in an abductive theory. What I understand now is how this is necessary in the evolution of sustainability theory.

From this experience, the understanding of Peirce’s (1960) description of how abductive thought is a product of successful evolutionary habits. By conscious application, we can evoke pragmatic selections for the very next direction, within a trajectory of previously successful applications. To consolidate this understanding, and the praxis for the very next steps in the thesis process, I for the first time had an embodied recognition of Peirce’s statement:

> Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea; ...if we are ever to learn anything or to understand phenomena at all, it must be by abduction that this is to be brought about. No reason can be given for it, as far as I can discover; and it needs no reason, since it merely offers suggestions. (Peirce, 1960, p. 106) [CP 5.171].

Perhaps, one contribution of this thesis is to discover, using abduction, the reasons for abduction’s effectiveness, being what Peirce himself could not find in being the ‘origin of the praxis’ and living out the principles of his own unique conception.

### 3.5 Summary

This chapter concludes that for Research Question #3, the analogical propositions derived for conceptions are summarized as:

- the feature of autonomy derives the principle of *flow* (self-definition);
- the feature of boundary derives the principle of *flex* (self-limitation);
- the feature of centrality derives the principle of *flux* (self-restoration).

The inquiry by analogy into reasons for phenomena observed led to three principles as tentative propositions. The next phase of the research method shifts the inquiry from theory-generation to theory-formulation. This involves
theory-formulation for conceptions specifically. This next phase of the research method asks the abductive question: *What explains it?*
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Chapter Four – What explains it?

4.1 Introduction

The aim of this chapter is the formulation of a hypothesis that explains the formation of conceptions. The general propositions formed (Chapter Three) are used directly to generate a specific theory for conceptions. The requirement in abductive pragmatism is to select only hypotheses that will generate theories with explanatory worth and pragmatic utility.

The abductive method used to answer the research question for this chapter is described as theory-formulation. In this abductive phase plausible hypotheses are proposed as tentative theories of explanation. A ‘dialogical’ emphasis was selected as the appropriate abductive theory approach. The inquiry was guided by an eight-stage syllogistic argument scheme (designed for this purpose).

The outcome of this chapter is the articulation of three inter-related explanatory hypotheses for the formation of conceptions. These explanations are derived from the proposed principles (Chapter Three) and admitted as being plausible, subject to the feasibility of defeasance conditions (Chapter Five).

4.2 What was the question?

Research Question #4

*What hypothesis best explains the formation of systems of conceptions?*

This question contains a familiar assumption in an abductive method that there is a 'best' explanation that can be derived as an inference from facts or phenomena. This assumption, unique to abductive theory, requires a technical clarification. Commonly, informal processes of abduction are characterized by
the phrase ‘inference to best explanation’ (Lipton, 1991). This derives from the use of abductive inference in scientific process to select a preferred theory where alternatives exist (Hintikka, 1998). This selection between potential hypotheses represents a common step in exploratory research work (Atkinson, Delamont, & Coffey, 2003). This is ordinarily one part of the normal discretions exercised by the deductive researcher.

In a formal abductive method the generation, formation, formulation and selection of a preferred hypothesis has a number of specific considerations. Significantly, the ‘best’ explanation is not the one that is preferred in terms of being consistent with a deductive or rhetorical argument. Instead, it is the hypothesis that advances the research most significantly, which may include disproving a particular line of otherwise promising inquiry (Fann, 1970). Within the overarching assumption of pragmatism, the best inference may also be a hypothesis that with great economy can be easily tested and dispels the greatest number of potentially viable theories. Additionally, the inclusion of anomaly is essential for explanatory breadth, rather than its exclusion for explanatory consistency, and a ‘best’ explanation is one that includes all anomalies. This overall approach could be characterized as an assumption of advancements towards truths (rather than the advancement of a truth).

Accordingly, in an abductive method grounded in pragmatism there is a shift in presumption, from the formulation of a hypothesis that advances a particular assertion, to one that opens the possibility for discovery. This requires an alteration of focus from generally seeking broad generalizations to a preference for breadth in explanations (Thagard, 1978). Hence, the assumption within this chapter’s research question is that there is permission to challenge explanations of the formation of conceptions that do not reflect fully the phenomena detected. The aim is for an explanation that is satisfactory, rather than personally satisfying. The clarification made in method is that, in this context, ‘best’ does not mean generally consistent with one’s existing understanding. To the contrary, the best explanation may be particularly inconvenient. A potential
outcome from such an inquiry can be a challenge to existing generalized assertions, resulting in the generation of more intriguing research questions.

**Existing Understanding**

The knowledge to be gained through the inquiry represented by this chapter can be described as the development of a hypothesis for the formation of systems of conceptions from principles derived from the formation of individual conceptions (Chapter Three). With the level of observation being located between individual ‘concepts’ and metaphysical ‘conceptualizations’, theories of conception-like phenomena are traditionally considered in abstract terms in the different domains of philosophy (sometimes using principles of systems theory) (Bateson, 1991; Loevinger & Blasi, 1976; Morris, 1991). The existing understandings gained from traditional philosophical investigations provide an invaluable commencement point for the specific research question.

By way of overview, American philosophical theorist and transpersonal psychologist, Ken Wilber (1998b), abstracts a meta-pattern of all structures (and states) of consciousness in his integral schema. The three primary component parts are described as the ‘Big Three (I-We-It)’, being an integration of subjective, inter-subjective and objective perspectives as an ideal compositional form. Wilber (1998b) narrates how “dozens of examples could be given” of this “near universal” form, deriving his confirmation from the “results of an extensive data search across hundreds of holarchies” (p. 75), naming examples including the philosophies of Plato, Jürgen Habermas and Karl Popper as support. While nothing in the following analysis contradicts this position at its specific level of generalization, a more nuanced reading of the source material on the different question of the formation of conceptions does, however, offer additional information, different propositions and new interpretations.

With reference to the abductive process, the benefit of such orientating generalizations is how they point to set scenes of significance. In abduction, the
nature of existing understandings is a bit like the observations of bystanders to an accident who, in not attending specifically to observe the cause of the accident, saw only the apparent effects as they occurred within the frame of their own observations. Anecdotally, there is an immense amount of information to be gathered from the assembled crowd. What we find is that view gathered depends on the questions asked of them. An abductive (rather than deductive) reading of the source literature reveals how each philosopher may describe similar patterns in the formation of thought based on distinctively different conceptions, each doing so in a way that is consistent with their own domains of observation. An assembled (rather than constructed) account can result. The aim in this gathering is not “to overcome differences, but to analyse them, to say what exactly they consist of, to differentiate them.” (Foucault, 1972, p. 171).

For example, looking in more detail to existing philosophy, first there is an exquisite passage in the detail of Plato’s Symposium from the closing speech of Socrates (recalling Diotima) where the right path to ‘perfect revelation’ is described as an unfolding sequence (p. 92). Plato (1951) proposes a process of inquiry, that potentially provides a classical description of the formation of conceptions, which reads (in translation):

...begin with examples of beauty in this world, and using them as steps to ascend continually with that absolute beauty as one’s aim, from one instance of physical beauty to two and from two to all, then from physical beauty to moral beauty, and from moral beauty to the beauty of knowledge, until from knowledge of various kinds one arrives at the supreme knowledge whose sole object is that absolute beauty, and knows at last what absolute beauty is. (p. 94)

For Plato, the traversing of the beautiful, the good and the true involve the formation of the conception of an absolute truth, which is discovered firstly from attention to form, through empathy with morals in goodness, into past knowledge of the particular, to the ideals beyond. This account provides a description of a conception in the process of formation at the level of ideal philosophical forms. Rather than a compositional assemblage, Plato here describes a dynamic pathway in coherentist ascension. The completion of this
spiral traverse is a process which enables the virtuous person “who contemplates absolute beauty with the appropriate faculty and is in constant union with it” (p. 95) to bring forth “true goodness, because he will be in contact not with a reflection, but with the truth” (p. 95). This allusion suggests that the formation of a ‘true’ conception requires a process of counterpart progressions.50

In a more contemporary context, German philosopher and sociologist, Jürgen Habermas (Habermas, 1998) examines how the formation of a mutuality in the understanding of reality (i.e. a conception) occurs as a complex process of dependent relations. He provides his explanation from the position, not of ideal Platonic forms, but sociological interactions. Rather than relying on three validity claims, Habermas arguably outlines five forms of dependent contexts (Ingram, 2010). These are: a) the truth (factualness) of the locutionary proposition of fact (evoking the external world), b) the rightness (appropriateness) of the illocutionary normative action in speech (evoking the social world), and c) the sincerity (truthfulness) of the perlocutory subjective disclosure (evoking the phenomenological world); situated in the fourth world d) of preparatory meaningfulness (being the “lifeworld of the always already taken-for-granted background of meaning”), that is framed within e) the prior domain of the comprehensibility of the language signs used and the assumptions of the function of grammatical sentences in their relations to reality (Habermas, 1998). In this description of the process of formation, Habermas explains how mutual understanding (Verständigung) of any validity claims offered, is first dependent on the prior need for simple linguistic understanding (Sprachverstehen) in label or recognitions. This respects how there is a preliminary act of agreement as to the mere potential existence of the proposition (Einverständnis) and how the formation of the meaning requires prior integrations (Ingram, 2010). In this description, there is recognition that the mutuality of conceptions, even in relation to mutually agreed propositions, requires a sequence of prior integrations to enable mutual validation.

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This approach can be contrasted with Karl Popper's analysis in an *Epistemology Without a Subject* (Popper, 1972) when describing his three worlds of experience, providing a third nuance to the formation of conceptions. These three worlds are: the domain of physical objects, including living and non-living things (*World 1*); the domain of mental and psychological states, feelings and processes, including suffering and dreams (*World 2*); and the domain of the products of the human mind, be they the intangibles of languages, myths and conjectures, or the artefacts of 'songs and symphonies, paintings and sculptures' (*World 3*). The critical contribution from Popper's analysis is the proposition of the dynamic reciprocity of these domains. He observes how World 3 objects are created in the social interaction of people as cultural events and are therefore dependent on the objects of Worlds 1 and 2 for their ontological existence. For example, the 'abstract objects' of World 3 may become concrete objects in World 1 physical forms and rely on the World 2 experiences to make the causal connection in meaningful representation. He notes how the artefacts of meaningfulness can be lost or destroyed, in both Worlds 1 and 3, to then subsequently fade from the World 2 of individual memories (Niiniluoto, 2006). This proposition introduces a dynamic relational constructionism to the conjunction of these domains as a process for the formation of conceptions.

These three specific examples from different domains of philosophy clarify that the patterns of formation of conceptions requires sequential progressions, prior formulations and dependencies for stabilization. These examples suggest that, within a schema for general integration, there are to be seen more complex dynamics of the formation of conceptions than are captured by broader generalizations. It is the collection of these philosophical nuances, rather than their combination and re-description, that provides the focus of this chapter's contribution.

**Chapter Four Proposition**

The thesis proposition for this chapter is that, drawing from the principles identified and existing philosophical theories, a hypothesis might be formed
that provides an explanation for the diversity of conceptions, their formation and their distinctive anomalous differences. The requirement is for an explanatory hypothesis which is able to be supported by the depiction of actual phenomenon in subsequent verification. The purpose of this chapter is to determine the structure of that hypothesis.

The counter-proposition would be that explanations are generally more useful to the extent that they are generalizable, with the anomaly of difference usually not being of real significance. In effect, if an explanation is too complex to understand then a theory at that level of specificity has no real utility. Arguably, a broad enough view will be able to take in all details without the burden of explaining anomaly and inconsistency. This potentially represents the error of generalization, where a theory neglects to limit its scope and describes a phenomenon universally. This may occur when the theory is generalized into an explanation of everything and consequently explains no-one-thing (i.e. a specific phenomenon or circumstance). Rather than the need for the theory to explain anomaly, by generalization, this detail can be negated, excluded or overlooked. This error can be avoided in abductive method by explicitly defining the axiomatic limitations of the theory (i.e. adopting incompleteness) and ensuring the theory does not contain statements concerning proofs of its own consistency (i.e. maintaining exclusivity) (Gödel, 1962).

The proposal of this chapter is to follow a logic for discovery from first principles that looks explicitly at anomaly as being significant, so as to develop the simplest possible explanatory inference for the phenomena of conceptions. In answering the question: ‘What explains it?’ the suggestion is that broad explanatory statements with multiple specific exceptions may ultimately not be of pragmatic benefit. The outcome desired is a hypothesis statement (or statements) that has sufficient simplicity, economy and specificity so as to be initially plausible and then admissible (in terms of being subsequently testable).

4.3  How was it answered?
What is the theory?

The transition from propositions to hypothesis requires a sequence of abductive logics. The fourth phase in the abductive method providing the overarching framework for this thesis is described as theory-formulation. In this phase the focus is on the formulation of plausible explanatory hypotheses (Haig, 2005a). The hypotheses generated then constitute the inference that is the best explanation possible as derived from the propositions from the theory-generation phase. Haig (2005a) credits the basis of his abductive approach to theory-formulation (generally) and hypothesis generation (specifically) to Peirce’s philosophy.

Peirce’s articulation of abduction as a form of philosophical logic (while fragmented and dispersed in his collected writings) can be seen as clear, encompassing and highly nuanced (Boler, 1963). The thematic and chronological collections of Peirce’s work reflect a recursive and iterative process to the development of this peculiar aspect of his expansive philosophical reach (Peirce, 1960, 1982). A defining feature of a Peircean approach to hypothesis formulation is the assumption that it constitutes a primary stage in the process of scientific discovery, preceding deduction and induction (Walton, 2004). Essentially, abduction, deduction and induction relate to different stages of one much larger process of inquiry (Richardson & Kramer, 2006). However, while primary in scientific inquiry, the abductive hypothesis is taken to be only a preliminary statement of theory. Hypothesis formulation provides a ‘suggestion’ of a pragmatic explanation that requires subsequent verification (Walton, 2004). Abduction as a process is, therefore, to be understood together with deduction and induction in their reciprocal relationship to a wider pragmatic philosophy of scientific thinking (Reilly, 1970). This clarifies the premise and the extent of the validity claim of any abductive hypothesis. An abductive hypothesis is only a first step, a mere ‘suggestion’.
Given this qualification, that abduction does not need to replace deduction or induction, if abduction is primary in the research process (and all follows from it) the real question becomes how is it done *expertly*? The ‘method to the method’ of a Peircean approach to hypothesis formulation raises three essential theoretical considerations that inform the design of an abductive research methodology. These have been contentiously discussed and relate to: a) the logic of discovery; b) the role of theory development in the scientific process; and c) evaluations of inferences by standards of explanatory worth (Haig, 2005a). From an analysis of the existing theory, propositions to inform the design of the research method are offered for each of these fundamental considerations.

On the first consideration of the logic of abductive processes, for Peirce, abduction provided a pragmatic and perfectly definite logical form to the process of scientific serendipity (Walton, 2004). Peircean claims to an apparent ‘logic for discovery’ raises a concern that the use of mathematical syllogisms could be thought to guarantee the validity of an abductive scientific fact (in terms of formal logic) (Suppe, 1974). While conversant with syllogistic logic, Peirce argued that the process of scientific discovery need only be rational in its sequence of development, not in the philosophic proof of its assertions. However, the theoretical debate over a ‘logic of discovery’ has been fraught with confusions and is filled with philosophical distinctions, many of which are arguably only of semantic significance (Suppe, 1974). One proposal in resolution is that a heuristic for the discovery of theoretical laws may enable a logical *approach* to rational analysis that is not itself philosophical ‘logic’ (Suppe, 1974). Therefore, it is argued for the purposes of this chapter that, within any specific context, an explicit ‘logic of process’ can be recounted and documented. This will provide a ‘logic for discovery’ only. The use of syllogisms accordingly provide rigor in process, not evidence of conclusiveness. This leads to the second consideration.

The second consideration is whether following theory-formulation an abductive hypothesis requires robust theory-construction and development, or stands on
its own terms immediately (Haig, 2005a). The implication of this decision is that immediate testing to prove or disprove the proposed hypothesis, prior to admission, may not be desirable and is accordingly not required (Hanson, 1965). Hanson (Hanson, 1958, 1965), relying on Peirce and reintroducing abduction as the process of retroduction, argued that there is a distinction to be made between the logic of discovery (i.e. admission of a plausible hypothesis as a suggestion) and the logic of justification (i.e. proof of a hypothesis as its acceptance). Aliseda (2006) similarly draws on Karl Popper’s (1959) own statement in Logik de Forschung (translated as ‘The Logic of Scientific Research’) to clarify that there is a difference between the process of conceiving of a new idea, and the methods and results of examining it logically. In recognizing this distinction explicitly, it is argued that, while an abductive hypothesis needs to be initially generated from phenomena, it is only by subsequently tested using valid data applicable to the hypothesis itself once formulated can the hypothesis be verified or disqualified (Mackonis, 2011). This reflects Peirce’s own intention that formalized abductive philosophy apply, not for defending scientific pride or academic challenge, but to balance the simple pragmatics of economy while advancing the beneficial effects of new discoveries (Peirce, 1957). This accords with Simon’s statement that “ideas that spring full-blown from the head of Zeus, then are tested with data that exists timelessly and quite independently of the hypothesis.” (Simon, 1977, p. 41).52 Accordingly, an abductive hypothesis does not require immediate verification to be admitted. This leads to the third consideration.

The third consideration concerns the standard for admission of a hypothesis once formulated (prior to subsequent development and verification). The essential principle is that explanatory worth (not predictive success) is the evaluative test for an abductive hypothesis. Magnani (2009b) critically inquires into whether mere generation of a plausible hypothesis is in fact sufficient, or whether the additional step of evaluating the hypothesis by inductive analysis as an ‘inference to the best explanation’ is also required (p. 18). He concludes, after citing Thagard’s (1988) analysis of Peirce’s own writings on the topic that “abduction does not have to be considered a “solution” to a problem, because it
only calls for a response to it,” (p. 19). This is consistent with Walton’s view (Walton, 2004), who while noting that abductive inference is sometimes taken to be essentially the same as the principle of ‘inference to the best explanation’ there are really two levels at which abduction applies. The first is as an informal process of logical inference similar to deductive or inductive inference that advances inquiries non-specifically. The second is the role of formal abductive logic in the wider cycle of the directive method of scientific inquiry as the primary source of the novel hypothesis. It is the second of these forms that this thesis is focused on. Therefore, it is the premise of this research that the need for inductive testing is external to the abductive process itself, however, a good abductive hypothesis must be designed with veriﬁcation in mind. Accordingly, the preliminary test for admission of a hypothesis is the test of ‘explanatory worth’.

In summary, three conclusions were reached after examining these three critical questions affecting abductive method designs. First, rather than abductive logic providing a conclusive ‘logic of discovery’, the abductive method need only enable a formal ‘process for discovering’. Second, hypothesis formulation represents a stage in the scientiﬁc process, and requires only subsequent veriﬁcation. Third, the standard for hypothesis admission is not conclusiveness, only explanatory worth. Accordingly, a valid abductive process consistent with the theory of abduction was designed for the formulation of an explanatory theory of conceptions.

How was it applied?

For the theory-formulation phase of the abductive method the primary choice in emphasis is framed as being between two alternative approaches a) evidentiary and b) dialogical. Evidentiary approaches might begin with a specific case or outcome and selectively build a logic chain towards that premise. A dialogical approach might work more as a conversation with the evidence to generate conditional propositions that require evidentiary investigations (Walton, 2004).
Essentially, the choice in emphasis reflects the situation of the abductive inquiry and a process of abduction is generated accordingly.

To provide guidance, Walton (2004) investigates the logical form of abductive reasoning from Peirce’s own work and finds that Peirce himself “seemed to admit that he could go no further except to say that deductive necessity, inductive probability, and abductive expectability all come from a process of “inhibitory” self control of thinking.” (Walton, 2004, pp. 13-14). The fact of self-imposed structures and controls, reflecting the abductive processes of a particular research field and its unique questions, appears to be more important than the particular form or nature of the inhibitions (Aliseda, 2006, 2007). Different approaches, in different fields of application, adopt a different emphasis to different aspects of an abductive logic (Aliseda, 2004; Magnani, 2009a; Psillos, 2009; Shank, 1998). Within all these discipline-based approaches a commonly used premise is Peirce’s own heuristic syllogism for an abductive logic, which reads:

*The surprising fact, C, is observed;  
But if A were true, C would be a matter of course,  
Hence, there is reason to suspect that A is true.*

(Peirce, 1960, p. 117) [CP 5.189]

The question for the researcher is: *How to get to A?*

Arguably, it is open for the researcher in a new field to establish the abductive process that is appropriate to that field (Aliseda, 2006). In doing so, it is necessary to be cognisant of the common (and invalid) criticism that the classical abductive syllogism represents the philosophical error of ‘affirming the consequent’ (Walton, 1995). This is described as the argument where the proof of existence of an unseen cause is claimed by the fact of the occurrence described. This is known as ‘reversing’ a *modus ponens* logic scheme. The usual form of the *modus ponens* logic scheme is valid for deductions, an example being: “*As a rule, if P, then Q. P [occurs], Conclusion: Q*”. Peirce describes the
reverse of this form as “transposing the antecedents of the consequential” where in a chain of known causation, intervening circumstances can be presumed and noted in abbreviated logical form (Peirce, 1960)[CP 3.377]. The difficulty arises when in a novel discovery the intervening chain of logic is not disclosed. Walton (2004) clarifies that, while an abductive logic scheme appears to be a reverse modus ponens argument, it is actually of a different character. Walton innovatively proposes an alternative form of abduction using a forward modus ponens argumentation scheme. This involves a logic-chain which moves from the “antecedent to the consequent of a conditional” (Walton, 2004, p. 216). This approach requires acceptance of a presumed hypothesis, which is subject to conditional propositions, moving forward to a tentative conclusion that is subject to evidentiary verification. In making the conditional assumption explicit, the abductive conclusion can be proposed and tested. This is a particularly useful process in evidentiary situations where vital information is absent until identified and later sought. The example of the colligation of the depictions of witnesses to an accident is one specific example of the utility of this abductive approach, where the interpretation changes, as more evidence and testimony become apparent.

For the present analysis an additional step was required where, in the absence of an initial presumption, the progression of a hypothesis with provisional acceptance is subject to explicit defeasance conditions. The direction of the argument scheme is therefore backwards from the consequences to the antecedent cause and then, following the selection of the best explanatory hypothesis, forward in a defeasible chain of causal explanations. In this design the logic is dialogic, being tested and enhanced in two directions, while still remaining solely within the domain of abductive formulation. The process proposed accordingly takes a dialogic defeasible reverse modus ponens form. This chain of inquiries can be articulated as a logical syllogism represented by the following underlying argumentation scheme.

Given situation G,

With knowns B,
Unexplained fact C,

With conditions D, E, F;

Is explained (potentially) by A.

The elements are explained as follows:

A ~ is the abductive hypothesis

B ~ is the deductive presumptions

C ~ is the evidentiary anomaly to be explained

D, E, F ~ are the defeasance conditions presumed

G ~ the limitations of the problem definition (or specific situation).

This provides an argumentation scheme for an abductive process of discovery relevant to the present inquiry. The discrete components of situational givens, deductive presumptions and defeasance conditions are made explicit. This allows for the retroductive observation of the process of abduction and its assumptions. Accordingly, an emphasis using dialogical abduction is more appropriate and is preferred in this instance. Following this logical premise, hypotheses were developed for each of the three propositions to propose an explanation for the phenomena of conceptions.

What was done?

From the argument scheme an inquiry heuristic was developed to provide a consistent logic-chain for the development of the abductive hypotheses using a dialogical emphasis. This ‘syllogistic heuristic’ comprises a series of open abductive questions derived specifically from the literature on abductive process. The heuristic includes a specific question for each of eight elements leading to an abductive theory-formulation (see Table 4.1). This format links into one logical chain all of the components needed from the proposed
argument scheme (consistent with the abductive syllogistic logic). This series of questions was applied sequentially (and recursively) to each of the three propositions (from Chapter 3). For the three propositions this represents twenty-four separate inquiries relating to three distinct parallel sequences. These combine to represent one combined theoretical approach.

**Table 4.1 – Theory-Formulation Interrogation Heuristic**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Element</th>
<th>Investigatory Question in Logic Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Preparation</td>
<td>Q1. What has been observed (without presumption)?</td>
</tr>
<tr>
<td>2.</td>
<td>Direction</td>
<td>Q2. What are the existing knowns (without contention)?</td>
</tr>
<tr>
<td>3.</td>
<td>Investigation</td>
<td>Q3. What anomaly is unexplained (causing consternation)?</td>
</tr>
<tr>
<td>4.</td>
<td>Proposition</td>
<td>Q4. What propositions are suggested (by colligation)?</td>
</tr>
<tr>
<td>5.</td>
<td>Selection</td>
<td>Q5. Which has most explanatory worth (by reduction)?</td>
</tr>
<tr>
<td>6.</td>
<td>Qualification</td>
<td>Q6. What defeasance conditions apply (as conditions)?</td>
</tr>
<tr>
<td>7.</td>
<td>Articulation</td>
<td>Q7. What is the hypothesis for causation (for clarification)?</td>
</tr>
<tr>
<td>8.</td>
<td>Evaluation</td>
<td>Q8. What in practice changes as a result (as an implication)?</td>
</tr>
</tbody>
</table>

This form of praxis in abductive reasoning is supported by Aliseda's (2006) consideration of Herbert Simon’s approach to the psychological process of abductive discovery in computational theory. The use of ‘superior heuristics’ as fallible search devices within a normative theory of approach enables a logical process (rather than a philosophy of logics) to consistently generate incremental gains that result, over time, in emergent solutions to problems. This approach leaves the process of insight as a mystery in creativity (although guided and traceable), proposing only a frame to establish the conducive conditions making such insights more possible (and more rigorous). This is consistent with Peirce's pragmatic proposition that deductive proofs are best served by the presence of a counterpart logical process for the structured formation of those ideas (Peirce, 1957). Correspondingly, the scientific process
is re-framed to be open, generative and constructive, rather than closed, static and defensive.

In terms of the emphasis in this approach, Walton (2004) outlines within a sequence of abductive phases the process of a guided interrogatory dialogue, where an initial question is responded to with explanations in a repeating sequence in a finite series of recursions. In this way robust hypotheses are generated from the evidentiary facts by isolating unknowns and then testing the robustness of necessary assumptions by interlocutory interrogation. This provides a looping process in the construction and convergence of plausible possibilities, rather than a linear progression on a continuum of truthfulness to a pre-set destination.

This approach is confirmed by Nickles (1987), who in examining the science of scientific process, concludes that the convention of logical linearity to avoid viciously circular arguments does not deny other forms of combinational logics. The argument is, that for complex problems, a wider arc of inclusiveness of mutually supportive claims enables complex systems of causation to have a virtuous circularity, with the cross-relations of claims being supported within the whole logic of the proposition. Nickles (Nickles, 1987) concludes that in global-level problems, the space of reasons ultimately curves back on itself in closure, and so we need a 'spherical' logic, to extend with efficacy the linear Euclidian logic of the local and rational, into the abductive observation of the universal and conjunctional. The effect of abductive suspension is described in Nickles' own terms as: “And finally, the resulting coherence is a wonderful achievement and not [at] all guaranteed in advance” (Nickles, 1987, p. 62).

In this way, each stage of the inquiry as structured by the syllogistic heuristic contributes a particular perspective to the combinational logic. Each individual stage requires a specific framing for the abductive inquiry, adopting a particular emphasis for the selection of information as ‘one eighth parts’ of an entire sequence of investigation. To illustrate the process, the sequence of these parts
is described as a narrative summary of their individual purposes (referencing the supporting literature from which they were derived):

In *preparation* the researcher establishes a stance of ‘epistemic openness’ (Walton, 2004) adopting an ‘attitude of preparedness for being unprepared’ (Reichertz, 2010) to arrive with a clear mind but not an ‘empty head’ (Coffey & Atkinson, 1996). In *direction* the process of abduction as ‘retroduction’ (Emery & Emery, 1997) being different to deduction in looking ‘forwards’ and induction as looking ‘sideways’ (Shank, 1998), involves a dialogue with the data in recursive augmentation between ambiguity and completeness (Walton, 2004). In *investigation* there is a focus on anomaly (Kelle, 1995), where subsumption and generalising (Reichertz, 2010) are suspended in favour of a ‘strategic search’ (Simon, 1981). In *proposition* there is a ‘binding together’ (Walton, 2004) of ideas as the performance of ‘colligation’ (Walton, 2004) in a progressive coherency as new evidence on the apparent anomaly comes into sight. In *selection* the active reduction of alternative propositions by specific tests presumes that the ‘best’ proposition is not perfect, only the most explanatory (in scope), testable (in practice) and economic (as advancement) (Aliseda, 2006). In *qualification* the conditions on assumptions allow in ‘defeasance’ (Walton, 2004) the ‘tentative admission’ (Haig, 2008c) of the most pragmatic inference. In *articulation* the causal chain of events is set out to enable critical examination of the ‘logical coherence’ (Haig, 2005a) of the hypothesis. Finally, in *evaluation* the articulated hypothesis is assessed on ‘pragmatic usefulness’ (Peirce, 1957) recognizing that abductive inferences are ‘neither (preferred) constructions, nor (valid) reconstructions, but (useable) reconstructions’ (Reichertz, 2010).

This process of inquiry was conducted as a sequence of interrogatories of the relevant literature and documented in the form of interlocutory dialogues. For brevity, the results of these are summarized into a tabular form which contains an outline of the analysis and answers found for the twenty-four discrete parts.
of the three inquiries conducted in the eight sequential phases (see Appendix G). The results of these abductive inquiries are described and discussed in the following section.

4.4 What was discovered?

Summation of Findings

From the abductive process conducted three (rather than one) explanatory hypotheses were derived. These represent a non-reducible inter-related set of hypotheses. The formation of each of the three proposed hypotheses follows specifically the structure of proposed abductive argumentation scheme:

A ~ an explanation of the breadth of formulations (i.e. for the commonalities and idiosyncrasies of conceptions),

B ~ in the context of analogical presumptions (i.e. principles of flow, flex, flux),

C ~ taking account of the definitive features derived from phenomena-detected (i.e. the definitional characteristics of autonomy, boundary and centrality),

D,E,F ~ being subject to any necessary defeasance conditions (i.e. factor interdependency of each hypothesis proposed),

G ~ for the specified problem-delineation (i.e. a theory for the formation of conceptions meeting the solution-demand).

The ‘observed effect’ to be explained is the phenomena of conceptions as apparently: a) autonomous, b) bounded and c) centrally orientated phenomena. The hypothesized explanation of causation of that apparent effect, extending on from the application of the principles derived, is that:
a) the coherency of \textit{flow} in composition generates initial form (i.e. \textit{initiality});

b) the integration of \textit{flexibility} in configuration generates function (i.e. \textit{integrity}); and

c) the orientation of \textit{fluctuation} in directionality generates normalcy (i.e. \textit{identity}).

In a formal axiomatic structure these three hypotheses are stated as:

\textit{Hypothesis of Coherence:}

A. Conceptions have the definitive feature of autonomy because of formational coherency.

\textit{Hypothesis of Integration:}

B. Conceptions have the definitive feature of boundary because of relational integration.

\textit{Hypothesis of Orientation:}

C. Conceptions have the definitive feature of centrality because of cyclical orientation.

These three hypotheses operate together as a totality (i.e. an axiomatic set) to form the foundations of a proposed explanatory theory. The detail of the three hypotheses and their implications are further analyzed in the following discussion section.

This result provides a keystone in the archway of the abductive process for this thesis. That archway advances from: problem definition (Introduction), to observation (Chapter One), to phenomena detection (Chapter Two), to
proposition (Chapter Three), to explanation (Chapter Four), to conditional assumptions (Chapter Five), to dimension definitions (Chapter Six). At that point a definable and testable explanatory hypothesis has been formed. This enables the subsequent abductive development of the deductive methods used for measurement (Chapter Seven), demonstration (Chapter Eight) and comparison (Chapter Nine) of the theoretical premises developed. To conclude speculations on future applications are provided (Chapter Ten).

**Discussion of Findings**

A notable contribution by Peirce to the philosophy of scientific process was to insist, not on the logical proof of the abductive proposition, but rather on its retroductive exposition (Hansen, 1958). In the discourse on abductive method it is contended that abductively discovered rules are ‘neither (preferred) constructions, nor (valid) reconstructions, but useable (re-constructions)’ (Reichertz, 2010) (p.8). Arguably, an abductive logic can be recounted and reconstructed, yet if authentically derived, the act itself cannot be repeated. The repeatability of a discovery is either confirmation by replication or is actually itself a new discovery, only of the same underlying causal principle. The question then is how to re-describe an act of creative abduction?


> I have been interested, for a long time, in the psychological processes of discovery as the most concise manifestation of man’s creative faculty – and in that converse process that blinds him towards truths, which, once perceived by a seer, become so heartbreakingly obvious. (Koestler, 1964b, p. 10)

Koestler concludes in his investigation of heliocentric astronomy (as one example of a changing vision of the universe) that the history of human thought is replete with both acclaim and ignominy, stating: ‘It looks as if, while part of their spirit was asking for more light, another part had been crying out for more
darkness’ (p. 10). To Koestler (1964b), who spent nearly fifteen years on this topic, these two characterizations are the twin Janus faces of the guardian of doors and gates with "the face in front alert and observant, while the other dreamy and glassy-eyed, stares in the opposite direction“ (p. 21). Of these two faces, one face defensively protects what is known, the other looks naively and welcomingly into the presently unknown. These dual tensions, of the erstwhile process of open discovery while being temporarily blinded by the existing from seeing the subsequently obvious, also characterize the presences of mind required in an abductive process of theory-formulation and construction.\(^\text{54}\) This involves the preparedness to be openly unknowing, informed by existing theory, while also being alert to the significance of meaningful anomalies.

Of significance to this question of reconstruction is Koestler’s description in The Act of Creation (Koestler, 1964a, 1970) of how the discontinuity caused by continued close attention to an anomaly is often found to be the cause for new discoveries. Koestler saw in the creative act the importance of bisociation, which involves a shift from thinking within a single plane to being in “a double-minded, transitory state of unstable equilibrium where the balances of both emotion and thought is disturbed.” (Koestler, 1970, p. 35). The process of an abductive logic of discovery is often assisted by the close association of two conflicting truths. Koestler (Koestler, 1970) describes the creative act as a way of escaping from the tensions of a single-minded plane to a different plane of understanding "signalled by the spontaneous flash of insight which shows a familiar situation or event in a new light, and elicits a new response to it.” (p. 45) as ‘the sudden shaking together of two previously unconnected matrixes’ (p. 213). Koestler (1970) also notes that creativity itself is not sufficient, as false inspirations, premature linkages, obscuring presumptions and lost integrations become barriers to the permanent association of two distant frames of reference. In abduction, the act of creation comes from sustaining the tension of the paradox of the known and unknown, which only finds release in a satisfying resolution of new knowing. The discipline of re-description (in part) enables that resolution, as reflected in this chapter and in the following sections.
From this premise, the following sections (one for each hypothesis) recount the results of the abductive process. These each contain: a) the abductive premise for each inquiry, b) explication of the logic for selection of best inference, c) discussion of the proposition of the hypothesis and its implications, d) theoretical evidence in support of that selection and e) an outline in specific terms of the inter-dependent defeasance conditions. This represents merely a descriptive précis (the full set of twenty four inquiries being summarized in Appendix G).

**Hypothesis #1– Coherence**

The first observation made from the analysis of the detected phenomena (see Chapter Two) concerned the ‘autonomy’ of conceptions. The proposition formed from that observation is that the appearance of autonomy is the result of ‘compositional self-definition’. This is described as the principle of ‘flow’ (see Chapter Three). If this proposition were correct this would be evidenced by an apparent diversity in the forms of the composition of conceptions. While the content of conceptions is unique to each conception, conceptions also appear to have a definable (if diverse) structure of composition. The question is: what is the explanation for the diversity and commonality of that composition? This explanation ideally would apply to each conception uniquely and also apply to all conceptions generally.

By applying the logic-chain of the abductive heuristic, three alternative hypotheses were proposed to explain the observations. On a continuum of possibilities, two alternatives are described as counter-part logics. The first alternative considered is the hypothesis of a universal meta-pattern. It proposes that all conceptions have one common structure. To the extent that the composition of a conception does not represent this structure, the phenomenon of this conception is an anomaly and can be negated by the hypothesis of generalization.55
The second alternative considered is the hypothesis of compositional randomness. It proposes that while there is some similarity in the composition of conceptions, there is in actuality no recurrent pattern of form between conceptions. The composition of a conception is then entirely unique to any particular situation. To the extent that there are any apparent similarities in composition, these are attributions from the process of observation. By this hypothesis the anomaly of any similarity can be eliminated by reduction of the explanation to be due to the unique idiosyncrasies of composition of each conception.\textsuperscript{5,6}

The third alternative represents a reconstructive bisociation of the arguments for one universal compositional form and for no compositional similarity. The alternative hypothesis is that each conception has a unique composition representing stages in a trichotomy of formation. This hypothesis proposes that rather than a common content, there is a common process. The implication is that the compositional form of conceptions represents a coherency in the process of the reception to phenomena, its distinction by description, and the expectation of repetition. The diversity of the compositions of conceptions reflects the similarity of this in-common process within their unique circumstances of composition. Support for this third alternative is provided by Peirce (1960) in his development of the conjunctival principles of First, Second and Thirdness.

Peirce draws from Hegel's (1977) \textit{Phenomenology of Spirit} in developing a (then) modern theory of phenomenology (literally the 'study of phenomena') which was designed by Peirce to “discover what conceptions, if any, are applicable to every phenomenon, or item of experience” (Peirce, 1960). In his novel approach Peirce firstly proposes the term \textit{phaneron}, being that which is “in any way present to the mind, quite regardless of whether it is real or not” (Peirce, 1960). This distinguishes this inquiry as the attempt to resolve the paradox of the duality of the phenomenal (i.e. reductionistic appearance) and the noumenal (i.e. abstract reality). Peirce concludes that, in terms of logical and empirical 'indecomposability' of the fundamental categories of the \textit{phaneron},
“every relation must be monadic, dyadic, or triadic; that each of these three types is irreducible; and relations which appear to be of greater complexity are logically analyzable into two or more triads.” being a *polyad* (Goudge, 1969, p. 79). These three essential categories Peirce designated as *Firstness, Secondness* and *Thirdness*, which concepts were used by Peirce to form the philosophical basis for his corresponding theory of semiotics. The resultant of the coherent conjunction of these non-reducible elements is the formation of the potential for the meaningful phenomena. Essentially, the thing denoted (i.e. Firstness), by the sign that denotes (i.e. Secondness), results in the expectation or habit of the interperant (i.e. Thirdness). Peirce concludes that: “From the perspective of phenomenology, whatever can be observed is a complex of these three categories.” (Goudge, 1969, p. 101). Uniquely, this approach provides a general schema for composition without prescription as to content or configuration. Significantly, Peirce’s analysis is also not dependent on social convention, speech forms, or anthropomorphised perception as the primary basis for the description. In examining the grades of separateness of the three forms and their irreducibility, Peirce states: “Perhaps its is not right to call these categories conceptions: they are so intangible that they are rather tones or tints upon conceptions.” (Peirce, 1960, p. 179) [CP. 1.353]. In proposing this distinction Peirce moves from proposing a conception of composition to a means to describe the composition of conceptions. The hypothesis from this analysis for conceptions is that formation is not a mere attribution of description, rather it is a fact of stages of progression in an ongoing process of the formation and reformulation of meaningful coherences. This reflects the *Hypothesis of Coherence*.

There are two specific defeasance conditions that apply to this hypothesis. These are, that to have ‘coherence’ in the autonomy of formation, a conception must: a) have a specifiable boundary (i.e. relate to a definable scope), to identify its limitations, and b) have an identifiable focus (i.e. a central idea as content) that provides its locus of formation (i.e. together resulting in initiality). These qualifications to the Hypothesis of Coherence clarify that if a conception is limitless in differentiation or is infrequent in localization, then it cannot also be
‘coherent’ – as it therefore would be non-existent (and so is unable to be sufficient). The acceptance of the Hypothesis of Coherence is therefore subject to the premise of these conditions of defeasance.

With reference to the specific phenomena considered and research question asked, on tests of explanatory breadth, testability and economy, the Hypothesis of Coherence constituted the inference which comprises the ‘best’ explanation for the phenomena of conceptions relating to autonomy.

**Hypothesis #2– Integration**

The second observation noted from the analysis of the detected phenomena (see Chapter Two) concerned the ‘boundary’ of conceptions. The proposition formed from that observation is that the appearance of boundary is the result of ‘configurational self-limitation’. This is described as the principle of ‘flex’ (see Chapter Three). If this proposition were correct, this would be evidenced by an apparent diversity in the different spans of inclusion and exclusion in the ambit of conceptions. While the scope of a conception is possibly content-dependent, conceptions appear to have structural limitations to their inclusions independently. The question is: what is the explanation for the variation and similarity in the construction of conceptions? Ideally, such an explanation would apply for each conception individually and also to all conceptions generally.

By applying the logic-chain of the abductive heuristic, three alternative hypotheses were proposed to explain the observations. On a continuum of possibilities, two alternatives are described as counter-part logics. The first alternative considered is the hypothesis of a generalization of the internal architecture of conceptions. It proposes that conceptions have levels of integration and prior structures enable later structures. The configuration is nested into structures and sub-structures (i.e. wholes and parts). The level of complexity attained represents the necessary scope of inclusion. To the extent that the composition of a conception does not represent this conceptual
structure, then the conception is an aberration (and can be ignored as a deviation).

The second alternative considered is that there are variable configurations limiting the boundaries of inclusion of conceptions and that these are random, with there being no preconditions to formation. It proposes that complexity manifests chaotically. Any assembly that has viability, by the fact of its mere existence, has integrity. The configuration of conceptions is entirely haphazard and random. The diversity of the boundaries of inclusion is then arguably based on the idiosyncrasies of configurations for each conception.

The third alternative represents a reconstructive bisociation of the arguments for one structure of composition and for no structure of composition. The alternative hypothesis is that each conception has a unique structure of composition that follows similar principles of formation. This hypothesis proposes that rather than a common form, there is a common process. The implication is that conceptions have different architectures of configuration. This would be reflected in different scopes of inclusion and limitations of extension. Support for the hypothesis is provided by the work of computational theorist, Herbert Simon (Simon, 1955, 1957, 1962, 1973, 1977, 1981, 2002; Simon & Iwasi, 1988).  

Simon is described as the first architect of complex systems (March & Augier, 2004). His work informed the development of many subsequent theorist's work, including Koestler's articulation of holons and holarchy theory (Koestler, 1978). The relevance of Simon's research to the theory of conceptions derives from his studies of computational logic, artificial intelligence, the psychology of decision-making, and rational choice in economic social theory (March & Augier, 2004). In the now classic essay, The Architecture of Complexity, Simon (1962) explains why the phenomena of discernable levels of organization is a usual, although not universal, feature of complex systems. The terms 'complex' and 'hierarchy' have specific (and possibly unfamiliar) meanings in this source work. In Simon's work the term 'hierarchy' is expanded from the usual meaning of the direct
subordination of functions in systems of control, to include the resultants from the formation of the inter-relationships of subsystems which themselves contain successive sets of subsystems (Simon, 1962). This is a much richer picture of organization, which defines structures of organization by the frequency of interactions, both within subsystems and between subsystems. A ‘complex’ system of hierarchy is defined as being “made up of a large number of parts that interact in a non-simple way” (p. 468) where it is “not a trivial matter to infer the properties of the whole” (p. 468) given the properties of the parts and their inter-relationships (Simon, 1962). Essentially, hierarchy is not defined by the levels of the structure, but by the structure of interactions. Similarly, complexity is not a function of the number of components, rather the frequency of their connections.61

The significant contribution by Simon relevant to the proposed hypothesis is the distinction he made between decomposable systems, which have weak relations between sub-systems being independent in their contributive operations, and nearly decomposable systems in which the interactions between subsystems are, weaker than within the subsystems, but not negligible. Complex systems of sub-systems such as these are non-reducible to their parts, with short run cycles of behavior in each sub-system being influenced by, and influencing in aggregate, long run cycles of the entire system (Simon, 1962).62 Simon identifies that near-composable systems are exceedingly common. Considerably more rare are hierarchical systems, where there is no connection between levels of sub-systems, or conversely, non-composable systems which are merely complicated (rather than complex) and where each variable part is possibly linked, with almost equal strength, to all other parts of the system (Simon, 1962).63 The proposition made is that conceptions (as complex systems of meaning) are neither merely hierarchical, in terms of containing neatly nested decomposable sub-systems or simply chaotic, in terms of being comprising momentary and inexplicable formations. The argument made is that they have another more distinctive characterization of structure entirely.
Within a complex hierarchy the arrangement of loose horizontal coupling between sub-systems enables the discrete components within levels to operate “dynamically in independence” (Simon, 1973, p. 16). In this way, hierarchical systems become immensely sensitive to feedback within the system and so are fundamentally robust. If multiple loose couplings allow different horizontal configurations to produce essentially the same outputs, then ‘functional equivalence’ is achieved (Simon, 1973). The evolutionary advantage of this form of hierarchical organization enables scales of complexity and enduring continuity in relatively stable environments. Simon (1973) describes this approach to the characterization of systems as “one path to the construction of a non-trivial theory of complex systems” (p. 481), where a pragmatic description is achieved to allow comprehension of the system without gross reductionism, naïve simplification or unwarranted anthropomorphism. The proposition is that the different boundaries of inclusion for conceptions is a result of variations in their composition as a complex hierarchical system with functionally equivalent sub-systems. The effect of ‘functional equivalence’ is that similar conceptions result from the configuration of similar compositions, yet their boundary of inclusion (i.e. their capacity for flexibility) is a function of the frequency of connections between the sub-systems of that structural configuration. The hypothesis from this analysis for conceptions is that essentially the discrete ‘architecture of complexity’ of each conception sets the potential for its flexibility of inclusion. This reflects the Hypothesis of Integration.

There are two specific defeasance conditions that apply to this hypothesis. These are that to have ‘integration’ with a certain boundary of inclusion a conception must: a) have a recognizable composition (i.e. autonomy of formation), and b) have an identifiable focus (i.e. a central idea as content) that defines its locality of inclusion (i.e. together resulting in integrity). These qualifications to the Hypothesis of Integration clarify that if a conception is unformed in composition or is infrequent in localization then it cannot also be ‘integrated’ – as it therefore would be unbounded (and so is unable to be differentiated). The acceptance of the Hypothesis of Integration is therefore subject to the premise of these conditions of defeasance.
With reference to the specific phenomena considered and research question asked, on tests of explanatory breadth, testability and economy, the Hypothesis of Integration constituted the inference which comprises the ‘best’ explanation for the phenomena of conceptions relating to boundary.

**Hypothesis #3- Orientation**

The third observation noted from the analysis of the detected phenomena (see Chapter Two) was the ‘centrality’ of conceptions. The proposition formed from that observation is that the appearance of central location is the result of ‘reciprocal self-restoration’. This is described as the principle of ‘flux’ (see Chapter Three). If this proposition were correct this would be evidenced by an apparent diversity in the focus of direction of conceptions. While the purpose of a conception is unique to each conception, the conceptions analyzed also appear to have a definable (if diverse) focus of directionality. The question is: what is the explanation for the changeability and apparent intentionality in those foci of attention? This explanation should ideally apply for each conception individually and also apply to all conceptions generally.

By applying the logic chain of the abductive heuristic, three alternative hypotheses were proposed to explain the observations. On a continuum of possibilities, two alternatives are described as counter-part logics. The first alternative considered is the hypothesis of a single teleological direction. It proposes that all conceptions represent one common intention. To the extent that the orientation of a conception does not represent this direction, the phenomenon of this conception is an anomaly and can be negated by the hypothesis of generalization.

The second alternative considered is the hypothesis that the direction of attention within conceptions is entirely random and there is in actuality no recurrent pattern within or between individual conceptions. The apparent intentionality of conceptions is then entirely unique and the directionality is
variable for any particular situation. To the extent that there are any apparent similarities in the direction of attention, these are mere attributions from the process of observation. By this hypothesis the anomaly of similarity can be eliminated by reduction of the explanation to the idiosyncrasies of the particular history of formation of each conception.

The third alternative represents a reconstructive bisociation of the arguments for a single teleological intention and for completely variable situational attentions. The alternative hypothesis is that each conception has a unique orientation representing a direction of attention towards self-enactment as normalization. This hypothesis proposes that rather than a common focus, there is a common process. The implication is that conceptions enact distinct and discernable orientations that represent pre-selections of certain forms of phenomena. The diversity of the directions of attention of conceptions reflects this in-common feature contextualized within the unique history of each conception’s own process of formation. Support for the hypothesis is provided by French phenomenologist, Maurice Merleau-Ponty, in his encompassing critical analysis, *The Structure of Behavior* (Merleau-Ponty, 1963).

In this work historic work, Merleau-Ponty examines the phenomenology of responsiveness and takes an expansive view of the reflexive response, looking at the process of observation from the chemistry of physiology to the spirituality of contemporary society. In doing so he directly challenges the attributions of the observer in terms of descriptions of cause and effect in stimulus and response terms, particularly in relation to the fluctuations of observed behavior. In a re-thinking of the general arguments for philosophical holism or empirical reductionism, Merleau-Ponty illustrates how the ‘finalistic realism’ of attributing a ‘preferred’ behavior to the whole, and the ‘mechanistic realism’ of attributing a ‘chronaxic’ (i.e. reactive) response to the parts, fails in its causal reasoning. The alternative involves the challenge of seeing behavior, not as would be psychologically satisfying to the observer as a ‘normal’ response, but rather how phenomenological formation is “the projection outside the organism of a possibility which is internal to it” (p. 125). As Merleau-
Ponty explains: “The structure of behavior as it presents itself to perceptual experience is neither thing nor consciousness; and it is this which renders it opaque to the mind.” (p. 127). In adopting this third stance, his approach may “teach us not only not to explain the higher by the lower, as they say, but also not to explain the lower by the higher.” (p. 124).

To illustrate the wider phenomenological principle applicable to conceptions, Merleau-Ponty (1963) uses the specific example of the ‘abstract organism’. In describing the difference between a physical reaction (that can be observed) and an organic process of response (which can only be inferred) he describes how a change in behavior (i.e. flux) is seen with reference to a state that is ‘preferred’. Rather than evaluations of absolute economy, order or normality by the observer, the fluctuation is seen as an orientation to a ‘preferred’ state by the entity, being the ‘simplest for it, preferred in it’ (p. 147). In this way, the alternatives of whole-part duality are instead seen as reciprocations as part of a dynamic normality as determined by the entity.

Merleau-Ponty (1963) specifically describes how to pragmatically resolve the problem of observation of direction by changing the locus of perception, stating:

Thus each organism, in the presence of a given milieu, has as its optimal conditions of activity and its proper manner of realizing equilibrium; and the internal determinants of this equilibrium are not given by a plurality of vectors, but by a general attitude to the world. The thresholds of perception in an organism, as we were saying, are among the individual constants which express its essence. This signifies that the organism itself measures the action of things upon it and itself delimits its milieu by a circular process which is without analogy in the physical world. (p. 148)

Significantly, Merleau-Ponty (1963) then clarifies “that ‘organism’ is an equivocal expression” (p. 151) and is more accurately seen as being in a continuous sequence of phasic change. Accordingly, it is difficult to recognize the continuous organism from the intermingled totality. He proposes that “in order to make a living organism reappear” one must trace lines of delineation, cleaving categories of concrete events (Merleau-Ponty, 1963). This division is usually on terms satisfactory to the observer. It reveals merely the ‘phenomenal
body’ which operates as a cluster, being a ‘unity of signification’ (Merleau-Ponty, 1963, p. 156). In essence, Merleau-Ponty is arguing that causality is not derived by the artificiality of description in division (or by a lapse into the acausality of vitalism), but involves the recognition that fluctuations are determined by orientations. This is the unity that the centrality of the phenomenal entity has in itself, being the preferred means of its becoming. The hypothesis from this analysis for conceptions is that fluctuation in the direction of attention, with reference to the self-defined centrality of normalization, represents phases in an internalized logic as responses in a continuous process of self-definition and self-enactment. This reflects the Hypothesis of Orientation.

Once again, there are two specific defeasance conditions that apply to this hypothesis. These are that to have ‘orientation’ to a centrality a conception must: a) have a recognizable composition (i.e. autonomy of formation), and b) have a specifiable boundary (i.e. relate to a definable scope) that defines its localization of continuation (i.e. together resulting in identity). These qualifications to the Hypothesis of Integration clarify that if a conception is unformed in composition or is limitless in differentiation, then it cannot also be ‘orientated’ – as it therefore would be unrecognizable (and so is unable to be identified). The acceptance of the Hypothesis of Orientation is therefore subject to the premise of these conditions of defeasance.

With reference to the specific phenomena considered and research question asked, on tests of explanatory breadth, testability and economy, the Hypothesis of Orientation constituted the inference which comprises the ‘best’ explanation for the phenomena of conceptions relating to centrality.

**Evidence in Support**

In an abductive approach to theory-formulation, arguments for admission of a hypothesis on the grounds of plausibility are to be supported by situations of similarity (Walton, 2004). For example, in the unique situation of a coronial inquiry into an accident with unknown cause, evidence of similar incidents
(even if different in circumstances) may lend weight to a hypothesis that is consistent with previous occurrences. While theories advanced in the fields of phenomenology, complexity theory and cognitive theory do not relate to the phenomena of conceptions specifically, similar explanations are relevant as comparisons. These operate as secondary confirmations from different contexts, rather than replacements of the results of the primary abductive investigations. Three similar depictions, one integrated formulation and a figurative metaphor are provided as elucidations for the proposed hypotheses.

First, on the Hypothesis of Coherence, Carl Jung (Jung, 1967) intuits similar subtle forms of distinction in the esoteric Septem Sermones and Mortuos (The Seven Sermons to the Dead), describing the pleroma, the creatura and the Abraxas. The pleroma (i.e. Firstness) is cryptically described as the nothingness or the fullness, with the propositions that “A thing that is infinite and eternal hath no qualities, since it hath all qualities.” (p. 7). The creatura (i.e. Secondness) is changeable and is confined within time and space, it being distinct with distinctiveness as its essence, the fact of existence separating it from the quality of the pleroma. Jung clarifies that the creatura, which distinguishes qualities in the pleroma, is the enactment of difference by the principium individuationis; as a defence by life not to “fall into indistinctiveness” (p 10). Jung’s addition is to then distinguish the actuation of the potential of the pleroma, being the ‘improbable probability’ that is ‘force, duration and change’, which is named Abraxas (i.e. Thirdness); being evaluated effect or actuation in effectiveness, having the quality of good and evil, beauty and ugliness, and destruction and creativeness.65 The Hypothesis of Coherence suggests that the formation of conceptions represents a similar process of differentiation enabling the (causally) intuited and indescribable to become (subtly) identified, enabling subsequent reliance on the physical (gross) forms of expectancy which are realized as forms of reality then enacted.

Second, on the Hypothesis of Integration, the distinctions of Simon’s complexity theory were later recapitulated by Arthur Koestler in his investigations of the human mind (Koestler, 1964a, 1964b, 1967, 1970, 1978). Koestler simplifies the
concept of the assembly of whole-parts with hierarchies by the construction of
the abstract form of the holon within a holarchy without overly reducing the
nuances of Simon’s complexity. In proposing his General Properties of Open-
Hierarchical Systems (OHS), Koestler (Koestler, 1967, 1978) notes how rather
than the infinite regress of self-reflection from ever higher positions,
hierarchical systems are more like a ‘hall of mirrors’, with each holon reflecting
outward and inward. This depiction supports a multi-tiered observational
depiction, using ‘sublimation’ where lower-order sub-assemblies operate
without constant attention until required. Koestler depicts how holons are of
various types (he lists over ten forms) and notes how integration hierarchies,
rather than being neatly organized, are more often vertically ‘arborised’ and
horizontally ‘reticulated’. This architecture of complexity provides the
sensitive feedback loops necessary for robustness. As in Simon’s descriptive
analysis, for Koestler feedback operates between levels of organization, across
multiple hierarchies that utilize different criteria of relevance for their
organising principles. The Hypothesis of Integration explains the relevance and
the degree of ‘flexibility’ inherent in the architecture of such networked pattern
of interlinking arborization has for multi-state resiliency.

Third, for the Hypothesis of Orientation, an example of the fluctuating ‘mode’ in
conceptions is specifically described by the example of the phasic change of an
organism’s self-determination of the orientation of its responses to the
environment. An example is provided by Jakob von Uexküll (von Uexküll, 1957),
who in describing the perceptual life-worlds (Umwelten) of animals noticed how
a single object in a perceptual environment operating as a receptor image (e.g. a
cylindrical object to a hermit crab) may evoke different functional meanings
depending on the periodic and phasic circumstances of the animal and so may
Similarly, neurologist, Kurt Goldstein (1995), in drawing on von Uexküll’s work
in his own classical exposition of a holistic conception of the organism describes
how “performance is not based on the activity of certain mechanisms but on the
potentiality of the organism” which “realize themselves by utilization of all sorts
of substitute means when the ‘normal’ means are out of order” (p. 187).
Goldstein (1995) describes how the impaired organism adjusts performance to adapt to perturbation, noting that with "shrinkage of the milieu" or "too great a reduction of demands" there may be more, rather than less, impairment (p. 197). The Hypothesis of Coherence suggests, that for cognitive organisms (like vertebrates and humans) fluctuation is linked with self-perception of performance, rather than stimulus, in the adaptive milieu that constitutes the environment. The equivalent for conceptions is forms of external perturbation and challenge may not necessarily involve generation and adaption, this being dependent on the composition, configuration and normalization of the conception.

As an integrative summary, Rollo May (1958), in existential philosophy, explicitly examined the approach to finding a state of well mental health for the 'patient-in-his-world' as an abstract entity. May distinguishes three simultaneous aspects of our being-in-the-world that characterize a coherency of existence for a conception of reality held personally. First, there is Umwelt (i.e. Firstness), being the 'world of the perceived environment' and internal drives (cf. von Uexküll), second is the Mitwelt (i.e. Secondness), being the 'with-world' of mutuality of those of one's own kind, and the third is the Eigenwelt (i.e. Thirdness), the 'own-world' as the mode of existential relationship to one's self, explicitly being the grasping of what perception 'means to me' as a 'for-me-ness' that describes the quality of perception, not merely its fact of recognition. May (1958) concludes that all three of these 'modes in the world' are simultaneous and constitute one reality of being-in-the-world, the coherence of which is lost if "one of these modes is emphasized to the exclusion of the other two" (p. 63). Significantly, for May, these are not three ways of seeing reality, rather the modes are three dynamics that together constitute a reality (i.e. 'a conception') for each individual. Importantly, these three 'worlds' are not reducible as an integration of the mere physical, sociological or psychological, rather they represent one process in the operation of co-construction.

To conclude, in the most elegant metaphor in support, Koestler (1967) proposes 'the candle', 'the tree' and 'the helmsman' (p. 220-221) as a means to illustrate
three correlating principles. The candle ‘exchanges its materials, and yet preserves its stable pattern’ (i.e. flow - Coherence). The tree ‘symbolises hierarchic order’ with flexible arrangements (i.e. flex – Integration). The helmsman represents ‘cybernetic control’ in the feedbacks that ensure self-enactment (i.e. flux – Orientation). The addition made by this chapter is to derive similar forms in an extension consistent with one reading of existing sources and to propose their combination as one inter-dependent formulation for the phenomena of conceptions.

**Additional Insight**

The reflection for this chapter is that the undertaking of an abductive process is not for the faint of heart or conservative in nature. All must be released in favour of what might be gained. Further, research into the dynamics of intangible abstract phenomena is most definitely not for the unimaginative mind preferring concrete forms and pre-existing formulations. To facilitate an outcome, the design of a logic for discovery required providing the constraints necessary to evoke the tensions of conjunction in bisociation. Koestler (1970) remarks how the suspense in humour (i.e. bathos) and empathy in pity (i.e. pathos) construct a generative tension, the release of which re-establishes by resolution a new form of normalization. The example is that once the joke is heard, it is not unlearned. The logic of discovery in abduction benefits from a similar suspension into tension. To enact these conditions involves both the designing of the container and the willingness to be contained.

While many research topics involve the investigation of paradox, the tension of abduction requires resolution to a different plane that is not mere reduction by recursion. The insight discovered was the dissatisfaction of the middle ground had been well trodden by significant theorists. The alternative plane has been less walked, for this is not synthesis, rather new genesis. For example, the alternate plane to the middle ground between structural commonality and situational uniqueness is; dynamic formation (i.e. Coherence). The alternate plane to the ground between nested formation and randomized dissociation is;
arborised equivalence (i.e. Integration). The alternate plane to the ground between holism and reductionism is; centralised signification (i.e. Orientation). From within the plane of definition we find there are only the paradoxes of polarity. With the abductive logic of colligation, the three hypotheses proposed instead provide an explanation of complementarity. The three factors evoke a plane of phenomena that relies on conjunctional emergences.

The interesting implication from the formulation of these hypotheses for conceptions is, therefore, the fact of their interrelationship. The defeasance condition derived for each hypothesis is the presence of the effect proposed by the other two hypotheses. The additional insight, therefore, is that the three hypotheses together reflect a dynamic equilibrium of reciprocal parts, not a static description of integrated factors. Accordingly, a conception, rather than being a static entity, is proposed to be continually in the process of reformation, re-construction and re-direction. By making each hypothesis conditional on all three hypotheses, a ‘resultant’ form of depiction occurs (see Figure 4.1).

**Figure 4.1 - Three Dimensional Trefoil Knot**

The observation made in reflection is that a conception is most accurately defined as a resultant state of three inter-dependent dynamics. The significance is, like Merleau-Ponty (1968) suggests, that rather than describing an
ontologically existent ‘entity’, what is actually being observed is ‘significance’ within a trialectical unfolding process.

Not surprisingly, the affirmation of the proposed hypotheses for conceptions is how their identification and description required for their recognition the same processes of re-formation, re-construction and re-direction of the limitations of the conceptions of the researcher. In essence, the theory (and the theorist) is made subject to its own hypothesized formulations and limitations.

4.5 Summary

This chapter concludes that for Research Question #4:

- the formation and deformation of conceptions is explained by the Hypothesis of Coherence (subject to its defeasance conditions);
- the integration and disintegration of conceptions is explained in the Hypothesis of Integration (subject to its defeasance conditions);
- the extension and fixation of conceptions is explained in the Hypothesis of Orientation (subject to its defeasance conditions).

The formulation of the three explanatory hypotheses links the propositions to explanations of anomaly in the phenomena detected. The addition of defeasance conditions qualifies theory-formulation enabling theory-confirmation. The next phase of the research method asks the (abductive) question: What confirms it?
## CHAPTER FIVE – WHAT CONFIRMS IT?

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Chapter Five – What confirms it?

5.1 Introduction

The aim of this chapter is to attempt to dismiss or confirm the defeasance conditions supporting the hypotheses proposed. This reflects that, in an abductive process, theory is advanced with economy by the pre-emptive confirmation (or elimination) of a prospective hypothesis.

The abductive method used to answer the research question for this chapter is described as theory-confirmation. In this abductive phase a process is created to test critical assumptions in a manner consistent with the principles of the proposed hypothesis. An ‘assembled’ emphasis was selected as the appropriate abductive theory approach. This testing process used five criteria from the iconic paramorph of panarchy theory.

The outcome of this chapter is confirmation of the viability of the defeasance conditions. The inquiry confirmed that systems of conceptions appear to have panarchy-like characteristics. This provides confirmation of the feasibility of the proposed hypotheses (Chapter Four) to an extent sufficient to require articulation and definition of their critical dimensions (Chapter Six).

5.2 What was the question?

Research Question #5

\textit{Is it potentially feasible that the defeasance conditions to the proposed hypotheses could be satisfied?}

The research question for this chapter is different in form to the other questions in the abductive process for this thesis. Rather than an open question leading to investigative propositions, the question posed is closed. It contains an
assumption that there can be a ‘yes’ – ‘no’ response. While not finally conclusive, the question should be answerable based on existing anecdotal evidence. The effect of the question is that it operates as a gate, either allowing or preventing further theory development.

The role of this ‘gateway’ as a research question is to examine the defeasance conditions on which the three proposed hypotheses are premised to determine if any theory that results is potentially ‘feasible’. There is some skillfulness required in the design of this phase of an abductive inquiry. Success in this analysis is not the mere dismissal of the hypothesis based on examination against known methods, assumptions and measures. Nor is dismissal of the hypothesis based on the absence of existing evidence not previously been required to be generated or investigated. Rather, the task it is to design an inquiry that provides the greatest economy towards either confirmation or refutation of the theory on its own terms. The assumption behind the abductive development of a theory in this way involves the recognition of how critical examination, rather than extensive testing, can provide the quickest path to methodological verification. The balance aimed for in pragmatism is to not pre-emptively dismiss a hypothesis that can eventually be proven, yet not to advance an admissible hypothesis that has no prospect of verification.

This form of analysis is explained by Karl Popper (1972) who notes that conjecture on the process of the ascertainment of a belief is a form of critical engagement, which uniquely provides a feedback effect “from our creations upon ourselves” so that “new emergent problems stimulate us to new creations” (Popper, 1972, p. 119). Popper formalized this philosophical process of critical examination as evolutionary reflection into a simple logical heuristic:

\[ P_1 \rightarrow TT \rightarrow EE \rightarrow P_2 \]

By this formula Popper explains how noted problems \((P_1)\) proceed to a tentative theory \((TT)\), which may be (partly or wholly) mistaken, which in either case will be subject to error-elimination \((EE)\), and then autonomously generate new
problems (P2). The effect is that by testing our beliefs critically there are refinements in the problems of knowing “which we cannot help bringing into existence with every action, however little we intended to do so” (Popper, 1972, p. 119). Essentially, the effect of the process of critical examination is to move from a broadly admissible hypothesis to ‘new problems of knowledge’. These problems, by a need for their resolution, then generate the new epistemological premises that lead to appropriate verification methodologies. Popper’s premise is that, in robust science, the mere act of attempted refutation contains the unintended possibility for enhancement of our conjectures (Popper, 1969). The key to obtaining the benefits of this form of development is in the appropriateness of the method of refutation. In terms of pragmatic advancement of an abductive hypothesis this is best accomplished by abductive investigation. The test for feasibility of the proposed hypotheses is therefore to be determined squarely within the process of an abductive logic.

Existing Understanding

The purpose of the research phase of this chapter is to critically examine a speculative question. The proposed three hypotheses (Chapter Four) are each subject to defeasance conditions, being a reliance on the related effects of the other two hypotheses. The assumption is that where there is evidence of one of these hypotheses there should (in theory) be evidence of the other two.

As abstract causal dynamics, the effect of these hypotheses themselves are not (at this stage) empirically verifiable. The predicted effect of their conjunction is that a resultant dynamic will form, which has been identified as a ‘conception’. We presently do not have data that specifically considers the composition and distribution of conceptions in the process of formation. Accordingly, there will be only anecdotal evidence of the effect of these inter-related defeasance conditions. At this stage of the research even initial anecdotal evidence would be more than sufficient for admission of the hypotheses to further investigation. The complicating factor and difficulty with this inquiry is that thought occurs in multiple scales of organization, which can also be interpreted from multiple
levels of observation. We know from observational theory that phenomena at one scale of observation can be seen as mere noise and distortion when considered from an inappropriate level of observation (Ahl & Allen, 1996). Sometimes, however, that ‘noise’ will be telling us something.

An anecdote from a more familiar field provides some guidance to this novel problem of theory-confirmation. The research question in this chapter reflects a similar situation which occurred previously in the study of complex ecological systems. The predominant assumption that previously existed in the study of ecology was of a continuous dispersal of homogeneous species in generic ecological systems (O’Neill, DeAngelis, Waide, & Allen, 1986). Logically, it would make sense that different forms of life would appear in many different places, utilizing different combinations of ecological resources to their best advantage, wherever possible. However, it was recognized that complex ecological systems may be hierarchical systems and so would appear to be organized across multiple spatio-temporal scales (O’Neill, 1989; O’Neill, et al., 1986). The effect of this change in assumption of the structure of organization was that a discontinuous patterning in the frequency of the distribution of species was to be expected (T. F. H. Allen & Hoekstra, 1991). Rather than in a normal distribution outliers being disregarded as non-typical aberrations, specific anomalous features took on new significance.

One example of this effect that was specifically discernible was in the discontinuous distribution of body masses of a particular species in a localized landscape (Holling, 1992). This localized effect was subsequently found to have broader application and broader relevance to predictions of vulnerability and extinction (C. R. Allen, Forys, & Holling, 1999). The data gathered on the variations in the body masses of bird species provided an empirical anecdote that conflicted with assumptions of unimodal distributions which had explained minor variations as merely the influences of random environmental contingencies (C. R. Allen, et al., 1999). The identification of regular discontinuities in these structures and a focus on the inexplicable ‘lumpiness’ of ecological systems led subsequently to the proposal of ‘panarchy theory’
(Gunderson & Folke, 2009). It is argued that in terms of significance, the noticing of small differences (through even anecdotal evidence) can inform the development of more nuanced theories of causation in systems of hierarchical complexity. However, this ‘lumpiness’ in otherwise unimodal distributions could just as easily be negated as aberrations in the normal distribution by adopting a conservative analysis (Manly, 1996). The question is whether to admit a hypothesis that advances an understanding of a specifically interesting and frequently occurring anomaly.

The significance of this sequence of investigatory studies to this thesis was not in the different interpretations at different scales of observation, or the advancement of the premises for contemporary ecological analysis, rather it was the insight gained into the process of ‘adaptive inference’ (Holling & Allen, 2002). The proposition of adaptive inference is that, in complex observational systems, often a theory cannot be evidenced by a single hypothesis that is confirmable by a single unambiguous test, but only by a suite of tests that form, by colligation and comparison, a more robust synthesis as analysis (Holling & Allen, 2002). The proposition of adaptive inference is that in the early stages of a new theory ideas should be “roughly tested in a quick and effective manner using easily obtained data from any source” so as to generate “an approximate test of a large proposition” (Holling & Allen, 2002, p. 320). The initial findings made then prompt the design of more stringent tests consistent with the new analysis. It is argued that this process, which significantly advanced the investigation of ecological systems, is equally applicable to the investigation of (what can metaphorically be called) the ‘ecology of thought’.

It is to be expected that we would usually portray systems of thought in conformance with our own personal perceptions and experiences (i.e. the composition of our own conceptions). Essentially, in the same way as an ecological system might be observed at different spatio-temporal spans, so will the landscape of thought generate similar topographies of interpretation. This provides a theoretical problem of analysis. This question of whether thought is a continuously distributed landscape or has discontinuous features due to
hierarchical structures of organization, has fortunately been partially innovated by the recent progress in the field of developmental psychology. Like in ecology, more recent analysis suggests that at an individual level the 'shape of thought' is less contiguous than expected, with plateaus and phases between developmental levels and stages (Dawson-Tunik, Commons, Wilson, & Fischer, 2005). From similar research we can begin to recognize some of the different scalar landscapes from which the phenomenon of thought might be considered. However, even these observations leave open the question of what is the 'shape' of systems of conceptions where 'thought as a system' is to be depicted beyond the scope of the phenomena examinable at the observational level of individual cognitive development. While we may have an indication of differences in the sizes of the 'species of thinking', there is an absence of verifiable theory for complexity of the 'ecology of thought'.

A significant reason not to investigate this question follows a distinctly different logic. This logic would state that we can recognize from our own personal knowledge that the phenomena of thought is continuously distributed experience. Our experience of the phenomenon of thought (within a stable conception) is that it involves a series of relatively constant interactions, within a reasonably consistent landscape, which is perceived of mostly similarly, by people of generally equivalent intelligence and capacities. This continuous subjective perception makes the idea of mapping the landscape of thought (as opposed to randomly distributed variations in the 'content' of thinking) essentially inconceivable. In an undifferentiated landscape there is no phenomenon of significance. Significantly, as the scale of the measurement system for thought selected presumably accords identically with one's own perception (i.e. the scale of representation is 1:1), this selection of the observational level that is one's own confirms only the differences one is already noticing. The experience of thought is immediately verified as the undifferentiated phenomenon commonly experienced. We are seemingly aware of the entirety because it presents itself to us as a naive locality. The argument from this logic would be, what might be there to see, has already been seen, at least by someone, and so should be able to be represented in a way that can be
confirmed by one’s own existing understanding, without any alteration of perception or conception.

However, what we know from psychological research is that the complexity of the landscape of thought is distinctly more interesting and the universalizations of our own perceptions is not a fair representation. Using an approach based on the assumption of the discontinuous spatio-temporal organization of thought, interesting orientating graduations are noted. At the neurological scale, we understand that preafference (i.e. a pre-establishment of receptivity) creates a circular-causality in patterns of cognition which are historically unique to each neurological perceiver (Freeman, 1997, 1999). At the biological scale, differences in age and maturity generate different forms of perceptual capacities and preferences in logical functions (Howe, 1988; Stevens-Long & Commons, 1992). At the cognitive scale, differences in structural processes for the formation and reformulation of cognition represent stages in various maturities (Fischer, 1980; Fischer & Bidell, 2006; Greenspan, 1989; Piaget, 1928). At the conceptual scale, differences in self-sense and relationship to ‘other’ establish scalar patterns in abstract subject-object relations (Kegan, 1982, 1994). At the perceptual scale, differences in self-concept enable distinctive developmental forms of self-thought about the thinker (Cook-Greuter, 1990, 2000; Torbert, 1999; Torbert & Fisher, 1992). At the transpersonal scale, the relations of no-self to all existence occurs in graduations of exquisite pre-descriptions (Tsong-Kha-Pa, 2004). From even this broadest of transect maps it seems the phenomenon of thought requires our closer attention to discern if there is the potential for a topology of conceptions.

The primary limitation in the refutation (or confirmation) of an abductive hypothesis for the formation of conceptions is, possibly, whether it accords with our own direct personal experiences of how we are able to experience thought as a system. However, a focus on the anomalous features of significance, in an otherwise evenly distributed landscape, occurring at different spatio-temporal scales, has the potential to provide early confirmation of the tentative hypothesis proposed. The point of the abductive pragmatism approach to
economy is that, while we are unlikely to see what we do not look for (assuming its non-existence), if we inquire with specificity and clarity and still find precisely nothing, at least we will know our research efforts might be better invested in examining an alternative proposition.

Chapter Five Proposition

The thesis proposition of this chapter is that if the proposed hypotheses are valid and inter-dependent, then there should be some anecdotal evidence of their resultant effects. The implication of this is that, while the dynamics hypothesized may not (as yet) be specifically observable, their combined effect should be otherwise discernible. The purpose of this chapter is to verify (or refute) the inter-dependency of the defeasance conditions to the hypotheses.

The counter-proposition to this approach is that in establishing a belief reliance can be placed on assumed conditions, provided those assumptions are made explicit. An abductive argument is then considered valid until otherwise disproved. This applies even if the contingency is an event far in the past or distant into the future. This approach potentially represents the error of assumption, where reliance is placed, not on existing evidence as a presumption, but on an unverified condition to a hypothesis that is unverifiable or undisputable by its own terms. Examples of this might include the conceptual construction of a mythical force or the assumption of continuance of a previous pattern regardless of contingency of future conditions (Bunge, 1972). This error of abductive logic can be avoided in an abductive method by designing a means to qualify the unconditional assumptions, adopting a level of reliance that is reasonable based on the fact of evidentiary circumstance.

The proposal is that, even though in the formative phases a new theory is not required to have means pre-developed for its verification, if it is subject to specific defeasance conditions that can be verified, there may be anecdotal evidence that justifies a level of conditional reliance. In answering the question, ‘What confirms this?’ the suggestion is to design a test that provides justification
for that preliminary reliance. The outcome desired is the presence (or absence) of evidence that confirms (or refutes) the hypotheses or their defeasance conditions, based not on the circular logic of observance of the original phenomena, but rather the implications of the hypothesized effects.72

5.3 How was it answered?

What is the theory?

The research question for this chapter can be greatly advanced by using the specific processes of an abductive method. The fifth phase in the abductive method providing the overarching framework in this thesis is *theory-confirmation*. In this abductive phase the tentative hypothesis is developed by examination and advancement of its underlying assumptions. This reflects that one implication of an abductive formulation is the need for methodological innovation. In the sequence of a formalized abductive method, Haig (2005a) specifically separates out theory development as a having a distinct role, stating:

...theory development expands our knowledge of the nature of our theories’ causal mechanisms. This is achieved by using the pragmatic strategy of conceiving of these unknown mechanisms in terms of what is already understood. (p. 379)

In the abductive theory-development phase, the initial hypothesis (as generated by abductive methods and formulated into causal explanations) is refined. This involves the explicit step of exploring the specific causal mechanisms in more detail and developing further the causal explanations that advance the hypothesis. This may be done by examining defeasance conditions and clarifying causal explanations as part of a process of theory-confirmation. This process recognizes that in respect of dispositional abductive hypotheses “explicit provision has to be made for their development before they are systematically evaluated against rival theories with respect to their explanatory goodness” (Haig, 2005a, p. 379). An abductive approach to theory development, therefore, explicitly allows for closer examination of causal mechanisms before
inductive testing occurs. Significantly, this phase is preliminary to, and is
distinguished from, the later stage of methodical inductive testing which defines
the limits of application of the theory developed. Arguably, an abductive
hypothesis will always benefit from early verification and refutation of its
propositions (as opposed to its evidentiary conclusions) based on the principle
of research economy (Fann, 1970). The abductive phase of \textit{theory-confirmation}
balances the permissiveness of admission with the requirement for
confirmation of the means of verification before further advancement (Haig,
2008c).

Specifically, in a Peircean approach to abduction the primary aim is to generate
theories based on hypotheses that are capable of more than mere rhetorical
affirmation (Peirce, 1957). If an abductive proposition might stand or fall on a
single fact, this fact is worthy of investigation for the purposes of theory
refinement. The importance of this is not to be underestimated, as represented
by Peirce's own opinion:

\begin{quote}
Not infrequently the whole life’s labor of a number of able men is required to
disprove a single hypothesis and get rid of it. (Peirce, 1960, p. 361) [CP 6.530]
\end{quote}

Accordingly, the researcher must not only come up with the novel discovery,
they must also eventually provide the means for its proof or dismissal. The
theoretical distinction is that admission of a hypothesis as plausible is not to be
taken to be equivalent to the assertion that it is testable. Consequently, the
testing of a defeasance condition occurs prior to considering all other
corroborating evidence that might exist in support (Peirce, 1966). The
researcher's specific task is to develop the means for development by testing in
ways that are appropriate to the premise of the abductive proposition. Theory
development is therefore best advanced by choosing a compatible method for
early verification or refutation in the process of theory-confirmation.

Often, in the testing of a truly novel abductive proposition, the means of direct
observation has not been developed with the formation of the hypothesis itself
instigating the necessity for a valid means of methodological confirmation. Consequently, Peirce proposed that a 'method of methods' should apply to determine how to approach and examine broad explanatory hypotheses admitted to investigation (Fann, 1970). The criteria for the effectiveness of this abductive approach relies on three grounds, being: a) economy, b) simplicity, and c) cautionary likelihood (Fann, 1970). These tests in pragmatism provide one means for validly structuring a methodical approach to abductive theory development and hypothesis confirmation.73

For the first test of economy, this is achieved when a hypothesis is testable by readily available means, is high in value in terms of the result, and will have wide effects on other similar cases (Fann, 1970). If one single inquiry can advance the hypothesis generally for the widest scope of application this examination is to be preferred in priority. For the second step of simplicity, while a proposed hypothesis may be broad in scope, according to Peirce (Fann, 1970), the preferred sequence in testing competing elements of a hypothesis is to advance those propositions containing the fewest elements first. This is not because they are likely to be more correct (in fact, often the opposite being true), but because their disproof will provide greater certainty by clear disclaimers of the most definite elements. As to the third test of cautionary likelihood, Fann (1970) relates Peirce's testing of an abductive hypothesis in the theory-confirmation stage to the common game of twenty questions. That simile reveals Peirce's view that "the secret of the business lies in caution which breaks a hypothesis up into its smallest logical components, and only risks one of them at a time" (Fann, 1970, p. 50) [CP 7.220]. In this way the test that advances the examination furthest, without dismissing the hypothesis entirely, is seen as the most prudent form of advancement.

The hypotheses proposed for systems of conceptions posit that conceptions have a discernable features that represents degrees of formational coherence, at different levels of structural inclusion, within recurrent patterns of cyclical variation and that these primary features are causally connected, or even dynamically inter-dependent. In the absence of a method for observing
conceptions directly using methods derived from the theory itself (being at this stage of the research premature), the presence (or absence) of anecdotal evidence of the resultant forms of these elements when combined might provide the necessary evidentiary preconditions justifying further investigation. The pragmatic guidance on this task provided by existing abductive theory is to critically examine the hypotheses as to their effect and to do so with economy, simplicity and cautionary probability.

**How was it applied?**

For the theory-confirmation phase of the abductive method the primary choice in method emphasis is framed as being between two alternative approaches: a) *replicated* and b) *assembled*. This distinction represents the difference in the forms of analogy used to explore the theory being developed (Haig, 2005a). In a replicated comparison the source model and the subject of comparison are the same (i.e. a homoeomorph). One knows what one is looking for and the comparison is exact. The new model is replicated from the familiar. In an assembled comparison the source model and the subject of comparison are similar, but different (i.e. a paramorph). By use of imagined criteria the thing is known when found. A paramorphic confirmation is useful where the theory being confirmed is novel and unknown (Harré, 2004). In the present situation there is no existing model specifically for systems of conceptions at the specified level of observation. As a result, the emphasis for the choice in method presented some unique questions. These were answered by the selection of an *assembled* paramorphic confirmation as the appropriate emphasis in method.

However, one applicable method for theory-confirmation is provided by existing abductive processes used in other fields. This is the process of analogical modeling. Haig (2005a) proposes that analogical modeling has a role of ‘central importance’ in the development phase of an abductive theory of method. This may involve the ascertainment of an ‘iconic paramorph’ (i.e. being an illustrative exemplar that applies even where the source of the comparison and the subject of observation are different). This represents the ‘model
imagined object’. The use of an iconic analogical model in this way provides one strategy to increase the content of explanatory theories in abduction consistent with the tests for economy, simplicity and cautionary likelihood (Haig, 2005a). Haig (2005a) provides a general argument schema for how the modeling of analogical functions logically works in an abductive method:

Hypothesis [H1] about property Q was correct in situation S1. Situation S1 is like the situation S2 in relevant aspects. Therefore, an analogue of [H1] might be appropriate in situation S2. (p. 380)

The process for comparison involves determining what is being looked for (H2) and then seeking to make the comparison using the knowledge (H1) of existing comparable phenomena (S1) in a different context (S2). The skill in confirmation using the analogue is derived from an understanding of the prior field, which understanding is then expressly applied to the new situation, with a particular focus on distinctive differences.

To test the explanatory hypotheses proposed in Chapter Four a model for comparison was required. Examining each of the criteria in turn, a comparison with greatest economy would be a similar explanatory theory for another category of phenomena that was as equally diverse as the phenomena of human thought (i.e. a theory of wide application). A comparison with greatest simplicity would be one that contained inter-dependent principles equivalent to each of the three defeasance conditions for the proposed hypotheses (i.e. rather than three separate comparisons which would need to be tested separately). A comparison with the greatest potential for cautionary likelihood would be an explanatory theory that had multiple principles and sufficient components to be tested individually, yet which were not also so compositionally complex as to be incompatible or incomparable.

Looking at conceptions as a theory representing complex systems, the proposed hypotheses (see Chapter Four) represent heterarchical dynamics (i.e. coherence at a level of organization), hierarchical dynamics (i.e. integration of different levels of organization, and holarchical dynamics (i.e. orientation in cross-level
dynamics of organization). After considering alternatives, one field of comparative diversity, with comparable principles of inter-dependency, and comparable complexity and structural similarity containing these three inter-dependent dimensions, was ecological systems theory. For the explicit reason that the third hypothesis (i.e. Hypothesis of Orientation) specifically concerns cyclical recurrence, the proposed comparison was focused on the propositions of ‘panarchy theory’ within the discipline of ecological systems theory, as this incorporates assumptions of slow and fast cyclical variables which are interlinked at different levels of organization.75

One advantage of panarchy theory for this purpose is that it is itself ‘iconic’ in its representational forms. The reason for the name of the field itself is explained by its foundational terms, which are best explained by its originators:

Since the word hierarchy is so burdened by the rigid, top-down nature of its common meaning, we prefer to invent another term that captures the adaptive and evolutionary nature of adaptive cycles that are nested one within the other across space and time scales. We call these panarchies; drawing on the Greek god Pan – the universal god of nature... In addition to a creative role, Pan could have a destabilizing, creatively destructive role that is reflected in the word panic, derived from one facet of his paradoxical personality. (Holling, Gunderson, & Peterson, 2002) (p. 74)

More illustratively, in the words of C. S. Holling, when linking ecological and sociological human systems to evolution and learning, this assumption of balance between structure and chaos is explained:

Panarchy is an odd name, but one that is meant to capture the way living systems both persist and innovate at the same time. It shows how fast and slow, small and big events and processes can transform ecosystems and organisms through evolution, or transform humans and their societies through transformational learning or the chance for learning. (Holling, 2004)

This informal description contains the depiction of panarchy as a dynamic and evolving interlinked system of multi-scalar dependencies. Holling (2001) specifically identifies two key features that distinguish the panarchy representation from traditional hierarchies. The first is the adaptive cycle within each level, such that a panarchy can be seen as a nested set of adaptive
cycles operating in different cyclic phases of recurrence. The second is that multiple connections are possible between different phases and different levels leading to cross-scalar impacts, linkages and effects. It is this premise of inter-linked cross scalar dependencies that provides the linkage to the proposed hypotheses. This feature that supports the use of panarchy over holarchy (or hierarchy) as a comparison as this feature represents the form of interdependency that characterizes the defeasance conditions to the proposed hypotheses. Specifically, in panarchy theory the adaptive cycle 'transforms hierarchies from fixed static structures to dynamic, adaptive entities whose levels are sensitive to small disturbances’ (Holling, 2001). A panarchy is then essentially a dynamic cross-scalar, multi-temporal holarchy. It is this unique depiction which reveals the effects of interconnected systems of different observational frames, operating dynamically, cyclically and inter-dependently, that is the primary attraction in forming an analogy to potentially disclose the dynamics of systems of conceptions.

As an affirmation for selection of this comparison, Holling and Allen (2002) explain how the theory of panarchy itself was derived from a process of adaptive inference, reflecting the process of abductive theory-generation and its subsequent confirmation:

Hence, in one of the cycles of investigation, adaptive inference move from propositions, to hypotheses, and thence to models, with several competing causal explanations being proposed and tested at each step. The two processes of confirmation and disproof, acting together, take each raw, naïve proposition through maturation toward theory. (Holling & Allen, 2002, p. 322)

Following selection of an appropriate 'iconic paramorph', the next step was to determine the criteria for comparison with the hypotheses for the causation of systems of conceptions.

**What was done?**
For the purposes of comparison the distinguishing features of a panarchy approach were first isolated from the many summarizing definitions of that field. These elements were taken from the various definitions of a ‘panarchy’ provided by leading researchers. The following definition provides a useful summary description (in one location) as an illustration of those forms:

Panarchies are hierarchically arranged, mutually reinforcing sets of processes that operate at different spatial scales, with all levels subject to an adaptive cycle of collapse and renewal, and with levels separated by discontinuities in key variables. (Holling, Peterson, & Allen, 2008, p. 3)

Specifically, the definitional components of ‘hierarchically arranged’, ‘sets of processes’, of ‘different spatial scales’, operating in ‘adaptive cycles’ of ‘mutually reinforcing’ ‘levels separated by discontinuities’ which when viewed together describe one coherent conceptual approach. Second, with reference to the wider theory (Gunderson, Allen, & Holling, 2010; Gunderson & Holling, 2002; Gunderson, Holling, & Light, 1995b), these distinct components were summarized into five elements for the purposes of comparison:

a) Holarchical (i.e. organizations of vertical arrangements in hierarchies);
b) Scalar (i.e. operating as different scales of phenomenon);
c) Temporal (i.e. over different timescales of occurrence);
d) Cyclical (i.e. subject to patterns of phasic reoccurrence); and
e) Cross-Level (i.e. with the potential for contingent interactions).  

Third, a sampling of the existing research literature in the various sub-disciplines of psychology, sociology and consciousness theory was undertaken by a broad review for each of these five criteria to see if there was any evidence for panarchy-like characteristics in the patterns of human thought. This was completed for different scales of complexity in the organization of systems of conceptions by adopting a multi-disciplinary analysis (rather than simply limiting the phenomenon studied solely to individual adult cognitive development). The different elements were kept discrete, with evidence of one of the five features at one scale not then constituting evidence of another
discrete element by implication, such that no presumption of colligation representing a generalized pattern was imposed.

Specifically, the different fields of psychological research and psychological phenomena considered included as multiple and discrete disciplines of inquiry, were: neurology (thinking), psychology (thought), semiotics (concepts), developmental psychology (conceptions), social psychology (understandings), sociology (presumptions), psychological systems theory (assumptions), anthropological psychology (worldviews), philosophical post-metaphysics (philosophies), evolutionary psychology (capacities), and consciousness theory (potentials) (Varey, 2011b).

The results of this analysis have since been presented (Varey, 2010b) and published (Varey, 2011b) and report accordingly on the conclusions reached in the abductive analysis. The remainder of this chapter represents a précis of that research (which appears in full as Appendix H).

5.4 What was discovered?

Summation of Findings

The comparison of the indicia of ecological panarchy using five criteria was intended to determine if there was anecdotal evidence reflecting the resultants of the hypotheses and the conjunction of their respective defeasance conditions. The result was to confirm that panarchy-like criteria are apparent in the research on the phenomena of thought.

This led to the secondary proposition that ‘psychological-panarchy’ was a viable form of inquiry into the complexity of the resulting structures of human thought. Accordingly, the result was that the research question was answered in the affirmative. The implication of this is a confirmation that the defeasance conditions to the proposed explanatory hypotheses for the formation of
conceptions could feasibly be satisfied and the proposed relationship between the proposed hypotheses is reasonable.77

In this way, the proposed hypothesized explanations move from mere admission to potential feasibility, warranting further investigation. This prompts the need for further theory development to enable the hypotheses to move from general assertions to a theory with empirical validation.

**Discussion of Findings**

The problem posed by the research question of this chapter presented a particular conundrum. A hypothesis for a thesis to disclose an undisclosed phenomenon cannot find direct verification for its propositions prior to the establishment and maturity of its own methods. On pragmatic considerations of economy, that particular research topic may then remain unexamined and the question it raises is considered 'best left unanswered'. Although, on reflection, this situation is not dissimilar to that faced in Charles Darwin's proposition of evolution by means of natural selection (Darwin, 1883; C. Darwin, 1969; Darwin, 2006a, 2006b; F. Darwin, 1969). The theoretical problem for Darwin was, if natural selection might be viable as a hypothesis, where was the empirical evidence that supported the abductive observations? While there was a logical argument to be derived from the general propositions of the abductive theory, the specific hypothesis of the ‘descent of man’ as a hominid species from earlier primates had no direct empirical evidence at the time of the theory's proposal (Darwin, 1883). The dynamic factors of the theory such as selection pressures, hereditary transmission and evolutionary speciation could not (at that time) be feasibly observed or measured (Gribbin & White, 1995). How would someone establish a theory that was primarily based on anecdotal speculation of an unobservable phenomenon (being evolutionary effects of timescales longer than human oral history and collective memory)?

In an intriguing example of abductive logic, Dutch physician Eugène Dubois, identified that if fossil evidence were to be found of the transitional form of
homo-sapiens then, geologically, it could be likely to occur in several locations, one of which was the Dutch East Indies (Dubois, 1896). From the work of German biologist Ernst Haekel (1909) on morphology, Dubois recognized that the resultant form of the effects of the hypothesis of evolution would be evidenced by specific anatomical features, such as bipedal locomotion, the morphology of the human ear and the volume of the cranial cavity (Shipman, 2001). At the time, the study of fossils was a novelty and the theory of evolutionary paleontology was still embryonic. In a five year expedition (1887-1892) Dubois conducted methodical excavations that led to the discovery of the fossil evidence of Pithecanthropus Erectus (i.e. ‘Java man’) (Shipman, 2001). To guide his analysis of the 11,284 specimens recovered he developed an ‘iconic paramorph’ for the skull, thigh and leg bone of the hominid that would represent evidence for the resultant form of Darwin’s evolutionary hypotheses. To explain these findings Dubois had to develop new research methods, establishing the fields of paleontological anthropology and evolutionary bioregionality, together with the empirical methodologies on which the evidence of modern evolutionary theory is now premised (Shipman, 2001).  

Following this analogy, the method adopted for the theory-confirmation phase involved taking the proposed hypotheses (Chapter Four) and imagining what their resultant effects would be over time. The effect of the defeasance conditions would mean specific phenomena would be likely to occur and should be evidenced in discernable patterns. The five criteria from panarchy theory, being: holarchy, scale, temporality, cycles and cross-scale effects, represent the theoretical paramorphic equivalents for conceptions in the evolution of thought (i.e. being analogically equivalent to the femur, larynx, molar, ear and skull that Dubois used to find Haekel’s ‘man-like-ape’ (Haackel, 1909). The difficulty of the research question would be to identify these forms in the fragments of existing research not designed to surface these elements specifically.

In conducting the literature study, what was initially interesting was the experience of the confirmation of Popper’s (1969) assertion that differences in intention and frames of reference would generate multiple observations
representing different conceptions of the same phenomena. The preliminary observation of the source information was stated (by me) as:

A review of the psychology literature on systems of thought reveals a panoply of perspectives, in multiple dimensions, without organizing principles and with no discernable system of causation or relations. (Varey, 2011b) (p. 516)

In applying the five paramorphic criteria independently, the anecdotal evidence reflected confirmation of each of the noted features. This is described by illustrative examples for each criterion across multiple scales of organization (Varey, 2011b). A précis of that analysis is provided for the five criteria.

First for the criterion of holarchy, this feature is now evidenced in the patterns proposed by the developmental stages of adult cognition, specifically seen as distinct forms of cognitive complexity (Commons, et al., 1982; Commons, et al., 1984), moral development (Gilligan, 1977; Kohlberg, 1969), ego-stages (Loevinger & Blasi, 1976) and managerial action logics (Torbert, 1999, 2000, 2004). However, the evidence of abstractions in structures in the patterns of human cognition do not evidence a complex panarchy any more than discontinuities in the body masses of birds evidence a complex ecology. These patterns would need to be evidenced in different scales of thought (representing conceptions and not being isolated or abstracted simply from forms of individual cognition).

The second criterion of scalar difference was noted by neglecting the scale of aggregation of individual thinking and considering instead the scope of inclusion in abstract thought (Fischer & Bidell, 2006; Fischer, et al., 1984). This appreciation that conceptions occur in different scales of inclusion is evidenced in concepts such as sustainability where the span of care held extends from immediate personal concerns to intra-generational scales of equity (van Marrewijk & Werre, 2003; Ward & Dubos, 1972). Similarly, in terms of moral principles, the resolution of moral dilemmas in ethics represents considerations of inclusivity of the categories of moral subjects (Lapsley, 2006; M. A. Smith, 2004). However, conceptions are described as a ‘space’ that operates with
dimensionality and in the intangible domain of thought this too must be represented by corresponding spans in temporality.

The third criterion of *temporality* was specifically reflected in the research into the philosophy of the perception of time by the evidence of how systems of thought incorporate structurally different temporal scales. In this analysis it is the features of psychological time that are relevant, rather than the more familiar physically empirical ‘chronological’ time (Varela, 1999b). Specifically, it was noted how, in moving beyond individual cognition, the concept of time itself has been ordered into the distinct temporalities of atemporal, prototemporal, eotemporal, biotemporal and nootemporal, representing different psychological ‘self-worlds’ (Fraser, 1975; Fraser, 2001). However, in terms of the hypotheses there is no assumption of a single teleological direction, with each conception also reflecting a centrality of recursion. The effect is that evidence of temporal discontinuity would also suggest some feature of cyclical activity.

The fourth criterion of *cyclical* recursion was satisfied, not so much by the assumption of recurrence, as in the evidence of a counter-assumption to continuous teleological progression. From the micro-levels of synaptic pulse (Hameroff & Penrose, 1996), to the formation of new individual developmental levels of consciousness (Graves, 2002), and in the transition of human paradigms of knowledge (Miller, et al., 2008) the progression of formation of systems of thought at different scales of observation cannot be said to represent solely a unimodal direction of progression. Representations of evolution are in fact ‘within’ a particular form of temporal conception, being the product of thought, not the description of the dynamics of the conception that holds them (Varela, 1999a). Instead the phenomena of thought, while it might progress (over time) in structures of abstraction, itself can be seen to fluctuate in patterns of non-identical recursion (Bateson, 1979). Pritrim Sorokin (1975) recognized this in terms of cultural patterns noting how “history ever repeats itself and never repeats itself;” (p. 675) However, even evidence of each of these four fundamental features (i.e. spatio-temporal holarchical cycles) representing the effects of the hypotheses and defeasance conditions does not completely
represent the assumptions of interdependency. It is the causation of cycles of recursion by the effect of cross-scalar impacts in a system of conceptions that supports the presumption of inter-dependency between the defeasance conditions.

This fifth criterion of cross-scalar inter-dependency was the most difficult to discern, involving the perception of constraint and perturbation dynamics between adjacent levels of organization. Examples are provided in multiple scales, such as stability in individual neurological balances and functioning (Robinson & Westley, 2009), conflicts between individuals in terms of subject-object relations (Kegan, 1994), group processes of values normalization (Taifel, 1982), and societal individual conflicts of values formation (Vickers, 1983). This was the area of weakest anecdotal evidence, with the concluding observation that “it is in the observation of tensions in cross-scalar relationships that the most interesting research work is yet to be done” (Varey, 2011b) (p. 519).

The study concluded by noting the limitations of these anecdotal secondary-source observations. From the theoretical work considered, it appears we are not practiced in looking at thought. Rather we are skilful at looking with thought and the patterns of conceptions are then a different secondary phenomena that results from that primary activity (i.e. a ‘resultant’). This makes the cross-scalar interactions in systems conceptions a further (and even more difficult) level of abstraction. With this explicit recognition, the concluding finding was stated as:

> From this preliminary analysis, it appears that such an approach is practically workable and theoretically viable. Using the principles of panarchy theory, in the way demonstrated, there exists a method of approaching the existing research on psychological functions to inform the foundations of a comparative dynamic hierarchical systems theory of thought. (Varey, 2011b) (p. 519)

The observation in forming this conclusion is that the discernment of panarchical structures in psycho-socio-ecological systems is difficult. The conjunction of disciplines in order to rely on the validity of the underlying theoretical assumptions is uncompromising, yet essential. The application of
this discipline to the structures of human psychology is, though, potentially possible. The extension of this form of inquiry to systems of conceptions, while it requires great precision, is also feasible.

**Evidence in Support**

This conclusion regarding the potential extension of panarchy-like features to psychological and psycho-social phenomena is not without theoretical support. The relevance of cognitive models and mental forms of representation, while at the core of panarchy theory’s origins, has not (until recently) been considered in its domains of application. There are in this general observation a few notable exceptions concerning the learning about panarchy theory and how this might be informed by developmental psychology (Fazey, 2010; Fazey, Fazey, & Fazey, 2005; Fazey & Schultz, 2009). However, the consideration of psychological dynamics in panarchy structures has not been completely overlooked. In a consideration of ‘policy pathology’, Holling (2010b) speculates on the psycho-social dynamics of psychological expectations in response to the policy management of socio-ecological systems. To frame the localization of effects of panarchy dynamics, Holling introduces the concept of ‘surprise’, being “when perceived reality departs qualitatively from expectation” (p. 71). He potentially also describes how the process of formation of (what would be now called) a conception occurs within the dynamics of a psychological panarchy system:

> Expectations develop from two interacting sources from the metaphors and concepts we evolve to provide order and understanding and from the events we perceive and remember. Experience shapes concepts; concepts, being incomplete, eventually produce surprise; and surprise accumulates to force the development or [sic] those concepts. This sequence is qualitative and discontinuous. The longer one view is held beyond its time, the greater the surprise and the resultant adjustment. (Holling, 2010b, p. 71)

This passage warrants further detailed consideration and explication. Holling describes how a conception (i.e. ‘the concepts we evolve to provide order’) might form from a pattern of structural coupling based on periodic recurrence. The coherence achieved based on localized perceptions of order is a necessarily
‘incomplete’ state. As a result, external events caused by the dynamics in perturbations of higher orders of organization than those contained by the conception then cause ‘surprise’. The point about surprise is that it is a subjective criterion based on a variance of perceptions to psychological expectations. It is also important to note that ‘surprise’ in this context is a psychological reaction (which to the extent the expectation is shared becomes sociological) of an otherwise discernible event or impact. While ‘surprise’ may not represent new physical facts, it does represent a new mental fact. This passage hints at how psychological domains can have their own panarchy dynamics that may, or may not, represent physical facts.

This analysis by Holling potentially introduces the dependent functions of coherency, integration, and orientation and their relationship to external perturbations as a description. Instead of understanding complex systems (ecological or psychological) by describing what they do, the ultimate aim proposed by this thesis is to instead discover ‘why they do’. This chapter seeks to confirm the premise for the conditions for formation by reference to an understanding of the dynamics of causation, rather than a description within an existing conception.

As a footnote to this inquiry, Holling (2010b) goes onto say that, while he does not explore the psychology and dynamics of individual, institutional, and social adaptation in that essay “this is ultimately necessary if we want to understand and design sustainable systems” (p. 75). This view accords with and supports the premise, propositions and ultimate aims for this thesis.

**Additional Insight**

The additional insight gained at this stage of the research explains the reason for the eventual architecture and forms of rigor used in the abductive process. The choice for me to use panarchy theory as a paramorphic comparison was not one of my original thesis intentions. The path I took to that decision involved re-tracing the development of ecological theory from its origins (Varey, 2010b). In
the initial chapters of this dissertation there are parallels drawn to the types of observations usually made within autopoiesis theory (Chapter Three) and complexity theory (Chapter Four). In being faced by similar assumptions of static structures and the discounting of discontinuities I recognized that I was facing similar problems to those solved by ecological systems theory. Once the anomalies similar to those that gave rise to panarchy theory became a necessary consideration (i.e. cyclical variation) it became necessary to consider that possibility. The question I was moving to answer was almost identical to that which had perplexed the key panarchy theorists, as posed in their integrative reflections of their own main points for future learning, when asking:

Why do intelligent, knowledgeable people organized in sophisticated societies degrade their life support systems to the point of ecological and economic disaster? And how can such catastrophic degradation be prevented? (Yorque, et al., 2002, p. 437)

However, in proposing a “view of sustainability that stresses adaptability and learning through thoughtful probing” (Yorque, et al., 2002, p. 436) there was also a transparency (and honesty) in what is proposed by panarchy theory as being one way forward by ‘developing new myths’. This leads to the consideration of a research propensity and an explicit temptation for each researcher in this proposed field of the analysis of conceptions.

Holling and Gunderson (2002) explore that, while the adaptive cycle heuristic is general in its application, it has limits to its applicability. Even restricting the assumptions of the adaptive cycle to living systems they suggest it may equally apply to “cell development, meiotic reproduction, ecosystem formation, evolution, human organizational stasis and transformation, political and social change and transformation” (p. 52). This leads to the propensity, that in adopting panarchy as a new mental model there is the possibility to see everything as a panarchy. The irony apparent is the mental model that overcame static assumptions in nature becomes a new form of stabilizing conception. In a theory of conceptions, this effect would be in accordance with its predictions, reflecting our human nature to often describe and ascribe forms of recognizable stability (even to complexity).79
This led to me noticing the research temptation of pre-attribution. When provided with an opportunity for adoption of a theory for which I already had a deep empathy and some intimacy, there was no real barrier to its automatic adoption as a solution to a presenting problem. The phenomena considered is easily represented as falling into the heuristic model of a parallel theory if the aim is to negate apparent tension of anomaly and complexity. For this reason, a specific process of inquiry was designed to mitigate that presumption. This was done by explicitly recognizing the difference between metaphorical adoption and paramorphic applications. The additional realization was that, while systems of conceptions are not ecological systems, the anecdote of panarchy (at the very least) might indicate, due to the similarity in its originating causes, how an independent discipline might develop from its own first principles.

This cognitive pause for reflection led to a decidedly inconvenient innovation. I discovered that the potential depiction of systems of conceptions as socio-ecological-psychological systems using a panarchy representation firstly confirmed and then (inconveniently) expanded the explanatory hypotheses proposed. Following my analysis, I initially thought that the addition of psychological criteria to the socio-ecological panarchy literature would provide a complete conjunction representing a ‘biopsychosocial’ sustainability system. For each of these three primary domains (i.e. bio-psycho-social) a different phenomenon of primary significance would have alternative precedence. These three analyses would then be compatible and could be made to be conjunctural. For example, in the biological it might be the viability of the organism was privileged, in the sociological the values of the community, and in the psychological the cognitive complexity of the problem definition. All three domains would then provide a conjunctural representation which would be reflected at multiple scales of organization (i.e. a single fishing boat’s catch, a local fishing industry’s vulnerability, the sustainability of a fisheries policy, etc.). In this way we might observe psychological systems of panarchy in the same way socio-ecological systems were constructed. The implication from this
proposition is that our thinking about sustainability learning might one day similarly be adaptively and reflexively managed.

The additional insight was that this inquiry at the scale of individual psychology using psychological panarchy theory reveals a great deal about descriptions of thinking, yet considerably less about the causation of thought. Adding psychological considerations to socio-ecological systems, while a novel and potentially valuable contribution in itself, was not going to fully answer my specific research question. The unfortunate fact is, to the extent that ‘conceptions’ are a resultant phenomenon of interdependent dynamics (see Chapter Four) this specific unit of observation could not be reduced to a conjunction of the biological, the sociological, and the psychological. To observe and theorize about ‘conceptions’ a different paradigmatic premise of observation was going to be required.

For this reason, a theory of conceptions is not, for example, reducible to the dynamics of individual thinking. The individual, while convenient and satisfying as a locus for explanation, was not a meaningful measure for the analysis of systems of conceptions. This conclusion was reported in the following terms:

If we desire to study the system of thought, it would be natural to begin with the thinker. The analogy is that the biology of the organism is to ecological panarchy as individual psychology is to psychological panarchy. This logic is incorrectly placed. If we were to develop a valid taxonomy for psychological panarchy theory, the psychological concept that correlates to an individual of a species in a psychological system is the concept. (Varey, 2011b, p. 520)

The insight gained was that a ‘conception’ is a different category of resultant phenomena. It is at a different level of observation to the abstract unit of the ‘concept’. The psychological span in the thinking of an individual was also not synonymous with the theoretical premise of a ‘conception’. The resulting effect of this extra ‘yard’ of inquiry was that instead of my thesis now being complete, the journey of the extra miles yet to be walked towards a more integrating conclusion, had only just begun. The development of a theory by abduction was, however, over its critical point of decision and now on its homeward run.
5.5 Summary

This chapter concludes that for Research Question #5:

- there is evidence for psychological panarchy;
- there is a possibility that systems of conceptions are panarchical; and
- the comparison confirms the conditions to the hypotheses are viable.

The anecdotal evidence of the potential resultants of the defeasance conditions identified using the paramorph of panarchy theory confirms the initial viability of the proposed hypotheses. This completes the necessary elements of theory-confirmation enabling theory-construction. The next phase of the research method therefore asks the abductive question: *What defines it?*
Chapter Six – What defines it?

6.1 Introduction

The aim of this chapter is to develop definitions for the key dimensions enabling a theory of conceptions. Definition of the dimensions of the proposed theory will be necessary to enable subsequent verification. Formal definitions are proposed for each of the hypothesized dimensions of Coherence, Integration and Orientation.

The abductive method used to answer the research question for this chapter is described as theory-construction. In this abductive phase the essential terms or concepts are articulated and defined. A ‘relational’ emphasis was selected as the appropriate abductive theory approach. The three dimensions of the adaptive cycle from panarchy theory were used as a homomorph for comparison.

The outcome of this chapter is the clear and unambiguous definition of the three primary dimensions used to depict systems of conceptions. This articulation enhances the broad assumptions of an iconic model (Chapter Five) providing the precision needed to enable measurement forms (Chapter Seven).

6.2 What was the question?

Research Question #6

What are the definitions for the three dimensions representing the three proposed hypotheses?

There is an assumption in the research question for this chapter that definitional coherence is a necessary part of abductive theory-construction. Three distinct considerations support this assumption.
The first consideration is, when examining novel phenomenon described in familiar terms there is often an implicit assumption that previously held definitions will apply equally to the new situation. The research question asked in this chapter directly raises the query of whether systems of conceptions are to be seen as identical to, similar to, or different from other complex systems. For example, the conclusion (from Chapter Five) that the defeasance conditions to the proposed hypotheses for conceptions have panarchy-like features generates the possibility that systems of conceptions can be depicted as panarchical systems. If this is the case, the question of definition is easily answered. The dimensions of analysis are merely those used for ecological and socio-ecological systems. The figurative metaphor of the ‘ecology of thought’ necessarily involves a naturalistic presumption that systems of human conceptions can be modeled on similar assumptions to those used for ecological systems involving biological agents operating in a physical environment. The research question posed critically examines the validity of the automatic adoption of this presumption.\(^{81}\)

The second consideration is that definitional coherence as part of the abductive process is enhanced by the use of conceptual synonyms for key definitions (in place of undefined homonyms like ‘resilient’, ‘sustainable’, or ‘healthy’). This ultimately enables comparative appraisal of one hypothesis with its alternative hypothesis on logical and pragmatic grounds. A theory that does not define its critical terms cannot be effectively critiqued. It cannot also be effectively critically appraised. This necessity for definitional clarity when dealing with abstract models is highlighted in Freund’s discussion of Weber’s concept of ideal types in the context of promoting sociology as a (social) science:

Every science worthy of the name defines its concepts precisely. The naturalistic method has the advantage of dealing with concepts – such as power, force, mass, energy – which are entirely unambiguous terms because they can be expressed in figures. The same concepts, when used by the human sciences, are exceedingly vague and constantly give rise to misunderstanding and confusion... If we concede that the content of a historical concept varies from one period to another, we must each time specify in what sense we are using it, lest we confuse our analysis and arrive at inconsistent results;” (Freund, 1968, p. 59)
The step of providing definitional coherence means, even as an abductive theory matures and its conceptual base develops with refinement, the consistency of its results can be appraised and that development may be followed based on consistent conceptual parameters.

The third consideration is much simpler (and less obvious). By definition, a theory which depicts systems of conceptions will be interpreted primarily by each conception differently. In the absence of precise terminology there is the potential for the conceptual system to be modified, adapted and reconstructed by each new conception to reflect its own constitution. The benefit of the theory developed is then diluted by alteration of the precision of its concepts as content. Ostensibly, for this thesis, a theory premised on the diversity and complexity of systems of conceptions will, in the absence of conceptual coherence, be potentially evidenced by its own ambiguity and absence of utility. The need for precise definitions acknowledges the significance of the role of conception formation in the process of meaning-making, especially when describing human systems. The definition of critical dimensions for systems of conceptions means the hypotheses can primarily reflect the structure of the theory (rather than meanings attributed to that form by other conceptions). These three considerations inform the design in method used to answer the research question for this chapter.

**Existing Understanding**

One would think definition is an essential step in the development of new theory. The reality is that the act of definition is more usually iterative and interpretive, than conscious and pre-emptive. In an abductive approach the process of re-interpretation and mis-description is consciously considered in the phase of theory-construction. The benefits of a conscious approach to definitional coherence can be illustrated by the example of the concept of ‘resilience’ as it is used and has developed in panarchy theory (Gunderson, Pritchard, Holling, Folke, & Peterson, 2002; Holling, 2010a). This parallel
example (see Chapter Five) provides an existing understanding of the potentials for definitions in formulation of a new theory of depiction of complex systems.

The concept of ‘resilience’ in the ecological context has part of its origins in a novel distinction made between ‘ecological resilience’ and ‘engineering resilience’ (Holling, 1973, 1976). The use of the term resilience in engineering traditionally focuses on material properties, such as robustness and rigidity (Gunderson & Holling, 2002; Holling, 2010a). By contrast, ecological resilience focuses on the natural system properties of adaptability and flexibility. The innovation was to recognize that definitions which provided certainty, stability, measurability and predictability in command and control type scenarios potentially caused a pathology of false descriptions. The pathology was identified when the descriptions were compared to the actuality of the complex natural environments they represented (Holling & Meffe, 1996). If the natural cycles of complex ecologies involve adaptability and change, defining resilience as ‘the capacity to remain unchanged’ potentially creates a distorted priority in “making the world appear more simple, tractable and manageable than it really is” (Holling & Meffe, 1996, p. 333). For this reason, the alternative definition of ecological resilience was proposed to reflect a different paradigm approach for a different context. In panarchy theory the concept of resilience reflects the idea of “the magnitude of disturbance that can be tolerated before a system moves into a different region of state-space and a different set of controls” (Carpenter, Walker, Anderies, & Abel, 2001, p. 766). The exact terms of this definition are explained by the comparison of counterpart antonyms:

*Resilience* determines the persistence of relationships within a system and is a measure of the ability of this system to absorb changes of state variables, driving variables, and parameters, and still persist. In this definition, resilience is the property of the system and persistence or the probability of extinction is the result. *Stability*, on the other hand, is the ability of a system to return to an equilibrium state after a temporary disturbance. The more rapidly it returns, and with the least fluctuation, the more stable it is. In this definition, stability is the property of the system and the degree of fluctuation around specific states is the result (Holling, 1976, p. 83)

This first illustration demonstrates both the potential pathology and corrective power of distinctive definitions. The denoting of a concept of ecological
resilience identifies a paradigmatic shift in the phenomena of significance and distinguishes homonyms between disciplines. This example demonstrates how in finding definitions for the study of conceptions, the ease of measurement and predictability of formal models might also contain the risk of inclusion of assumptions (e.g. such as ‘stability as normal’ or ‘expansiveness equaling goodness’) taken from other disciplines. The recognition is that familiar definitions often include presumptions of a pre-emptively applied normative mental model.

The second illustration from the definition of resilience in panarchy theory is the conflation of the use of the term ‘resilience’ as a property of the entire system and also as one of the three dimensions of depiction in the adaptive cycle. Holling and Gunderson (2002) explain how the addition of the dimension of ‘resilience’ to depictions of ‘potentials’ and ‘connectedness’ then “provided a way to reconcile the delicious paradoxes of conservative nature verses creative nature, of sustainability verses creative change.” (p. 40). This addition of an additional dimension transformed the concept of nature from being robust which “sees resilience of a system as a fixed quantity for the whole system” (p. 40). The effect was to transform the concept of ‘resilience’ for the paradigm of panarchy in ecological science.

From this example it is clear that each dimension for the formation of conceptions, even though inter-related, must be distinct from each other, and distinct from a description of the overall quality of the conception or of the whole system of conceptions (e.g. a conception can have the attribute of high coherence, or be a ‘coherent conception’, but not both). Effectively, the guidance is that the resultant quality of a conception should not be reducible to one of its dimensions, with each dimension being defined distinctly and seen as equally contributive parts to the formation of the analysis.

The third illustration relates to the actual role of definitions in the developing discourse of an emergent theory. This role reflects a balance between conceptual precision and practical application. A term can be validly talked
about in broad conceptual terms and then applied in a practical situation using precise parameters as chosen for that situation. In panarchy theory this balancing eventually has led to a protocol that when moving from ‘metaphor to measurement’ panarchy researchers should articulate specifically the resilience ‘of what, to what’ (Carpenter, et al., 2001). This protocol portrays the necessity for epistemological precision required in defining the spatio-temporal span of the particular research inquiry when dealing with panarchy-like systems of complexity. It requires definition of the observational parameters of the scope of the attractor basin (i.e. the socio-ecological system) with reference to the fast and slow variables operating within the scope of short and long adaptive cycles. To the extent that the potential models for systems of conceptions are to be scalable (i.e. operating at multiple spatio-temporal scales of organization) definitions that allow a similar scope of precision will also be required.

In the panarchy field, the resolution (in part) of this potential for confusion in the use of its key concepts was to provide conceptual clarifications for the critical terms, while also enabling an openness to multiple interpretations of those key terms to support a diversity of practical applications. One specific example for panarchy theory is illustrated by the adaptive cycle (and its three dimensions) which is formally seen as an ‘untestable metaphor’. The balance adopted reflects perfectly a pragmatic approach to the utility of conceptions:

Theory itself is rarely tested directly, indeed, it may not be testable in any definitive way. Instead, its success is measured by the utility of the conceptions in terms of their ability to influence the research topics chosen by scientists and to stimulate productive hypotheses. (Carpenter, et al., 2001, p. 59)

Primarily, the precision of a theory’s definitions will reflect not only the clarity of the discourse, but also future mental models held and past hidden assumptions retained. The adoption of ad hoc definitions, particularly when working across ontologically complex systems of observation can prescribe assumptions, force presumed models, exclude dimensional phenomena of significance and conflate different aspects of appropriateness. If the empirical and tangible measures of ecological systems can reflect equally the propensities
for definitional pathologies and clarities of mind, the definitional coherence for the description, measurement and modeling of a theory for the propensities of systems of conceptions may require an even more careful analysis.

Chapter Six Proposition

The thesis proposition of this chapter is that, if systems of conceptions have panarchy-like characteristics, then definitions of the conceptual dimensions used in panarchy theory may also be applicable to conceptions. The implication from this is that the differences and similarities between ecological systems and systems of conceptions will need to be discerned. The purpose of this chapter is to form definitions for the hypothesized dimensions of systems of conceptions in a way that is sufficient to enable conceptual consistency and verification of the proposed theory on its own terms.

The counter-proposition is that, when proposing a new theory a new lexicon of meaning is unnecessary if one can adopt meanings from other disciplines and even use familiar homonyms that lend credibility to the new theory indiscriminately. This enables the new theory to ‘feel’ metaphorically familiar, even if its terms have distinctly different premises, making it more accessible to robust and vigorous discourse. This potentially represents the error of equivocation, where a hypothesis relies on the ambiguity of its essential terms for the initial validity of its proof. This is seen where a critical term is taken to mean one thing in the context of one argument and is given a different meaning when used to provide support for the counter proposition. This error can be avoided in an abductive method by developing a level of definitional precision sufficient to allow discussion and development, while also creating a clear framework enabling conceptual development.

The proposal of this chapter is that each of the three proposed hypotheses represents a different and separately definable dimension of relevance to a theory of conceptions. In answering the question: ‘What defines it?’ the suggestion is to create definitions for the new terms by finding the exact
similarities to or differences with existing definitions and concepts. The outcome desired is to have definitions for the three dimensions that are conceptually discrete, yet sufficiently broad, so as to allow the full potential range of possible phenomena to be included.

6.3 How was it answered?

What is the theory?

The sixth phase in the abductive method providing the overarching framework of rigor in this thesis is theory-construction (Haig, 2005a). Theory-construction represents the process of the formalization of critical propositions and the colligation of hypotheses (Haig, 2005c). In the (prior) theory-formulation phase, ideas were explored in a dialogical relationship between analysis and theory, resulting in an elaboration of interpretive concepts that still require articulation (Coffey & Atkinson, 1996). In discovering, developing, refining and creating new concepts as formal theory, the central objective is to “transcend the local and the particular” while at the same time ensuring the analysis is methodologically and rhetorically convincing (Coffey & Atkinson, 1996, pp. 162-163). In doing this, the researcher is asked to use ideas to develop interpretations that go beyond previous uses in a synthesis that marks a new interpretation (Coffey & Atkinson, 1996). This act of new interpretation is the underlying purpose of theory-construction, in moving beyond the data to more generic issues, while being still within the original problem-delineation.

Previously mentioned are Haig’s (Haig, 2005a) distinctions in abductive theory between logical coherence, probabilistic coherence, and explanatory coherence (see Chapter Three). Under these three tests the constructed theory, articulated in a form sufficient for appraisal, should have explanatory coherence “in which the propositions hold together because of their explanatory relations.” (Haig, 2005a, p. 381) (see Chapter Three). The theory should also be logical, in terms of being able to lead from the evidence, to the proposition and then, with reasonable assumptions, to a theory of causation (see Chapter Four). The theory

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should also have probabilistic coherence, in that the conjunction of events hypothesized at least have plausibility in their circumstantial likelihood (see Chapter Five). In addition to these three tests, it is proposed that an abductive theory should also have \textit{definitional} coherence.

The argument is that an abductive theory, particularly one which focuses on different modes of observation and description for new phenomena, will require completion of definitional coherence prior to any measurements or validation being asserted by the accumulation of data. Essentially, for a new theory to be appraised successfully it needs to be discussed and discusssable on its own terms (i.e. to have rhetorical adequacy). This form of completeness avoids unnecessary semantic conflicts, particularly in a consensus of observations about identical data using only different terms to describe the same thing. This allows for more generative forms of evaluation in the theory-appraisal stage. The benefit gained is explained by the following principle (from ecological systems theory):

\begin{quote}
Two theories are truly competitive when they use the same definitions and operate on the same level of analysis. Then more data can help. However, two theories appear competitive but are in fact working at cross-purposes when they use the same words perhaps to mean different things, or are focused on different levels of analysis. Then data cannot indicate which theory is superior. (Ahl \& Allen, 1996, p. 21)
\end{quote}

The applicable principle in pragmatism is that an abductive theory of worth must be valid, testable, and applicable for the broadest set of conditions. In adopting a Peircian logic of the role of abduction in a wider scientific process, it is sensible in the theory-construction stage to anticipate the conclusion of the abductive process in theory-appraisal by keeping one eye on the pragmatic utility of the theory in terms of its potential for deductive forms of empirical testing. A theory that cannot be verified may be rhetorically attractive yet have predictive worthlessness. Accordingly, definitional coherence is required. This involves defining in clear terms the critical dimensions in ways that do not involve logical category errors and are not easily subject to misinterpretation. This is the primary theoretical aim of this chapter.
How was it applied?

For the theory-construction phase of the abductive method the primary choice in emphasis is framed as being between two alternative approaches: a) extensional logics, and b) relational logics. Extensional logics might use identical terms applying them to new contexts (i.e. an extension). Relational logics might use similar or entirely new terms, but explain the relevant differences (i.e. a relating). The extent of these definitional differences has significance in the validity of the extension or relation, and so also for the theory generally.

To understand how to make this choice in emphasis in theory-construction, a useful distinction has been made in abductive logic between approaches that develop extensions of existing laws to new situations and those that develop entirely new theoretical principles by drawing on relationships demonstrated by other existing theories (Aliseda, 2006; Walton, 2004). To provide guidance on this analysis, Gerhard Schurz (Schurz, 2008) draws together patterns in abduction from a diversity of research situations and identifies forms of abductive process by examining the kind of hypothesis produced, the type of evidence explained, and the beliefs relied on for each form. Ideally when forming definitions for a new abductive theory the degree of theoretical extension is ideally reflected in the adoption of new definitions.

To assist with this analysis of the extent of the difference, Schurz clarifies a subtle distinction between first-order abductive hypotheses, which involve new applications of known laws by extension, and second-order abductive hypotheses that develop, in part, new theoretical laws by forming logical relations with other cases. In the class of second-order abductions Schurz (2008) makes three further distinctions based on degrees of relational scale, being micro-part comparisons (i.e. a new law for the smaller follows existing principles for the larger), analogical comparisons of types of cases (i.e. a new principle follows a familiar concept), and a common cause hypotheses (i.e. a new unobservable entity subsequently explains all previous inter-correlated
These three approaches place their reliance on methods of: a) extrapolation, b) analogy, and c) pure unification, respectively. However, where an analogical approach to the formulation of new theoretical principles is adopted these distinctions cannot so easily be maintained. Schurz (Schurz, 2008) describes the subtle relationship between an analogical abduction of a new law which involves reliance on known theory as follows:

Here one adduces a partially new concept and at the same time new laws which connect this concept with given (empirical) concepts, in order to explain the given law-like phenomenon. The concept is only partially new because it is analogical to familiar concepts, and this is the way in which this concept was discovered. So analogical abduction is driven by analogy. (Schurz, 2008, p. 217)

Insightfully, Schurz (2008) further advances Thagard’s (1988) description of the process of conceptual combination to define a valid analogical abduction as involving the crucial process of “a conceptual abstraction based on isomorphic or homomorphic mapping.” [emphasis in the original] (p. 217). In doing so, a significant distinction of profound guidance is made between the generation of a conceptual abstraction as a principle validly derived from an analogous situation, and the cognitive error of mistaking a literal similarity for a valid analogy. Essentially, calling a thing by a familiar name does not make the application of the relational theory valid simply by that association. In establishing definitional coherency for the new theory a greater level of precision is gained.

Noting these theoretical distinctions means the often made cognitive error of using a weak analogy that is reliant on an invalid metaphor, which appears to be literally similar and is only figurative, can be avoided. While valid in rhetoric, such relational associations may not be valid in logic, and ultimately are not pragmatic. The preference in this thesis is to avoid that particular error and its result. Accordingly, the theory proposed represents a second-order abductive logic. It uses analogical comparisons to demonstrate how ‘a new principle follows a familiar concept’ rather than assert that ecological principles can be directly extended to systems of conceptions. This results in the choice of a relational approach as the appropriate emphasis in the method.92
The practical implication of a relational emphasis is to ask the question if systems of conceptions can be described as 'panarchy-like', to what extent can the definitions of the three dimensions in panarchy theory (i.e. *resilience, connectedness* and *potential*) be relied on when defining the three related dimensions for a proposed theory of conceptions? To provide a method to answer this question, five distinct alternatives were identified, from which one was selected.

**What was done?**

To derive definitions of the three proposed dimensions for depicting systems of conceptions a two-step process was undertaken. The first step was a review of the panarchy literature to identify different categories for the extensional and relational adoption of panarchy principles to non-biological systems. Drawing on Schurz' (2008) analysis and distinctions, five different categories of definitional 'borrowings' were identified. The second step was to select from these forms the most appropriate abductive method. Definitions for the three dimensions were then generated by relational comparisons. Essentially, the process was to assess the conceptual relationship between existing theories and the proposed theory and determine what the appropriate level of 'fit' possible, while also maintaining the integrity of the abductive hypotheses.

To inform this analysis, a review of the literature on the formation of panarchy theory and its primary definitional terms was undertaken. This revealed firstly its origins in ecological systems theory and the early emphasis primarily on the biological dynamics of ecological resources (C. R. Allen, et al., 1999; Cherrett, 1989; Walker, 1989). In more recent decades it has been increasingly noted that the sustainability dynamics of ecosystems are directly impacted by the presence of humans (Folke, et al., 1998). Accordingly, sociological factors then began to form fundamental components in the study of an ecosystem resilience (Gunderson, et al., 1995b). Subsequently there have been applications of the principles of panarchy theory (as developed from the observations of the
dynamics of ecological systems) to the social dynamics of human systems (Westley, Carpenter, Brock, Holling, & Gunderson, 2002). The inclusion of social factors was initially made to better inform the management of the dynamic effects of those human systems on the adaptive management of ecological systems (Folke, Hahn, Olsson, & Norberg, 2005; Gallopin, 2006; Gunderson & Light, 2005; Holling, 1978). The integration of socio-ecological considerations was then extended significantly to become a permanent component of the panarchy discourse (Berkes & Folke, 1998; Berkes & Turner, 2006; Carpenter & Gunderson, 2001; Folke, et al., 1998; Holling & Sanderson, 1996; Westra, Bosselmann, & Westra, 2008). Consequently, the panarchy model is no longer solely isolated in its application within the discipline of ecological systems theory. This creates the opportunity for its wider application to other systems of complexity, including social systems and, potentially, systems of conceptions.

Following this, a diverse range of applications of panarchy theory, outside of the domain of biological systems, was identified from the source literature from within the primary discourse. Examples include the extension to sociological considerations of eco-system management (Carpenter & Gunderson, 2001), the socio-governance factors in ecological management (Holling & Meffe, 1996), socio-cultural factors that impact on ecological systems (Holling & Sanderson, 1996). There is the adoption of adaptive cycles to non-ecological and non-physical systems (Carpenter, et al., 2001), including the socio-political (Hanna, Folke, & Maler, 1996), socio-economic (Perrings, 2006), organizational (Garmestani, Allen, Mittelstaedt, Stow, & Ward, 2006), policy structural (Clark, Jones, & Holling, 2010; Gunderson & Light, 2005; Walters & Holling, 1990), individual psychological (Robinson & Westley, 2009) and urban formational (Garmestani, Allen, & Gunderson, 2009). Novel applications of panarchy metaphors have since been used to visualize the dynamics in the growth of organizations, phases of leadership, changes in political systems, or the patterns of organization of firms (Garmestani, et al., 2006). The principles of panarchy theory have also been innovatively used to supplement other complexity theories, such as seeing multiple levels of interacting systems as feedback loops in self-organizing systems (J. J. Kay & Boyle, 2008), in the analysis of lock-in
traps in natural resource management (Allison & Hobbs, 2006), or the application of adaptive cycle phases to economic resource clusters in organizational growth theory (Martin & Sunley, 2011). Distinctively, the application of panarchy principles has informed the separate and distinct creation of dynamic theories of change for social systems (Westley, et al., 2002), economic systems (Brock, Maler, & Perrings, 2002), and macro-economic systems (Gotts, 2007).

From this panoply of ‘panarchies’ five distinctive categories of extensional and relational applications of panarchy theory concepts and terms can be specifically noted, being: 1. extension of ecological resilience models to incorporate human factors as system effects on those ecosystems; 2. adoption of ecological resilience principles and their application to non-ecological systems, usually by rhetorical metaphors; 3. depiction of the structure of phases of other systems in terms of the models and terminology of panarchy theory; 4. adaptation of other systems and resilience models using comparative elements or a direct analogy to ecological resilience principles; and 5. applications of panarchy principles as derived from a meta-analysis to discrete parallel disciplines by independent investigation of the dynamics operating (see Table 6.1).

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Description of Abductive Application</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological</td>
<td>Addition of non-ecological factors as impacts</td>
<td>Extension</td>
</tr>
<tr>
<td>Sociological</td>
<td>Application of concepts to non-ecological systems</td>
<td>Adoption</td>
</tr>
<tr>
<td>Cross-Disciplinary</td>
<td>Descriptions used for non-ecological systems</td>
<td>Depiction</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>Modification of concepts to parallel applications</td>
<td>Adaptation</td>
</tr>
<tr>
<td>Para-Disciplinary</td>
<td>Generation of comparative principles in parallel</td>
<td>Application</td>
</tr>
</tbody>
</table>

It is proposed that all these forms of approach are valid in their various uses of the panarchy model for support. Each also has a different claim to validity and different limitations in terms of the conceptual integrity claimed from reliance on the underlying principles of ecological systems theory. For the purposes of this inquiry it was the fifth category of application of the panarchy principles to a relational situation that had specific relevance and corresponded with the
selected emphasis in method. This form of adoption of panarchy principles involves the advancement of a new theory by a new and parallel application of relational principles. The reason for this selection is that, just as social systems are not purely biological systems, so too conceptual systems are not merely socio-ecological systems (Westley, et al., 2002).

The implication of this selection is that unlike an extension, adoption, depiction or adaptation, application involves re-defining the same principles as they apply to a uniquely different disciplinary context. This involves an examination of the underlying conceptual assumptions of ecological resilience theory, a determination of the validity of the application of those principles to other domain specific systems, and the construction of new theory using the principles and forms applicable specifically to that domain. This entails the need for comparative processes of measurement, observation and adaptive management unique to the field subsequently being developed. While more exacting, the enduring effect is a more robust theory of greater understanding. Accordingly, this fifth category of application provided the basis for the analogical comparison to generate the specific definitions required.

6.4 What was discovered?

Summation of Findings

The findings from the analysis were that the conceptual definitions of the three dimensions of the adaptive cycle in panarchy theory conceptually correlate with the relational principles in the three hypotheses for the formation of systems of conceptions (see Table 6.1).

The qualification to this finding is that, although the three dimensions correlate, the definitions of those dimensions for ecological systems do not directly translate to systems of conceptions. Essentially, systems of conceptions can be generally understood using panarchy principles, but will require their own theory of causation. The primary reason for this is that conceptions, as a
resultant phenomenon, are not reducible to physical, sociological or psychological principles (see Chapter Five). The result is that new definitions for the new dimensions are required reflecting with precision the key differences in the newly formed relational principles (see Table 6.2).

<table>
<thead>
<tr>
<th>Panarchy</th>
<th>Key Concepts - Panarchy</th>
<th>Conceptions</th>
<th>Key Concepts - Conceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectedness</td>
<td>Adaptability to variations</td>
<td>Coherence</td>
<td>Stage of formation in process</td>
</tr>
<tr>
<td>Resilience</td>
<td>Vulnerability to disturbance</td>
<td>Integration</td>
<td>Range of levels of operation</td>
</tr>
<tr>
<td>Potential</td>
<td>Range of alternative options</td>
<td>Orientation</td>
<td>Directions of normalization</td>
</tr>
</tbody>
</table>

Table 6.2 - Correlation of Panarchy and Conception Dimensions

Consequently, three newly defined terms are proposed for the three dimensions formed from the three proposed hypotheses for systems of conceptions (Chapter Four). The defined terms and their correlating panarchy dimensions are:

a) for the dimension of ‘connectedness’ ~ the new definition of Coherence;
b) for the dimension of ‘resilience’ ~ the new definition of Integration; and
c) for the dimension of ‘potential’ ~ the new definition of Orientation.

For clarity, from this point in the dissertation use of those capitalized terms for the new definitions indicates the use of those terms as defined in this chapter.

Discussion of Findings

The roles of the proposed definitions within this novel conceptualization are understandable only from within the paradigm of thought they are representing. With this recognition, the form of the proposed definitions was as important as their substance. The critical question to be answered by the process of this inquiry adopted was how might the definitions be familiar and how must they be different to existing terms from different applications?
To provide some constraints on the form of the definitions three criteria were specified as necessary conditions. These were qualitative criteria, specific to this inquiry. They adopt a convention for the avoidance of a tautology in the construction of the definitions by explicitly dealing with the possibility of self-reference and circularity in the terminology. These criteria were:

a) the definition should be primarily of a conceptual dimension which must lead to an empirical measure, yet is not be defined in terms of that measurement scale (i.e. where the quality is merely the measure of that quality).

b) the definition should be descriptive of the quality of the phenomena of the dimension, yet cannot be a qualitative description of that phenomena (i.e. to define ‘health’ as when something feels healthy).

c) the definition should contain the flexibility for the representation of the presence and absence of a quality equally, not reflecting a preferred conditional state (i.e. the dimension by its structure ‘defines-out’ the presence of a potentially desired state).

In this way, the intention was to deliver definitions of the key dimensions that were facilitative of form, descriptive in speech, and neutral in mind.

By the relational comparison with the existing defined dimensions of panarchy theory the definitions of correlating dimensions for systems of concepts were logically developed. Details of this process are provided in the following sections.

For ease of analysis, each section contains: a) a description of the panarchy dimension, b) an example definition of the panarchy dimension, c) a relational comparison of the dynamics of that dimension to the correlating hypothesis, d)
application of that analysis to systems of conceptions, e) a succinct definition for the new dimension, and f) an abbreviated statement of the lexical structure.

Defining ‘Coherence’ (Connectedness)

The concept of ‘connectedness’ (also referred to as ‘connection’ and ‘extent of connections’) is often used abstractly and metaphorically within the panarchy literature. The concept is essentially described by its quality of effects, being the ‘degree of internal control over variability’ (Holling & Gunderson, 2002, p. 40). Technically, ecological connectedness describes the patterns of processes and pathways of configurations that enable the resulting functions and structure of ecosystems to operate successfully. This concerns the composition of the ecological system and the effect of variations of flows within the system. The distinction made when describing connectedness is that it is the regulation that results from internal variables and processes. The defining elements of connectedness are provided by Holling and Gunderson (2002) when outlining the three dimensions of the adaptive cycle, providing a clear illustration of the resultant qualities of a panarchy system with this quality:

The second property is connectedness. It reflects the strength of internal connections that mediate and regulate the influences between inside processes and the outside world – essentially the degree of internal control that a system can exert over external variability. An organism, ecosystem, organization, or economic sector with high connectedness is little influenced by external variability; its operation and fate are controlled by internal regulatory processes that mediate variability. (p. 50)

In this definition there is an apparent correlation between the fragility of over-connected systems and their resilience. A more detailed understanding of panarchy theory acknowledges how highly inter-connected diverse ecological systems can also become unresponsive to external environmental variances, entrenching structural dependencies and making them vulnerable to small disturbances (Holling & Gunderson, 2002). Accordingly, the measurement of factors representing connectedness, such as ‘diversity’, should ideally not be a measure of the finite numbers of pathways, but only those contributing to the
connections between significant structures and key system dynamics (T. F. H. Allen & Starr, 1982) (Costanza, 1992). Consequently, under-connectedness, where critical functions become independent and disconnected in terms of feedback flows, reduces resilience. Counter-intuitively, over-connectedness, where critical functions are highly inter-dependent (also) reduces resilience, or more accurately, reduces the probability of the apparent stability enduring as a consequence of the degree of changes in external variability. When seen cyclically (or seasonally), the kinds and strengths of the desirable levels of connections also change. Connectedness is therefore a feature than ensures functional integrity within a range of tolerances, rather than the ecosystem’s durability in terms of its resilience to cycles of extremes outside of those tolerances. Accordingly, this dimension serves an independent function, yet has inter-dependencies with the other panarchy dimensions. It can be likened to the concept in autopoiesis of concatenation in self-production, with its descriptor being the capacity for ‘flow’.

In application of this principle to systems of conceptions, the compositional complexity and diversity in the pathways enabling the formation of meaning within conceptual systems provides a similar quality by analogy. In systems of conceptions, the quality that the principle of connectedness represents is the capacity of the conception to assimilate flows of information and significance, particularly in the form of differences and variations. As an example, if a conception was limited in the diversity of its domains of knowledge, information from outside of its specializations of experience cannot be effectively assimilated. For example, the use of multi-disciplinary inquiries reflects the desire for the cogent assimilation of information of great diversity and complexity. However, like with ecosystems, while over-connected conceptions may be narrow in their definitions and scope of inclusions, under-connected conceptions would be plagued by an absence of cogency and confused multiplicities. The function of connectedness in a theory of conceptions is to utilize the composition of domains of knowledge to form a coherency of interpretations enabling reliable expectations. The correlating dimension representing the principle of ‘connectedness’ for systems of
conceptions is therefore proposed as *Coherence*. The following definition is offered:

*Coherence* ~ the ability to assimilate anomaly based on the recognition of phenomena within existing forms of composition.

To facilitate the understanding of the definition: the focus is on *anomaly*, the measure is *ability* and the feature of significance is *composition*.

**Defining ‘Integration’ (Resilience)**

The concept of resilience is central to panarchy theory (Holling, 1976). The term itself takes on multiple forms and different meanings in practice based on the particular traits and characteristics considered desirable by the researcher in respect of the system being researched (Carpenter, et al., 2001). The dimension of ecological resilience primarily concerns the adaptability of the system and is judged by the potential for regimes shifts at different scalar levels of organization (Folke, et al., 2010). Specifically, studies of resilience determine the gradients of change required in the triggering of these regime shifts. The defining elements of ‘resilience’ in panarchy theory are provided by Holling and Gunderson (Holling & Gunderson, 2002):

The third property is ecosystem resilience, or its opposite, vulnerability. As described in an earlier section, we use resilience in its ecosystem sense to represent the capacity of a system to experience disturbance and still maintain its ongoing functions and controls. Resilience of this sort depends on the existence of multi-stable states, for it concerns the likelihood of flipping from one to another. A measure of resilience is the magnitude of disturbance that can be experienced without the system flipping into another state or stability domain (p. 50)

In this definition, a number of concepts are highlighted. The first is that resilience connotes flexibility, while sustaining overall identity. The second is that resilience is dependent on scales above and below particular levels of organization, introducing the concept of a hierarchical dependency. The third is how resilience is related to (but not synonymous with) the integrity of the
entire system and its capacity for generative change in the face of external perturbations. In this compound description we see how resilience is a both a separately distinguishable dimension and is also intimately related to other factors. Of primary significance is that resilience is defined with reference to multi-scalar levels of organization. In making this technical distinction we can recognize that resilience is a not a description made at a single-level of observation, but of the capacity of multi-leveled panarchical systems to maintain an identity of functions notwithstanding impacts and variations impacting at specific levels of integration. This can be likened to the concept in autopoiesis of homeostasis in enabling entity self-regulation, with its descriptor being the capacity for the system to 'flex'.

In application of this principle to systems of conceptions, the integrity of each order of conceptual complexity in complex abstractive hierarchies of thought provides a similar quality by analogy. In systems of conceptions, the quality that the principle of resilience represents is the capacity of the conception to accommodate external perturbations, particularly in the form of learning and adaptation. As an example, conceptually abstract ideas can be easily understood by use of metaphors describing experiences that are familiar. Relational concepts can be formed by extensions of the familiar into the unfamiliar (Sørensen, et al., 2007). Similarly, an absence of lower order systems of complexity (i.e. grammar, syntax and vocabulary) can make higher-order explanations vulnerable to distortion, re-description and simplification (Sternberg, 1984). The meaning made might be coherent, but may not be able to be integrated at the same order of abstractive logic (i.e. resulting in simplification, exclusion or recursion). The formation of complex conceptions is therefore dependent on the workable integration of different scalar orders of meaning. The correlating dimension representing the principle of ‘resilience’ for systems of conceptions is therefore proposed as Integration. The following definition is offered:

Integration ~ the capacity to accommodate abstractions with acuity based on the maintenance of integrity across scales of configurations.
To facilitate the understanding of this definition: the focus is on *acuity*, the measure is *capacity* and the feature of significance is *configuration*.

**Defining ‘Orientation’ (Potential)**

The third dimension that panarchy examines as an ecological system property is ‘potential’ (Holling & Gunderson, 2002). The ‘potential’ of the system is judged in terms of the possibility available for change. This dimension is significant as it determines the range of alternatives for potential system states as viable options in times of variation (Gunderson, Holling, & Light, 1995a). This dimensions could be considered as the potential states of the system and is expressed and measured “in ways specific to specific situations or systems” (Holling & Gunderson, 2002, p. 49). A preliminary definition of ‘potential’ is provided in the following form:

The inherent potential of the system that is available for change, since that potential determines the range of future options possible. This property can be thought of, loosely, as the wealth of the system... Potential, or wealth, sets limits for what is possible – it determines the number of alternative options for the future. (Holling, 2001, p. 394)

In this definition the concept of potential in panarchy theory is as equally confusing as its counterpart dimensions, partially due to the attribution of value-laden subjective qualities applied differently in different situations (for example social, cultural, economic and informational capitals) (Holling & Gunderson, 2002). Specifically described is how the potential for change can be measured in different ways depending on what is to be represented by the particular assessment. Examples are given as measures of potential productivity in terms of accumulated nutrients in bio-systems, cultural capital in social systems, physical infrastructure in technical systems, the economic potential of knowledge capital in socio-economic systems and the ‘foresight potential’ in political decision-making systems (Holling & Gunderson, 2002). Potential as a panarchy concept is, therefore, not limited to biotic forms. As an example, in
socio-ecological systems, potential can be represented in cultural capital terms as the “character of the accumulated networks of relationships – friendships, mutual respect, and trust among people and between people and institutions of governance” (Holling & Gunderson, 2002, p. 49).85

The interesting feature of the dimension of potential is that while it is related to connectedness in terms of availability of flows, and resilience in terms of flexibility of structures of containment, potential may continue to be retained notwithstanding the de-construction of existing forms of organization of an ecological system.86 This counter-intuitive conclusion is expressed by the idea of ‘landscape-level ecological memory’ where spatial resilience is carried forward by cultural practices and institutional memory (Berkes & Folke, 2002). This examination of the interface between social and ecological systems reveals how ‘ecological’ knowledge is transmitted through social rituals and oral history, represented as the “wisdom to interpret novel observations” (Berkes & Folke, 2002, p. 138). It is at this point that the panarchical correlation between systems of conceptions and the knowledge of corresponding ecological and sociological landscapes becomes significant in terms of the capacity to preserve human understanding about our habitats as they, and we, undergo great change. This attribute of potential as ‘memory’ can be likened to the concept in autopoiesis of the utilization of the experience of recurrent normalization, with its descriptor being the capacity for ‘flux’.

In application of this principle to systems of conceptions, the nearest analogy of a similar quality is the potentiality in intentionality. In systems of conceptions, the quality that the principle of potential represents is the capacity of the conception for expansion, maintenance, contraction or collapse. However, for systems of conceptions, potential is an entirely different form of capital. This could illustratively be called meaning-capital (i.e. the ability to recall experience and prior learning). This could be measured in terms of the potential for the system to, now or in the future, make meaningful interpretations, noting how this capacity is affected by changes in its internal and external environments.
The role of foresight potential as a function of meaning capital is highlighted in one of the few implicit references to psychological potential provided by panarchy theory:

A particularly important version of that is foresight potential, possible because of the unique self-awareness and cognitive abilities of people ... because it adds a role for future expectations and the influence of future conditions on the present. This is one of the features that distinguishes human systems from strictly biological and physical ones. It answers, in part, the question of why human systems are not like ecosystems. (Holling & Gunderson, 2002, pp. 49-50)

Significantly for systems of conceptions, the way in which humans as conscious agents have the capacity (potentially, if not actually exercised) to be conscious of their choices is significant in terms of the recognition of the ability to work with a conscious understanding of the processes of adaptive change in cross-functional multi-temporal levels of thought. The dimension of 'potential' in a system of conceptions represents the receptivity of human agents, through different processes to gain conscious awareness of changes to the fundamental dynamics of a system of which they are part. The dimension of orientation is, essentially, an assessment of the future capacity of the system of conceptions to work within its own dynamics for system health, renewal and emergence. The presence of potential within a system of conceptions is evidenced through the capacities created for an increasing orientation towards learning, conceptual growth and enhanced capacities for coping. The correlating dimension representing the principle of 'potential for change' for systems of conceptions is therefore proposed as Orientation. The following definition is offered:

*Orientation ~* the capacity to actuate intentionality in ambiguity based on the receptivity to opportunity as aligned with directionality.

To facilitate the understanding of the definition: the focus is on *ambiguity*, the measure is *receptivity* and the feature of significance is *direction*. 
Proposal of New Terminology

In summary, convenience would have suggested that in using the illustrative metaphor of the ‘ecology of thought’ we might speak with accuracy about systems of conceptions by exclusively using ecological concepts from biological systems. The analysis of a comparison of the underlying hypotheses for complex ecological (and socio-ecological) systems and their comparison to the proposed theory for systems of conceptions showed that there were, in fact, many informative comparisons of similar dynamics from unrelated contexts. However, these parallel systems are only similar, not identical. This required the creation of new terms to indicate the distinctly different dimensions to specifically examine systems of conceptions as a proposed field.

For example, the term ‘connectedness’ as applied to ecological networks is not directly analogous to the parallel hypothesis for systems of conceptions, as the existence of the pathways of flows representing the conceptual interactions of meaning (i.e. as opposed to the tangibles of information) are not (as yet) empirically confirmable. Hence, the term Coherence is used to make this distinction that the paths for the formation of meaning in conceptions are less tangible, yet have a resulting quality that is equally discernable (and potentially disclosable).

Also, the term ‘resilience’ in socio-ecological systems terminology is not directly analogous to its parallel hypothesis in the analysis of systems of conceptions, as the subtlety of different forms of understandings, when observed from different systems of understandings, make assertions of value-based assessments of beneficially enduring characteristics problematic (i.e. one person’s ‘resilient’ is another person’s ‘resistant’). Therefore, the term Integration is used to denote how cognitive complexity establishes systemic dependencies reflected in the viability of assumptions and the rigidity of presumptions that result in the formation of level-based opinions and values systems.
Similarly, for the term ‘potential’, the limitations of the comparisons reveal that the concept of ‘wealth’ or accumulated capitals in biotic systems is not directly analogous and applicable to systems of conceptions, as by the inclusion of human psychological motivations there is a component of intentionality that alters potential consciously. Consequently, the term Orientation is proposed as an alternative to ‘potential’ to make this distinction. The results of the definition process are summarized for each dimension (see Table 6.3):

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Focus</th>
<th>Measure</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherence</td>
<td>Anomaly</td>
<td>Ability</td>
<td>Composition</td>
</tr>
<tr>
<td>Integration</td>
<td>Acuity</td>
<td>Capacity</td>
<td>Configuration</td>
</tr>
<tr>
<td>Orientation</td>
<td>Ambiguity</td>
<td>Receptivity</td>
<td>Direction</td>
</tr>
</tbody>
</table>

This definitional precision, in providing clarity and certainty as part of theory-construction, has the effect of generating parallel and altogether new questions of epistemology and methodology within this novel ontological approach.

**Evidence in Support**

The support for the conclusion that the dimensions of ecological panarchy correlate to the dimensions of systems of conceptions is (in part) evidenced by an ability to substitute the new definitional terms for those in a classical panarchy description. The effect is seen as an example of correspondence in theoretical cogency (as opposed to definitional extension by transposition).

In a description of how the three dimensions of an ecological panarchy analysis provide a conceptual ‘shape’ to the dynamics of systemic change, each dimension can be seen as equally contributing to a unique and observable set of dynamics in this informal summary:

These three properties shape a dynamic of change. Potential sets limits to what is possible – it determines the number of alternative options for the future. Connectedness determines the degree to which a system can control its own destiny, as distinct from being caught by the whims of external variability. Resilience determines how vulnerable the system is to unexpected
disturbances and surprises that can exceed or break that control. (Holling & Gunderson, 2002, pp. 50-51)

From the analytical relational second-order comparison proposed, this conjunctural summary could be read to equally apply to systems of conceptions. By substituting, almost verbatim, the corresponding new definitional terms a description is derived of how the dynamics of formation and change might occur in systems of conceptions. Using the alternative definitions proposed for systems of conceptions, a cogent description results:

These three properties shape a dynamic of change. Orientation directs attention to what is possible – it determines the number of alternative options for the future. Coherence determines the degree to which a system can evoke its own destiny, as distinct from being caught by the whims of external variability. Integration determines how vulnerable the system is to unexpected perturbances and surprises that can exceed or break its capacity for integrity.

From these comparisons, the panarchical dimensions used in ecological, sociological and socio-ecological systems are therefore seen to have possible correlates with the three dimensions identified for systems of conceptions, yet definitional differences (that insist on the requirement for new knowledge). In an application of panarchy theory to this new territory these dimensions require independently derived principles, which represent analogous, yet altogether different, systemic properties. This leads to the possibility for the analysis of the dynamics of systems of conceptions, not as an analogy to ecological systems or socio-ecological systems, but on their own terms.

This analysis is further confirmed by policy systems theorist, Sir Geoffrey Vickers (1987) who in undertaking a similar inquiry decades earlier introduced the concept of the ‘appreciative system’. He described this as a complex conjunction of three-dimensions in the formation of human conceptions, representing a ‘values system’, a ‘reality system’ and (what could be called) an ‘expectational system’ for the future based on past events. While Vickers work was primarily in human systems, he had an explicit affinity with natural systems, leading him to make this observation:

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So I regarded as a legitimate analogy, though not of course, an exact one, to speak of our interpretive system – I call it an appreciative system – as an ecological system, even though the laws which order and develop a population of ideas (conflicting, competing, and mutually supporting) in communicating minds are different from those which order and develop a population of monkeys in a rainforest or of insects under a paving stone. (Vickers, 1968, p. 12)

As support for this conclusion, in an explicit consideration of how ecological panarchy assumptions may relate to social systems, Westerly et al. (2002) identify how ‘structures of signification’ allow human systems to engage in abstraction, reflexivity, prospectivity and externalization in expectancy. This feature makes human social systems different to ecological systems, which are primarily time and space bounded. While many animal systems also use system artifacts to signify behavioral requirements (e.g. trails, nests, food reserves, etc.) human social systems uniquely involve abstract symbolic constructions. It is argued that beyond the symbols and artifacts of human systems there is this quality of ‘significance’. This is the additional dimension captured by an analysis of systems of conceptions. This fact of the ‘significance of signification’ is why systems of conceptions are not conceptually (or empirically) reducible to socio-ecological social systems.

In summary, there appear to be clear parallels (i.e. a ‘legitimate analogy’) in the applicability of some components of panarchy theory to a theory of the dynamics of human conceptions. What is unclear is the extent of the validity the observations from panarchy theory may have when applied to systems of significantly different composition (i.e. conceptual human thought rather than biotic flows of nutrients or a population of monkeys). This suggests that new definitions, modes of observation, and models for prediction will be required.

Accordingly, rather than extend the ecological metaphor for systems of conceptions endlessly, the next stage of this research is to articulate a theoretical approach to the dynamics of systems of conceptions that can stand on its own ontological footing, yet also reflect analogous principles in the study of dynamic interactions of complex systems available from other disciplines.
This process of refining the means of measurement for the defined dimensions is the next step and the explicit function of Chapter Seven.

**Additional Insight**

The additional insight gained for me from this chapter’s inquiry was that in the experience of searching through the different definitions of ‘resilience’ I gained a deeper intimacy with how conceptions themselves come into existence from their formative conditions and then evolve, change, transform and propagate. While the concept of ‘resilience’ is part of the content of the fields of ecology, psychology, engineering, systems theory, medicine, economics, political theory, disaster studies and anthropology, when looking across the paradigms of its use it can be seen as one distinctive form of conception (Pendall, Foster, & Cowell, 2007). The observation is that in the process of definition by using an existing conception as a comparison to discern differences with new phenomenon we potentially bring into being new conceptions, in both novelty and competition.

This is confirmed by the more tangible experience of working with dynamic natural ecologies. A personal practice of mine is to relax from theoretical analysis by using various forms of embodied engagement, principally in terms of being with and within natural ecological systems. Specifically, I am fortunate enough to be the caretaker of a forest ecology comprising a small but complex intermingling of ecosystems that demand ongoing attention and close observation (Esbjörn-Hargens & Zimmerman, 2009). Everyone should be able to have this form of intimacy with a natural system, which may simply involve the honest labor requested by rusting fences, weed infestations, disease monitoring and riparian restorations. This practice is colloquially described as ‘to go worship in the church of dirt’ and the experience is as immersive as it is transformative. In this I am not alone, as indicated by the following quote from systems theorist, Sir Geoffrey Vickers (1987):

> Personally I have a sharper appreciation of nature than of human artifacts. I do not need botany to enable me to enjoy a leaf or a tree, geology to enjoy the color, shape and texture of stone. But either of these experiences will
periodically for time to time return me to reflective consciousness to solve some problem, the answer to which will in turn heighten my appreciation. (p. 64)

In the reflexive process of comparing dynamic responsive ecological systems to the potential constructions of the ecology of thought two features stood out. The first is how the characteristics of landscapes, gradients, contours, diversities, competitions, intrusions, seasonal transformations and flourishments are equally discernible in both ecological systems and systems of conceptions. The richness and surprise, the potential and the persistence, found in the observance of systems of conceptions are unexpected and at the same time fundamentally natural. In the near future, I have no doubt that the ecology of thought will demand our aesthetic attention in the same way old forests, wild rivers and cottage gardens evoke our ever increasing appreciations (to use Vicker's favored phrase) (Vickers, 1968).

The second is that there is something else about a human system of thought that makes it instantly familiar and also subtly not recognizable. This relates to the qualities that Holling and Gunderson willingly attribute to healthy, complex, resilience ecologies. These are the capacities to 'learn' and to 'remember' (Gunderson, Holling, et al., 2010). The observation is that, in the potential to shift observational frames and reflexively engage with prospectivity, there is something permitted by the ecology of thought that provides for human systems something quite remarkable. This is the making, as an appreciative system, of its own systems of appreciation. Rather than an environment of thought occurring through the top-down and bottom-up consequence of a panarchical construction, the human system has a more profound potential available to it. It is the quality of that unique reflexive human capacity and its potential to generate surprise and diversity that continues to inspire the humble thought-ecologist:

Systems have become very difficult for human beings to maintain. They demand from whole populations levels of understanding and tolerance seldom before found even among the few. Time is short – but so is the whole human time span. Who knows what regulatory powers might not emerge at least among some of the different populations which face the future – even if it be a future measured
only in decades? We need not expect only one answer. Different treasures from the rich and diverse human heritage may survive and even flourish in different places. Precious innovations still undreamed may be spawned by necessity. (Vickers, 1983, p. 177)

The concluding reflection from my experiences is that in the wildwoods of bemused theory and debate we are likely to find the smallest of the wildflowers of newly forming conceptions, whose seeds might blow like ideas on the winds of change and propagate into complex contributions. Such new forms of human meaning then made may enable humanity's flourishing in ways only a young Charles Darwin, could ever have imagined.

6.5  Summary

This chapter concludes that for Research Question #6:

- there is a correlation between the proposed dimensions and panarchy;
- they operate in a similar manner in terms of inter-dependency; and
- however they are different and must be defined separately.

The analysis used generated three original definitions to articulate three dimensions representing the proposes hypotheses. This completes the necessary elements of theory-construction enabling theory-verification. This next phase of the research method asks the abductive question: What measures it?
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Chapter Seven – What measures it?

7.1 Introduction

The aim of this chapter is to examine possible measures and the means of measurement of the three defined dimensions (Chapter Six). The purpose of this chapter is to determine the appropriateness of existing measurement modalities which might be applicable to the measurement of conceptions.

The abductive method used to answer the research question for this chapter is described as theory-verification. In this abductive phase practical means are designed by which the proposed hypotheses can be reliably verified. A ‘coherentist’ emphasis was selected as the appropriate abductive theory approach. This involved examining three existing modalities for measurement that are conceptually comparable to the hypothesized dimensions for conceptions.

The outcome of this chapter is the design criteria for a process of measurement of the three dimensions of Coherence, Integration and Orientation. The design of a practical means of measurement to quantify phenomena in the dimensions as defined (Chapter Six) enables the depiction of systems of conceptions (Chapter Eight).

7.2 What was the question?

Research Question #7

*Which existing measurement systems for comparable dimensions may inform the design of measures for systems of conceptions?*
The first assumption in the research question for this chapter is that there are comparisons to be made between the dimensions of existing measurement systems and the dimensions of Coherence, Integration and Orientation in the depiction of systems of conceptions. As the proposed dimensions represent an entirely different category of phenomena, which may not have been previously measured, that assumption may not be valid. It may be that the dimensions are not comparable to existing measurement systems and doing so makes a conflation error across logical categories of abstraction (e.g. individual psychology and conception theory). It is for this reason that definitions of the dimensions (see Chapter Six) were required prior to selecting modes for their measurement. The premise of the research question is that, before commencing to design a measurement method from first principles, if there is an existing instrument or testing modality that is appropriate, either for use or comparison, the primary aim should be to utilize that existing knowledge.

Second, there is an assertion contained in the research question that a measurement system for conceptions can be designed. In addition to the possibility that there are no existing modes of measurement appropriate for the defined dimensions, it might be arguable that the dimensions proposed cannot be practically measured. If this is the case, then the hypotheses remain unverifiable and the pragmatic use of the theory will be limited to explanatory descriptions. If no appropriate mode of measurement of the defined dimensions is readily available, an alternative answer to the research question is to instead generate the design guidelines for the establishment of such a process. The assumption is that investigation of the availability (and aptness) of an existing solution leads, in an abductive process, to a better understanding of the specific problem and the design requirements for its resolution.

Third, contained within the framing of the research question is an implicit recognition that any existing measurement systems adopted must fulfil the overall thesis aims (generally) and eventually the five criteria for the problem-constraint (specifically) (see Chapter One). In re-stating this requirement it is significant to note that any existing measurement modalities will potentially
have been designed for different purposes. In proposing solutions to different problems they will contain in their design inherent corresponding biases. Existing methods, modes and models may be designed to validate an existing theory, confirm an assumption, disprove a bias, or descriptively categorize (otherwise neutral) phenomena (Stein & Heikkinen, 2009). For this reason, specific note has been made of the origins, assumptions and motivations behind the formulation of the test instruments selected for comparison, the processes they specifically use and the hypotheses they were designed to confirm. The recognition is that, while the adoption (and modification) of existing forms of measurement might be a relatively easy way to advance the proposed theory, the establishment of valid measures for the actual dimensions of the dynamic relations of systems of conceptions will require a degree of care and conscious design choice.

**Existing Understanding**

The primary task of the research phase of this chapter is to consider what should be the measures for the dimensions that might depict the dynamic composition of systems of conceptions. To advance this question several existing measurement modalities were considered before selecting three for examination in detail. One of the preliminary recognitions was that the various modes of measurement represent different accepted narrative assumptions (e.g. developmental stages, abstract cognitive structures, distinctive cognitive intelligences, etc.). These assumptions are grounded in their respective disciplines of theory and paradigms of practice.

In an abductive method, the assumptions of what the modeling of conceptions will ultimately demonstrate are not fully formed. This leaves the question of measurement open and potentially answerable by an abductive analysis. The emphasis is therefore placed on reflecting accurately each dimension as defined, without previous assumptions of what it must demonstrate. Also, the proposed hypotheses require the measurement of three inter-related, yet discrete dimensions. Accordingly, an existing single-mode measurement model will
probably not be able to be used without extensive modification. Each potentially comparable measurement mode represents strengths in its own domain of knowledge. The abductive task for this chapter is to determine how existing understandings might be drawn from to combine these comparative strengths.

As a way of approaching the task of benefiting from existing understandings three different approaches might be relevant. Architectural philosopher, Christopher Alexander, in *Notes on the Synthesis of Form* (Alexander, 1966) writes about the ‘goodness of fit’ in adapting to an irregular world, stating “the ultimate object of design is form” (p. 15). Alexander clarifies that the ‘object’ that achieves the design ‘objective’ is a match between “an effort to achieve fitness between two entities: the form in question and its context. The form is the solution to the problem; the context defines the problem.” (p. 15). A mismatch of form and context is similar to having a good answer to a different question. In the assessment of human thought, we have many good answers. In the theory of conceptions, we have a different question. The design principles of architecture, particularly in the recognition of patterns, provide useful guidance to the (equally abstract) aesthetic of an ‘architecture of thought’.

The following argument is based on the assumption that physical clarity cannot be achieved in a form until there is first some programmatic clarity in the designer’s mind and actions; and that for this to be possible, in turn, the designer must first trace his design problem to its earliest functional origins and be able to find some sort of pattern in them. (Alexander, 1966, p. 15).

This premise explains how the problem-definition and solution constraint (Chapter One) informs solutions as to ‘fitness’ in this chapter. Therefore, the *form* of practical application, the *functionality* of similar purposes and the general appropriateness in *fitness* of are some primary considerations in comparing existing measurement modalities.

In terms of form, specifically considered as valid choices for comparative measurement systems on this basis were: the Fischer Skill Theory Test (Fischer & Bidell, 2006); Lectical™ Assessment System (Stein, Dawson-Tunik, & Fischer,
2010); the Washington University Sentence Completion Test (Loevinger & Wessler, 1970), the Sentence Completion Test Integral-Maturity Assessment Profile (Cook-Greuter, 1990, 2004; Cook-Greuter & Soulen, 2007), Moral Judgment Standard Issue Scoring System (Colby & Kohlberg, 1987), Leadership Development Framework Inventory (Torbert, 2000), Values Survey (Rokeach, 1967), SD Values Profile II and SD Discover Survey (Cowan & Todorovic, 2000), the Leadership Circle Profile (Anderson, 2006), and the Personal Orientation Inventory (Oakland, Freed, Lovekin, Davis, & Camilleri, 1978; Shistrom & Knapp, 1966). A detailed comparative analysis is not attempted. Each modality is ostensibly effective to the extent of its stated intentions. Their relevance is in considering the form that a measurement modality, specifically designed for conceptions, might possibly take.

In relation to function, there are recently some general observations made from the functional use of existing modalities that may be specifically relevant to the assessment of conceptions. The counter-part benefits of the ongoing critical review and development in this area are considered extensive. For example, Stein and Hiekkinen (2010) in use of the Lectical™ Integral Model Assessment (i.e. LIIMA) consider how ethically ‘thick concepts’ (Williams, 1985) might be reconstructed in different levels of cognitive development as variations of ‘absolute conceptions’. A similar premise could be used for conceptions to identify the coherences in composition by using universal conceptualizations (e.g. ‘health’, ‘sustainable’, or ‘caring’) that hold meaning beyond locally specific enculturations.

Similarly, Dawson and Hiekkinen (2009) enhance the Lectical™ Assessment System from an assessment of phases of abstractions to disclose the descriptive content of developmental levels by using situational reasoning in common dilemmas to indicate decision-making capacity. A similar approach could be used to disclose the content of conceptions using a comparative dimensional analysis for multiple levels of integration.
Pragmatically, Cowan and Todorovic (2000) have used the values-based projection tests of the SD Values Change Inventory to profile the work groups of organizational social systems, providing a triangulated correlation between organizational dynamics and individual values representing the present psychological focus. A similar combination of modalities could be used to profile the composition of systems of conceptions, specifically examining the predominant direction of focus to disclose the patterning in orientations.

There are many more examples of innovations extending existing assessment models designed to nuance information ranges, stretch assumptions, and test the boundaries of their limitations. The present challenge is not in terms of the validity of these existing modalities, but perhaps only to the conceptual limitations of our underlying assumptions when using them. This represents a great potential for parallel advancements and collaborations.

On the additional criteria of fit, one example representing considerations of appropriateness is provided by developmental psychologist and educator, Howard Gardner (Gardner, 1983, 2006a, 2006b). Gardner has innovatively offered a reconsideration of the assumption that composite measures of intelligence were equivalent with ‘capability’. In specifically examining the ‘semantics of intelligence’, he proposed alternative lexical positions for definitions of intelligence. The essence of Gardner’s reconceptualization is to propose that we might determine, not how intelligent a person is, but the many ways in which they might be intelligent in its different forms (Gardner, 1993).

For systems of conceptions, such as organizational teams, local communities and cities, there is a parallel analogy. The test of fit would be to depict, not ‘how capable the system is’, but rather ‘how it might be capable’. Ideally, this would be conducted in the specific context of that system’s future challenges.

Chapter Seven Proposition

The thesis proposition of this chapter is that, if there are definitions of the three dimensions that evidence the proposed hypotheses, there can be measures for
the phenomena defined within those dimensions. The implication of this is that in finding measures and means of measurement for each of the dimensions their resultant form can then be quantified and depicted. The purpose of this chapter is to determine if such measures (and modes of measurement) are potentially possible.

The counter-proposition is that measures quantifying a conception can only be made by a relative comparison, possibly within another more encompassing conception. The argument would be that each conception reflects a relative condition and is assessed by its level of advancement in that direction. This potentially represents the error of subordination, where recursions in evaluation are mistaken for advancements in perception. This error can be avoided in an abductive method by not conflating the concept with the conceptualization (i.e. developing a yardstick without a yard). While it could be argued that some apparently indefinable conceptualizations, for example ‘happiness’, ‘goodness’ or ‘virtue’ cannot be measured, something representing a conception of these inexpressible qualities can be quantified with appropriate accuracy (e.g. subjective satisfaction – for happiness). The task is to define such measures with transparency.

The proposal is to determine appropriate measures of comparisons between conceptions within a system of conceptions. In answering the question: ‘What measures it?’ the suggestion is to select measures that can be applied without the assumption of other conception-based biases in that evaluation. The outcome desired is three measures (and systems of measurement) that can reflect accurately the full range of phenomenon of significance relevant to the proposed hypotheses.

7.3 How was it answered?

What is the theory?
The fulfilment of the proposal of this chapter moves this research from theory-generation to practical application. The seventh phase in the abductive method providing the framework for this thesis is *theory-verification*. In the sequence of an abductive method, Haig (2005a) describes how exploratory testing can be used to reflectively examine causal explanations in a move from theory to practice, generating for the first time data specific to the hypothesis developed. In this way, the emphasis of validity proceeds to verifiable forms of analysis not solely reliant on individual human perception, which is summarized as:

Methodologically speaking, what matters in science is not the phenomenal or experiential qualities of perception but whether or not perception is a reliable process... It is for this reason that reliable nonhuman measurement techniques are just as important as human perceptual techniques in detecting phenomena. (Haig, 2005a, p. 384)

This sentiment is confirmed by Peirce in relating the process of abduction and measurement to the sequences of sound science (and alluding to their reflexive relationship as systems of conceptions):

To satisfy our doubts, therefore, it is necessary that a method should be found by which our beliefs may be determined by nothing human, but by some external permanency – by something upon which our thinking has no effect ... It must be something which affects, or might affect, every man. And although these affections are necessarily as various as are individual conditions, yet the method must be such that the ultimate conclusion of every man shall be the same... Such is the method of science. (Peirce, 1960, p. 242) [CP 5.384].

Significantly, in promoting an abductive approach to research, neither of these key theorists diminishes the significance of empirical testing and validation of observations in the advancement of sound theory. The primary importance of developing viable measures for the abductive principles proposed from the phenomena observed is explicitly outlined by Peirce in his characterization of the essential three-part process of valid science:

Physical research is of three kinds: first, the making of new phenomena; second, the investigation of their laws; and third, the measurement of constants. The order of importance of the discoveries is: 1. Phenomena 2. Laws 3. Constants. The order of technical skill and discipline required is just the reverse... To find a new phenomenon[on] is more or less a matter of chance. But to observe it and to
recognize it as new and to take the first steps in analyzing it and determining its frequency of occurrence requires a real genius. (Peirce, 1966, p. 326).

Accordingly, it is proposed that the process of an abductive research logic does not cease with the development of the hypothesis and its articulation. Where an abductive hypothesis involves new assumptions, new definitions and new phenomena for observation, existing measurement methods may be insufficient for its verification. The attractive solution to this problem is an inductive approach to the measurement of conceptions. This would involve deciding that the proposed dimensions are ‘sufficiently similar’ to existing concepts captured by other measurement modalities. Existing valid instruments would then be used to reveal forms of secondary data that they were not specifically designed to capture. This would then require an extended period of reliability and validity testing and iterative modification to eventually gain a viable system of measurement of what has not yet been measured. The alternative proposition is to make an abductive comparison of similar dimensions, in parallel situations, of compatible motivations, to identify the successful methods (and their problems) within existing instruments. This abductive approach may (at best) identify a method for immediate adoption, or (at least) provide the next iteration in pragmatically focused design questions and specifications directly advancing the chosen research question.

For the particular use proposed by this thesis, purpose-specific, reliable and validated instruments for the measurement of conceptions using the tripartite delineation of the dimensions (as contained in the definitions provided in Chapter Six) may not exist. Accordingly, new instruments, using existing or newly developed methods of measurement, might be required. This raises the importance of the role of abductive theory in their development, subject to one qualification. To the extent analogous concepts or research objectives have looked at almost identical or substantially similar dimensions, these may provide valuable guidance in the advancement of the design of appropriate research methods. Metaphorically, the pre-existing wheel may not be the right size, or spin in the right direction, but it might be of the right shape (at least for the purposes of comparison). While this thesis scope stops short of measuring
data and validating the frequency of occurrences of the phenomena predicted, it does attempt to do all that is necessary to enable a means to verify or disclaim pragmatic belief in the hypotheses proposed.

**How was it applied?**

For the theory-verification phase of the abductive method the primary choice in emphasis is framed as being between two alternative approaches: a) *reliabilist* abduction and b) *coherentist* abduction. This concerns the preferred basis for the justification of beliefs held (Haig, 2005a). Succinctly, reliabilist approaches to justification rely on the proven reliability of existing processes or methods. In contrast, coherentist approaches rely on the coherency of the findings with other accepted beliefs for justification (Haig, 2005a).

Rather than being seen as competing approaches, it is noted that the chosen methodological emphasis may shift at different points of the research as the methods for theory-verification develop (Haig, 2005a). Reliable methods may be used for initial phenomena generation and a coherentist logic may be applied to make a tentative hypothesis more robust and aesthetically confirming. In research with an underlying focus on paradigmatic anomalies, the exclusion of potentially meaningful data on reliability grounds can significantly reduce the breadth-claims of any subsequent assertions of wider applicability (Haig, 2005a). For the research aims of this thesis a reliabilist approach may instead unduly limit the form and usefulness of the primarily new and abductive observations for which reliable methods do not presently exist. Additionally, there is at present an absence of a reliable method for the depiction of the specific dynamics of conceptions for large-scale social systems. For these reasons, a *coherentist* approach is preferred for this research. The implication of this choice in method is that it is the compatibility of comparative methods, rather than the reliability of otherwise valid (but incompatible) instruments, that must guide the analysis conducted.
Accordingly, the question of establishing the criteria for selection of comparisons was less influenced by the ease of present application (i.e. to measure something easily using existing means) and was guided more by the ultimate solution-demand of the proposed modality (i.e. to measure the required thing, using appropriate means, enabling the widest use). The criteria decided on to assist this ‘coherentist’ analysis was:

*Criterion 1:* There is an extensive history of validated applications of a test instrument or documented procedures applied in a diversity of social and psychological contexts (Practicality Criteria ~ *Form*).

*Criterion 2:* The measurement modality is conceptually as close as possible to the proposed dimensions in terms of aiming to measure essentially the same dynamics using similar components (Similarity Criteria - *Function*).

*Criterion 3:* The origins of the research and its intentions are compatible with this thesis aims in terms of an empathy with and relevance to sustainability and humanistic development concepts (Compatibility Criteria ~ *Fit*).

Additionally, where two or more candidates for possible comparisons were proposed a preference was given to methods that were pragmatically scalable from individual to societal level assessments, consistent with the problem-delineation requirements (see Chapter One). While this was not a primary criterion, test processes based on individual interviews or individual assessments were recognized to be limited in terms of the scales of inquiry proposed by this research (i.e. in terms of a focus on societal-level psychodynamics, rather than development in the levels of individual psychological capacity).87

**What was done?**

Taking the theoretical guidance of the abductive approach to theory-verification and the emphasis in method adopted, the next step was to select the most
appropriate candidates for the measurement modalities as comparative assessments. The following sequence outlines that process:

a) an initial compilation was made of samples of all of the assessment tools and theoretical models personally experienced in professional practice, specifically studied in formal academic courses, in which I had been certified in the use of by licensed practitioners, or had undertaken under supervised test conditions;

b) this list was supplemented by a review of the academic literature specifically relating to the measurement of conceptions, conceptual opinions, health, well-being, quality of life, leadership skills, personal development and learning;

c) those modalities most relevant to the defined dimensions of Coherence, Integration and Orientation in terms of coherency with the underlying conceptual foundations were identified using the three criteria (i.e. Practicality, Similarity and Compatibility) and shortlisted;

d) literature review of the chronological work of the originating theorists studies was reviewed, together with secondary applications of that research which had maintained, conceptually modified, refined or altered the original measurement system's assumptions, instruments or methods as a meta-analysis (see Appendix I); and

e) a précis of the review of the work of three primary theorists was prepared covering the categories of: i) biographical details and historical context; ii) research design and validation evidence, iii) method comparison and relative significance, iv) critical evaluation and potential application, and v) research interest and design questions.

In the selection process of potential comparisons, some modalities with validated processes were conceptually interesting, yet were not compatible as
direct comparisons to the proposed dimensions (e.g. measuring one developmental line in an aspect of individual cognition, rather than abstract levels of thought in formation). Other informal assessment tools were conceptually compatible yet, while descriptive, did not have sufficient academic evidence of confirmation of reliability to make them useful for comparisons in terms of methodological rigor (e.g. 360 degree self-assessment surveys or self-selection values tests). The remaining tools or procedures may have been statistically valid and examined similar concepts, however, were paradigmatically limited (e.g. specifically designed for the quantification of psychopathology in a clinical context) and so were excluded or precluded as outside the domain of the phenomena of interest (e.g. conceptions of humanity-level health and well-being).

On these criteria, three testing models were considered of particular relevance. These are (as selected for each dimension individually):

a) **Coherence**: Antonovsky’s Sense of Coherence (SOC) Scale (A. Antonovsky, 1987, 1993)- Antonovsky SOC Scale (SOCS);

b) **Integration**: Graves’ Levels of Existence (LOE) Conception Projection Test (Graves, 2002)- Graves Emergent Cyclical LOE Test (ECLET);

c) **Orientation**: Laffrey's Health Conception Scale (HCS) (Laffrey, 1986; Laffrey, Loveland-Cherry, & Winkler, 1986)- Laffrey HCS Test (LHCS).

This resulted in a review of the specific similarities and differences between the evaluated assessment models and the proposed dimensions on a coherentist basis, leading to the following findings on the relevance of those comparisons and the identified dissimilarities.
7.4 What was discovered?

Summation of Findings

The analysis of each of the methods of measurement for the respective comparative dimensions results in the findings that:

a) each method was valid, reliable and replicable for its stated aims;

b) each method had relevance to measurement of the proposed dimension;

c) each method’s results evidenced inherent limitations in its assumptions;

d) the limitations of each method were predicted by the other methods.

The accomplishment of the stated aim for this chapter is evidenced by the design-criteria for a measurement modality for systems of conceptions, the concluding recommendations for which (with counter-point clarifications) are:

a) *Separation:* Each dimension is to be tested for independently (i.e. a composite test score for the dimensions will potentially merge distinctions, conflating extent, range and phase).

b) *Qualification:* Measures for each dimension are to be qualified by reference to the impacts of the other dimensions on those measures (i.e. the recognition that anomalous results are accurate when seen in the context of their correlating causes from other dimensions).

c) *Projection:* Tests may rely on open projection to disclose the primary dynamics of present focus (i.e. utilize, rather than negate, the effect of personal projections in the test formulations and interpretations).

d) *Variation:* Tests may sample for frequent periodic variations in preference to asserting the reliability of one-off categorizations (i.e.
reversing assumptions of enduring structures to instead notice variances in the composition of conceptions).

e) Contextualization: Results are to be interpreted in the context of situational variables for the specific system or conception (i.e. use correlating empirical data for environmental factors to assist interpretation at the level of observation, rather than assume a neutral situation of assessment).

The discussion that follows highlights the insights and observations derived from the comparisons of the modalities for each dimension and the reasons for the findings and the recommended design-criteria.

**Discussion of Findings**

The assumption implicit in the research question was that, in examining the history of development, application and verification of existing measurement methods, existing research tools might potentially be used to validly measure the hypothesized dimensions for systems of conceptions. The result was, this preliminary assumption was disconfirmed and an entirely different order of learning occurred in alignment with the research question.

By examining the relationship of the three selected measurement modalities together insights were gained into the limitations of the underlying assumptions of each. This insight informs the design criteria for a different modality of measurement that acknowledges (rather than amplifies) those limiting assumptions and integrates the weaknesses into strengths. The following summaries explain the analysis for each of the dimension of comparison (i.e. Coherence, Integration and Orientation), which are organized by these specific considerations:

a) history of development;
b) method of measurement;
c) application to conceptions;
d) limitations of assumptions; and
e) concluding interpretations.

Measuring Coherence (Antonovsky)

History of Development
The first measurement methodology considered is the Sense of Coherence Scale (SOCS). This test instrument was derived from the work of public health sociologist, Aaron Antonovsky ([A. Antonovsky, 1968, 1974, 1979, 1984, 1985, 1987, 1991, 1993, 1996a, 1996b; A. Antonovsky & Arian, 1972; H. Antonovsky & Sagy, 1986; H. F. Antonovsky, 1980]). The abductive origins of the ‘sense of coherence’ (SOC) concept is recounted by Antonovsky as arising from his research into the long-term health impacts of conditions of stress and coping. This was evidenced by interviews with Israeli women who had experienced internment in the harsh conditions of war-time concentration camps (A. Antonovsky, 1979). Antonovsky was primarily concerned with public health policy, rather than individual health status or disease etiology, ultimately adopting a wellness approach that he named ‘salutogenesis’ ([A. Antonovsky, 1968; A. Antonovsky & Arian, 1972]).

Method of Measurement
The primary theoretical concept of relevance to the dimension of Coherence is the measurable human psychological quality defined by Antonovsky as a sense of coherence (SOC). Antonovsky (1979) provides his definition of SOC (which comprises three distinct parts):

The sense of coherence is a global orientation that expresses the extent to which one has a persuasive, enduring though dynamic feeling of confidence that one’s internal and external environments are predictable and that there is a high probability that things will work out as well as can be expected. (p. 123)

The significance of the SOC concept, as evidenced by the Sense of Coherence Scale (SOC Scale), is that it takes the three components of this one phenomenon
and derives subjective measures for each component and then compiles their resultant effect as an aggregate score (A. Antonovsky, 1993). These three components are isolated as the distinct concepts of: a) manageability, b) comprehension; and c) meaningfulness. For the purposes of this summary, manageability is defined as the perceived direct or indirect control of resources sufficient to meet or withstand the challenges faced; comprehension is defined as the presence of a clear, ordered and structured logic to one’s perceived life’s challenges in internal and external stimuli; and meaningfulness is defined as that which makes sense emotionally and reflects the person’s motivation to cope with stimuli encountered. Together the presence or absence of these three factors represent a person’s enduring ‘sense of coherence’ (A. Antonovsky, 1979, 1987).

Antonovsky developed and refined the SOC concept by further research following its initial formulation (A. Antonovsky, 1991, 1993, 1996a, 1996b; A. Antonovsky & Arian, 1972; H. Antonovsky & Sagy, 1986; H. F. Antonovsky, 1980). One such refinement was Antonovsky’s proposition that availability to an individual of an adequate range of coping strategies (which he named ‘General Resistance Resources’ - GRR) directly enables a stronger SOC (A. Antonovsky, 1987). It has been since argued that a person’s existing SOC facilitates future actions to expand the GRR range accordingly in a ‘dynamic, catalytic, and reciprocal’ developmental relationship (Wolff & Ratner, 1999). The effect of an enduring SOC potentially operates as a feedback loop of positive reinforcement, leading to a lifelong pattern of generative wellbeing and enhanced capacity in an increased range of potential environments.88 This positive state of enduring wellbeing based on a strong SOC was named ‘salutogenesis’ and identified as the origin of life-long health (A. Antonovsky, 1985).

The reliability and validity of the SOCS test instrument developed by Antonovsky has lent support to the sense of coherence as a theoretical concept and the premise of salutogenesis as a public health policy (A. Antonovsky, 1984; Lindström & Eriksson, 2006). Eriksson and Lindström (Eriksson & Lindström,
2005, 2007) conducted supportive reviews of the research extending from Antonovsky’s original work by analyzing 458 scientific papers and 13 doctoral dissertations applying the SOC test. These case studies applied the SOC scale in 32 languages, in 33 countries and relate to 15 different versions of the original test format. They considered the face validity, consensual validity, construct validity, criterion validity, predictive validity, responsiveness, reliability and repeatability of the SOC Scale. They concluded that: “The SOC scale seems to be a reliable, valid, feasible and cross-culturally applicable instrument” (p. 463) in measuring how people manage stressful situations and stay well. This makes the SOC Scale potentially useful as an exemplar method for the measurement of the dimension of Coherence.

Application to Conceptions
The general conclusion is that Antonovsky’s three components comprising the SOC concept have relevance to the dimension of Coherence. Specifically, SOC is measured by a conjunction of three distinct factors, which may correlate directly with the components that compose the dimension of Coherence (i.e. First, Second and Thirdness). The SOC components represent physical inclusions (i.e. manageability of practicalities), sociological explanations (i.e. comprehension as symbolic recognition) and psychological expectations (i.e. meaningfulness of resolutions) reflecting the primary domains of conceptions (Chapter Two). The SOC concept also represents an autonomous process of formation of uniquely individual components of composition, as does the dimension of Coherence. The effect of formation of SOC represents different degrees of completeness from totally unformed to consistently stable, as does the dimension of Coherence. The proposition made by Antonovsky is that a relatively stable SOC enables similar stability in future forms of the SOC, which may potentially be the case for the dimension of Coherence. Additionally, subsequent research has indicated that an SOC can be negatively reinforcing, as is proposed for the dimension of Coherence. For these reasons, the comparison between the conceptualization and measurement of SOC and the mode of measurement of the dimension of Coherence is potentially illustrative.
Limitations of Assumptions

There are some limitations to the SOC concept that also inform the measurement of the dimension of Coherence. First, the SOC concept and the SOCS instrument were premised on the hypothesis that the establishment of the conceptual means for psychological coping endured throughout one’s life (A. Antonovsky, 1987). The belief Antonovsky formed was that a strong SOC, if developed in childhood, would be indicative of a lifetime of salutogenic wellbeing (A. Antonovsky, 1996a, 1996b). Recent longitudinal studies, however, show that individual SOC Scale scores do not appear as completely stabilized as Antonovsky hypothesized and while SOC may potentially increase with age, it may also change with dramatic life circumstances (Eriksson & Lindström, 2005; Suominen & Lindström, 2008). The implication is that, if a different level of organization is required, coherence may not be so easily stabilized in the different conditions faced. The parallel proposition for Coherence is that formation is subject to subsequent changes in the level of Integration.

Second, an additional interesting observation was the discovered correlation between stress and SOC, in that chronic stress such as the continual exposure to environmental stressors can weaken a person’s SOC (Taylor, 2003). This is contrary to Antonovsky’s more general hypothesis that adult SOC is relatively unchanging in the context of familiar stressors for which there are effective GRR (A. Antonovsky, 1987). The implication of this limitation is that conditions of continuous distress may degrade one’s SOC and other forms of biopsychosocial resilience. The parallel proposition for the dimension of Coherence is that a change in external factors may result in subsequent changes in the direction of Orientation.

Third, it was proposed that the absence of a range of coping strategies appropriate to changing conditions for existence could itself be a stressor (i.e. experienced as a sense of vulnerability in expectancy). The hypothesized result over the longer term of a loss of coping resources may be a compounding of stressors, leading to a loss of meaningfulness, comprehension and subsequently
manageability, which may be evidenced by depression and developmental regression with the corresponding loss of one’s personal self-concept (Carstens & Spandenberg, 1997). The parallel proposition for the dimension of Coherence is that the dimension should be measured as comprising both positive and negatively reinforcing dynamics and represented on a bimodal continuum.

Concluding Interpretations
Accordingly, while Antonovsky's SOC Scale offers a valid and reliable method of testing individuals, the assumption that SOC is an enduring and unchanging quality cannot be sustained. To the extent that parallels can be drawn between the concepts of SOC (for individuals) and Coherence (for conceptions) the SOC Scale and instrument does not contain sufficient precision for adoption.

The learning gathered is that the dimension of Coherence is potentially a relatively stable dimensional factor, yet it would also be subject to situational and developmental variables. This leads to the conclusion that a valid test for Coherence would need to primarily assess for the extent of formation, in the context of the dependent variables of the range of Integration and subject to the concurrent phase of Orientation.

Measuring Integration (Graves)

History of Development
The second measurement methodology considered is Levels of Existence (LOE). This concept encapsulates the work of Clare W. (Wray) Graves, a psychology professor at Union College in Schenectady, New York State who developed a theory of psychological levels of existence as a biopsychosocial systems conception of the adult personality. After teaching the many different, and apparently contradictory, theories of human psychology to undergraduates, in 1952 Graves began a 34 year research project to develop a reconcilable theory
of development for the adult personality (Graves, 2002). The motivation for this research was that “erroneous conceptions of the psychological development of the adult and the psychological development of the species were producing more problems for us than they were producing effective means for coping with them.” (Graves, 2005, p. 33). Specifically recognizing the strength and limitations of the behaviorist, psychoanalytic, and humanist paradigms of which he was conversant, Graves (2005) sought a conjunctural paradigm, illustrated by this quote on the criteria for a ‘meaningful psychology’:

It must accept that in some manner all the established systems of psychology somehow represent the whole. Each of them, no matter how strange it may seem, is neither right nor wrong, but is a psychological datum, a part of the whole. But we cannot accept that an eclectic selection from each system is a way to the whole, because such a selection would disrupt the partial whole. The whole is the all of the each, not the best of each. (p. 32)


The theory Graves proposed is complex, expansive, and theoretically abstract. Because it concerns the underlying structural constructs of human systems of conceptualization, by its nature it describes content that is unfamiliar to each of
those constructal systems, making the theory itself susceptible to multiple forms of reinterpretation. Its components include hierarchically ordered, emergent, cyclical, levels of existence, formed as a coupling of states of cognitive coping and experiential problems of existence, which emerge sequentially into identifiable systems of conceptualization - to identify only a few of its primary elements (Varey, 2005). Consequently, the most accurate description of the general thesis of Grave’s theory, is found by reliance on his own words: 

The psychology of the adult human being is an unfolding ever-emergent process marked by subordination of older behavioral systems to newer, higher order systems. The mature person tends to change his psychology continuously as his conditions of existence change. Each successive stage or level of existence is a state through which people may pass on the way to other states of equilibrium. When a person is centralized in one of the states of equilibrium, he has a psychology which is particular to that state. (Graves, 2005, p. 29)

Graves’ general theoretical statement of progressive stages is qualified in that genetic, constitutional, morphological or environmental limitations may arrest this developmental process in any individual. Also, progression, stabilization and regression in development may occur equally under different conditions (Graves, 2005). Specifically, he stated that a person may show “behavior of a level in a predominantly positive or negative fashion” representing that the levels of existence are themselves neutral in terms of their potential for ‘healthy’ and ‘unhealthy’ (as opposed to mature) expressions (Graves, 2005). A table (adapted from collations of the source literature) summarizing Graves’ levels of existence, their labels, the nature of existence experienced and the existence problems face is provided for reference (Graves, 1981, 2001, 2002, 2005) (see Table 7.1)

<table>
<thead>
<tr>
<th>LOE</th>
<th>Code</th>
<th>Nature of LOE</th>
<th>Existence Level</th>
<th>Existence Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 8</td>
<td>H-U</td>
<td>Experientialistic</td>
<td>Second Being Level</td>
<td>Existential Dichotomies</td>
</tr>
<tr>
<td>Level 7</td>
<td>G-T</td>
<td>Cognitivistic</td>
<td>First Being Level</td>
<td>Disordered World Viability</td>
</tr>
<tr>
<td>Level 6</td>
<td>F-S</td>
<td>Personalistic</td>
<td>Sixth Subsistence</td>
<td>Living with Human Element</td>
</tr>
<tr>
<td>Level 5</td>
<td>E-R</td>
<td>Materialistic</td>
<td>Fifth Subsistence</td>
<td>Conquering Physical World</td>
</tr>
<tr>
<td>Level 4</td>
<td>D-Q</td>
<td>Deferentialistic</td>
<td>Forth Subsistence</td>
<td>Everlasting Peace of Mind</td>
</tr>
<tr>
<td>Level 3</td>
<td>C-P</td>
<td>Egocentric</td>
<td>Third Subsistence</td>
<td>Living with Self-Awareness</td>
</tr>
<tr>
<td>Level 2</td>
<td>B-O</td>
<td>Tribalistic</td>
<td>Second Subsistence</td>
<td>Achieving Relative Safety</td>
</tr>
<tr>
<td>Level 1</td>
<td>A-N</td>
<td>Automatic</td>
<td>First Subsistence</td>
<td>Physiological Stability</td>
</tr>
</tbody>
</table>

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Note: Adapted from Table 1 and Table 2 in *Levels of Existence: An open system theory of values* (Graves, 1970a).

**Method of Measurement**

Graves was primarily an academic of psychological theory and psychological testing procedures. He was conversant with the broad range of different methodologies and clinical survey instruments used for the testing of different aspects of adult personality and psychopathology. The result of his research was a comprehensive biopsychosocial systems theory of maturity in the adult personality (Graves, 2005). Particular interests included its application to clinical therapy practice (Graves, 1970a; Graves, et al., 1965), industrial psychology (Graves, 1965b, 1966), organizational management (Graves, 1965b; Graves, et al., 1970) and societal development (Graves, 1974). His theoretical formulation of levels of existence has distinctive advantages over other more specific theories of developmental psychology. In terms of the contribution to that field generally, he summarizes the benefits of his conceptualization as:

> As a contribution to cognitive-development stage theoretical psychology, it deals with at least five criticisms directed toward them: (1) it offers an explanation of how constructs develop; (2) it presents a picture of what the process of development looks like; (3) it hypothesizes what factors determine the hierarchical order of constructs; (4) it explains what determines the particular characteristics of constructs; and (5), it suggests how the constructs operate. (Graves, 2005, p. 7)

The strength in Graves’ abductive methodology was his embracing of many modes of inquiry (and the different methods within those modes) as a collective research inquiry process. Consequently, the model he developed was derived from a cross-correlation of a range of multi-methodological approaches. His primary research method involved collating and coding individual essay-based projection tests (Graves, 2001, 2002, 2005). These personal ‘conceptions’ (as Graves described them) were subject-authored descriptions of the psychologically mature adult personality. Initially this test was completed by psychology students at Union College over a period of four weeks with the instruction: “You are to develop your conception from what you now know, from that which you have experienced and from what you now believe.”
(Graves, 2005, p. 44). The participants were later asked to defend their conceptions verbally, receive criticism from their peers, to subsequently revise their conception with reference to comparisons with the psychology literature and discuss their conception with Graves himself in a concluding private interview (Graves, 2005). In this way the immutability or flexibility of the original formulation of the person’s ‘conception’ could be discerned. Graves had the original written essays of conceptions (from adults aged 18-61 years) coded by independent non-specialist assessors into the fewest possible categories into which they were classifiable (Graves, 2005). By this method, independently verifiable categories of difference were established iteratively over time (Graves, 1965b, 1970a; Graves, et al., 1970).

This process of the independent coding of actively constituted ‘conceptions’ based on categories of structural difference (rather than similarity of content) initially disclosed five categories, discernable into two sub-categories. These were styled by Graves as either express-self or sacrifice-self conceptions, with a further sub-categorization of either nodal or transitional conceptions, and a final additional sub-categorization of the transitional conceptions as either entering or exiting conceptions (Graves, 2005). This delivered 18 coded sub-categories across the five main conception systems identified. Of the data set, 40% of the sample contained a mixture of types or of sub-types rather than a single, clear typology (Graves, 2005). Of these mixed conceptions (i.e. non-nodal) Graves found it was common to find at least 50% of the thinking relating to a single central theme, with the remainder being coded as the adjacent sub-types or a mixture of various category types (Graves, 2005). Rather than mere stages of psychological development, this process revealed a complex and dynamic range of potentially operant discrete cognitive systems (that were not necessarily contiguous). These finding were not directly explained by the psychological research of the time.

Two things surprised Graves in completing this process. The first was that over nine consecutive years of the process the coding by different groups of independent judges of the categories confirmed the underlying categories. The
independent assessors “agreed markedly” and came to “the same classification 
system and roughly the same percentage of classifiable documents” in each 
round of assessments (Graves, 2005, p. 93). This level of reliability of 
assessment and repeatability of classification was unexpected. The second 
surprise was the observation that shifts in the conceptions held by subjects did 
occur and the nature and the triggers of those shifts occurred differently for 
each discernable type of conception representing different ‘levels of existence’.
It appeared to Graves that each type of conception coped with the life conditions 
imposed by using discernibly different conceptual coping systems. A pattern of 
consistently ordered structures was indicated by the data generated.94 The 
discernment of a minimal number of structurally different categories eventually 
led to his hypothesis regarding the existence of distinct levels of organization of 
the mature (non-psychopathic) adult personality (Graves, 1970a).

Different secondary research methods were then used by Graves to confirm, 
disprove, qualify or elucidate this initial data and formative conjectures (Graves, 
2005). Subjects with previous identified and coded LOE scores from a related 
study then completed various psychological and psychometric tests for traits 
including; intelligence, cognitive complexity, authoritarianism, dogmatism, 
deferece, autonomy, opinionation, affiliation, aggressiveness, rigidity, self-
causality, self-concept, religiousness, honesty, creativity and belief flexibility 
(Harvey, 1966; Harvey, et al., 1961). The results compared favorably with 
similar categories from Graves’ coded conceptions, showing a diverse mixture of 
correlations with other dimensions of personality (Graves, 2002, 2005; Harvey, 
1966). For example, the sequence of the levels of organization of conceptions 
proposed by Graves correlated strongly with tests for conceptual complexity 
showed no correlation with intelligence and showed a negative correlation with 
authoritarianism and dogmatism (Graves, 2002; Harvey, 1966). These 
confirming studies suggested to Graves that he had identified a set of categories 
with dynamic properties not reducible to any single dimension in existing 
personality theory (Graves, 2005).
In further validation studies, Graves used the observation of comparisons in group problem solving techniques by forming sets of seven to fifteen people based on their previously coded LOE category (Graves, 2005). This revealed qualitative and quantitatively different problem solving styles between the different categories of conceptions (Graves, 2005). A collaborative study (using a small sample group) further tested subjects from each LOE category for perceptual readiness, indicating that the conception types had different psychological reaction times to system-sensitive word cues (e.g. safety, esteem, power, submit, adjust etc.) when shown in short-response intervals using a tachistoscope (Graves, 1964b; Graves, et al., 1965). Graves also undertook a process of isomorphic comparisons of corroborating structures from the findings by twenty-two other researchers (including William Perry (Perry, 1999), Jane Loevinger (Loevinger & Blasi, 1976), David Ausubel (Ausubel, 1968), Lawrence Kohlberg (Kohlberg, 1969), David Hunt (Hunt, 1966), John Calhoun (Calhoun, 1962) and Erik Erikson (Erikson, 1959) as prominent examples) to elucidate on inconsistencies and provide cross-disciplinary theoretical confirmation of his observations (Graves, 2005).

However, despite his own extensive and confirming research the question that remained unanswered for Graves at the time of his incapacitation was the means for an appropriate method for measurement of these levels of existence. He remarks:

I have been working in the direction of trying to develop some means of assessment which would, in theory, enable the individual to assess the degree of operation of all the systems in a person at any one time... But, I’ve run into a problem, and I can’t get it solved. It’s one of the things which is making me reluctant to hurry out with the book I am working on, and I don’t know whether I’m going to solve it. (Graves, 2002, p. 88)

This research disclosed that the patterns in structures perceived by Graves were present and confirmable by independent coders, yet were not adequately able to be isolated with specificity using any existing psychological testing methodologies. The learnings from this mixed-method approach are not so much derived from the application of single valid measurement instrument,
rather they are from the rigorous testing of methodological assumptions derived from the consideration of the problem of assessment itself.95

Application to Conceptions
The relevance of Graves’ conceptualization of Levels of Existence (LOE) to the measurement of Integration relates to three propositions. The first is Graves’ hypothesis that LOE were not categories of psychological types, rather a LOE operated as a generalized conceptual system, not being (in its schema) idiosyncratic to an individual (Graves, 2002). The second proposition is that while each LOE was potentially available to all persons, each individual had a different propensity for operating at different LOE’s depending on the actual conditions to be coped with (Graves, 2005). The third proposition was that in following and extending the work of Maslow (1973a) each LOE was pre-potent and hierarchically organized, representing a multi-state system of potentially available conceptions that were developmentally activated based on life conditions and experiences. These propositions, being that LOE represent conceptions that are: a) hierarchically ordered, b) psychodynamically generalizable, and c) environmentally conditional, directly reflect the hypothesis for the dimension of Integration.

Limitations of Assumptions
There are limitations identified by Graves’ in his own methodology that also relate to the dimension of Integration and may inform the design of a measurement modality for systems of conceptions. First, the observation was made by Graves that, while many individuals were easily identified as being centralized in a LOE, others would shift LOE during the course of the survey period. This reflects the proposition that a person operates through a range of LOE and this is dependent on the conditions of existence which represent “the totality of the environmentosocial forces” they must face (Graves, 2005, p. 162). As the conditions of existence change, there may be a corresponding change in the primarily operant LOE. The parallel proposition for the dimension of
Integration is that the range of configurations would be potentially available, subject to the formation of appropriate stabilized states of Coherence.

Second, in observing that change in LOE was not uncommon, Graves hypothesized that, corresponding with a transition between the stabilized LOE and a newly emergent psychological system, there would be a phase-like shift in the individuals psychological condition from feelings of psychological satisfaction through different phases, including cognitive inadequacy, anxiety, rigid functioning, regression and consolidation (Graves, 2005). The parallel proposition for the dimension of Integration is that concurrent with a change in the operant range of capacities there would be a corresponding fluctuating change in the dimension of Orientation.

Third, Graves noted that it was difficult to assess the degree of operation of all the LOE systems operating in a person at any one time (Graves, 2005). This reflects the finding that while individual LOE are generalizable and identifiable by a coding process, for each individual there will also be an idiosyncratic mix of different potentials in the conceptual LOE available (based on their individual life histories, circumstances and patterns of biopsychosocial development). Accordingly, rather than measuring an upper range, a situation specific location or a commonly centralized LOE, the more correct measurement aim is to identify the potential strengths and vulnerabilities of each specific individual in a range of potentials. The parallel proposition for the dimension of Integration is that the measurement is not of a single point, but rather an assessment of an operant range on a continuum of potential capacities.

Concluding Interpretations
The history of Graves’ research provides an anecdotal summary of the problems faced in meeting the complexity of the measurement of the capacities of individual conceptual systems. To the extent that parallels can be drawn between the LOE (for individuals) and the dimension of Integration (for conceptions) the observations made reveal the problem of the isolation of their
dynamic properties and also indicate how these measures represent similar
degrees of complexity.

The primary learning gained is that the dimension of Integration is potentially
identifiable by the independent coding of projection tests, yet this scoring is
subject to environmental and individual variables (as well as individual
assessor biases). This leads to the conclusion that a valid test for Integration
would need to primarily assess for the range of operation, in the context of the
dependent variables of the extent of Coherence, and be subject to modification
for the phase of Orientation.

**Measuring Orientation (Smith/Laffrey)**

*History of Development*

The third measurement methodology derives from the work of Judith Smith (J.
Smith, 1981, 1983) and Shirley Laffrey (Laffrey, 1985a, 1985b; Laffrey, et al.,
1986). Professor Judith Smith completed her PhD research in nursing studies
within the specialization of community health nursing for acute care patients.
That research became a theoretical paper titled *The Idea of Health: A
philosophical analysis* (J. Smith, 1981), subsequently published as the book of
the same title (J. Smith, 1983). In this work Smith described and defined four
different categories of conceptions of health. The work is innovative in that it
seeks to incorporate non-medical conceptions of health into the medical
context. The primary thesis proposed by Smith is described as:

> On the basis of tentative investigations of the literature, the various conceptions
and idea of health can be resolved into four distinctive types: (1) clinical model,
(2) role-performance model, (3) adaptive model, and (4) eudaimonistic model.
Each of these models can be defined by the way the extremes of the health-
ilness continuum are characterized (J. Smith, 1983, p. 31)

The motivation behind this research was 'the aim of health as *paideia*',
referring the Greek ideals of medicine (Jaeger, 1945). This originating idea of
health promotes the ideals of equality, harmony and symmetry, which are to
become "an intrinsic, pervasive element of the culture, active life, and education
of a people” (J. Smith, 1983, p. 30). The underlying definitions of the health conceptions used by Smith in the formulation of this research are worth describing verbatim, as they delineate four clear separate orientations to ‘conceptions of health’ in four parallel continua (J. Smith, 1983):

Clinical Model: Health extreme: absence of signs or symptoms of disease or disability as identified by medical science; illness-extreme: conspicuous presence of these signs or symptoms.

Role-Performance Model: Health-extreme: performance of social roles with maximum expected output; illness-extreme: failure in performance role.

Adaptive Model. Health-extreme: the organism maintains flexible adaptation to the environment with maximum advantage; illness-extreme: alienation of the organism from environment, failure of self-corrective responses.

Eudaimonistic Model. Health-extreme: exuberant well-being; illness-extreme enervation, languishing debility. (p. 31)

Smith (1983) specifically references Maslowian ideals and proposes that the four conceptions of health represent a similar structure of prepotency to Maslow’s own ‘hierarchy of needs’ (Maslow, 1943a). In Smith’s characterization the later conceptions incorporate the former, representing ‘four ideals of humanity’, with the eudaimonistic model representing the most comprehensive conception. The structure and relationship of the four models is outlined by Smith (1983), reflecting this assumed ‘prepotency’ characterization:

The four models of health presented here can be viewed as alternative ideas of health, although they are not mutually exclusive ideas. The adoption of one model does not preclude the adoption of the other models of health, although the degree of emphasis put on each model may differ. But they can also be viewed as forming a scale – a progressive expansion of the idea of health. The models of health can be seen as viewing individuals within broader and broader contexts. (p. 89)

Smith (1983) then details how the four models are not in opposition, each having validity, yet “there are significant differences in outlook and emphasis” (p. 91). Smith (1983) identifies that:

The clinical and role-performance models on the one hand and the adaptive and eudaimonistic models on the other appear in very different perspectives. Both the clinical and role-performance models seem focused on the maintenance of stability; they may be said to aim at physiologic and social homeostasis. In contrast, the adaptive and eudaimonistic models are orientated towards change in growth. (p. 91)
In this particular passage, Smith identifies how the four discrete continua operate in four distinct orientations, yet appear on two horizons in a higher-order delineation. From this initial basis, further work was done on refining, testing and altering the underlying abductive framework of these key dimensions of health ideals (Laffrey, 1985a, 1985b, 1986).

Specifically, Smith’s conceptions of health were expanded and altered, in theory and practice, by Professor Shirley Laffrey (1985a), a nursing science researcher who examined the role of choice in preventative health behaviors. The originating basis for this research is identified as describing a health continuum from pathology to health ‘generativity’ as a theoretical alternative to describing health merely as the absence of disease (Laffrey, 1986). Specifically, identified was the difference in these two ‘orientations’ as marking the evolution of two discernibly different behavioral health paradigms (Laffrey, et al., 1986). Laffrey's (1985a) motivation behind this re-description is stated as the intention to propose a ‘developmental’ public health policy shift; from treating disease in a passive reaction to socially and environmentally hostile surroundings, to preventing disease in socially enabled beneficial environments, and then subsequently to health promotion of active choice in health lifestyles. A notable difference in Laffrey’s approach (to that of Smith’s) is the research focus on the importance of an environmentally situated analysis, stating: 'It would be simplistic and dangerous to exhort individuals to adopt healthier lifestyles without considering the complex relationship between them and their environment' (Laffrey, et al., 1986, p. 94).

In relation to the different paradigms of health, Laffrey's primary contribution to this research was to outline generative categorizations of health behaviors, citing research on a staged series of behavioral choices applicable to different situational environments. These include: a) choosing options, b) seeking options, and c) transcending health options in the enactment of proactive health autonomy (Duffy, 1984). The observation (and innovation) made by Laffrey was to note that professional conceptions of health differ from those of the non-
professional person (Laffrey, et al., 1986). This research highlighted the pathogenic-mechanistic professional-expert care paradigm and contrasts this with the self-empowered, patient-centered, organismic actuation of health potentials paradigm. A key feature of this alternative ‘health-based’ paradigm is that the individual is not seen as being passive in the environment and, being self-determining, is able to “interact continuously with the environment, affecting it and being affected by it” (Laffrey, et al., 1986, p. 97).96

Laffrey et al. (Laffrey & Kilbok, 1999; Laffrey, et al., 1986) argue further that in the preventative health paradigm underlying humanistic growth motivations had not been adequately examined, regardless of the degree of proactivity towards ‘ill-health’ that is proposed. This reflects the discernment of a contrast in the understanding of health behaviors. Specifically, the pathogenic model of health apparently relies on responses to perceived susceptibility to ‘health threats’ for action, rather than on ‘growth producing motivations’. The resulting conclusion reached was for a call for the replacement of the tendency to associate health promotion ‘as synonymous with, or a part of, illness prevention’ (Laffrey, et al., 1986) (p. 98) thereby introducing a wider range of orientations in health conceptions to public health policy formation.

Method of Measurement
Following on from Smith’s theoretical work, Laffrey (1986) tackled the absence of a means to discern clear differences in conceptions of health directly, with the development, verification and reliability testing of the Laffrey Health Conception Scale (LHCS). The LHCS was specifically designed to measure individual perceptions of the meaning of health based on four distinct dimensions (Laffrey, 1986). Laffrey (1986) relies on Schlenger’s (1976) multidimensional view of health, in two major concomitant dimensions. One dimension is focused on negative feedback and the absence of illness and equilibrium attainment. The other dimension focuses on positive feedback, being the growth and actualization component of health. The assumption of this model of testing is that within these two major dimensions there might be a
broad range of multidimensional manifestations of health conceptions.

Recognizing the need for a broader method for the assessment of health conceptions, Laffrey used Smith’s (1981) four health dimensions as the foci of tests for the orientation of health conceptions.97 Because the underlying theoretical assumption within this approach is that health conceptions in the four dimensions are additive, not mutually exclusive, this influenced the design parameters of the research instrument. A ‘prepotency approach’ like that of Maslow’s (Maslow, 2000; Maslow & Mittelman, 1981) hierarchy of needs was assumed. The effect was to assess the range of development and conceptual preference in each of the four orientations. The process used for this assessment was a question prompted response selection survey with a randomly sorted mix of conceptual descriptions. The LHCS instrument was subsequently refined and shortened as the Reduced Laffrey Health Conception Scale (RLHCS) for use in a broader range of situations (Hong, Lusk, & Klem, 2000). The reduced Laffrey health conception instrument (RLHCS) combines the three non-illness orientated categories from Smith (J. Smith, 1981, 1983) into one category of non-clinical illness, creating a bidimensional scale of clinical unhealth and overall wellness. This format uses a reduced 16 question prompted-selection format, with options selected in response to an open statement commencing: “Health, or being healthy, means for me…” 98

The LHCS and RLHCS have been applied, verified and modified in a number of research studies. Specifically, Hong, Lusk and Klemm (Hong, et al., 2000) applied a format previously developed for factory workers (Lusk, Kerr, & Baer, 1995) to the health conceptions of a sample of 1297 construction workers. That study concluded positively on the reliability, validity and consistency of the RLHCS with the following qualifications:

The two-factor, 16-item RLHCS demonstrated robust psychometric properties, with acceptable levels of internal consistency and invariance of the factor solution. Despite the fact that present findings corroborate results of the Lusk and associates study (1993), in terms of documenting validity and good internal consistency, additional measures of reliability and validity, such as test-retest reliability and concurrent, convergent, and discriminant validity, need to be
assessed to augment the current findings. And the scale does need to be validated for use with diverse samples other than Caucasian males. (Hong, et al., 2000, p. 115)

In terms of applicability of the LHCS and RLHCS to different and diverse survey samples, Yarcheski (Yarcheski, Mahon, & Yarcheski, 2005) applied the LHCS to 230 adolescents aged 12-14 to confirm a correlation between self-definition of health and personally selected wellness practices and concluded the test was “a reliable and valid measure of health conceptions in early adolescents” (p. 65), suggesting it should also be validated for late adolescents and adults, noting “establishing validity for a tool is a never ending process.” (p.74). Other studies of the needs of a range of migrants, social classes and cultural groups form similarly supportive conclusions as to validity and reliability (Lee & Laffrey, 2006; Lusk, et al., 1995). 99

Application to Conceptions
The relevance of the LHCS to the dimension of Orientation is that this assessment methodology is premised on the existence of differently orientated, non-professional, conceptions that are contextualized situationally. The presence of dimensional categories of distinctly different mental models for conceptions of health reflect strongly the preliminary observations made of the different orientations of conceptions (see Chapter Two). Of specific interest is that in the use of the LHCS ‘health’ is examined from a community health perspective as a more generalized conception, potentially indicating the application of a similar technique to other equally generic ideas.

Specifically, by way of direct comparison, the four delineations used represent four different extended perspectives, as does the dimension of Orientation. The concept contains a delineation of a dual ‘horizon’ of progressive and reactive characterizations, as does the dimension of Orientation. The reflection of the different categories of health conceptions as equally valid and alternatively available human ‘ideals’, also accords with the dimension of Orientation. The method also highlights the role of environmental and situational factors in the effect on these ideals (being held non-exclusively), much like the dimension of
Orientation. Similarly, the idea that each conception of health represents motivations in distinctly different directions is compatible with the dimension of Orientation. For these reasons the comparison is potentially illustrative of similar measurement design problems and solutions applicable to the dimension of Orientation.

Limitations of Assumptions
Given these similarities, the research studies using the LHCS reveal surprising challenges to the possible assumptions informing the design of a test method for Orientation as a distinct and separate dimension in a theory of conceptions.

First, Yarcheski's et al. (2005) analysis of the LHCS supported a dichotomous, rather than multi-dimensional, conception of health, noting the studies by Pender et al. (Frank-Stromborg, Pender, Walker, & Sechrist, 1990; Pender, Walker, Sechrist, & Frank-Stromborg, 1990) into differences in health motivations. Their findings suggested that the two factor solution proposed from their data did not conform to the four conception model (J. Smith, 1981). Their explanation was that a health-professional's view of health may be more nuanced than the lay-persons in terms of their self-assessment. The recognition from this analysis is that perhaps it is the degree of complexity in levels of abstraction, rather than differences in motivations, that may account for the single, two factor and multi-factor analysis (e.g. health, wellness, and forms of wellness). The parallel proposition for the dimension of Orientation is that the test will have different interpretations and responses depending on the corresponding results in the dimension of Integration.

Second, the practical result of Laffrey's studies was that, in nursing practice, an understanding of the conception of health held by a patient could assist the nurse in providing health behavior choices. The finding was that health promotion aims were limited to enabling the patient to formulate health goals that are “acceptable and realistic within the client’s [own] perspective” (Laffrey, 1985b, p. 291). This recognizes that, while the aim of health promotion might go beyond alleviation of specific illness, the conception of optimal health (and the
corresponding range of health choices available) “is defined with and by the client” (Laffrey & Kilbok, 1999, p. 92). Essentially, the conclusion reached was, what a patient cannot coherently conceive of, they cannot reasonably be expected to choose. The parallel proposition for the dimension of Orientation is the range of potential conceptions within an Orientation is subject to those that might also meet corresponding tests of Coherence.

Third, Laffrey (1985b) tested the hypothesis of Smith’s (J. Smith, 1981, 1983) fourfold conceptions of health within the premise that there might be a positive association with health behavior choices and health conceptions. Specifically, Laffrey asked the question of whether health choices would correlate with the motivations of self-actualization in meeting individual growth needs (Laffrey & Isenberg, 2003). Laffrey’s (1986) hypothesis was that choice in health behaviors would instead become increasingly promotive with the increased complexity and sophistication of the health conceptions held. The results of this initial study showed that self-actualization values were not positively associated with health conceptions or health behaviors. There was though, as expected, a positive correlation between the health conception held and health behavior choices. Significantly, the study found that: “All the variation in health behavior choice was accounted for by health conception alone.” (Laffrey, 1985b, p. 289). The parallel proposition for the dimension of Orientation is that this dimension is not mono-directional and a bimodal continua of measures will be required.

Concluding Interpretations
Similarly to the research of Antonovsky and Graves, the research of Laffrey (and her colleagues) represents the most stringent set of inquiries into a complex, highly nuanced, and variable phenomenon. Each theorist studied the forms of conceptions through the eyes of diversity of the multiple perspectives of unique individuals. From Smith and Laffrey’s analysis, the noticeable feature of an extension of the application of their original research was how factors reflecting the dimensions of Integration, Coherence and Orientation all played a part in the
re-conceptualization of their original formulation. In a surprise result, more nuances are seen by the reformulations of Smith’s original four continua of the conceptions of health from its process of measurement than are evidenced in the original theory itself. To the extent that parallels can be drawn between the HCS (for individuals) and the dimension of Orientation (for conceptions) the observation made is that individuals can only select choices for interpretation that are available from their presently operating conceptual capacities. This conclusion reflects the originating provocation for this thesis research in terms of the relevance of the capacities of systems of conceptions to social learning situations (Bouwen & Taillieu, 2004; Reed, et al., 2010; Wenger, 1998).

The specific insight gained is that the dimension of Orientation is clearly discernable by a range of self-completion tests, yet the specificity of this form of data is subject to individual and conceptual variables. This leads to the conclusion that a valid test for Orientation would need to primarily assess for the phase of circumstances, in the context of the dependent variables of the extent of Coherence and subject to modification for the range of Integration.

Conclusions on Methods

For the measurement of systems of conceptions, the resulting conclusion from the comparisons undertaken is that the limitations of the existing instruments and processes are not satisfied by these modalities individually or collectively. Primarily, this concerns the independence and the inter-dependence of the measurement dimensions. To elucidate, assumptions of attainment will fail to reflect that deconstructions of Coherence can, in fact, represent developmental progressions. Assumptions of progression in stages of developmental levels may neglect that prior absences in Integration will only appear in situations of non-normal challenge. Assumptions of developmental motivations equaling sufficiency will omit how shifts in Orientation in responsiveness are reflected as stabilizing regressions. For the unique measures for systems of conceptions, it is necessary to alter the governing assumptions. Instead of measures of the simple quantity of coherency, development or aspiration portrayed by systems of
conceptions, assessments of more dynamic relations are required. Therefore, it is proposed that the relevant measures must in particular assess:

1. the extent of Coherence;
2. the range of Integration; and
3. the phase of Orientation.

This conclusion represents a shift towards the examination of the quality of conceptions, not the quantity of their dimensions. The implication of this conclusion is the requirement for a paradigmatic shift in testing procedures. The specific effects of the shift in practical presumptions for the measurement of conceptions, in a comparison to paradigms for the measurements of capacities of cognition, are summarized in Table 7.2.

### Table 7.2 – Paradigmatic Premise for Measurement of Conceptions

<table>
<thead>
<tr>
<th>Item</th>
<th>Measurement of Cognition</th>
<th>Measurement of Conceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>Scoring to general stage theory</td>
<td>Depiction of specific conception</td>
</tr>
<tr>
<td>Item 2</td>
<td>Responses on survey instrument</td>
<td>Response as user generate landscape</td>
</tr>
<tr>
<td>Item 3</td>
<td>Individual qualified survey scorers</td>
<td>Self-selection by algorithmic precision</td>
</tr>
<tr>
<td>Item 4</td>
<td>One time client commissioned data</td>
<td>Frequent subscriber contributed data</td>
</tr>
<tr>
<td>Item 5</td>
<td>Results scored on set protocol</td>
<td>Results depicted in spatial relations</td>
</tr>
<tr>
<td>Item 6</td>
<td>Assessments as valid and reliable</td>
<td>Instantaneously relatable and variable</td>
</tr>
<tr>
<td>Item 7</td>
<td>Negate variance to confirm rubric</td>
<td>Discovery of a person's unique niche</td>
</tr>
</tbody>
</table>

By way of illustration, this involves a general shift: a) from abstraction to detection (Item 1), b) from attribution to generation (Item 2), c) from evaluation to self-definition (Item 3), d) from (single) determinations to (frequent) occasions (Item 4), e) from rubric to relationship (Item 5), f) from validity to currency (Item 6); and g) from negation to habitation (Item 7).

These specific premises, together with the previously described design criteria, have the effect of taking the strengths from existing test instruments and reversing the generic problems of testing into potential solutions. A proprietary survey and data system is accordingly now being developed on this basis.
Evidence in Support

The evidence of support for the limitations in the measurement models analyzed came principally in the form of recognitions directly from each of the individual theorists. This reflects the maturity of their analysis and the integrity with which they approached the development of the research they conducted. In effect each saw around the curve of the horizon of their own perception into the domain revealed by their counterparts conceptualizations.

First, in respect of Coherence, Antonovsky himself recognized that a salutogenic orientation from a strong SOC, while formed in childhood, needed to be ‘remade’ with each set of transitional life-stage challenges. This represented a profound reversal of the underlying research premise (and his hope) that early life-stage SOC formation was a guarantee of a life-long salutogenic health, altering the foundational assumption formed from the inspirational lives of the concentration camp survivors he initially interviewed. In a late essay, Antonovsky (1991) specifically notes (in a passage insightfully titled A Brief Attempt at Integration):

> The assumption has been that salutogenic experiences, from early childhood, slowly build up a salutogenic personality orientation. At each stage of the process, structural factors are decisive in determining whether the experience will indeed be salutogenic. This brings us to a crucial final point, which rests on the concept of autopoiesis. Once a stable strength has come into being, the human system is capable of reorganization of self into a higher level of complexity, more capable of proaction. Which brings us to what would require another essay: the possibility of reorganization of the environmental suprasystem. Lest this sound too abstract, the reader may think of the move from adolescence to adulthood; divorce and remarriage; the retirement of a family; the creation of an international community; or building a viable democratic society (p. 102)

In this reflection, Antonovsky accentuates the significance of the early formulation of a strong SOC and the dependency of contingent factors at each transitional stage of emergence in different levels of organization, which may involve subsequent reorganizations. The realization is that, with complexity in the dimensions of maturity also comes the possibility of failed navigations and the non-formation of new coping resources for each level of Integration. It
appears that while the skill of SOC formation may be learned, its task of reformation is a ‘never ending quest’ (Graves, 2005). From this limitation in the assumption of stabilized Coherence, there is a recognition of the variance caused by inclusions across a wide range of Integrations.

Second, Graves specifically noted that within the clarity of the demarcations of the LOE as structures of Integration there were transitional phases. These possibly represented a cyclic sequence of dissonance, regression, insight and progression (Graves, 2005). Graves recognized in his longitudinal review of the progressive development of individuals that, while most remained consistent in their attributed LOE, some were subject to dramatic changes. These were not always entirely beneficial or developmental (Graves, 2005). The recognition gained by Graves applicable to conceptions was that phases of Orientation may otherwise confuse and distort the findings of clear levels of Integration. Graves’ (2005) own observation (in the context of his data) specifies six phases of change, qualifying the stage-like assumptions of each LOE:

The first was potential – some never changed. The second was the solution of the existential problems. The third was disturbance of the solution, that is dissonance, which precipitated a stage of regression. Then insight came into the picture as that which halted the regressive phase. This was followed by the need to remove barriers so that a quantum-like jump to a different way of thinking could occur. Then it was necessary for consummation of the change to take effect. (p. 107)

This insight confirms the finding that the measurement of the range of Integrations must be sensitive to the phases of Orientation, especially in the context of the processes of transition (whether in progression or regression). From this limitation in the assumption of progressive Integration, there is the recognition of the variance caused by changes in phases of Orientation.

Third, although Laffrey pursued Smith’s theoretical assumption that an eudemonic orientation resulted from higher orders of self-actualization, the data from contexts other than acute care reflected that health orientation, while potentially in unchanging circumstances might be generally consistent, was ultimately situationally contingent. In Laffrey’s own recognition of the
dependency of health resources and coping strategies in situations of contingency, she states:

Additional use and testing of the instrument will be needed to determine if the relationships between health conception, health behavior and health status exist across population groups. For example, do well persons hold different health conceptions from ill persons? ... The study concluded that one’s conception of health may be a more significant factor than health status in assessing health behavior. It will be important to include ill persons in future studies to determine if their conceptions of health differ from those of well persons. (Laffrey, 1986, p. 112)

From this insight we recognize that for systems of conceptions measurements of Orientation will be qualified by the extent of the potential for Coherence operating for the proposed behavioral choice.\textsuperscript{102} From this limitation in the assumption of the discretion of Orientation, there is the recognition of the variance caused by the formative extent in Coherence (as related to applicable operant levels of Integration).\textsuperscript{103}

The conclusion in following each of these researcher’s own work to the limits of their natural extensions is to see their intrinsically inter-related conjunctions. The finding is that to measure one is to measure each. The primary learning that informs a design intention for systems of conceptions is that the conjunction of the primary dimensions requires a clear separation of measurements of their distinct elements to remove the inherent anomaly of their inter-relationship. Where these linkages were negated or overlooked by the researchers in their privileging of their similar, yet different, individual research motivations, limitations to their assertions (and acceptances of their theoretical propositions) resulted. This given, the element that each of the originators of the comparative methods shared in common was a profound commitment to the development of human health and wellbeing. In each case, from a reading of their work, this was the consistent foundation in their respective contributions.

In summary, we can learn from these comparative studies that potentially for systems of conceptions that; Coherence is lifecycle-recurrent (i.e. is not established and set forever), Integration is conditions-dependent (i.e. must be
represented by different multi-state forms), and Orientation is not pre-potent (i.e. the direction of a cyclical change is situational). These omissions from this pioneering body of work informs precisely the inclusions needed for a valid means for testing the specific dimensions for systems of conceptions, both individually and relationally.

**Additional Insight**

When I first proposed my PhD research the original intention was to develop a workable test instrument to measure the psychodynamic capacity of small groups and social systems, primarily for sustainability-type discussions. In the candidature phase of my thesis proposal the anticipation was that any factors identified could be tested for by the use of existing modalities (and preferably ones I was already trained in and intimately familiar with). The ambition was to develop and trial a workable instrument with a small sample group and isolate its limitations by reference to the correlating assessments from validated instruments. The aim was to learn from that experience, report on fairly straightforward conclusions and to then modify the trial instrument accordingly. The insight gained from working in the method of an abductive logic is that the researcher must be open to a reversal of all existing ambitions and assumptions.

When reading the detailed commentary in the works of Antonovsky (1987), Graves (2002) and Smith (1983) of their own research what became apparent was the lifelong commitment each researcher shared to their initial research question. These were researchers deeply embedded in the social needs they had witnessed. Measurement was important, only not at the cost of the integrity of the observation of the phenomenon they wished to report on. The evidence of this was seen in their continued revision and refinement (and reconsideration) of their modalities of depiction, which was then continued by followers of their work with a similar passion.
This highlighted for me an ethical consideration in the metonymic depiction of conceptual systems. While we might like to place appropriate qualifications and restrictions on the use of test instruments and their assertions, the factual reality is that once a measurement is made an evaluative assertion is communicated (even if only to the researcher). The instrument used reflects the philosophy of that assertion. In keeping with the theme of this thesis of reflexive learning, the additional insight gained was that in representing a complex phenomenon using one significant attribute we inflict on it a violence of metaphor. The question for the researcher is whether they feel this is sufficiently justified. The effect of this assertion on a reflexive human system is spoken to directly by cybernetician, Sir Geoffrey Vickers (Vickers, 1987):

A mistaken view of planetary motion, held for centuries, made no difference to the planets, which continued in their ellipses, undisturbed by human preference for circular motion. But a mistaken view of human nature, once accepted, might easily provide its own bogus validation. (p. 28)

This understanding informed the recognition that, for conceptions (as defined and described in this thesis) a different modality that reflected a different ethic was going to be needed. However inconvenient this conclusion, it became quickly apparent that the dynamics of systems of conceptions are not reducible to the aggregation of the capacities measured by individual cognitive assessments. This insight is now reflected in the design-criteria specified for the measurement of systems of conceptions that will guide its development. The perceptual shift that is involved for this is not insignificant.

For example, for the criterion described as Separation, in testing for the developmental levels for a person there is an assumption of prior coherences and a neutrality of orientation. On analysis, for systems of conceptions, these distinctions are potentially much more subtle and significant. In terms of Qualification, in individual psychological tests the aim might be to eliminate error by focusing attention on the phenomenon of the test, making those individuals with limited linguistic capacity (i.e. literacy, dyslexia, attention disorders, language barriers) untestable or their data unreliable. For systems of conceptions, the qualifications of limitations are actually the data of most
relevance, requiring the inclusion of the relations of these conceptions in the system's assessment to be representative. In working with Projection, often individual distortions of the carefully structured survey questions means misinterpreted responses have to be eliminated. For systems of conceptions, those forceful projections are perhaps the indications of features of conceptions that are most significant. In considering Variation, an assumption of enduring forms of cognitive structures neglects the nuances of evolutionary drift and structural change. For systems of conceptions, the range and flexibility of formation and deformation in situations of collapse and renewal represents the complexity specifically sought to be revealed. This leads to the criterion of Contextualization, which might be negated in assessments that assume a neutral or even conducive context for the survey completion. For systems of conceptions, the assumption of developmental stages might be shifted, looking to the qualities of continuing (and contingent) capacities not reliant on assumptions of ongoing stability.

The conclusion reached on reflection is that quantification of the capacity of system of conceptions is not necessary or appropriate. The proposition is that the solution-demand for 'depiction' of dynamic relationships is best met by discerning existing composition and any ongoing changes. In Bateson's (1972) consideration of the ecology of minds this is described as the 'news of difference'. Essentially, the premise is that representations in the maps that become available to us affect our recognition of the world around us. Bateson (1972) uses this phrase to highlight how the mental world, the world of information, is 'not limited by the skin'. The unit of evolutionary survival is not the organism, rather it is the unit of organism plus environment "... which turns out to be identical with the unit of mind" [Emphasis in original] (Bateson, 1972, p.491). The purpose of the proposed depiction of this thesis is not to quantify a quality defined by human observers as an evaluation of individuals, rather it is to enable learning by reflexive engagement with the systems of thought (of which we may form a part) by way of the enhanced appreciations of change and difference.
In this way, we might become more aware of the landscape of the rich diversity of the gardens of thought for which we are the appreciative gardeners and active participants. This conjunction of reflexivity, between the inner and outer worlds of conceptions, is where my sense is of the “difference that makes a difference in some later event.” [Emphasis in original] (Bateson, 1972, p. 381). This meaningful information is what will enable corrective and generative responses in the pattern of our collective learning. The design-criteria for the paradigmatic shift necessary for the generation of that information is this chapter’s insight of significance. The means of depiction of that system for learning is the focus of Chapter Eight.

7.5 Summary

This chapter concludes that for Research Question #7:

- the three modalities are valid for their own measured dimensions;
- they each have limitations as determined by the other two dimensions;
- what needs to be measured is not assessment, but what reveals difference.

The comparison of three modalities for measurement generates the possibility for verification of the proposed hypotheses. The design-criteria recognizes the contributions and limitations of existing modalities. This completes the outcome required for theory-verification. The next phase of the research method asks the abductive question: What depicts it?
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Chapter Eight – What depicts it?

8.1 Introduction

The aim of this chapter is to propose a model to depict the dynamics of systems of conceptions. Of specific relevance to the practical workability of this model is how, within the problem-constraints, the solution-demand might be met.

The abductive method used to answer the research question for this chapter is described as theory-demonstration. In this abductive phase proto-types are proposed to model the proposed hypotheses. An ‘enacted’ emphasis was selected as the appropriate abductive theory approach. Parallels are drawn with the use of models of n-dimensional hypervolumes in ecological niche theory.

The outcome of this chapter is a workable demonstration of how a system of conceptions might be meaningfully depicted as thought-ecology. An example is provided for conceptions of sustainability. This modeling of potentially verifiable measures (Chapter Seven) enables appraisal against a comparable alternative to determine the pragmatic benefits gained (Chapter Nine).

8.2 What was the question?

Research Question #8

*How might the measured dimensions of systems of conceptions be most meaningfully depicted?*

The assumption in the research question for this chapter concerns the eventual utility of the method of depiction of the dynamics of systems of conception. In the exploration of models one emphasis is on their ‘meaningfulness’. The assumption that is unspecified in the question is to whom the model is meant to be ‘meaningful’. In Chapter One, the decision regarding the appropriate location
for observation was answered with reference to Gregory Bateson's learning theory (Bateson, 1972). If the models of systems of conceptions are potentially to be used to enable social learning, multiple meaning-making systems might be operating during that process. To be of greatest utility, the criterion of meaningfulness might be satisfied if learners could effectively 'see themselves in the system'. Meaningfulness could then be tested by what is meaningful to the most number of participants and reaffirmed over time. This reflects Peirce's (1960) view of how knowledge must continue to be affirmed in community (e.g. [CP 5. 311]) operating as a “continuous self corrective process” (Bernstein, 1971, p. 177). This aim is reflected in the problem-constraint criteria explicitly (see Chapter One).

However, by definition, being a description of systems of conceptions, the conception of participants in that learning may be contained in the content of the depiction. The potential shift involved is from a map of information of significance only to a distant and removed observer, to a form of depiction that meaningfully engages the broadest range of participants represented by the information. One way to do this is to use interactive visualizations. Essentially, the proposal is for a three-dimensional representation of the environment of thought depicting its ecological capacity as a system of relations.

This question of what constitutes a meaningful depiction is also resolved in part by an analogy with another situation of abstract representation. In Henry Parker Manning’s (1914) classic text Geometry of Four Dimensions, it is explained why we might use algebraic equations and spatial metaphors to extrapolate ideas derived from crude physical experience into the dimensions of abstract imagination:

Although it is doubtful whether we can ever picture to ourselves the figures of hyperspace in the sense that we can picture to ourselves the figures of ordinary space, yet we can reason about them, and, knowing that the validity of our geometry depends only on the logical accuracy of our reasoning, we can proceed to build it up without waiting for a realization of it; and then we may in time acquire such facility in handling the geometrical proofs of the theorems and in stating precisely the forms and properties of the figures that it is almost as if we could see them. (p. 15)
In imagining a depiction of thought in four dimensions we might provide the prospect for this anticipation of how things might be, prior to their realization. This example provides a hint as to how in spatial depiction, rather than observer-based description, “this geometry greatly increases our power of intuition and our imagination” (Manning, 1914, p. 16). It is for this reason that the setting of an inquiry around the ‘means of depiction’ requests from us an extension of the boundaries of our own imaginations.

The additional element implicitly contained within the research question for this chapter is how the problem-constraint and solution-demand (see Chapter One) might guide the outcome desired. Assuming a measurement system can be designed based on the design-criteria to generate quality data (see Chapter Seven) the model for depiction needs to be:

f) **reliable** (i.e. there is a level of potential replication or repeatability in the process and product of the data gathered);
g) **comprehendible** (i.e. that the depiction is in a form accessible or translatable into information that makes-sense on its face-value);
h) **meaningful** (i.e. that people can make meaningful interpretations from the disclosure, particularly to enable possible shared learning);
i) **updatable** (i.e. that the information is not a static typecasting but is dynamic and able to be refreshed to enable the noticing of difference);
j) **scalable** (i.e. that the data represented can work for an individual, a small team, a community or to the scale of the population of a large city).

These criteria represent the requirements for a useful depiction (which may then be supplemented by any technological, representational or aesthetic requirements).

**Existing Understanding**
The primary task of the abductive research phases of this chapter is to explore how models can be used reflexively to engage with data that reflects real world situations as forms of abstract learning. In terms of existing understandings the theory and processes used to depict systems of ecological niches may provide some guidance as to an appropriate means for depiction of systems of conceptions.

The use of ecological niche theory to enable representations of the ecology of thought is not without precedent. Specifically, in one authoritative account of abductive theory in the field of computational science a mention is made of the possibility of application of the processes of abductive development to ‘cognitive niches’ (Magnani, 2001). A cognitive niche provides a resultant physical, sociological and psychological environment of potential ‘affordances’ for the thinker in their range of perceptions and meaning attributions (Gibson, 1959, 1979). Magnani (2001), in applying abduction as a process in theory of cognition, extends the idea of ‘niche’ in cognitive systems further:

My contention is that the notion of niche construction is fruitfully applicable to human cognition. More precisely, I claim that cognitive niche construction can be considered as one of the most distinctive traits of human cognition. It emerges from a network of continuous interplay between individuals and the environment, in which they more or less tacitly manipulate what is occurring outside at the level of the various structures of the environment in a way that is suited to them. Accordingly, we may argue that the creation of cognitive niches is the way cognition evolves, and humans can be considered as ecological cognitive engineers. (Magnani, 2001, p. 332)

Accordingly, the process of modeling ecological niche systems lends itself to a direct application in the visualization of ‘cognitive niches’ (Magnani, 2001, 2009a, 2009b).

In ecological niche theory, Evelyn G. Hutchinson (Hutchinson, 1957, 1959, 1961, 1978) pioneered forms of three-dimensional visualization to represent and model ‘the conditions for existence’ of different species, particularly in terms of their competition dynamics. In defining an ecological niche as the combination of a limited number of factors, he created conceptual models that
describe, spatially and temporally in abstract terms, the space of potential existence of an organism so as to define their potential locations of habitation (Hutchinson, 1978). Hutchinson outlined the theoretical premise for modeling ecological niches as follows:

It is assumed that at least ideally all the variables that affect a particular species are capable of being ordered linearly. If we consider an \( n \)-dimensional space any point in which is defined by some value of the variables \( x', x'', x''' \ldots \) measured along rectangular coordinates, we can represent the conditions for existence of a species, which requires that the values of \( x' \) be between \( x'_1 \), and \( x'_2 \) of \( x'' \) between \( x''_1 \) and \( x''_2 \), etc, will have a rectangular projection onto any coordinate plane such as \( xx'' \). This hypervolume is the fundamental or preinteractive niche of the species. (Hutchinson, 1978, p. 158)

In this description, Hutchinson draws a distinction between the ‘fundamental’ (or preinteractive) niche of a species, being the theoretical scope of the habitats potentially available, and the ‘realized’ (or postinteractive) niche, being the actual niche space that occurs when two species are introduced into the same habitat applying Gause’s (1971) principle of competitive exclusion. This distinction allows for the modeling of the actual interactions of multiple species within the one ecological zone of potential occupation. Hutchinson expands the base model by introducing further axes:

If a third variable such as oxygen concentration is also involved in deriving the niche, as would be likely, the reader can visualize a three-dimensional niche rising from the page or sinking into it. If a fourth variable such as pH is then needed, most readers will find further visualization impossible and will have to be content with a purely verbal or symbolic statement, so also for higher dimensionality. (Hutchinson, 1978, p. 159)

In this way, the niche model can combine an increasing number of dimensions with greater precision (i.e. literally being an ‘\( n \)-dimensional’ space). The question of why not then proceed to depict infinitely more dimensions, in infinitely greater complexity, is also clarified by Hutchinson:

Before we proceed further, it is desirable to point out that the reader need not be frightened by the contemplation of an excessive number of dimensions. As the concept of the \( n \)-dimensional niche is developed, it will become increasingly clear that, although to define the tolerances and needs of a single species completely would indeed require a very large value for \( n \), the study of the difference between two species can usually be conducted in a niche space of two or three dimensions. (Hutchinson, 1978, p. 161)
Hutchinson (1978) makes a further distinction of significance that explains how the model might operates across multiple spatio-temporal scales. Hutchinson defines a *biotope* as “any segment of the biosphere with convenient arbitrary upper and lower boundaries” (p. 159). The biotope represents, in ecology terms, a homogeneous limited range containing a biodiversity that is not merely a physical property of the space. An *ecosystem* is then “the entire contents of a biotope” and a *biocoenosis* is “the totality of organisms living in a biotope, or the living part of an ecosystem” (p. 160). This reflects the significance of the ecologist’s task in determining the gradients, boundaries and composition of complex ecological systems as a conceptual exercise, and not simply an exercise in description (T. F. H. Allen, O’Neill, & Hoekstra, 1999).

**Figure 8.1 – n-Dimensional Hypervolume**

Fig. 8.1 In this diagram, Hutchinson (1978) illustrates how a three-dimensional orthogonal niche is formed by $x'$ as the dimension of food size (i.e. acorns), $x''$ as temperature tolerance, and $x'''$ as branch density (p. 159). The resulting conjunction represents a niche space configuration.
The representational frame for these conceptual ecological spaces is known as a hypervolume. In spatial mathematics terms, a hypervolume is the volume of a hypersolid, which is defined by the interior of a closed hypersurface, as a portion of hyperspace within a four dimensional geometric plane, as measured in units of hypercubes (Manning, 1914). The abstraction of these distinctions and their use for biological ecologies suggests that a similar approach might be possible for systems of conceptions (see Fig 8.1).

The significance of Hutchinson’s development of niche modeling theory is that, instead of reducing the complexity in ecology to the analysis of the behaviors of single species in a narrowly defined habitat, abstract models might be developed that could be infinitely expanded in complexity to examine the co-occurrences of different organisms in guilds, communities and ecologies.\textsuperscript{106} This enables the dynamics of conjunctions of predation and parasitism, disturbance conditions, seasonal densities and evolutionary propensities to be modeled effectively (Case, 1981).\textsuperscript{107} The approach of niche modeling using conceptual hypervolumes can arguably be extended further, from the characteristics of individual species, to the traits of communities using similar principles of abstract description (Olden, Poff, Douglas, Douglas, & Fausch, 2004).\textsuperscript{108}

Specifically in relation to adaptive learning, Carpenter and Cottingham (2002) explain that, while there are unique dynamics at the ecosystem level, general patterns leading to specific principles can appear as research knowledge builds:

Lake ecosystems can be configured in only a limited number of ways. Certain control processes are repeated in lake after lake, time after time. These regularities make it unnecessary to study each lake as if it were a new, unique system. Instead, we can look for general structures and processes that explain broad patterns. (p. 62)

The application of a similar approach to the modeling of systems of conceptions potentially moves empirically based developmental psychology into a theoretical domain similar to that of complex systems ecology, involving the
interactions of multiple forms of conceptions within one ‘ecology of minds’ (Bateson, 1978).

The introduction of ecological niche modeling was not, however, without its critics. Biologist and ecologist, Daniel Simberloff (1982) recognized that forms of speculative ecology, even if reliant on sound mathematical models, could move research dangerously away from reliance on empirical data taken from the field. The methods of ecological science existing at that time relied on traditional processes of observation, hypothesis and verification. The research position taken by the opponents of ecological niche theory (described as ‘Popperians’) was to instead prefer the null hypothesis approach to falsifying the presumptions in ecological systems speculations (Slack, 2010). By 1970, what was described as a ‘vitriolic’ controversy defined by an ‘acerbic and acrimonious’ debate was occurring around the theory of ecological niches (Slack, 2010).

Hutchinson, who had written extensively about what actually happens in nature (particularly for biological limnology) countered these criticisms with the position that if the purpose of science was purely to ‘falsify the other fellow’s hypothesis’ the ‘ultimate’ null hypothesis could show that everything was due to chance (as cited in Slack, 2010). Hutchinson, not surprisingly promoted a more abductive approach, where data could be specifically generated to see if what it revealed was consistent with a proposed theory, using assumptions consistent with learnings gathered from field research. Supporters defended the Hutchinson approach as being consistent with sound and grounded naturalism, with the role of niche modeling being seen as important in potentially leading to the useful discovery of alternative explanations for many unexplained community structures (Slack, 2010).

A possible additional reason for the controversy can be understood from the fact that Hutchinson described himself as a self-confessed ‘philosophic naturalist’. He proposed in an American Scientist column titled, What Is Science For? that science should be used to produce a ‘technology of love’ based on
social values, with an ethic of precautionary care being taken for its harmful innovations (Slack, 2010). As a trans-disciplinary researcher Hutchinson proposed a perspective of expansiveness in the quest for scientific theory, arguing that:

One of the most important [positive] aspects of the intellectual climate of the present time is the increasing tendency of scientific workers to pass the conventional boundaries of their subjects ... and to borrow from diverse fields information that can be related to the results obtained in their own special investigations. (cited in Slack, 2010, p. 333)

It was this cautionary stance on the continuing atrophication of ecological and scientific thought that attracted criticisms for Hutchinson’s scientific work. In more recent times, the use of abductive models in managed ecological resources (e.g. fishing communities) has enabled different forms of social learning with a generative effect on the psychological dynamics of the participants, particularly in terms of the capacity for “evoking insight, collective learning, and action in discussion among diverse stakeholders” (Carpenter, Brock, & Ludwig, 2002, p. 179). It is actually this very quality of ‘expansiveness’ in an abductive inquiry which makes ‘niche theory’ of particular utility and applicable in illuminating the question of the abductive depiction of systems of conceptions (Holt, 2009).109

For the research question of this chapter it is recognized that presently there are no existing means for empirical measurements in the proposed paradigm. Forms of empirical exactitude are not readily available as a viable alternative solution. Accordingly, an abductive modeling process is potentially the appropriate solution. While the abductive generation of a viable model will subsequently lead to the capture of validating empirical correlations, the initial aim is merely to achieve a level of conceptual precision and theoretical simplicity. This approach reflects how an abductive approach is most useful in a sequence of sound science, not in challenging empirical analysis, but rather to inform its focus and direct its gaze to questions of later found significance.
Chapter Eight Proposition

The thesis proposition of this chapter is that systems of conceptions can be meaningfully depicted. This can potentially be done by using the modeling of \( n \)-dimensional hypervolumes. The implication of this would be the generation of forms of representation that make the invisible locatable. This would be done by comparisons to other conceptions within the system of depiction. The purpose of this chapter is to demonstrate the process to be used to generate the simplest depiction possible.

The counter-proposition would be that such representations should not be by comparison to other phenomena, but rather to an arbitrary external criteria, set by an observer. The argument would be that the researcher should determine the purpose of the evaluation and represent all the data equally by comparison to a single benchmark measures or pre-determined standard. This potentially represents the error of signification, where in selecting one quality of a phenomenon, to represent the phenomenon, there is a proposed metonym (i.e. symbolic representation by one characteristic part). Rather than the phenomenon of significance being represented, its representation is the object attributed with the significance (e.g. the IQ is the child). This error can be avoided in an abductive method by taking care in the process of generation to ensure that selective representation does not create a distorted, obscured or projected depiction (Ackoff & Emery, 1972).\(^{110}\)

The proposal is to depict systems of conceptions based on their measured dimensions. In answering the question: 'What depicts it?' the suggestion is that evaluation and comparison are actions of interpretation to be conducted in engagement with the depiction through the processes of social learning. The outcome desired is demonstration of the step-by-step method by which such a depiction would be constructed.
8.3 How was it answered?

What is the theory?

The eighth phase in the abductive method providing the overarching framework for this thesis is *theory-demonstration*. This step follows the theory-formulation and theory-construction phases of an abductive theory of method (Haig, 2005a). In this phase the focus is on developing the requirements and testing the limitations of a working model by which to advance the hypotheses. Having previously derived the potentially relevant dimensions of measurement (see Chapter Seven), this phase determines how best to represent the data to be generated. In this way, the potential forms of utilization of the model may recursively guide the generation of quality data that has usefulness and reliability in terms of depiction.

Essentially, within an abductive method the role of theory-demonstration is to provide initial exemplars of possible practical applications. The proposal is that by trialing initial forms of modeling useful guidance can be gained on how to approach the problems of verification of new questions within an (as yet) unformed paradigm. This phase of theory-demonstration completes the components of theory-construction, which potentially then allows for progression towards deductive verification. However, this interim stage is still squarely within the abductive theory of method. It involves forming abductive inferences on only ‘possible’ modes of demonstration and verification, being processes not yet perfected, only proposed for the purposes of developing a means for verification (Haig, 2008b). Fundamentally, this is the demarcation point between the first and second of Peirce’s three phases of a scientific method, where abduction leads to deduction following formalization of a testable hypothesis by directly relevant and specifically applicable research methods (Aliseda, 2006). The theoretical point is that theory-demonstration does not demonstrate the ‘truth’ of the hypothesis, only confirms that an approach to consciously working with its surprises is now practically possible.
This important distinction, between abductive demonstration and inductive validation, is clearly drawn by Addis and Gooding (2008) who clarify the role of abduction as ‘demonstration’, in a detailed account:

By contrast, Peirce’s notion of ‘abductive’ inference does not depend upon truth-values. Instead, the process of validation depends upon ‘induction’, the third type of inference that Peirce recognized. First, an abduction generates a model (an hypothesis) that is used together with deduction to explain some surprising fact and also to predict new ones. Where these are successful, this reduces our uncertainty about the world or, as Peirce put it—makes the world a less surprising place. However, any reference to the world requires a form of validation that depends upon observation of the world. Peirce’s version of induction involves comparison of expected and actual outcomes to validate the abducted model of the world. Traditional ‘induction’ as generalization from instances conflates this Peircean abduction with validation. (p. 38)

The significance of the distinction described is that an abductive hypothesis is only verifiable by an experimental design based on its own abductive logics, rather than the logic of existing presuppositions which use other non-applicable methods. The proposed hypothesis is dependent for validity, in terms of a threshold test of pragmatic utility, on comparison of present belief to expected results. A surprising result (in terms of familiar generalizations) that is expected under the hypothesis when modeled verifies the abductive hypothesis, meaning the hypothesis warrants further deductive investigation. This process of initial modeling does not, however, validate the hypothesis, only its claim that we can in future reasonably ‘expect something unexpected’ (Aliseda, 2007).

In this regard, Gabbay and Woods (2006) highlight that an abductive approach to theory-demonstration willingly involves what are called ‘ignorance problems’, where what is sought is clearly defined while the means for its definition might remain elusive. This is where an approach of providing more information so as to proceed with greater probability toward a potential resolution, even if inexact, is a desired design feature. The abductive model dispenses with the need for presumptive epistemic closure based on narrow constructions due to the absence of a present process for valid refutation. This requires acceptance of the fact that mere entertainment of the abductive hypothesis (i.e. H) recognizes that “it is essential that H lacks some degree of
epistemic value” (p. 196). The abductive aim of theory-demonstration is to allow probability and presumption to enhance the chance for explanatory originality and pragmatic investigation. This is described by Magnani (2001) succinctly and quite eloquently:

...abduction does not have to be considered a “solution” of an ignorance problem, but rather a response to it, in which the agent reaches presumptive attainment rather than actual attainment. (p. 11)

This aim of ‘presumptive attainment’ is the essential criterion for abductive theory-demonstration. A useful distinction might be drawn at this point between what could be named: selective deduction, prospective induction and abductive generation. The aim of deduction is selective verification. The aim of induction is generalization of similar cases. The aim of abduction is explanation of particular observations. These are different and distinct in their purposes, requiring different methods, and different modes of rigor (Magnani, 2001). This distinction is easily lost, by even skilled researchers, in confusing exploratory modeling with inductive attempts at statistical verification. The appropriate abductive process might then be mistakenly replaced by practices of inductive inference (Rozeboom, 2008).

Haig (2005a) further assists in clarification of the apparent level of rigor required in the theory-demonstration phase by making a distinction between ‘description and explanation’ to outline the benefits of an abductive process. He confirms that there is an initial role for an abductive exploratory analysis in the description of ad hoc data for the purposes of phenomena-detection (Haig, 2005a). At a subsequent stage of the abductive process, data is generated and organized specifically to test the hypotheses proposed as the explanation of phenomena. Eventually, the new data generated and examined is formulated into a version that can be summarized and communicated. In terms of process, the distinct roles of data manipulation within an abductive process could be characterized (in sequence) as: a) exploration, b) detection, c) collection, d) organization, e) depiction; and f) communication. It is only with meaningful depictions that the real work of forming inferences as explanations from measured phenomena can occur with any efficacy. Therefore, the process phase
in method of this chapter concerns the specific question of ‘depiction’. Specifically, Haig (2005a) clarifies these distinctly different roles for the modeling of data in abduction:

The compendium of methods for the exploration of data is designed to facilitate both the discovery and the communication of information about data. These methods are concerned with the effective organization of data, the construction of graphical displays, and the examination of distributional assumptions and functional dependencies (p. 375).

The significance of these distinctions is demonstrated by approaches to testing dispositional theories in empirical psychology (Haig, 2005b, 2008c). Essentially, two different approaches are promoted. The first can be characterized as a ‘trial and error’ approach to deriving explanations of effects from potential correlations of various factors from the analysis of available data (e.g. a combined study of health symptoms, personality dispositions, and combination of medications). The combinations for testing in this set are potentially infinite. The second is characterized as the abductive generation and verification of dispositional theories of ostensibly related factors (e.g. the causal relationship between Coherence, Integration and Orientation). The data set derived for verification is specific and finite. From the premise of pragmatism, the second approach where conceptual accuracy (not statistical quantity) is paramount is more appropriate for this thesis. Essentially, the role of abduction is to move from the confrontation of a million possibilities to possibly the one combination that has the greatest potentiality. From this theoretical understanding, a clear method can be proposed for the abductive formulation of a demonstrable model for systems of conceptions.

**How was it applied?**

For the theory-demonstration phase of the abductive method the primary choice in emphasis is framed as being between two alternative approaches: a) recalled and b) enacted (Holyoak & Thagard, 1996). In this context, a recalled approach makes use of an example recalled from memory that might have application to the present situation. In an enacted approach the logic of
demonstration is built from the basic to the complex step by step. While a model for systems of conceptions (as that term is specifically defined in this thesis) had not been developed previously, three-dimensional modeling of abstract systems has many precedents in psychology and ecology (Cattell, 1978; Haig, 2005b; Kearney, 2006; Kearney, Simpson, Raubenheimer, & Helmuth, 2010; Tilman & Lehman, 2001; R. Wilson, et al., 2010). However, the results of the analysis in this thesis (Chapter One to Chapter Seven) demonstrate consistently that systems of conceptions are not equivalent to psychological or ecological systems. This might mean an error of depiction occurs by the early adoption of modeling approaches for similar, yet not identical, dynamics. While the ‘recalled’ approach is initially more convenient, a step-by-step enacted approach is preferred to develop a model specifically for systems of conceptions.

Given this premise, the design of an abductive model for phenomena depiction would then involve an additional sequence of design choices. Three sets of choices in a sequence provide a structure for model formation. The first choice concerns the type of analysis. The second choice concerns the selection of constructs. The third choice concerns the number of factors. These choices were considered separately to build the model specifically for systems of conceptions.

A. Type of Analysis (Exploratory and Confirmatory)

The first choice involves selecting the correct type of analysis. The role of theory-demonstration in an abductive method involves forming a preliminary model of how the explanatory hypotheses operate in actuality. The predictive value of a model based on an abductive hypothesis is initially weak (even if its explanatory power is strong). As a result, theory-demonstration provides the means to test the hypotheses against their own limitations to enable confirmation of the hypotheses derived. In the field of psychology, factor analysis provides one method of multivariate research to “summarize the interrelationship among the variables in a concise but accurate manner as an aid to conceptualization.” (Gorsuch, 1983, p. 2). In essence, factor analysis provides the perspective of a “second story with a skylight” on the supposition
of correlations in ground floor data (Cattell, 1978, p. 4). This approach is potentially relevant to the formation of a model for systems of conceptions.

Within this field there are two different approaches to the use of factor analysis to explain the causal relationship between factors. These are characterized as: a) exploratory factor analysis, and b) confirmatory factor analysis. Haig (2005b) proposes that, over the one hundred year history of factor analysis, exploratory factor analysis (EFA) has provided a primarily abductive method for generating explanatory theories “postulating latent variables which are thought to underlie patterns of correlations” (p. 304). This is contrasted with the more frequent use of confirmatory factor analysis (CFA) as a method of data reduction through structural equation modeling to analyze statistical problems (Rozeboom, 1982).

In the present research at the propositional stage of an abductive model, detailed analytical factor analysis is not possible in the absence of a statistically reliable and specifically generated data sets. This raises the question of how to progress ‘measures to model’ benefiting from the use of factor analysis methods, without avoiding the risk of pre-emptive empirical reductionism. Ostensibly, within the preliminary theory-demonstration stages of an abductive method there is a strong argument for using forms similar to EFA (Haig, 2005b). Haig notes, however, that, while EFA has a primary role in generating knowledge claims, it does not have a preferred role in evaluating them (Haig, 2005b). Similarly, CFA is seen as appropriate to undertake the more familiar work of inductive and deductive verification (Bandalos & Boehm-Kaufman, 2009). These two approaches are therefore best seen as complementary rather than competing (Haig, 2005b). The conclusion is to design a modeling process consistent with EFA principles that will provide the initial demonstration of the causal connections between the proposed hypotheses, which might in the future also be consistent with a more rigorous approach using CFA on the detailed data subsequently generated. To develop this EFA approach, the next step is to confirm the initial constructs which will be used to guide that analysis.

B. Confirmation of Constructs

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The second choice in method concerns the establishment of constructs. Richard Gorsuch (1983) provides guidance on the process of using factor analysis as an abductive research technique by clarifying the different role of concepts, constructs, operational representatives, variables and empirical referents. He states:

If a theory has clearly defined constructs, then scale can be directly built to embody those constructs. However, it is often the case that the theories in a particular area are sufficiently underdeveloped so that the constructs are not clearly identified. Whereas confirmatory factor-analytic procedures would be used if the constructs had already been defined and were being tested, exploratory factor analysis is generally used when the constructs are less well defined. (Gorsuch, 1983, p.351)

Accordingly, the initial step is to provide clarification of the constructs for the model proposed (Gorsuch, 1983). Essentially, while a large number of variables might influence the form of a single conception (e.g. cultural circumstances, linguistic familiarity, historical development, interpretive ambiguity, availability of confirming or conflicting information, etc.) it is the dimensions that represent differences in causal dynamics that are of most significance in this investigation.

To illustrate the outcome, the use of three dimensions to represent the minimal number of dependent correlations in psychodynamic systems is not an unfamiliar approach. Classical illustrations include: Eysenck’s (1970) three basic personality types (i.e. extra/intro-version, neuroticism and psychoticism), Thurstone’s (1947) factors of intelligence (i.e. verbal fluency, numerical ability and visual reasoning), Osgood’s (Osgood, Suci, & Tannenbaum, 1957) analysis of meaning within the ‘semantic space’ (i.e. evaluation, potency and activity), Rummel’s (1965) analysis of dimensions of political conflict (i.e. turmoil, revolution and subversion), Neperud’s (1973) analysis of college-students appreciations of art (i.e. observational, derivational, interactional), and Krooenberg’s (1985) analysis of multiple personality disorders (i.e. personality, concept and scale). However, as demonstrated in personality theory, there are
an infinite number of equally valid ways by which to delineate a conceptual space (C. S. Hall, Lindzey, & Campbell, 1998).

For the generation of the dimensions of hypervolumes, Hutchinson highlights how the choice of dimensions to generate these abstract models requires great care and specifically noted the mindfulness needed to model something not physically in existence:

Various methods, comparable to the use of discriminate functions, introduced in the last few decades provide ready-made approaches to the description of multi-dimensional niches. Like some other modern conveniences, they must be applied with care and thought. The principle involved is to determine points in an n-space and then by mathematical manipulation reduce the number of dimensions so that all are orthogonal, independent, and significant... The main intellectual difficulty comes in evaluating the meaning of the final dimensions. (Hutchinson, 1978, p. 192)

Noting these considerations, in recapitulating in this thesis the observations made (Chapter Two), the propositions proposed (Chapter Three), the hypotheses generated (Chapter Four), the conditions confirmed (Chapter Five), the dimension defined (Chapter Six) and the measures compared (Chapter Seven), the primary dimensions proposed are consistently those of Coherence, Integration and Orientation. These dimensions provide the foundations for the exploratory analysis. This leads to the third question of how many factors are to be used as delineation within the analytical constructs.

C. Number of Factors

The third choice in method concerns how detailed the modeled analysis needs to be to reflect relevant causal factors. This can be equated to the choice in the number of ‘dimensions’ in an n-dimensional hypervolume analysis of a complex ecology, which may have one, two or many competing species. Unlike formal psychometric statistical analysis, the choice of dimensional variables in an ecological system is informed by actual fieldwork and an appreciation of the forms and habits of specific species (Hutchinson, 1961). This research, representing new territory, proposes an approach to social-learning that
combines the empirical, the observational, and the experiential to best advantage.

The foundation of an approach using factor analysis is that evidence of the interdependence of two otherwise distinct variables can suggest a causative correlation (Galton, 1892). This principle is described as “if one 'phenomenon' varies in a similar manner to a second 'phenomenon', the latter is either a cause, an effect or there exists some common causative factor.” (Child, 1970, p. 4). While many strong and weak correlations are potentially possible from an infinite variety of variables the art (and science) of factor analysis is to derive meaningful correlations that yield verifiable underlying causal determinants (Child, 1970). This subsequently enables the identification of the means by which to generate systemic capacities (or mitigate systemic pathologies).

This outcome is facilitated by the proper selection of the major variables as “a set of potential operational representatives for whatever constructs emerge” (Gorsuch, 1983, p. 351). This involves identifying logical, often multi-dimensional, categories cutting across the total domain of data. The intersection of these categories of independent dimensions then form 'data cells' or divided facets, each of which becomes a logical area to be sampled. The premise 'is that sampling each cell will lead to an adequate sampling of the entire area' (p. 352). This then generates a workable and easily verifiable model from which to analyze further generated data and propose causal relationships.

However, in adopting a cautionary approach, Vernon (1961) provides early criticisms of factor analysis, specifically as the means of deriving a valid theory of personality in psychology. He clearly points out that "a factor is a construct which accounts for the objectively determined correlations between tests, in contrast to a faculty which is a hypothetical mental power" (p. 8). This highlights that while factor analysis provides the means to find abductive causes, the factors themselves (as creations of definition) cannot be validly posed as causal explanations (i.e. by reification as 'faculties'). Accordingly, the description and disclosure of data within abductively determined factors does
not, on reification, provide evidence of explanatory causes, but may lead to their eventual analysis, description and discovery. By way of explanation, Gorsuch concludes:

To have found the factors in a given area does not explain that area... research on constructs is only the preliminary step in a thorough investigation and understanding of the phenomena. Although the descriptive results are an important addition to man’s knowledge, a full scientific program follows description with explanation to build the actual theory. (Gorsuch, 1983, p. 354)

Similarly, it is proposed that the capacities of systems of conceptions (like faculties in the personality of persons) are not existent variables, rather they are the resultant of dynamic potentials in a complex system of relations. This requires a different approach to their identification. The choice is to not attempt to look for hypothetical objects, but instead to look at the effect of dynamic resultant.

The conclusion reached is that, at this point, it is not appropriate to propose factors for the analysis of systems of conceptions. Instead, a picture of complexity can be gradually built up from data specifically gathered. By use of exploratory descriptions, causes within specific scenarios can be abductively developed. This will subsequently enable the identification of systemic capacities, which may be unique to specific systems of conceptions individually. Rather than pre-assembly, or re-construction, this approach potentially enables reciprocal and iterative co-construction of the mutually envisaged form of the ‘healthy’ system and the relationship of its detailed parts.

In summary, the approach in method selected is that the model should enable exploration (rather than confirmation), constructs should reflect the adduced dimensions (rather than artificial delineations) and the factors should disclose resultant effects (rather than reify them as originating causes). With this clarity in the application of abductive theory, based on choices within an abductive methodology, steps were taken to construct the appropriate model.
What was done?

Based on the method choices adopted, a sequence of five steps was developed involving progressive delineations in the proposed model. These are:

Step 1: Establish the number of dimensions that represented primary (or secondary) factors for depiction (i.e. the \( n \) in \( n \)-dimensional);

Step 2: Determine the direction of the axes and the compatibilities in the graduations of scale (i.e. the divisions of the hypervolume);

Step 3: Categorize the potential definitional ‘spaces’ formed by the intersection of the graduations (i.e. the potential domains of viable data);

Step 4: Develop the transects used to compare correlations in the chosen delineations (i.e. the depiction of relationships between delineations);

Step 5: Select a conception topic and demonstrate the sequence of steps and resultant form of depiction (i.e. to illustrate the potential forms of classification to the extent of graduations selected).

For each of these steps a commentary is provided on the decisions made to enable the most workable components possible for the model proposed.

8.4 What was discovered?

Summation of Findings

The findings on the application of the five steps used to delineate the model for depiction of systems of conceptions are that:
a) the three proposed dimensions are sufficient initial factors (and are non-reducible and expandable to n-dimensions);
b) the axes delimitations involved centralized continua (which allow them to extend infinitely to the limit of the gradient of phenomena from a central reference point);
c) the initial grossest level of delineation is a bisect which generates eight primary zones (correlating with the presence or absence of the three dimensions);
d) the location of the perspective of analysis of transects is around a centralized axis point (which provides three transects of an enfolded conceptual space); and
e) this minimal division generates eight recognizable scenarios (which potentially represent a reflexive cycle of potentials).

The result was a model of a conceptual space dimensionally defined as a hypervolume, that reflects the three dimensions, in three continua, deriving eight potentials, as the resultant forms of the presence (or absence) of the combinations of Coherence, Integration and Orientation as dimensional factors.

Discussion of Findings

The step-by-step enacted process, informed by the abductive approach used in exploratory factor analysis, provided the design stages necessary for the development of the proposed model for systems of conceptions. To inform those decisions, recalled examples were also used from relevant ecological systems depictions as comparisons of potentially feasible processes.

Each step of the process for the design was examined discretely without pre-conception of a desired outcome in terms of the overall form. Using this approach, if a problem of depiction became practically insurmountable for one process stage at least the remaining components would retain their integrity of selection. The practical problem could then be resolved separately. The primary focus was the conceptual integrity of the primary parameters.
A discussion of the result for each step in the design process is provided. Each summary contains: a) the design considerations, b) a recalled example feasible in ecological modeling, and c) the decision taken for systems of conceptions.

**Step 1 – Determination of Constructs (Three Dimensions)**

The initial consideration for the design of the model of depiction was the determination of the critical dimensions as the primary constructs. The abductive delineation of the \( n \)-dimensional space for modeling purposes is not an arbitrary process. The determination of macro-patterns of connection would often be based on functional traits derived through observing direct associations in specific environments (Kearney, et al., 2010). The limitation of such spatio-temporal representations is when it is local and inductive (rather than causal and predictive). This makes an otherwise generally predictive model fundamentally limited. The findings from the discrete phases of this thesis inform the selection.

The feasible example for an ecological system might be seen when examining the habitats of tree squirrels (extending Hutchinson’s original illustration – see Fig. 8.1). Their food source (i.e. food resources) and tree canopy locations (i.e. physical conditions) might comprise two dimensions. A third dimension (e.g. body mass) might simply be a secondary factor that results from the other two primary factors (i.e. food rich environments produce gravity challenged squirrels). When observing species directly in their habitats the process of dimension classification is a process of making astute descriptions.

However, specific niche adaptations (e.g. patagia membranes on flying squirrels) can show on a further analysis that there are additional dimensions of significance to consider which may have been previously overlooked (Paskins, Bowyer, Megill, & Scheibe, 2007). In the analysis of niche occupancy, the selection of the correct number and types of the number (i.e. ‘\( n \)’ of dimensions (and whether these are primary or secondary) is critical (see Figure 8.2).
Figure 8.2 – Habitat niches: Inclusion of dimensions

Fig 8.2: This graphic represents the correlation of habitat range through the adaptation of gliding behaviors as a function of niche height and branch density, providing evidence of a dimension additional to those specified in Fig. 8.1 (Source: Paskins, et al., 2007, p. 1420).

For systems of conceptions, the determination was that the three hypothesized dimensions constituted non-reducible independent factors. Rather than one being a variable or qualification of the others, each was significant independently. The finding was that each of these should be depicted equally in a single three-dimensional model. Additional dimensions are then able to be included as either enhancements (e.g. gender differences) or additions for situational complexity (e.g. resource scarcity). This conclusion means the respective scope of inclusion of the three dimensions must be able to be correlated effectively into one three-dimensional form.

Step 2 – Division of Dimensions (Three Continua)

The secondary consideration for the model of depiction was the scope of the continua for the three dimensions and to represent comparatively their natural graduations. One of the requirements of such modeling processes is to determine where the baseline of each axis should be located and, as the dimensions represent potentially different scales, to minimize the effect of non-linear correlations (by scalar adjustment). The result is often to represent a
non-linear system in linear terms (to the extent this is feasible). The primary consideration is to what extent does this correlating of scales distort the depiction.

An example of a feasible approach in an ecological system might be the analysis of the depths that penguins swim to in foraging for food, involving the correlation of linear dimensions of energy expenditure, depth of dive and distance travelled with each factor increasing from a zero baseline point (R. Wilson, et al., 2010). If the dimensions begin from different baselines, or represent non-linear measures, the divisions made (as graduations) must be subsequently normalized (see Figure 8.3).\(^{114}\)

**Figure 8.3 - Penguin Foraging Data: Mixed Linear Scales**

![Graph of Penguin Foraging Data](image.png)

Fig. 8.3: This graphic is an example of a three dimensional depiction using the same scale in two dimensions (i.e. distance/depth) and third dimension using a different dimensional scale (i.e. energy expended in joules) with the effect of normalising the three scales into one depiction (Source: R. Wilson, et al., 2010, p. 654).

For systems of conceptions, the determination was that each of the three primary dimensions were, in effect, limited by the others. For any specific level of observation all three dimensions could then be correlated and their scope and ranges would be finite and closed (rather than infinite and open-ended). This reflected a reversal of the original developmental assumptions and a re-conceptualization of the primary premise of the initial working models (see
Chapter Two). The insight was that rather than measures originating from a single base-line point, the more correct depiction was based on the conjunction point of the three centralized open-ended continua. The effect of this was to recognize that, for systems of conceptions, the hypervolume space is enfolded (i.e. each system of conceptions operates in a discrete space of potentials). This led to the need to determine the number of graduations (in each direction) from the central point of delineation for each of the three continua.

**Step 3 – Delineation of Combinations (Eight Potentials)**

The third consideration for the model of depiction was to select the number of graduations in the continua for the three dimensions. The previous assumption was that to the extent that existing measurement instruments could be used, a simple solution would be to adopt the graduations implicit in those existing modalities (e.g. Smith’s four conceptions of health, Grave’s eight levels of existence and Antonovsky’s three dimensions of coherence). These distinct graduations could then be combined as some form of integrated score.

As an example of a feasible approach used for ecological systems, in an examination of plankton in a lake system the competition for resources and environmental turbidity means the lake’s stratification (i.e. in terms of niches based on food and temperature) may not remain constant. The niches and the habitats of each species are, as a result, in continuous fluctuation and not consistently graduated by depth. This represents one type of model with complex changes and reformations in response to the forces of disturbance and stabilization (Hutchinson, 1961) (see Figure 8.4). The model must then accommodate different topologies for the different dimensions with no real fixed graduations.

For systems of conceptions, the determination was that graduations based on assumptions from the measurement models of other phenomenon (e.g. individual cognitive development, health policy intentions, or existing survey scoring systems) could not be adopted as the premise for graduations as they were not relevant specifically to conceptions. The recognition was that in
defining the dimensions as open-ended continua the primary graduation needed for workability was simply the division into two horizons for each dimension. When these equal divisions are combined the result of that division in three dimensions is eight potential hyperspaces as distinct scenarios (Schumacher, 1974).

**Figure 8.4 – Plankton Stratification: Specifying Turbidity Graduations**

Fig. 8.4: Graphic depicting the distribution of various species of planktonic rotifer representing how consistent temperature gradients as delineations fail to capture variations of size, food, and tolerance for physical conditions (Source: Hutchinson, 1978, p. 172).

The proposal is that these graduations, when seen in combination across the three dimensions, provide the minimal level of depiction necessary. With subsequent measurement precision, infinitely greater graduations can subsequently be incorporated. The result was to adopt graduations that were consistent with the degree of measurement sophistication initially proposed by the problem-constraint criteria. This level of precision could later be increased indefinitely as different strata became apparent and were empirically demonstrated. This was a better outcome than imposing sets of conformance measures as prior assumptions that would negate the discovery of subtler complexities subsequently.
Step 4 – Depiction of Transects (Three Graphics)

The fourth consideration for the model of depiction was to select the primary transects for analysis purposes. In recognizing how each of the primary dimensions are equally significant, this posed a problem in terms of representation without a positional bias. Multiple transects for each combination of alternating pairs of two of the dimensions would potentially be required. However, separately each of these transects would provide an incomplete (and potentially misleading) picture. A different system might be required to represent all of the combinations of all transects equally as one unified representation with a perspective taken from no privileged location.

As an example of the approach to a similar problem in ecological systems, there might usually be a primary factor (e.g. species number as frequency), which is related to a specific research question (e.g. invasion and predation) with other dimensions then represented as tertiary factor variances (e.g. duration in time). Each dimension is correlated to the primary factor separately in separate charts reflecting the unfoldment over time in two dimensions (see Figure 8.5). The result is a range of interesting two-dimensional patterns of predictive scenarios.

Figure 8.5 – Phase States for Population Scenarios
Fig. 8.5: A graphic depicting transects of possible population interactions from a three-dimensional model with the additional dimension of time hidden. Each model provides a guide to understanding potential scenarios by privileging specific assumptions and omitting other relevant information (Source: Holling, 1973, p. 74).

For systems of conceptions, the decision was that a completely novel approach would be required. The normalized point of origin for the hypervolume is mathematically at the 0-0-0 point at the conjunction of the x, y, z axes. In the proposed combination of dimensions, using three equivalent continua, this point was in the center of the hypervolume. The solution found was to represent the model as an enfolded space as seen from its central combinational axis (Freidman, 2011). As a novel addition, rather than look at the hypervolume from outside (i.e. as an object by a subject) the better place of observation was the central-point of no-content. The result is the novel depiction of an unfolded hypercube represented by three unique transects.

**Step 5 – Description of Potentials (Eight Scenarios)**

The fifth consideration for the model of depiction was to identify a normative baseline from which to assess variances in the data. Generally, a null hypothesis might be used to evaluate correlations in the dimensions when considering the selected transects in a traditional factor analysis. To advance the proposed hypotheses of inter-relationship of the dimension, a normative assumption of what predictably should be apparent might be required to enable further abductive development (i.e. difference from analogical expectations leads to further abductive qualifications).

An example of a feasible approach for an ecological system might be in the modeling of nutrient levels in managed environments, where the preferred model is to avoid a collapse in the ecosystem (see Figure 8.6). By combining modeled parameters of the natural potentials, inputs by human users, and the width of ecological resilience boundaries into three dimensional models, scenarios mapping of the paths of systemic change can be seen and used in social learning processes about possible regime shifts (Carpenter, et al., 2002).
Figure 8.6 – Adaptive Cycle: Non-normative models of lake pollution

Fig. 8.6: This graphic demonstrates how normative models and manipulated scenarios using modeled data can be used together to enhance the social learning around parameter limits and regime shifts in socio-ecological systems. (Source: Carpenter, Brock, & Hansen, 1999)

For systems of conceptions, the determination was that, if panarchy-like dynamics might be applicable, the normative model might be the adaptive cycle used in socio-ecological systems (Burkhard, Fath, & Müller, 2011). However, like ecological systems, assumptions of patterns in enduring structures and the rates and cycles of their perturbations could not be adopted deterministically for systems of conceptions. While there might be strong correlations between the primary dimensions of systems of conceptions (i.e. as evidenced by the three hypotheses) - there might also be none.116

The conclusion was to reconsider applying a normative assertion. The practical solution would be to depict existing sets of conceptions (about which much was known) and trial the model. This leads to the final step of a workable demonstration of the result of each of these determinations. The topic selected was the conception of ‘sustainability’. The results of this demonstration comprise the next section of this chapter.
Demonstration of Depiction

Having developed the conceptual form of the model the next stage in the abductive method phase of theory-demonstration was to generate a workable example. To do this, five steps were proposed to generate the proto-form of the 'three-dimensional conception-hypervolume'. These steps are:

Step 1: Select the generic concept that is the focus for the inquiry. This may be of specific interest as to its content, or selected as a generic topic to illustrate hidden underlying structures by means of topic-neutral projections (e.g. the topic of 'sustainability').

Step 2: Delineate each dimensional axis into the number of divisions as are relevant to the required 'grain' of the inquiry. The grossest (i.e. simplest) level of delineation is two divisions (e.g. Low Coherence: High Coherence).

Step 3: Generate an analytic triptych for the $n^3$ combinations of the primary delineations for the three dimensions (e.g. $2^3$). This is at the simplest level the 'high-low' polarization of the data as alternatives for each axis (or as per more precise graduations), which identifies the eight domains within the hypervolume for coding purposes (e.g. Adaptation: - + +).

Step 4: Name and describe the resulting domain spaces based on the dimensional analysis to specify difference, either simply as a coding protocol or a descriptive heuristic for the data (e.g. $H$-$Space$ 1, $H$-$Space$ 2, etc.). Illustrate this with exemplars in the form of actual expressions or generic indicative responses from sampled data (e.g. 'Adaptive Sustainability': $H$-$Space$ 5).

Step 5: Use the conceptual three dimensional heuristic to collect, collate and code the data, mapping the coded conception data into the conceptual hypervolume space (using the level of measurement granularity required). This then enables analysis of the composition, intensity, and density of distributions of conceptions in the sample gathered as one set and for the three transects.

An example that demonstrates these steps at the simplest level is an analysis which uses 'sustainability' as the sample conception. For these purposes, no data has been generated, this being simply a demonstration of the model's structure and function.
The topic selected is ‘conceptions of sustainability’ (Step 1). The basic dimension delineation is Low : High (Step 2). The analytic triptych generates a trichotomy-matrix of the primary hyperzones (e.g. H Space~I) for the system of conceptions of sustainability (see Table 8.1). Further details of the categorizations produced are provided as Appendix J (Step 3).

Table 8.1 – Eight Domains for Sustainability Conceptions

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Coherence</th>
<th>Integration</th>
<th>Orientation</th>
<th>Resultant Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Reformation</td>
</tr>
<tr>
<td>II.</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Innovation</td>
</tr>
<tr>
<td>III.</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Reaction</td>
</tr>
<tr>
<td>IV.</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Preservation</td>
</tr>
<tr>
<td>V.</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Adaptation</td>
</tr>
<tr>
<td>VI.</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Generation</td>
</tr>
<tr>
<td>VII.</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Mitigation</td>
</tr>
<tr>
<td>VIII.</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Consolidation</td>
</tr>
</tbody>
</table>

The resulting domains comprise eight potentials for sustainability conceptions (Step 4). The corresponding depiction of that generic system of conceptions is a hypercube of the three hypothesized dimensions with each of the eight scenario domains delineated (see Figure 8.7).

Figure 8.7 – Sustainability Conceptions Hypervolume

Notes: Each of the eight hyperspaces of the cube represents a potential domain of conceptions. These are potential spaces for resultant forms as combinations of the three dimensions. The sequence of the numbering of the cube is based on the matrix coding and does not represent a temporal sequence of development (i.e. 4D).
The final step would be to collect and collate the specific data depicting different conceptions for a specific system of conceptions within the hypervolume. The three transects of that data would allow for more detailed analysis by the use of the 2-dimensional depictions which show density, relations, and individual differences for that system of conceptions (Step 5). The particular ordering proposed for the domains for each transect provides a common central point of reference, enabling comparisons between the three transects (see Figure 8.8).

**Figure 8.8 - Transects of n-dimensional sustainability hyper-cube**

<table>
<thead>
<tr>
<th>x~y Transect</th>
<th>H~1</th>
<th>H~3</th>
<th>H~5</th>
<th>H~4</th>
</tr>
</thead>
<tbody>
<tr>
<td>H~2</td>
<td>H~7</td>
<td>H~8</td>
<td>H~6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>y~z Transect</th>
<th>H~4</th>
<th>H~1</th>
<th>H~2</th>
<th>H~6</th>
</tr>
</thead>
<tbody>
<tr>
<td>H~5</td>
<td>H~3</td>
<td>H~7</td>
<td>H~8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>z~x Transect</th>
<th>H~5</th>
<th>H~4</th>
<th>H~6</th>
<th>H~8</th>
</tr>
</thead>
<tbody>
<tr>
<td>H~3</td>
<td>H~1</td>
<td>H~2</td>
<td>H~7</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 8.8: The three transects are derived from unfolding the cube around its three axes. A transect across the x-y axis folds out the top layer of the cube. A transect across the y-z axis folds out the left hand side of the cube. A transect of the z-x axis folds out the ‘back’ section of the cube. This unfolds the enfolded space into three 2D transects for analysis of the distribution patterns. The center point of all three transects is unchanged for each form representing a universal reference point for comparison.

This five-step process demonstrates the proposed modeling method and how it would be used to organize the data representing actual systems of conceptions. The data generated represents the operant ‘niche spaces’ in the three dimensions and would be modeled for the system, potentially continuously. The results gathered would be compared to any normative model selected (or
simply to the baseline data-set first depicted). In practical applications, the normative model providing most heuristic value would be in the comparisons drawn between learning communities, so as to compare features and recognize differences. This process represents a workable means to advance the premise of this research, its empirical verification (or refutation), and its potential use in practice.

**Meeting the Problem-Constraints**

The five elements of the problem-constraint for the design are potentially satisfied by the demonstrated approach. This is subject to the quality of the data generated and the usability of the means of depiction in processes of learning (i.e. the aesthetic of presentation). The following general observations are made for each of the specified criteria based on the findings:

a) **Reliable:** The reliability of the representation comes from its simplicity. In not adopting pre-determined factors based on existing measurement scales and their delineations, conceptions are represented relationally, rather than normatively. Only consistency of process is required for those relations to be reliable.

b) **Comprehensible:** The easily visualized 3-dimensional space can be viewed from any angle and also from 'within' the landscape depicted. Similarly, the use of the three discrete transects enables a composite picture to be 'read' in two dimensions for easy analysis.

c) **Meaningful:** This can only be assessed once those using the model engage with the modeling process. The illustration of the coding of sustainability domain spaces as potential scenarios simplifies navigation of that discourse. The degree of meaningfulness will primarily be a function of each individual user or participant 'putting themselves in the picture'.
d) **Updatable:** The collation of data as specifically identifiable individual conceptions would be continuously adjusted for each data addition, making the model dynamic and instantly representative of changes to the ‘ecology’ of conceptions and the system as an entirety.

e) **Scalable:** As the scale of observation increases the data set increases (in terms of conception-complexity, not geography) and the frame can be similarly expanded indefinitely. A more localized data-set would be similarly contracted to provided finer grain. The depiction operates as both a telescope and microscope.\(^{118}\)

The simplicity of this approach comes from the abductive proposition that any ‘description’ is a narrative from within a conception. The strength of the proposed model is to depict what is occurring, not describe categories of the occurred. The benefit gained is a participatory perspective of the ‘hundred universes’ in ways they self-represent, particularly in the contexts of collaborative sense-making. This provides a different tool for those looking into the dynamics of the constellation of thought, to enhance their own perception, or to “add to the moderate numbers that can be seen with the naked eye” (Koestler, 1964b, p. 370).

**Evidence in Support**

According to the abductive hypothesis, the eight domains of sustainability identified reflect distinctive conceptual ‘niches’ for possible conceptions. While the content of such conceptions is infinitely more diverse, the identification of these primary domains provides a level of specificity. This occurs at the level of observation of the composition of the system of conceptions. Each domain within that depiction represents a ‘potentiality space’ for sustainability conceptions. In a wider discourse, arguably each would be demonstrated and all might be required.
Each of these potentials might also potentially be reflected in the source literature of sustainability theory. Subject to the maturity of the development of that discourse, some might be already evident and others not yet apparent. To support (or refute) this proposition the sustainability literature was examined to see if there was any evidence available of these diverse and distinctive conceptions apparently operating conjunctively within the one discourse. Examples are provided from the works of various leading commentators for each domain by way of illustration. These are presented in their conceptual order of generation (rather than in any normative sequence of development):

a) **Sustainability as Reformation**

_Narrative:_ This domain represents sustainability at its inception. It is, as yet, an undefined concept, without a history of demonstration, derived primarily from a sense of unease or concerns held within an existing paradigm. There is a quality of an idea without form, description, or direction. These conceptions have: Low Coherence. Low Integration. Low Orientation.

_Example:_

Those who have painted pictures of an organized heaven have, implicitly or otherwise, appealed to the esthetic sense in man to try to gain assent to their plans. We know now that a completely planned heaven is either impossible or unbearable. We know that it is not true that design can come only out of planning. Out of luxuriant waste, winnowed by selection can come designs more beautiful and in greater variety than ever man could plan... Man, now that he makes himself, cannot do better than emulate Nature’s example in allowing for waste and encouraging novelty. There is grandeur in this view of life as a complex of cybernetic systems that produce adaptedness without foresight, design without planning, and progress without dictation. From the simplest means, man, now master of his own fate, may evolve societies of a variety and novelty- yes, and even beauty- that no man living can now foresee. (Hardin, 1959, p. 297)

b) **Sustainability as Innovation**

_Narrative:_ This domain represents the formation of the new paradigm. It proposes specific innovations, but possibly with no clear description or
universal ordering principle in mind. The proposals made are designed to redress unsustainability, potentially with impractical and equally unsustainable alternatives. These conceptions have: High Coherence. Low Integration. Low Orientation.

Example:

Developing innovative products, bringing them to market successfully, keeping customers happy, and other elements of business success are difficult enough. Adding an environmental dimension opens up new opportunities but adds another layer of complexity to the management challenge. Gaining an edge means learning new skills, operating in new ways, and working through some hard trade-offs. In truth, the story is more subtle. Some initiatives “fail” by traditional measures but create intangible value for a company. It’s often hard to tell when hard to measure returns are worth pursuing. (Esty & Winston, 2006, p. 23)

c) Sustainability as Reaction (++)

Narrative: This domain represents where there is a loss of conviction in the assumed ability for functioning to continue in the existing paradigm. Reactive steps are proposed to attempt to sustain unsustainable practices. The benefits of gains previously won are justifications for the avoidance of necessary remediation. These conceptions have: Low Coherence. High Integration. Low Orientation

Example:

The more one looks at it, the more one sees that the question isn’t whether the rich can afford to help the poor, but whether they can afford not to. There are five reasons why the level of required effort is, in truth modest. First, the number of extreme poor have declined to a relatively small proportion of the world’s population... Second, the goal is to end extreme poverty, not to end all poverty... Third, success in ending the poverty trap will be much easier than it appears... Fourth, the rich world today is so vastly rich... Fifth, our tools are more powerful than ever... At the core of poverty reduction lies the strategy of scaling up critical investments that have been rendered vastly more effective through rapid technological progress. (Sachs, 2005, pp. 289-290) [Emphasis in original]

d) Sustainability as Preservation (++)

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Narrative: This domain represents the continued hope for sustainability change. Evidence is provided for a belief in intrinsically good intentions and in the capacity for sustainability awareness and choice. The direction of sustainability is descriptively communicated, yet is not prescriptively cogent. The specifics of the forms of integrated planned change and transformation required are not provided. These conceptions have: Low Coherence. Low Integration. High Orientation.

Example:

The response of local artists and musicians in the neighborhood was equally enthusiastic. Many art pieces were donated for sale, while performers provided entertainment throughout the day. Sound systems, paper, food, and security were all contributed, and a local tent-and-awning firm donated a large piece of canvas with which [the] Elementary School students created an Earth Day banner. The public was invited to join in our celebration, and we suggested that they leave their cars at home and walk, bike, or take a bus. In celebrating the wonderful nuances of local people and ecosystems on Earth Day, we were reminded to be grateful for and solicitous of the mother of us all. (Suzuki, 1998, p. 219)

e) Sustainability as Adaptation (+++)

Narrative: This domain represents a clear need for an adaptive response, calling for action to prevent loss. There is a belief in the capacity for proactive enactment and a call to application. The confidence for the prospect is matched by the resources available for action. The element missing is a level of clarity in the required practical outcome. These conceptions have: Low Coherence. High Integration. High Orientation.

Example:

Instead of trying to find technological fixes to environmental problems, the emphasis should be on maintaining diversity (biological/ecological and cultural/institutional), as the raw material or memory for self-organization, and creating conditions that facilitate or enhance learning. Such an approach shifts the emphasis from efficiency goals (such as maximum sustained yields) to resilience; from a static, equilibrium-centered worldview to one that is
dynamic, multi-equilibrium, and rich with cycles of renewal, creating diverse learning opportunities. The latter worldview is not far from ancient traditions of wisdom that see sacred relationships and cycles in all manifestations of nature. (Berkes & Turner, 2006, p. 490)

f)  *Sustainability as Generation (+++)*

*Narrative:* This domain represents a pattern of progressive gains with an ongoing belief in the prospect for accomplishment. The sustainable vision is cogent, articulated and positive. The methods of execution are, however, dependent on isolated and often non-replicable examples. Multiple dimensions of potentially contradictory activity are proposed by various proponents equally. These conceptions have: High Coherence. Low Integration. High Orientation.

*Example:*

We have moved into this new world so rapidly that we have not yet grasped the meaning of what is happening. Traditionally, concern for our children has translated into ensuring their health care and getting them the best education possible... Today, securing our children's future means not only investing in their education and health care, but also investing in a program to reverse the trends that are undermining their future. As individuals, we should continue our membership in environmental and population organizations. We need to improve local recycling programs. We need to vote with our pocket books. ... We need to do all the things we are doing now to protect the environment. But they are not enough... meet with your elected representatives to discuss why we need to raise environmental taxes and reduce income taxes. Work with like-minded friends and associates toward this goal. (L. R. Brown, 2006, pp. 264-265)

g)  *Sustainability as Mitigation (++)*

*Narrative:* This domain represents the initial elements of doubt, pessimism, or disbelief in the continuation of the existing paradigm. Recognizing the potential for transition, the call is for urgent steps to be taken in remediation. These steps are seen as clear, systemic, presently undesirable and potentially unavoidable. The focus of considerations is shifted towards what was previously overlooked. This conception has: High Coherence. High Integration. Low Orientation.
Example:

Our conclusions are: 1. If the present growth in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime in the next one hundred years... 2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future... 3. If the world's people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be their chances for success. These conclusions are so far-reaching and raise so many questions for further study that we are quite frankly overwhelmed by the enormity of the job that must be done. (Meadows, Meadows, Randers, & Behrens, 1972, pp. 23-24)

h) Sustainability as Consolidation (+++)

Narrative: This domain represents the definable articulation of an alternative paradigm in terms of applicability, feasibility, and optimistic possibility. It provides an almost codified enactment of a sustainability premise with cogent arguments for the answers to the significant questions. The only barrier to its unqualified acceptance is the overlooked equal validity of all of the other domains of conception. This conception has: High Coherence. High Integration. High Orientation.

Example:

Societies need to adopt shared goals that enhance social welfare but are not the prerogatives of specific value or belief systems. Natural capitalism is one such objective. It is neither conservative nor liberal in its ideology, but appeals to both constituencies. Since it is a means, and not an end, it doesn't advocate a particular social outcome but rather makes possible many different ends... The chapters that follow describe an array of opportunities and possibilities that are real, practical, measured, and documented... Collectively these techniques offer a powerful menu of new ways to make resource productivity a foundation of a lasting and prosperous economy, from Main Street to Wall Street, from your house to the White House, and from the village to the globe. (Hawken, Lovins, & Lovins, 1999, pp. 20-21)

i) Summary

Notably, the examples provided are not descriptive of individual conceptions, nor of the source works, their originating authors, or the paradigms they
represent. They are simply illustrations of domain potentials in a more complex system of thought. People change, thinking changes, and (potentially) thought changes. The narrative descriptions also provided are generic and describe the dynamics of the model (not the anecdotal quotes provided). The identified domains of potential conceptions are themselves value-neutral in terms of their relative contributions. As in any living ecology, the real contribution of any enduring form is known only in terms of the potential enabled by its presence and the noticeable difference that occurs in the event of its absence.

The presence of these examples is more like finding a member of a species when undertaking ecological field research based on the predicted likelihood of conducive habitats derived from a study of topological maps. This represents a purposeful search for the likely occupants of a complex ecology rather than merely stumbling across them when looking for some other forms of life. While the presence or absence of examples of the derived domains of conceptions is not evidentiary proof of the viability of the model, it does provide anecdotal support for its abductive propositions. This is of note as in an abductive research process proof of the ‘plausibility’ of the proposed hypothesis is all that is required. The additional abductive steps of theory confirmation, definition, measurement, modeling and appraisal simply further advance the hypothesis towards its means for deductive verification.

**Additional Insight**

The initial recognition for this chapter is that it is very rare that at the practical design stage of demonstration an abductive method will still be applicable. Often, forms of representations are focused on proving specific theories of causation. The presumed depiction reflects the already held deductive assertions. Accordingly, such models may disguise more than they reveal. In the use of an existing modeling process for a novel question, assumptions as to the range of represented forms have usually been incorporated into the process long before. In appreciating that there was abductive approach to the modeling question many different potentials were opened up for me.
Specifically, this allowed for the possibility of niche hypervolumes and the flexibility of adding many parameters (most yet to be discerned). The competitive discourse on ecological modeling, the divergent theories in a factor analysis for personality theory, and the confirmatory investigation of the major conceptions of sustainability theory all demonstrated for me the complexity that occurs in diverse systems of conceptions. This also highlighted for me that the dynamics of conflict are usually less about the content and are more usually about the capacities of the conceptions that inform the range of that content.

The additional insight gained for this chapter was how that the models we develop may reflect a tendency to interpret data in the most convenient way possible. In this context ‘convenient’ means familiar, in terms of an inductive assertion where each case appears similar to the previous one, or in a deductive confirmation to support the given hypothesis.

The example of this was my own supposition that the demonstration of systems of conceptions would probably accord with the adaptive-cycle in panarchy theory. After following the step-by-step process to derive the model, the remaining step was to relate the phases of the adaptive cycle to the scenarios generated. Interestingly, the delineations from the original abductive phenomena and the assumption of the adaptive cycle did not correlate. Simply, by doing a detailed analysis of phase, stage and range the abductive conclusions and the normative assumptions could not be reconciled. A different normative model was going to be required for systems of conceptions.

The reason for this became clear subsequently. In the adaptive cycle the addition of the resilience dimension is a ‘back-cycle’ which was added to reflect that ecological systems do not develop and expand indefinitely merely from the conjunction of potential and connectedness (see Figure 8.9). This represents the appreciation that as ecological systems become more connected, they become less resilient, even when potential is accumulated and actuated (Holling & Gunderson, 2002). This addition of the dimension generating the ‘back-cycle’
mitigates the assumption of invulnerability and a constant progression towards developmental robustness (in a way similar to the conclusions reached in Chapter Two).

**Figure 8.9 – Adaptive cycle: Resilience, Connectedness, Potential**

Fig. 8.9: The figure depicts the adaptive cycle of a panarchy system in its three dimensions with capacity (i.e. potential) and connectedness extending in opposite axes and the third dimension of resilience representing a counter-force. The result is a four phase adaptive cycle as a normative model (Source: Holling, et al., 2002, p. 95).

However, in taking the abductive hypothesis of this thesis forward and approaching the question of each chapter from first principles, the assumptions that the hypothesized dimensions extend in ways similar to ‘potential’ and ‘connectedness’ were not confirmed for systems of conceptions. The recognition made was that, for systems of conceptions, the dimensions of Coherence, Integration and Orientation have an all-together different inter-relationship.

The resulting approach was to remain open to the epistemic possibility (rather than solve the ‘ignorance-problem’ pre-emptively) and to refrain from an initial decision about how the model might portray or confirm any normative position. This required the suspension of my existing assumptions regarding sustainability transitions. Specifically, I re-examined the curvilinear hyperspatial planes representing the trend line of a hypothesized set of representative data in an enclosed system of conceptions. The transects
generated for this data set revealed how the different phases of a cycle of conceptions would appear in an n-dimensional analysis of a thought-ecology.

Significantly, the hypervolume model generated for systems of conceptions uses assumptions of centralized continua on each axis, rather than having the X axis (i.e. resilience) as an additional criteria modifying two other related 0-100 point progressive axes (i.e. connectedness and potential). As a result the normative model needed to be reformulated. The insight is that the equivalent normative metaphor for systems of conceptions is actually a different structure.

The resultant form proposed reflects the depiction of an enclosed hypersolid. This recapitulates the form of the 3-Dimensional knot used figuratively to explain the hypotheses in Chapter Four. The conclusion is that rather than an adaptive cycle – it is an 'apitive cycle'. The apitive cycle (i.e. abbreviated as 'apicycle') is less a description of the phases of adaptations by a system in response to environment variables and more a depiction of the changing dynamic tensions of generative formation and reformation that apply to systems of conceptions. The proposed normative model for systems of conceptions is depicted accordingly (see Figure 8.10).119

**Figure 8.10 – Apitive cycle: Coherence, Integration, Orientation**

![Diagram of apitive cycle](image)

Fig. 8.10: The 'adaptive' cycle for ecological systems with mono-directional continua and a counter-directional third axis (i.e. resilience) can be contrasted with the 'apitive' cycle for systems of conceptions which uses three open-ended bimodal continua. In this depiction the 'back-loop' is not present representing instead an inter-dependency without the necessity
for adoption of a normative assumption of collapse or release. The points of inflection have been replaced with phases of transition reflecting the dynamic set of conjunctions.

This explained the inexplicable effect of the absence of ‘fit’ between the abductive dynamics for systems of conceptions to an assumed normative model taken from a different paradigmatic premise. The implications of this understanding are significant. Not least of these is a reappraisal of the predictive assertions of the inevitability of collapse in systems of conceptions. As specified in the solution-demand (see Chapter One) for this abductive research, the outcome desired is a means, not to speculate, but to investigate—so as to know. It is that work, with a different premise, that makes the praxis of modeling the systems of conceptions now so significant (Varey, 2012).

8.5 Summary

This chapter concludes that for Research Question #8:

- the use of a hypervolume depiction for conceptions was demonstrated;
- this generates eight potential scenarios (in its most simplistic form); and
- this form of the model satisfies the problem-constraint criteria.

The development of a method by which a model may be generated by applying the hypotheses completes the theory-demonstration phase. By providing a potential means for verification there is the prospect for future use and development of the hypotheses. This introduces the final phase of the research method that asks the abductive question: *What compares to it?*
CHAPTER NINE – WHAT COMPARES TO IT?  

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Chapter Nine – What compares to it?

9.1 Introduction

The aim of this chapter is to appraise the proposed abductive hypothesis. The three tests for appraisal in an abductive process are consilience, simplicity and analogy. In a pragmatism approach, the final determination of explanatory worth is decided based on pragmatic considerations.

The abductive method used to answer the research question for this chapter is described as theory-appraisal. In this abductive phase the test is whether the proposed hypothesis represents an inference to the best explanation. A ‘coherentist’ emphasis was selected as the appropriate abductive approach. The appraisal was made using assessment of explanatory coherence across eight criteria derived from computational logics.

The outcome of this chapter is the conclusion that the proposed hypothesis provides additions of significance to the best comparable alternative. The additional finding was that the proposed hypothesis, while not being incommensurable, is not reducible by comparison, as it examines different phenomenon, in different ways, enabling new approaches to learning and development.

9.2 What was the question?

Research Question #9

*Does the proposed explanatory hypothesis provide an inference of explanatory worth?*
This final research question of this thesis appears to require an evaluative opinion. The assumption within the research question for this chapter actually reflects the process of abductive recursion. The proposed hypothesis is actually evaluated objectively with reference to the original outcomes intended. This involves specific determinations of value based on, not what the hypothesis contains, but what has been excluded and selected so as to derive a verifiable (but as yet untested) inference. The role of theory-appraisal in the classical abductive form also provides an economical means of evaluating explanatory theories. This is done to distinguish a valid hypothesis from informal narratives, opinions or conjectures. Accordingly, the assumptions of the research question for this chapter recapitulate the underlying philosophical premise of this thesis.

Informally, we may consider a theory of ‘worth’ to be the one that we have a personal preference for, or that confirms our existing beliefs, or perhaps represents a theory that is better than its competitors on a narrow criteria of personal relevance. It may be that a ‘worthwhile’ theory is merely one with more certainty and veracity at this time, providing known answers, yet also containing many unanswered anomalies and contradictions. However, in abductive theory and for this research question ‘explanatory worth’ has a more technical definition. The research question of this chapter, therefore, completes the abductive method by evaluation in a manner consistent with the entire research proposal. The specifics of the criteria for evaluation of ‘worth’ are explained.

**Existing Understanding**

The primary task of the research phase of this chapter is to appraise the theoretical inference proposed by this thesis by comparison with another hypothesis. Essentially, what is required is a comparison of maps made by different mapmakers, of different parts of a larger conceptual territory, written with different legends to indicate their respective preferences for significance. Two difficulties are apparent in this task. The first is to ensure the map is appraised based primarily on the territory it seeks to represent. The second is
to do so on its own terms by testing its coherence. These difficulties are each resolved by guidance from our existing understandings of the general structures of semantic formulations (Korzybski, 1931, 1958) and the incommensurability of paradigms in their forms of representation (Kuhn, 1970, 1974, 1983).

Often reference will be made to Alfred Korzybski (1879-1950) when recalling the adage: *The map is not the territory*. Reliance on this attributed quote is sometimes used as a cautionary maxim of guidance, reminding the theorist not to mistake their representation for what is represented (but to use it with care nonetheless). The source of this quote reveals the problem of quotation (or representation) out of originating contexts. It also indicates how preferences for descriptions can modify the landscapes for depiction.

When outlining a formative version of the *Theory of General Semantics*, Korzybski (1931) uses in one passage the figurative metaphor of maps, specifically a metaphorical map to get from Paris to Warsaw via Dresden, to represent and simplify the structure of his complex abstract semantic argument (about semantics). Ironically, the words of this metaphor are used to partially represent the theory of semantics itself, and the fuller theoretical argument made by Korzybski can be easily overlooked. The original representation of that particular summation contains four inter-related maxims and reads:

A) A map may have a structure similar or dissimilar to the structure of the territory. B) Two similar structures have similar 'logical characteristics'... C) A map is *not* the territory. D) An ideal map would contain the map of the map, the map of the map of the map... endlessly. (Korzybski, 1931) (Reprinted in (Korzybski, 1958, pp. 750-751)

Within this original essay, Korzybski (1931) explains that the problem is not really with maps; these are very useful. The problem is when the second criteria is forgotten, being the match of the logical characteristics of similar structures, as this makes our maps potentially unreliable. A meta-map that becomes disconnected in structure from the underlying territory that it represents does not need cautionary qualification. As Korzybski (1958) warns, it is in fact so 'bad' as to be: “misguiding, wasteful of effort’ and ‘In case of emergencies, it
might be seriously harmful” (p. 750).

Korzybski subsequently re-iterates the metaphorical argument slightly differently:

Two important characteristics of maps should be noticed. A map is not the territory it represents, but, if correct, it has similar structure to the territory, which accounts for its usefulness. If the map could be ideally correct, it would include, in a reduced scale, the map of the map; the map of the map, of the map; and so on, endlessly, a fact first noticed by Royce. (Korzybski, 1958, p. 58)\textsuperscript{120}

In this explication we understand that the structural correspondence of the map is what determines its usefulness, once we accept the self-professed limitations of its form of representation. As an example, to reduce Korzybski’s four maxims to one part only (i.e. to remove the requirement for structural correspondence) is to alter its usefulness. Korzybski’s associated warning against this becomes more pronounced, reflecting how a map with a different structure to the territory, when used to orient ourselves in our travels, has an unintended effect:

It would lead us astray, and we might waste a great deal of unnecessary effort. In some case, even, a map of wrong structure would bring actual suffering and disaster, as, for instance, in a war, or in the case of an urgent call for a physician. (Korzybski, 1958, p. 58)

The key point which can inform any comparison of theories, is made explicitly by Korzybski, in noting that our reliance on representations does not need to be based on personal interpretations, provided we can make the necessary semantic distinctions in our ‘map-languages’, by stating:

If words are not things, or maps are not the actual territory, then obviously, the only possible link between the objective world and the linguistic world is found in structure, and structure alone. (Korzybski, 1958, p. 61)

This provides the first guidance to conducting an appraisal in an abductive method, being that structural correspondence is an essential test (to avoid evaluation entirely on personal preference). The additional observation is to recognize that our active distortions in the representations of reality are
actually psychologically satisfying, as they allow us to easily cope with cognitive complexity. It is only in their reliance that the potential for ‘suffering and disaster’ occurs. This is the primary source of concern and is the reason why such seemingly small omissions in complex theories do matter and why a formal abductive appraisal might be required.

This leads to consideration of the additional criteria of Korzybski’s formulation, that our maps should be qualified, not only by confirmation of the logical characteristics of their structure, but also by a reflective stance. To place the act of mapmaking in its meta-context, American philosophical theorist, Ken Wilber, describes the act of mapmaking in the following terms:

In short, thought is itself a movement of that which it seeks to know. It’s not that there is a map on the one hand and the territory on the other – that’s the nasty Cartesian dualism – but rather that the map is itself a performance of the territory it is trying to map. And the task of the philosopher, as it were, is not simply to clarify the maps and correct their deviations from reality, but to elucidate these deeper currents from which thought could not deviate even if it wanted to (Wilber, 2000a, p. 59)

From this it can be understood that the mapmaker is also making a map of themselves in the act of mapmaking. At the same time, all human mapmakers are also revealing maps of the deeper currents of the thoughts of humanity. This is why Korzybski’s fourth criteria, that maps contain maps of the mapmaker, allows for the expression and recognition of the deeper currents that we are seemingly caught within, to also be revealed.121

From this brief explication we understand that to accept the map we must accept the humanity of the mapmaker and their limitations. The true objective is to determine if the map proposed is structurally sound for what it purports to cover. If structurally different, it is a dangerous map no matter how familiar and comforting to its maker, or foreign and challenging to its users. The task of abductive appraisal is to examine and compare the inferential maps proposed by a structural analysis of their logical characteristics as coherent explanations.
This raises the second consideration, which is also informed by an existing understanding, being how can linguistically different representations from alternative paradigms be compared and evaluated? As guidance on this question, a significant contribution made by science historian, Thomas Kuhn, was his analysis of similarity relations in semantic ‘worlds’ (Kuhn, 1970). In his original work on this topic, Kuhn (1970) highlighted how ‘paradigms’ operate to constrain the category of referents relevant to a particular language group. The effect of this constraint is that, in using certain linguistic structures, members of one paradigm might be unable to validly conceive of a concept within an alternative paradigm (Kuhn, 1970). This observation is reflected in Kuhn’s complex concept of the ‘incommensurability of paradigms’. The present problem is identified as when two maps use different legends to depict the same structures, which of their ‘codes’ is to be preferred in comparing their accuracy (or usefulness) in representing the underlying features? This can be more simply phrased as: How might two semantically incommensurable paradigms be compared?

A commonly identified misinterpretation of the effect of Kuhn’s concept of ‘incommensurability’ is that different semantic paradigms are not comparable, reflecting a concern that ‘objective science’ is then to be set adrift in linguistic relativism (Sharrock & Read, 2002). In a subsequent clarification and refutation of criticisms of his initial descriptions of incommensurability, Kuhn (1983) draws the illustrative distinction between ‘translation’ and ‘interpretation’ to clarify his original intention. A translator, being bilingual, must find a commensurate term for each word or phrase used in an original work (whether being in a different language, or in the case of a science historian, a work from a different temporal context). By way of contrast, an interpreter substitutes new terms from the receptor language that replace the original term with a related meaning that is understandable within the new paradigm. Kuhn (1983) explains that terms in a paradigm are not learned in isolation. They are learned within a multi-dimensional lexicon that mirrors the structure of the world described. As a result, because each word or phrase is understood with reference to all other words or phrases of the paradigm "instead of there being an infinite number of
translations... there are often none at all.” (Kuhn, 1995, p. 479). The problematic conclusion is that this feature makes direct comparison and appraisal of counterpart paradigmatic representations potentially impossible, even though each paradigm is translatable. In resolution, the unique role of the ‘translator’ is to speak both languages, acting as a bridge ‘interpreting’ between each culture.

Kuhn (1995) likens the task of the skilled paradigmatic translator as being more like the anthropologist of immersed ethnography than the linguist working on structural semantics. Unfortunately, many critiques taking the guise of appraisals are based on the ambiguity or inconsistency of interpreted (not translated) incommensurable terms. The effect of these infinite translations is that, in fact, there are none at all. Rather than comparing inferences, the ultimate end point of interpretive critiques is a restatement of the need (and desire) for the corresponding existence of the two distinct and separate paradigms, with their own lexical coherence. The ill-formed comparison represents the confusions of interpretation and emphasis across the representation of ‘semantic’ cultures.122 This dilemma is resolved by Kuhn in noting that, while conceptual terminology as content may be idiosyncratic to the paradigmatic context, the structure of contexts can be compared without re-interpretation, stating:

Though I here verge on metaphor, my direction should be clear. What members of a language community share is homology of lexical structure. Their criteria need not be the same, for those they can learn from each other as needed. But their taxonomic structures must match, for where structure is different, the world is different, language is private, and communication ceases until one party acquires the language of the other. (Kuhn, 1983, p. 471)

The effect of this elucidation is that by looking at the lexical structure of two theories, rather than a comparison of content based on incommensurable terms, both theories can be seen on their own terms.123 This is significant as otherwise appraisal might be merely an assessment in line with one’s own idiosyncratic paradigmatic preference for a more familiar lexical landscape. Accordingly, the aim of this chapter is to not rely on a comparison of hypotheses from within paradigmatic biases using incommensurable semantics, rather it is an appraisal as to the utility of their abductive logics. Speaking metaphorically, this prevents
the (premature) drowning of a good theory under the waves of opinion from a
groundswell of unrelated propositions generated from the prevailing breeze of
unfamiliarity.

The third consideration for this chapter is provided by systems theorist, Béla
Bánáthy (Bánáthy, 1993), who in looking at the linguistic distinctions in
cognitive maps draws a distinction between ‘descriptive’ and ‘prescriptive’
narratives. This introduces a consideration that it is not the present ‘rightness’
of our depictions of the world and our place in it that are important, but rather
the evolutionary capacity to map ‘how things should be’ as a projection of our
intent to change our life and our systems. He writes, possibly foreshadowing a
dynamic theory of conceptions:

Cognitive maps are drawn on the basis of the values we hold, the ideas we have
about how the world works, and our perceptions of what is our role in the
world. Cognitive maps are “alive”. They are created, confirmed, disconfirmed,
elaborated, changed, redrawn. Furthermore, they dynamically “affect” each
other in a mutually interactive way. (Bánáthy, 1993) (p. 206)

These three considerations from existing theory, being the need for structural
correspondence, the translation of paradigmatic lexicons, and the significance of
evolutionary prescriptions, inform this chapter’s concluding abductive
propositions.

**Chapter Nine Proposition**

The thesis proposition of this chapter is that, for the phenomena selected, the
thesis presented represents an inference of explanatory worth. The implication
of this is that even though the hypothesis is incomplete, correctly raising more
unknowns than it provides knowns, its potential explanatory worth still can be
considered. The purpose of this chapter is therefore an appraisal of the
proposed hypothesis, on its own terms, based on comparisons to an available
alternative.
The counter-proposition is that an existing theory, which has more evidence, history of use, and a comprehensiveness of application, will always be superior. The argument could be made that only when an existing theory fails to explain anything of value should it be abandoned. This potentially represents the error of redescription, where the better theory is seen as the one that most closely reflects back to us our existing understanding. The error is to reject the unfamiliar unless it is in familiar terms. This error can be avoided in an abductive method by a stance of epistemic openness. This is reflected directly in the assumptions of Peircean pragmatism, where the intention is that our beliefs (and actions) should change whenever we are presented with a more pragmatic alternative (Peirce, 1960).

The proposal is to establish the fact of explanatory coherence in another existing theory that considers the phenomena of thought and make the comparisons of structure that can reasonably be made with efficacy. Notably, in each chapter of this thesis a counter-proposition has also been proposed. If those counter-propositions together represented a more explanatorily coherent proposition, arguably they would represent a better inference on the identical questions. It is argued that this thesis not only makes a contribution by the conjunction of its findings, but also by providing an alternative construction by its selected emphasis and specific answers to those questions.

In answering the final question: 'What compares to it?' the suggestion is that if the proposed hypothesis is consistent with an alternative hypothesis that has explanatory coherence, and enhances it, it compares favorably. The outcome desired is an appraisal based, not on personal preference, but rather on philosophical coherence and the resulting pragmatic benefit of that choice.

9.3 How was it answered?

What is the theory?
The final phase in the abductive method providing the framework for this thesis is theory-appraisal. Haig (2005a) describes how, following theory-construction, a process of theory-appraisal may now occur:

When the theories are well developed, they are assessed against their rivals with respect to their explanatory goodness. This assessment involves making judgments of the best of competing explanations. (p. 373)

This generates the specific theoretical question of what constitutes a ‘best’ explanation in abduction. To answer this, Haig (2005a) firstly explains how the process for appraisal of an abductive hypothesis is to be distinguished from other forms of hypotheses. For example, a deductive hypothesis is appraised in terms of its predictive success. An inductive hypothesis may be appraised in terms of its probability (i.e. by Bayesian ‘likelihood’). In an appraisal of abductive hypotheses the test for ‘best’ is instead determined by ‘explanatory worth’. 124 In pragmatism, this test of explanatory worth is ultimately judged by what Peirce described as the maxim of pragmatism. The maxim is stated here in its stated form (as taken from the 7th Harvard lecture titled Pragmatism: The Logic of Abduction):

For the maxim of pragmatism is that a conception can have no logical effect or import differing from that of a second conception except so far as, taken in connection with other conceptions and intentions, it might conceivably modify our practical conduct differently from that second conception... Thus, the maxim of pragmatism, if true, fully covers the entire logic of abduction. [Emphasis in original] (Peirce, 1960, p. 121)[CP 5.196]

In terms of the worth of one hypothesis over another, the pragmatism approach is to select the explanatory hypothesis which might ‘modify our practical conduct’ when taken together with all else that is known and believed. As Peirce also points out, the step of admission of a hypothesis of worth generates further questions in deduction and induction (i.e. regarding the economy of proof and the scope of potential application), which may qualify the priorities in terms of advancement of competing hypotheses otherwise admitted on equal grounds (Reilly, 1970). This highlights that the test of appraisal for an abductive hypothesis merely enables its initial advancement. It does not constitute its
proof. The logic then is that there is no reason why alternative, perhaps even contradictory, hypotheses might not *both* be admitted as having explanatory worth. The insight is that in the process of their comparison, both theories may benefit from the opportunity of examining their underlying structure, assumptions and explanatory propositions.

In approaching this task, the test of explanatory worth in the appraisal of an abductive hypothesis is often equated with the classical test of 'inference to best explanation'. In summarizing the aim of appraisal in an abductive theory of method, Haig (2005a) explains this concept:

> Being concerned with explanatory reasoning, inference to best explanation is a form of abduction. As mentioned earlier, it involves accepting a theory when it is judged to provide a better explanation of the evidence than its rivals do... To infer that a theory is the best explanation is to judge it as more explanatorily coherent than its rivals. (p. 381)

The originating principle of 'inference to best explanation' was elucidated by Gilbert Harman (1965) in an essay distinguishing enumerative induction (i.e. where assumptions concerning one case are applied to multiple cases) from abduction as alternative forms of inference to the use of deductive inference (Ennis, 1968). Harman, in rescuing abductive process (from child-like assertions of naïve belief by simple enumeration) explicitly leaves open the means for adjudicating the validity of an abductive hypothesis, stating:

> There is, of course, a problem about how one is to judge that one hypothesis is sufficiently better than another hypothesis. Presumably such a judgment will be based on considerations such as which hypothesis is simpler, which is more plausible, which explains more, which is less ad hoc, and so forth. I do not wish to deny that there is a problem about explaining the exact nature of these considerations; I will not, however, say anything more about this problem. (p. 89)

Verbeurgt, 1998), as “the definitive source for a detailed explanation of the theory of explanatory coherence” (Haig, 2005a, p. 382). Thagard has developed different forms of logical ‘coherence’ by combining theories from philosophy, psychology and computational logic into the approach of cognitive naturalism, which recognizes that “a great deal of human thought consists of coherence judgments that maximize constraint satisfaction” (Thagard, 2000, p. 277). Within this framing, Thagard’s comprehensive accounts of the nature of mind, the philosophy of science and the role of creativity in discovery, provides detailed guidance on this topic. This extensive work leads to three simple criteria for the determination of the foundational grounds for ‘explanatory coherence’, being:

a) **Consilience**: greater explanatorily coherent in a greater breadth of facts;
b) **Simplicity**: has fewer special, ad hoc or manufactured assumptions; and
c) **Analogy**: provides support to and gains support from analogous theories.

The precise meanings of these three criteria are relied on explicitly in the design of the appraisal method and therefore require elucidation as to their specific and significant distinctions.

For the test of **consilience**, Thagard (1988) explains how the specific appraisal criterion of consilience relates to comprehensiveness and the ability of one theory to explain ‘more classes of facts’ than another. The difficulty in the consilience test is to specify for any theory what constitutes an ‘isolated occurrence’ or a ‘class of common factual events’ and which of these it purports to explain. Specifically, Thagard (1988) draws a distinction between the explanation of static facts (i.e. being the set of existent knowns) and the benefit of ‘dynamic consilience’ where a theory explains more classes of facts than were existent at the time the theory was proposed. Logically, a dynamic consilience theory has more explanatory worth than a theory with static consilience as it provides for understandings gained in generative development and learning. However, Thagard (1988) states: “I see no reason to place special value on the temporal dimension” and instead proposes that: “The maximally consilient
hypothesis or theory is one that explains any fact whatsoever” (p. 82). This reflects that the strict test of explanatory comprehensiveness is a present (not future) assessment for a defined (and existing) problem scope.

For the test of simplicity, Thagard explains that this is adjudged by the number and range of new hypotheses introduced and their dependence on multiple auxiliary hypotheses of a qualifying or contextual nature. As Thagard states: “As has often been remarked, simplicity is complex” (p. 84). Essentially, a simpler theory is one that relies on fewer hypotheses for explanation of a broader range of circumstances (i.e. the linking of simplicity to consilience). It is this particular description of simplicity that explains why, in Thagard’s view, future dynamic consilience is of less evaluative weight than factual comprehensiveness, because when more cases are explained with fewer contextual qualifications, simplicity is present. To evaluate simplicity, Thagard (1988) proposes the test of ‘ontological economy’, being the number of assumed entities that must exist to support the propositions relied on. Significantly, Thagard (1988) does not privilege ontological economy as a separate criterion, recognizing that complex theories require complex facts. In an application of the maxim of Ockham’s razor, the guidance for the assessment of simplicity is that ontological assertions should be no greater than are necessary for comprehensiveness and predictive certainty, without an extensive dependence on auxiliary hypotheses or propositions for functionality.

For the final criterion of analogy, Thagard (1988) explains that the term analogy in its sense in appraisal is closer to the concept of ‘scientific familiarity’, distinguishing it from forms of analogical comparison (i.e. as used in the process of hypothesis discovery in Chapter Three). Without relying on analogy as “a reduction to the familiar” (p. 94), the criterion of analogy in the context of theory-appraisal is explained as:

However, other things being equal, the explanations afforded by a theory are better explanations if the theory is familiar, that is, introduces mechanisms, entities or concepts that are used in established explanations. (Thagard, 1988, pp. 94-95)
The prospective value of the criterion of analogy is two fold. It provides an explanation that is of the right ‘kind’, in that it is analogous to a particular form of problem characterization or approach to a question (e.g. constructivist or teleological). Also, in using analogous concepts the hypothesis increases understanding rather than merely introducing new and speculative propositions (Thagard, 1995). This can be characterized as ‘new in lineage’, rather than privileging the novelty of simply forming a new lineage. This test highlights the problem of producing ‘novelty’ in normal science and the requirement that worthwhile innovations should extend on from knowledge, not simply abandon it (Hart, 1983).

An additional benefit from this theoretical work is that Thagard (1988) also directly addresses the primary problem of the comparison of theories within existing knowledge domains by noting Kuhn’s issue of incommensurability (Kuhn, 1983), stating that because “a paradigm is so all-encompassing that it is not possible to stand outside it in order to compare it against other paradigms” (Thagard, 1988, p. 95). The problem recognized is that any hypothesis that promotes a new paradigm will theoretically be adjudged to fail the analogy test (by virtue of it being outside the familiar). Thagard’s (1988) solution is that analogous theories can rely on previously established facts and properties, without being reliant on existing idiosyncratic theory-laden descriptions and interpretations. This is consistent with the test of an abductive hypothesis as being better, not because it feels to be more true or is a more satisfying narrative, only in that it provides a better explanation. This enables the positive appraisal and development of new theory, on new terms, which may still use and rely on the summation of existing knowledge.

In summary, Thagard (1988) finds the three criteria for evaluation in an abductive theory-appraisal “turn out to be intimately connected” (p. 98) and application is “a very complicated matter” (p. 98). Essentially, a three way independent (yet inter-related) appraisal is proposed.126 The implications of applying all three tests as necessary parts of one appraisal, is illustrated:
Consilience and simplicity mitigate against each other, since making a theory more consilient can render the theory less simple, if extra hypotheses are needed to explain the additional facts. The criterion of analogy may be at odds with both consilience and simplicity, if a radically new kind of theory is needed for simple explanation of all the phenomena. Capturing the multi-dimensional character of scientific theory evaluation is yet another virtue of the view that scientific inference is inference to the best explanation. (Thagard, 1988, pp. 94-95)

These three criteria provide the overarching framework for the assessment in an abductive theory-appraisal. They provide the theoretical elements for a valid method for evaluating an 'inference to best explanation'. From this theoretical base, a set of framework principles for a definitive evaluation based on comparison can be developed. The development of appraisal criteria for the abductive process on this basis reflects that the aim of abductive hypothesis formation is not to derive an explanation, but the best explanation (Thagard, 1988).

Having determined that the test for 'best' inference is based on an assessment of explanatory worth, that 'worth' is appropriately judged by explanatory coherence, that coherence has three inseparable inter-related components, and paradigms using different language can be compared by their structures; the very next question is how is the structure of competing explanations to be practically determined?

**How was it applied?**

For the theory-appraisal phase of the abductive method the primary choice in emphasis is framed as being between two alternate approaches: a) *foundational* and b) *computational*. A foundational approach emphasizes the satisfaction that results from the relations of a theory’s essential axioms. A computational approach methodically examines the mechanics of the logics based on how they operate in practice. A foundational approach might be used for a new theory that does not yet have a history of decision-making and reliance. A computational analysis has application to the analysis post-fact of the logics of
decisive action to derive patterns of significance (Thagard, 2000). In this approach, established and formalized axioms representing a theory can be logically analyzed objectively. This approach has great benefits in unpacking the logics of complex theoretical choices (Haack, 1993). Each approach has its respective merits (and critics).\textsuperscript{127}

To inform the answer to this practical question of emphasis, Thagard (2000) provides a multi-coherence approach as a basis for the justification of knowledge claims. He establishes that primary kinds of coherence are necessary in the formation of knowledge, providing the examples of explanatory, conceptual, analogical, deductive, and perceptual coherence.\textsuperscript{128} In proposing an approach to coherence-based inference, Thagard suggests that any representation is acceptable (and should by implication be accepted, at least by the proposer) if it coheres maximally with the rest of one’s accepted representations (Thagard & Verbeurgt, 1998). This assessment can be objectively determined by use of foundational logics and the resolution of propositions within a set of positive and negative constraints.\textsuperscript{129} The foundational approach in coherentist epistemologies involves explanatory coherence being achieved by propositions having ‘relations of mutual support’ while also ‘maximising constraint satisfaction’ (Thagard, 2000). This approach has particular benefits when comparing abstract or formative relations that are unproven or imprecise. In the absence of an established pattern of decision-making in application, the foundational approach is preferred for this thesis.

To apply the foundational approach practically, Thagard (1989) has proposed seven overarching principles as a framework for articulating different forms of coherence within a Theory of Explanatory Coherence (TEC). These involve assessments of: symmetry (E1), explanation (E2), analogy (E3), priority (E4), contradiction (E5), competition (E6), and acceptance (E7).\textsuperscript{130}

Essentially, these seven principles expand the three essential criteria that a hypothesis should have consilience (E2), simplicity (E2) and analogy (E3) by also being: logically symmetrical (E1), not inconsistent (E5), unambiguous in
internal priorities (E6), be explanatory of the parts (E4), and that each part is internally consistent with the whole (E7).

Using these principles as a framework for relational comparison, an existing theory can be analyzed for explanatory coherence (on its own terms) and this appraisal can then be compared by relating the coherence principles to the structures of the proposed hypothesis of this thesis.

**What was done?**

To apply the abductive theory and selected emphasis as a process of theory-appraisal three tasks were completed. These were: a) selection of the hypothesis for comparison; b) specification of the precise principles of explanatory coherence for that comparison; and c) formulating the process steps to complete the comparison.

*Selection of Comparison – Integral Hypothesis*

A useful comparison for the purposes of appraising hypothesized descriptions of systems of individual consciousness is provided by the encompassing work of integral theorist, Ken Wilber (2000e). This post-postmodernist theory comprises a developing body of theoretical work that has been published, revised and recapitulated over a period of thirty years (Wilber, 1977, 1979, 1980, 1981, 1982, 1983a, 1983b, 1993, 1997, 1998a, 1998b, 1999, 2000a, 2000b, 2000c, 2000d, 2000e, 2003a, 2003b, 2003c, 2003d, 2004, 2005a, 2005b, 2006). Its origins are derived in transpersonal psychology (Wilber, 1977), evolutionary history (Wilber, 1981), consciousness studies (Wilber, 1997) and non-dual spirituality (Wilber, 1980) and its axiomatic premise has been applied by its originator specifically to develop explanatory hypotheses in psychology (Wilber, 2000c), sociology (Wilber, 1983a) and spirituality (Wilber, 2006). More recently the theory has been extended in its application by academics and practitioners to a range of disciplines, such as health (Schlitz, Amorok, & Micozzi, 2005), medicine (George, 2006), nursing (Jarfín, 2012), psychotherapy
(Zeitler, 2007), ecology (Esbjörn-Hargens & Zimmerman, 2009), community development (Hochachka, 2009) and education (Esbjörn-Hargens, Reams, & Gunnlaugsson, 2010) to name only a few. Of primary significance to this comparison is its development of a hypothesis for the origins, structures, states and forms of consciousness (Wilber, 1997, 2000d, 2003d). Its existing axiomatic clarity and expansive explication makes it a qualified explanatory hypothesis for the purposes of comparison. This will be referred to as the Integral Hypothesis.

*Principles of Explanatory Coherence ~ Criteria for Evaluation*

The three primary tests for explanatory coherence, being: a) consilience, b) simplicity and c) analogy, were expanded to reflect their three-way relational structure (as outlined) by adopting Thagard’s formalized seven criteria test (Thagard, 1989, 1991). These original categories for explanatory coherence were re-named (e.g. C1) to distinguish their particular meanings as applied in this context to systems of conceptions. These categories correspond directly to the original principles for explanatory coherence, with the addition of an eighth supplemental principle to represent the criteria of ‘dynamic consilience’ being the ability of the theory in explaining new facts (Thagard, 2000) (see Table 9.1).

| Principle C1 | Conjunction | The problem-definition and the resolution correspond |
| Principle C2 | Completeness | The phenomena seen and the explanation correspond |
| Principle C3 | Consistence | The prior knowledge and proposed theory correspond |
| Principle C4 | Composition | The phenomena and the characterizations correspond |
| Principle C5 | Contradiction | The propositions and their single scopes correspond |
| Principle C6 | Competition | The propositions and their set priorities correspond |
| Principle C7 | Concordance | The propositions as parts and the whole correspond |
| Principle C8 | Concrecence | The progression gained and the purpose set correspond |

This provides a comprehensive evaluation criteria reflecting the abductive theoretical premise and the emphasis in foundational logic selected as a method. The precise correspondences are defined for each of the set categories.

*Formalization of Process Steps ~ Process Undertaken*
The process of theory-appraisal used was:

*Step 1:* Appraisal of explanatory coherence of the Integral Hypothesis;
*Step 2:* Identification of additions for the problem-constraint solution;
*Step 3:* Comparison of the lexiconic structure of the paradigms; and
*Step 4:* Conclusions on an application of the pragmatic maxim.

In this way, the candidate theory for comparison is firstly confirmed as having explanatory coherence, an existing comprehensive theory is enhanced with reference to the specific problem-constraint criteria, the incommensurability of the paradigms is resolved by comparison of lexiconic structures (rather than content and intentions) and the final appraisal is determined based on the benefit of pragmatic difference.

## 9.4 What was discovered?

### Summation of Findings

*Step 1: Appraisal of Explanatory Coherence (Integral Hypothesis)*

The conclusion, from the inventory taken of the eight principles of explanatory coherence, is confirmation of the explanatory worth of the Integral Hypothesis. Each principle of explanatory coherence is satisfied by a different distinctive element in its lexical structure. As a summary, a brief narrative description is also provided in the following table (Table 9.2). The relevant quotations in support of the analysis are contained in Appendix K.

<table>
<thead>
<tr>
<th>No.</th>
<th>Principle</th>
<th>Appraisal for Integral Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Conjunction</td>
<td>Proposition of partialness and wholeness (Wilber, 2006)</td>
</tr>
<tr>
<td>C2</td>
<td>Completeness</td>
<td>Proposition of Big Three (Big Four) (Wilber, 2006)</td>
</tr>
<tr>
<td>C3</td>
<td>Consistence</td>
<td>Proposition of orientating generalizations (Wilber, 2000d)</td>
</tr>
<tr>
<td>C4</td>
<td>Composition</td>
<td>Proposition of the Great Holarchy (Wilber, 2000d)</td>
</tr>
<tr>
<td>C5</td>
<td>Contradiction</td>
<td>Proposition of the Twenty Tenets (Wilber, 2000a)</td>
</tr>
<tr>
<td>C6</td>
<td>Competition</td>
<td>Proposition of AQAL (Levels and Lines) (Wilber, 2000b, 2000d)</td>
</tr>
</tbody>
</table>
Step 2: Identification of Additions for Problem-Constraint

From this analysis, when considering the problem-constraints proposed for this thesis five specific aspects were identified as potential additions, drawing from the findings made in the abductive inquiries of this thesis. These are (in summary):

a) **Conceptions (in substitution for Holon):** This signifies a shift from a conceptual abstraction to an observable phenomenon.

b) **Trichotomy (in substitution for Quadrants):** This reflects the dynamics of formation rather than divisions in integration.

c) **Multi-Ontological (in substitution for Levels):** This recognizes that levels of organization alter with different structures of observation.

d) **Recursive Cycles (in substitution for Transcendence):** This indicates the potential for phase changes in direction within levels of organization.

e) **Coactions (in substitution for Inclusion):** This reflects the intersections between reticulated hierarchies as multi-scalar arborisations.

Step 3: Comparison of Lexiconic Structures

Given that the appropriate means of comparison of two abductive hypotheses is on principles of explanatory coherence, the task of the translator in learning the languages of two incommensurable paradigms is to find comparative structures using each theory’s own idiomatic lexicon of terms. This bridging of the two lexical structures leads to a comparison of the Integral Hypothesis and the proposed hypothesis for conceptions based on the eight principles (i.e. C1-8) identified (see Table 9.3). This identifies the applicable element of explanatory coherence, compares the central concepts, and illustrates the similarity of territories (and the differences in the interpretation keys) for these two representative ‘map-languages’.
Table 9.3 – Comparison of Lexicon of Criterion Terms

<table>
<thead>
<tr>
<th>No.</th>
<th>Element</th>
<th>Integral Hypothesis</th>
<th>Conception Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Focus</td>
<td>Partialness</td>
<td>Contribution</td>
</tr>
<tr>
<td>C2</td>
<td>Breadth</td>
<td>Holons</td>
<td>Conceptions</td>
</tr>
<tr>
<td>C3</td>
<td>Premise</td>
<td>Meta-Theory</td>
<td>Generativity</td>
</tr>
<tr>
<td>C4</td>
<td>Content</td>
<td>AQAL Categories</td>
<td>Resultants</td>
</tr>
<tr>
<td>C5</td>
<td>Location</td>
<td>Kosmic Address</td>
<td>Relations</td>
</tr>
<tr>
<td>C6</td>
<td>Priority</td>
<td>Holarchy</td>
<td>Ontonomy</td>
</tr>
<tr>
<td>C7</td>
<td>Ordering</td>
<td>Twenty Tenets</td>
<td>Assembly</td>
</tr>
<tr>
<td>C8</td>
<td>Direction</td>
<td>Transcendence</td>
<td>Formation</td>
</tr>
</tbody>
</table>

The conclusion reached is, in focussing on different content, the paradigms resulting from each hypothesis make different contributions to knowledge. This is notwithstanding that the respective solution-demands (i.e. ‘How thought is’) are ostensibly similar, reflecting primarily a difference in emphasis between consequentialist and generativist paradigms.

**Step 4: Conclusion of Appraisal on Pragmatic Maxim**

The additional (and final) criterion in the comparative analysis relates to application of the pragmatic maxim and the test of resultant action in reliance on the proposed hypothesis. The resulting summary statement is provided:

*Conclusion:* The conclusion is that, for the problem-constraint of depicting the capacity of systems of conceptions, a paradigm with an emphasis on generative formations (rather than consequentialist descriptions) provides the greater potential for reflexive learning in practice. Accordingly, the proposed hypothesis provides a ‘better’ inference for the specific research question that has been posed.

**Discussion of Findings**

The premise in many discussions of abductive discovery, acts of creation and conceptual revolutions is how the necessary element for success is conceptual coherence (Koestler, 1964a; Kuhn, 1970; Thagard, 1992). What was most
noticeably observed in researching and applying the abductive rigor of this thesis is the many ways in which errors of conversion, re-description and self-assertion may occur.\textsuperscript{131}

For this reason, the protocols of the abductive theory process for this chapter were strictly followed, relying on the means to the method already developed. What this highlighted was that in a comparison of paradigms, internal coherency allows for the clear identification of difference. The virtue in a good comparison is that it illuminates the points of significance and emphasis. The result was that rather than differences of conjecture or opinion the comparison highlighted differences in logic, language, levels, and learning.\textsuperscript{132}

For clarity, the hypothesis of this thesis is too premature to be described as a theory. It proposes the premise for a theoretical praxis with abductive assumptions that, in undertaking the appropriate injunctions and depictions, there will be disclosed phenomenon of significance. It is only after engagement with that model, through learning and reflection, that the worth of the hypothesis can be actually evaluated. For this reason, reference is made to the ‘proposed hypothesis’ of this thesis. The appraisal is made with correlating components in the ‘hypothesis’ of integral theory as referenced (rather than its wider body of theory or practice as enacted) and only for the purposes of that comparison (i.e. the ‘Integral Hypothesis’).

With that qualification, the following sections describes the analysis of explanatory coherence of the Integral Hypothesis, the highlighted additions of difference with the proposed hypothesis, the comparisons of similarity in their lexicon of language-maps, and the application of the pragmatic maxim to directly identify the resulting benefits gained.

**Evaluation of Comparison**

The totality of works concerning integral theory is a vast repository of hypotheses and observations. The assessment of explanatory coherence of that
body of work is not attempted. This theory-appraisal is not an analysis of the sufficiency or adequacy of those propositions as against other theories or potential counter-arguments. The test for explanatory coherence comprises merely an inventory of philosophical components (see Appendix K). In the form of a précis, the following represents the appraisal conducted (with identifying lexical terms added):

For the criterion of Conjunction (C1) the problem-definition and aim of the Integral Hypothesis correspond, with the stated aim being not to add content to existing disciplines, rather ‘... it simply shows them the areas of their own approaches that are less than integral or less than comprehensive, and this acts as a guide for reorganizing the disciplines ...’ (Wilber, 2006, p. ix) [e.g. Partial/Integral].

For the criterion of Completeness (C2) the phenomena privileged and its explanation correspond, with statement is made that, in respect of the three primary domains of the I, WE and Its, ‘... every event in the manifest world has all 3 of those dimensions.’ (Wilber, 2006, p. 19) [e.g. Big Three/Four].

For the criterion of Consistence (C3) prior knowledge and proposed theory correspond, with the statement the hypothesis has been generated from what is described as ‘... largely already-agreed-upon orientating generalizations.’ (Wilber, 2000d, p. 5) [e.g. Orientating Generalizations].

For the criterion of Composition (C4) the primary phenomenon and its characterization correspond, the hypothesis provided one ontological phenomenon of significance only, with the statement: ‘There is nothing that isn’t a holon (upwardly and downwardly forever).’ (Wilber, 2000d, p. 41) [e.g. The Great Holarchy].

For the criterion of Contradiction (C5) the foundational propositions and their individual scopes correspond, being provided as a non-comprehensive list of axiomatic statements of ‘... twenty patterns that seem to be true for evolution
However it occurs, from matter to life to mind.’ (Wilber, 2000a, p. 17) [e.g. Twenty Tenets].

For the criterion of Competition (C6) the propositions and their priorities correspond, with the sequence of priority established by the principle of inclusion and transcendence and relational differences, being a ‘series of nests within nests within nests indefinitely’ as structures of ‘greater and greater holistic embrace’ (Wilber, 2000b, p. 40) [e.g. AQAL – Quadrants, Levels, Lines, States, Types].

For the criterion of Concordance (C7) the propositions as parts and the whole correspond, by the ways of knowing being divided into discrete ‘zones’, comprising ‘... at least 8 fundamental and apparently irreducible methodologies, injunctions, or paradigms for gaining reproducible knowledge (or verifying repeatable experiences).’ (Wilber, 2006, p. 33) [e.g. Integral Methodological Pluralism].

For the criterion of Concrescence (C8) the progression of the purposes of the theory are met, with the confirmation that the hypothesis is not ‘fixed or final’ and is a collection of ‘a thousand hypotheses’ of which each sentence is open to ‘confirmation or refutation by a community of the adequate’ (Wilber, 2000d, p. 6) [e.g. Community of the Adequate].

The conclusion is that, as an inventory, the Integral Hypothesis has explanatory coherence in terms of its constituent inventory. This confirms it as a valid candidate for comparison in an abductive appraisal of the inference to the best explanation.

**Paradigmatic Extensions**

The finding that an existing theory has explanatory coherence raises the question why would generation of an alternative theory even need to be considered? This dilemma of sufficiency, in an otherwise comprehensive and
coherent theory, is raised directly by Wilber, in noting that the aesthetic attractiveness of the Integral Hypothesis should itself be sufficient:

If the universe really is a pattern of mutually interrelated patterns and processes – holarchies of holons – why do so few disciplines acknowledge this fact (apart from their own narrow specialties)? If the Komsos is not holistic, not integral, not holonic – if it is a fragmented and jumbled affair, with no common contexts or linkages or joinings of communions – then fine, the world is the jumbled mess the various specialties make it out to be. But if the world is holistic and holonic, then why do not more people see this? And why do many academic specialties actively deny it? If the world is whole, why do so many people see it as broken? And why, in a sense, is the world broken, fragmented, alienated, divided? (Wilber, 2000d, p. xviii)

This reflects that multiple theories exist for different functional purposes. In recognizing the explanatory coherence of the Integral Hypothesis, the next question is to consider the utility of its specific inference in answering the primary research question of this thesis.

The resolution of this question was indicated by the mention (but non-inclusion) in Thagard’s analysis of the criterion of ‘dynamic consilience’, primarily due to problems of its open-ended scope (Thagard, 1988). Thagard (1988) discusses ‘static consilience’ noting: “This is generally how it appears when a scientist presents the results of his or her research. Arguments to the best explanation cite a range of facts that are explained.” (p. 81). However, as the process of this thesis demonstrates, a theory can by its own terms grow and develop, altering its preconceptions as an element of its investigations. A theory has ‘dynamic consilience’ if it is able to explain and determine more cases than at the time of its formation, being “more consilient than it was when it was first proposed” (p. 81). This is not by modification of the theory, rather it is by its hypotheses confirming emergent anomaly and predictions of future occurrences within the terms of the theory that were previously unexpected. In contrast, a theory of static consilience which “judges all the types of facts available” (Haig, 2005a, p. 381) is a theory encapsulating everything that is known. This requires that the theory be continually updated, revised and refreshed, on an occasion by occasion basis. In doing so there is the inherent limitation of resorting to its own narrative of description in the re-
characterization of emergent phenomenon. This avoidance of novelty provides comprehensiveness and certainty at the cost of observational engagement with anomaly and discontinuity.

This distinction reflects a preference between a consequentialist abductive logic and a generativist abductive logic (Haig, 2005a). The product of consequentialist abductive hypothesis is an explanation by description (Haig, 2005a). This approach fully explains the question of what has happened, observing correctly “why there is something rather than nothing” (Wilber, 2000a, p. 3). However, this leaves the question of why there is that circumstance and not another unanswered. The question of future causation, on the other hand, is only answered by generativist abduction, which looks to patterns of causation as abductive explanations. This approach not only describes ‘why it was’, it potentially answers the additional question of ‘what could be?’.

For this reason the proposed hypothesis (for its one specific level of observation and the specific phenomenon of systems of conceptions) in adopting a generativist approach is preferred as the pathway to the inference to the best explanation for the specific research question asked in Chapter One.

Accordingly, the following specific additions are included within the proposed hypothesis for conceptions, representing questions significant in a generativist paradigm (being not directly covered by the Integral Hypothesis):

A. **Conceptions (in substitution for Holon):** The addition of the *Conception* enables the examination of predictive cognitive niches based on patterns of formation. In terms of the landscape of thought, they represent the places where people’s ideas might in actuality live (and become alive) as opposed to the addresses we might pre-prescribe. The practical effect of this addition is to move away from mapping the theoretical towards depicting and modeling the actual capacities of conceptions potentially available within an identified system of thought.
B. *Trichotomy (in substitution for Quadrants)*: The addition of the *Trichotomy* reflects the originating basis of the dynamics of First, Second and Thirdness in the formation of conceptions (subsequently described at a generalized level of observation in the Integral philosophy as the Big Three) and removes a conflation of structurally-coupled environments (i.e. the fourth quadrant) with those dynamics. The practical effect of this addition is to situate each conception in contexts of dynamic formation and re-formulation (rather than identifications with ontological abstract pre-givens).\textsuperscript{133}

C. *Multi-Ontological (in substitution for Levels)*: The addition of an a perspectival premise (i.e. no a priori privileged observational location) enables multi-leveled structures of observation. In providing for multiple-structures of conceptual inclusion based on different ontological premises, a more ‘ecological’ relationship between conceptions is recognized. Inclusion is then a function of the capacities of each conception (rather than a reliance on pre-attributions). The practical effect is to remove the need for adoption of a single organizing perspective on perspectives (e.g. the Witness) enabling the analysis of conjunctural constructivist hierarchies representing different communities of thought based on their respective constitutions.

D. *Recursive Cycles (in substitution for Transcendence)*: The addition of cycles of *Recursion* represents that conceptions operate dynamically in processes of formation and reformulation even within the orientating generalizations of recurrent deep structures. As such, the phases of directionality as a quality of conceptions become a phenomenon of significance. This reverses any assumption of fragmentation, alienation, or partialness (i.e. allowing equally for the qualities of integration, co-enaction and wholeness). The practical effect of this inclusion is to notice shifts in orientation, which would otherwise be negated in assumptions of a mono-directional assertion of teleological ascendance.

E. *Coactions (in substitution for Inclusion)*: The addition of a consideration of coactions represents a tentative hypothesis that the formation of coherent
conceptions has an effect on the potential in other conceptions (other than by way of nested inclusion). The practical effect of this addition is to consider how the presence (or absence) of the qualities of particular conceptions enhances (or limits) the potential of particular dynamic social systems based on the actual capacities and contributions of the conceptions in interaction (avoiding a reliance on more generalized assertions).

It is proposed that, with these additions, the proposed hypothesis for systems of conceptions would have greater explanatory worth for the primary research question posed and constitutes, for the problem-constraint defined, a better inference to the best explanation.

**Lexiconic Distinctions**

The discussion of the significant problems of comparisons using lexical terminology from within specific paradigms highlights that an explanatory hypothesis is to be compared only on its own terms. The effect of lexical incommensurability means that, even the finding of agreement on the criteria for coherence will not adjudicate ‘explanatory worth’ conclusively. Ostensibly, “two scientists in agreement on the list of such cognitive values may still disagree on which theory should be preferred” (Hoyningen-Heuene, 1990, p. 490).

Kuhn (1970) resolves this concern by explaining that a preference for a paradigm necessarily involves a preference for different questions, and therefore question choice is a function of problem definition, which is based on conceptual perceptions of a referent-neutral world which is naturally directed by the existing paradigm. The example is given of a scientist or philosopher measuring a pendulum-like motion:

If he saw a constrained fall instead, his question could not even be asked. And if he saw a pendulum, but saw it in the same way he saw a tuning fork or an oscillating balance, his question could not be answered. At least it could not be answered in the same way, because it would not be the same question. ...
sense such questions are parts of normal science, for they depend upon the existence of a paradigm and they receive different answers as a result of paradigm change. (Kuhn, 1970, p. 129)

The result of this consideration is that comparisons of coherency may admit hypotheses as being ‘better’ explanations, yet we must, even in normal science concede that two paradigms, with different questions, will generate radically different explanations each of which are potentially equally satisfying to their proponents. This makes detailed considerations of comparative coherence unnecessary.

Instead of different terms for the same thing, the Integral Hypothesis and the proposed hypothesis describe different paradigms. In a process of ‘translation’ across the lexical structures: a focus on partialness, becomes a focus on contribution; the explanation for holons, moves instead to conceptions; the theory premise of meta-recursion, becomes generative learning; the content of relevance, changes from categories to resultants; the phenomena of significance is not location, rather examines relations; the priority of form is less a holarchy, and more an ontonomy;\textsuperscript{134} the ordering principles shift from holonic tenets, to patterns of assembly, and the direction of prediction focuses less on grand unification, and more towards pragmatic formation.

The point made in conclusion is that, in asking a different originating question and directing the focus to different phenomena of interest, a different paradigm results. Hence, each paradigm by using their particular lexicons and structures of emphasis can continue to contribute according to their respective abductive emphasis. Rather than replace existing knowledge, the pragmatic effect of this thesis is to add to the potentials possible from existing conceptual coherences.

**Pragmatic Maxim Test**

If these two hypotheses potentially both have explanatory coherence and can co-exist (with the primary choice being one of paradigmatic preference) the question remains why does the proposed hypothesis deserve our further
attention? In terms of the premise of this thesis, this question can be examined based on the (previously mentioned) pragmatic maxim, which selects the conception when “taken in connection with other conceptions and intentions, it might conceivably modify our practical conduct differently from that second conception” (Peirce, 1960, p. 121) [CP 5.196].

The Integral Hypothesis, grounded in transpersonal psychology, reflects a spiritual teleology that points inevitably towards, wholeness, integration and Oneness (Wilber, 2004). An ostensible rationalization is that, eventually, the trajectory of that assumption will be accomplished. By contrast, the proposed hypothesis is more mundane and prosaic in its ambitions, applications and expectations. The pragmatic proposal is for a paradigm that enables our learning about the learning that leads to the continuous formation and reformulation of conceptions as an embodied praxis. In terms of transcendence it is not ‘better’. However, in terms of the pragmatics of systems of conceptions and our individual roles in enacting meaningful collective decisions, it may prove to be additionally ‘useful’.

A sense of the slight turn of attention that this pragmatic choice would enable highlights how this paradigmatic shift might ‘conceivably modify our practical conduct’. This would be reflected in an awareness: from transcendent psychologies to immanent epistemologies; from definitional holarchies to observational ontomologies; from descriptive narratives to empirically-informed predictives; from ‘higher’ observer assertions to context dependent co-constructions; from theoretical knowing to enacted learnings; from perspectival depictions to aperspectival reflections; and from abstract structures of thought to experiencing thought as dynamic co-enacting potentials.

**Evidence in Support**

The evidence supporting the evaluation of explanatory coherence for the Integral Hypothesis is supported by Wilber’s reflections on his own particular
abductive process. Wilber (2000d) describes the process of conceptual integration that he undertook in formation of those fundamental tenets:

At one point, I had over two hundred hierarchies written out on legal pads lying all over the floor, trying to figure out how to fit them together... There were linguistic hierarchies, contextual hierarchies, spiritual hierarchies. There were stages of development in phonetics, stellar systems, cultural worldviews, autopoietic systems, technological modes, economic structures, phylogenetic unfoldings, superconscious realizations... And they simply refused to agree with each other. (Wilber, 2000d, p. xi)

The proposition of an abductive premise is that a resolution of this process of reconciling complexity, fragmentation and non-integration would eventually find its own form of resolution. In Wilber’s description of his experience:

Keep holding the problem in mind and it will yield. The history of human beings is certainly testament to that fact. An individual runs into a problem and simply obsesses about that problem until he or she solves it. And the funny thing is: the problem is always solved. Sooner or later, it yields. It might take a week, a month, a year, a decade, a century, or a millennium, but the Kosmos is such that solutions are always forthcoming. (Wilber, 2000d, pp. xii-xiii)

This confirms how the problem-constraints, being the way a problem is delineated, influences the form of its eventual resolution. For example, one solution to the problem of fragmentation and pluralism is unification through a mono-definitional approach. The entire diversity of phenomenon can be ordered using a single definitional principle (Ahl & Allen, 1996; T. F. H. Allen & Hoekstra, 1992). This offers a way for different perspectives from partial conceptions of differing realities to be reconstructed into a single system of understanding. The definitional criteria can be applied at all levels of meaningful scale in a hierarchy of pre-defined nested levels of organization. A consistent portrayal within the definitional frame of a hierarchical system of nested abstraction then provides its own epistemological validation. The phenomenon as chosen by the observer supports an absolute ordering of the levels of observation. The problems of definition and integration are accordingly resolved. The new organizing theory can then inform and orientate all research methodologies with greater efficiency (Varey, 2010b). This logic as a process generates a theory with explanatory coherence.
This reflection on the formation of a coherent explanatory hypothesis is further elucidated by Korzybski (1958) in discussing the virtue of ‘un-sanity’. Korzybski identifies that where a person makes a truthful statement about a mistake in observation (i.e. the structurally non-corresponding map) there is no falsehood, repression or conscious mis-description where there is no conflict or disturbance, as: “The seen and the reported correspond to each other” (Korzybski, 1958, p. 529). He relates this experience to the tensions (and resolutions) in an abductive process within scientific discovery, stating:

In scientific work we have similar problems. We gather abstractions of lower orders and then make higher abstractions about them. When these two different orders of abstractions fit nicely structurally, we are satisfied and enjoy the resulting harmony. If they conflict we feel restless. ... Scientists know well the feelings of ‘mental’ pain and discomfort. Creative work is carried out because of such discomfort. Those who are not creative do not experience this, but they also do not produce important work. (Korzybski, 1958, p. 530) [Emphasis in original]

The tension we experience in attempting to understand complex systems, particularly when that understanding is essential for making decisions of great practical significance, is the dilemma of sustainability theory. If we alleviate our restlessness with simplification, this merely generates the potential for future complications. The purposeful aim is not the resolution of the question, rather it is the ability to sustain the openness of the inquiry. Different questions might then result.

For example, an alternative proposition to the problem of hierarchical integration is how to understand complex natural systems not structured in forms corresponding to human definitional classifications. In complex systems our levels of observation do not necessarily accord with existent levels of organization, no matter how generalized are our orientating generalizations (T. F. H. Allen, et al., 1999). Ahl and Allen (1996) explain how, in the observation of ecological systems, ‘nested’ and ‘non-nested’ approaches are complementary philosophies, appropriate at different phases of an evolving understanding:
Nested hierarchies are most suitable for exploration, where nestedness draws attention to a hierarchical system and helps keep order while intuition explores some poorly known phenomenon. ... After the exploratory phase, however, nestedness itself becomes uninteresting, or at least incidental. With further elaboration nestedness becomes subordinate to new, less general organizing criteria, such as rates of enzymatic reactions. The new criteria link between adjacent levels, but do not apply from top to bottom. More often than not, nesting serves its purpose as the point of departure for the investigation, only to be abandoned as other ordering relations come to the forefront. (Ahl & Allen, 1996, pp. 113-114)

Seen then as an evolutionary progression, the discovery of the limitations of one paradigm signals a shift to another, then the next, including the maps we have diligently made. The conclusion in confirmation is that, rather than seeing a problem of explanation and unification of fragmented partialness, this thesis proposed the enticing question of the enablement of exploration and learning as a practice of contributive nurturance.

**Additional Insight**

The additional insight for this chapter results from my own reflections on the complications and rigorous injunctions required in a comparison of paradigms. In a way, the functional components of paradigms reflect the enculturated effects of established conceptions. Their reformulation takes persistence and precision. An approach based in Peircean philosophy was invaluable in authentically engaging in the question of the comparison of beliefs. In undertaking this quest himself, Peirce appealed to what he called a ‘critical common-sensism’, recalling the maxim of pragmatism in a different form:

> Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of those effects is the whole of our conception of the object. (Peirce, 1960, p. 258) [CP 5.402]

To me this reflects Peirce’s belief as to how dynamic Thirdness is established, being a reasonable expectation of predictable occurrence which expectation becomes a habit of mind that provides reliable results. The practical effects that
one can conceive that their conceptual objects might have - \textit{is} their conception. By that reliance, in ethics and aesthetics, so knowledge and knowing (whether in ignorance or fair approximation) will be formed. This is not a prosaic solution in reduction. A pragmatic conception involves a new choice making it possible to “reach far beyond the practical” [CP 5.196]. This leads to the proposal that the exercise of a choice between paradigms involves a reflective learning stance (i.e. Learning II). The significant insight gained is that the pragmatic adoption of a generativist paradigm may result in the transformation of the choosers (i.e. Learning III).

On the specific topic of the type of transformation this enables, Thagard (2000) insightfully recalls Elgin’s (1996) description of a desire for ‘reflective equilibrium’ as requiring a reasonableness in openness:

So advancement of understanding is not an incremental growth in knowledge. A process of delicate adjustments take place, its goal being a system in wide reflective equilibrium. Coherence alone will not suffice. A system is coherent if its components mesh. Reflective equilibrium requires more. A system of thought is in reflective equilibrium when its components are reasonable in light of one another, and the account they comprise, is reasonable in light of our antecedent convictions about the subject at hand. (p. 15)

This distinction causes the need for semantic conventions to describe what is conceived of in the generativist paradigm. What is being described by Thagard’s reference is two distinct levels of coherence. The first is a meshing of components that enables reactive existence (i.e. reaction). The second is a mirroring of reflections on the reception of interactions (i.e. reflection). To this I propose extending Thagard’s suggestion for a growth in knowing by arguing that, not merely self-\textit{reflective}, but a self-\textit{reflexive} coherence is required (i.e. reflexion). This extension involves a move beyond self-assurance, to the openness required to be receptive to perturbances, without being perturbed. These engagements as reflexion will require self-transformation. In this mode of learning, not only is the map made, but also the map-making itself is observed and continually reformulated. In Ken Wilber’s words, as a reflective observation on the problem:
Most new paradigm approaches think that simply getting a more accurate map will solve the problem... But as Hegel (among others) forcefully pointed out, that doesn’t solve the problem at all, but merely continues it in subtler ways... we must realize that thoughts are not merely a reflection of reality, but are also a movement of that very reality itself. Thought is a performance of that which seeks to know, and not a simple mirror of something unrelated to itself. (Wilber, 2000a, p. 59)

The qualification to this conclusion is the recognition of a counter-part view provided by Arthur Koestler (1978) of the limitations of individual learning outside of a collective learning experience:

The experiencing subject can never fully become the object of his experience; at best he can achieve successive approximations. If learning and knowing consist in making oneself a private model of the universe, it follows that the model can never include a complete model of itself, because it must always lag one step behind the process which it is supposed to represent. With each upward-shift of awareness towards the apex of the hierarchy – the self as an integrated whole – it recedes like a mirage. (p. 238)

For me, if the answer is not found in gaining more personal altitude, perhaps it lies in finding greater nuances in the similitude. The conclusions of this thesis represent the reflexive choices that enable a means for a collective embodiment.

The implication of this distinction is about where do we seek the stimulus enabling coherence in our conceptions. The insight is that the stimulus for reaction, reflection and reflexion can equally be internalized defensively or evoke the openness to transform coactively. Each of these pathways is equally available. The reason for this thesis is that, for systems of conceptions, the capacities for such choices were (in a pragmatic sense) not presently observable.

By way of a final clarifying paradigmatic comparison, Wilber (2000d) commences his, Sex, Ecology and Spirituality with reference to the Web of Life (Chapter 1) and the Pattern that Connects (Chapter 2), reflecting the evolutionary and ecological themes of this immense opus. That phrase, ‘the pattern that connects’ is used primarily only once, when introducing a hypothesis that integrates all that is findable, into a common form:
We will be looking at holons in the cosmos, in the bios, in the psyche, and in the theos; and at the evolutionary thread that connects them all, unfolds them all, embraces them all, endlessly. (Wilber, 2000d, p. 4)

This particular passage can be compared with Gregory Bateson’s (1979) own examination of the patterns within the ecology of mind (as life, living, learning and spirituality) in his Mind and Nature, who saw the discovery of these patterns as an ‘aesthetic’ question:

Break the pattern which connects the items of learning and you necessarily destroy all quality.’ I offer you the phrase the pattern which connects as a synonym, another possible title for this book... What pattern connects the crab to the lobster and the orchid to the primrose and all the four of them to me? And me to you? And all the six of us to the amoeba in one direction and to the back-ward schizophrenic in another?... What is the pattern that connects all living creatures? (p. 8)... Perhaps by coincidence, I faced them with what was (though I knew it not) an aesthetic question: How are you related to this creature? What pattern connects you to it? (p. 9)

From Bateson’s engaged responsiveness to the diversity of life and its intriguing questions, he asks for an ecological aesthetic, not in a sacrifice of one consciousness in service of higher consciousness, but a viewpoint that sees; dependency, where others see transcendence; intimacy, where others see enfoldment; and grace, where others see only the fall. The art we are told to the finding of this pattern is to engage fully in the dance:

We have been trained to think of patterns, with the exception of those of music, as fixed affairs. It is easier and lazier that way but, of course all nonsense. In truth, the right way to begin to think about the pattern which connects is to think of it as primarily (whatever that means) a dance of interacting parts and only secondarily pegged down by various sorts of physical limits and by those limits which organisms characteristically impose. (Bateson, 1979, p. 8)

It is to this view, to the dance in inter-action, that my life participates. It is to that preference which I now turn my energies. The insight gained by this consideration is to seek to do this not ‘pegged down’ by the limits of a solitary conception which any one thinking organism (including myself) might characteristically impose. Instead it is to become the music in the dance we collectively might compose.
9.5 Summary

This chapter concludes that for Research Question #9:

- the explanatory coherence of the Integral Hypothesis was confirmed;
- additions constitute the proposed hypothesis as a better inference for the purposes of the problem-constraint; and
- on grounds of pragmatism, the capacity for reflexive learning over descriptive understanding provides a basis for pragmatic action.

This leads to the concluding chapter of the thesis and a personal reflection on the adequacy of the process of abduction and the sufficiency of the results gained. These are offered together with the suggestions for further development and some specific recommendations for applications.
Conclusion

10.1 Introduction

This chapter reflects on the thesis process. As topic specific summaries have concluded each of the chapters this overall concluding chapter offers a personal integration of meta-themes and comments on future prospects.

Interestingly, in the Introduction chapter three main topics were covered:

What question was asked?  
How was it answered?  
What was discovered?

For this Conclusion chapter the counterpart abductive topics are considered:

What questions can we ask?  
How was the answering?  
Who is discovered?

Accordingly, this concluding chapter: a) indicates future paths for further research and application, b) provides reflections on the abductive method and its progression, and c) asks who has been discovered (when previously thought missing).

10.2 What questions can we ask?

Further Research
The outcome of an abductive research process is a new hypothesis. Instead of proven conclusions, there is only a new beginning, with new understandings. A possible path unfolds with a different premise. In now knowing the extent of unknowing, its end becomes a beginning. The abductive difference between a conclusion and conclusiveness is found in the extent of directional openness. Hence, no conclusions are stated.

However, if I were directly asked: *what do you see as the further research areas of primary importance going forward from this point*, the following are proposed (in order of priority):

a) Ultimately, the data represented needs to be interpreted easily, equally, and meaningfully. With innovations in constantly-live information collection, the scope of computer mediated social networks, and virtual aesthetics in spatial representations, the interface between the collection and depiction processes can be distinctive and imaginative. A range of potential models for this (replacing survey forms and statistical analysis) will be investigated (*Data Interfacing*).

b) The models proposed, rather than having predictive accuracy, are intended more for ongoing descriptive inquiry, enabling learning discussions of the type: *How might we want to be?* The next step would be a pilot with a community already practiced at asking questions regarding its self-governance and future capacity, seeking to now engage with such depictions as a learning community (*Learning Communities*).

c) This dissertation intentionally does not speculate on causative relations between conceptions, either in closely held or disaggregated social systems. It is the modeling of these relations, particularly in terms of the cross-scalar interactions, where the proposed forms of depiction will provide otherwise unobtainable information. The evidentiary basis for causal connections would be the next most significant area as a focus for research investigation (*Theory Building*).
Potential Applications

At the time of commencing my research I approached a selection of civic leaders for whom I had developed a deep respect in terms of their societal visions. I asked them, should something like the depiction of what I was imagining be possible, could they see any utility or value from its formation? The range and scope of the responses surprised me. In an ecology of creativity a good product will find its own uses. Some of the examples provided included the following:

a) the proactive assessment of the regenerative capacity of regional and remote communities in the planning for community restoration and development as part of disaster relief efforts;

b) the biosecurity applications modeling the response times and methods likely to be used by different cities in the event of pandemics as they cycle through their different phases;

c) to supplement existing social learning processes for the adaptive management of shared resources, in particular water-resources and land-uses, to gain better conceptualizations of possible needs and solutions;

d) in youth education using processes of simulations and gamification so that learning about the capacities of thought in a social community becomes as commonplace an activity as the memorising of multiplication or periodic tables once were; and

e) the transparent depiction of the landscape of conceptions operating in multi-party negotiations, particularly for global policy challenges and opportunities with a premise, not in an economy of compromise, but rather to enable an ‘ecology’ of equitable and generative contributions.
Usually, it is not until something is visualized and seen to be tangible that what is presently inconceivable (being outside of a conception) becomes imaginable, commonplace and readily adoptable. The generation of trial depictions is what will enable practical applications of this research in new forms not presently imaginable. If there is a conception, there can be a depiction. The potential landscape for this form of representation is now wide open.

10.3 How was the answering?

Capturing the Abductor

In reflecting on the abductive process, I knew that in developing a theory of conceptions that a transparent process of inquiry was going to be necessary. Essentially, the study of the dynamics of thought would require the design of a process balancing rigor of mind and openness of process. I found in Peirce’s writings a rare and unconventional thinker, perhaps reflecting his own rejections of many existing conventions (McKaughan, 2008). However, it was the design of my own process of abduction in keeping with his conventions that provided the generative frame that enabled ‘acts of creation’ within a ‘logic for discovering’ (Koestler, 1964a).

Specifically, the use of the abductive process enabled a transparency in the logic of avoiding nine potential epistemological errors. These were identified as: the errors of conflation (Chapter One), prescription (Chapter Two), presumption (Chapter Three), generalization (Chapter Four), assumption (Chapter Five), equivocation (Chapter Six), subordination (Chapter Seven), signification (Chapter Eight) and redescription (Chapter Nine). To these identified forms are added the errors of misdirection (Introduction) and speculation (Conclusion). This thesis maintained the focus on its initiating question. It now proposes a continuation from the foundations provided (see Appendix L).
Additionally, the theory informing the abductive process enabled a conscious selection of the appropriate emphasis, which distinguishes this thesis in its application of the abductive method. This enabled a conjunction of the following specific abductive selections: constrained (Chapter One), generative (Chapter Two), analogical (Chapter Three), dialogical (Chapter Four), assembled (Chapter Five), relational (Chapter Six), coherentist (Chapter Seven), enacted (Chapter Eight), foundational (Chapter Nine), and pragmatic (Chapter Ten).

This selection is to be contrasted with the possible 'counter-part thesis' which would potentially arrive at comparable conclusions only informed by a counter-posing emphasis in adopting an: unrestrained, consequentialist, existential, evidentiary, replicated, extensional, reliabilist, recalled, computational, ideological premise. It is my contention that the outcome of this thesis, in rigor and in resulting conjunctions, has been enhanced by these conscious selections.

My main surprise in adopting the abductive method was actually how rarely this form of inquiry is investigated, expected, or even supported in the process of novel discovery. Once adopted and embodied, new potentialities arise. By this transparent demonstration I hope that, with appropriate guidance, others will make use of my learning and the processes developed similarly.

**Following the Red Thread**

Many traditions contain the concept of the ‘red thread’. In Eastern traditional cultural tales the red thread can be a string of destiny that binds two parties who are destined to meet under the guidance of the matchmaker Yuè Xià Lào (Mo & Shen, 1997). It is said that the thread that joins them may twist, stretch and tangle, but will never break (Liu, 2011). In the Hebrew language the ‘thread’ can be read as a translation for a ‘theme’ or ‘motif’ that runs through a knowledgeable discourse or teaching (ῥιζή) (Ritchhart, 2002). Specifically, from Greek and Cretan mythology this allusion is to the thread that Ariadne gave to Theseus to find his way home through the labyrinth of the Minotaur in the Kingdom of Minos (Bullfinch, 1993). In this fable Theseus finds the only way to
exit the labyrinth is the exact same path by which one has entered (Ovid, 1977).
We find that the pathway in, is also the pathway out.

There is a red thread in this thesis that connects all the additional insights, being
the reflections on the surprise implications taken from the primary findings.
Bringing the strands of the red threads together into one weave, these were:

*Introduction: Universe of a Hundred Eyes* ~ That a Learning III scenario
involving multiple perspectives can potentially disclose the capabilities
of systems of conceptions.

*Chapter One: Confusion is Data* ~ That an appreciation of system of
conceptions requires an embrace of its complexity and its forms of
conflation, recursion and exclusion.

*Chapter Two: Releasing the Narrative* ~ That the process of mapping
conceptions requires the release of one’s own pre-conceptions,
prompting an openness to the reformulation of expectations.

*Chapter Three: Changing the Back-story* ~ That each conception has a
praxogenic history, reflecting why forms of advancement are very rarely
Learning III rediscoveries.

*Chapter Four: Unknotting the Knots* ~ That the process of unfolding the
entanglements of existing understandings prompts the release into a
different plane of resulting equilibrium.

*Chapter Five: Complexity as Stability* ~ That the answer to a rigid view
becomes, eventually, a new rigid view, the art being to change the
conception by enabling forms of dynamic learning.

*Chapter Six: Naturally it’s Different* ~ That systems of conceptions are not
definable in ways identical to social, ecological, or psychological criteria,
yet being the product of human nature, they still resemble the natural.

*Chapter Seven: Unmeasuring the Measures* ~ That in depicting systems of
dynamic change, the measurement is not the measure, and news of
difference is more relevant than confirmation of appearance.

*Chapter Eight: Myth and Metonym* ~ That when the data does not fit the
model, the model reveals a new question of significance, and making the
narrative active enables the authored to become self-authoring.

*Chapter Nine: Reflexive Reflections* ~ That the quality of a system of
conceptions sets the potential for its self-observation, and also describes
the quality of reflexion that occurs in its various forms of recursion.
The theme that connects these reflections is that with new eyes the phenomenon of conceptions is seen with new clarity. The significance of this expanded appreciation is the recognition that descriptions of systems of conceptions are not reducible to other theoretical principles. The theory of conceptions, therefore, now requires its own terms, principles, conditions and forms of verification.

### 10.4 Who is discovered?

**Reflexive Summation**

In the English translation of Pierre Teilhard de Chardin's (1959) *The Phenomenon of Man* there is a short introduction by Sir Julian Huxley who describes what knowledge enables:

> Knowledge is basic. It is knowledge which enables us to understand the world and ourselves, and to exercise some control of guidance. It sets us in a fruitful and significant relation with the enduring processes of the universe. And, by revealing the possibilities of fulfilment that are still open, it provides an overriding incentive. We, mankind, contain the possibilities of the earth’s immense future, and can realize more and more of them on condition that we increase our knowledge and our love. (Teilhard de Chardin, 1959, p. 28)

The summation of this thesis is confirmation of the condition that Huxley places on the possibilities for the future. Without knowledge, our caring is insufficient. Without sufficient caring, we may direct attention to ineffective forms of knowing. The third component needed is the embodied action that results from the presence of both our knowledge and our love.

It is also wisely stated that in the ascertainment of belief "one can perceive something’s absence as well as its presence" (Ackoff & Emery, 1972, p. 83). When we cannot see someone who we expected to be there we *discover* that they are missing. The ‘who’ that is rediscovered by this thesis is the collective potential for reflexive human choice. The concluding proposition of this thesis,
therefore, is that the potential for collective reflexive learning is enabled by the
description of what is discoverable by the eyes of a hundred conceptions, which
cannot be seen by one person alone. By the understandings gained by this
thesis, it is proposed that the possibilities open in humanity's 'immense future'
for that discovery may have been appropriately enhanced.

William Varey
References


Graves, C. W. (1946). *A study of the genesis and dynamics of psychopathic personality as revealed by combining the clinical case history and experimental approaches.* Unpublished PhD Dissertation, Western Reserve University, Cleveland, OH.


Paskins, K. E., Bowyer, A., Megill, W. M., & Scheibe, J. S. (2007). Take-off and landing forces and the evolution of controlled gliding in northern flying
squirrels (Glaucomys sabrinus). Journal of Experimental Biology, 210, 1413-1423.


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Endnotes

1 This moment occurred while watching the live web-streamed coverage of the final hours of the 15th Session of the Conference of Parties to the United Nations Framework Convention on Climate Change (COP 15) in 2009 and the contentious discussions on the adoption of the Copenhagen Accord which was argued to provide a framework for future (as opposed to present) actions in response to climate change predictions (UNFCCC, 2009).

2 This dissertation is a précis of the research conducted. The nine abductive inquires were completed over a period of two years and written up (i.e. by a 506 page, 156,000 word analysis, relying on 1535 references, supported by a 120 page annotated bibliography and an abductive journal of over 550 entries, together with tables, charts, mind-maps and matrices). This dissertation reports on the second-order (and third-order) reflections and synthesis of that primary work.

3 In a recent confirmation of previous predictions it still is estimated that by 2030 the second highest cause of the global health burden after heart disease (in terms of Disability Adjusted Life Years) will be unipolar depressive disorders such as mental illness and depression (Mathers & Loncar, 2006). Arguably, if we were to meet the present priorities and cure all forms of cancer and the illnesses related to HIV infections by 2030 we would not have dealt with the potentially larger burden of the invisible impairment to human potential resulting from an absence of individual (and collective) psychological coping.

4 In an abductive inquiry the initiating research question may undergo a series of transformations. This occurs as data, hypothesis formulation, theory development and theory appraisal shape and transform the explanatory hypothesis (Haig, 2005a). Accordingly, rather than a single research question, this thesis addresses ten separate research questions and develops an appropriate method for each within an abductive discipline.

5 Instead of a formal methodology chapter, as might appear in a hypothetico-deductive thesis, this abductive thesis records methodological progressions in the abductive research conducted for each chapter. This chapter-by-chapter elucidation provides the mortar between the brickwork of the overarching architecture of the abductive method adopted.

6 One novel conclusion from the development and application of this method was the consideration of the effect of omission of each of the nine phases developed. Each omission identifies nine potential category errors in epistemology. The effect of the inclusion of each research phase (and the errors avoided) are articulated in Chapter Ten.

7 An express acknowledgement is made to Atocha Aliseda (1997) for the inspiration for the chapter headings and format of this dissertation. These are derived from her own Stanford University dissertation on abductive computational logics in artificial intelligence. Innovations of form take courage and this is appreciated by those who follow.

8 Boler (Boler, 1963) discusses Peirce’s distinction for abstractions and gives the example of a prescriptive abstraction as defining a campus library building as ‘large’, being only one of its features (i.e. ignoring others, such as its colour, composition, shape or materials of construction). This is contrasted with a description of the library as having ‘largeness’, which then becomes an essential feature encapsulating the essence of its significance. The hypostatic abstraction can then be discussed independent of the relationship to the source phenomenon itself (e.g. the largeness of significant buildings).

9 Peirce illustrates his own argument with the examples of ‘white’ and ‘whiteness’ [CP 2.428] and that ‘honey is sweet’ and ‘sweetness’ [CP 4.235], pointing out that ‘precind’ comes from the Latin ‘to cut off at its end’, noting how prescriptive abstraction is not ‘precise’ in its simplifications.
Fischer et al. (Fischer, et al., 1984) note that developmental levels in the skill of abstract thinking beyond Level 10 probably involve ‘new developmental levels’ and new domains with large amounts of time needed to consolidate and generalize them (e.g. systems of systems of principles). This distinction is potentially the recognition of the difference between the levels used in the abstract processes of thinking by an individual (i.e. content recursion) and the levels of development in ‘thought’ available to humans generally (i.e. pattern abstraction).

These levels can be compared to the stage theory of cognitive development in Jean Piaget’s theory of structuralism for childhood development (Piaget, 1928, 1972). This thesis primarily concerns phenomena not isolated to the individual person. As a result its method does not need to be limited to adult cognitive development. In theory, the depictions that result might equally include childhood thought as being within the category of significant phenomena.

These levels of skill in individual capacities for abstract thought explain some of the ways in which the research question of this chapter might be misconceived. In terms of skill, the observation of ‘thought’ is an abstractive logic that requires practice. In terms of abstract levels of development, those different levels of skill will be exercised across a range of levels from reduction into concrete experience to subtle perceptions in cross-paradigmatic systemic relations. The point is that each of these forms of thinking will theoretically re-describe the focal research phenomena differently, with different levels of skillfulness, despite its formal clarity.

While it is noted that informal abduction occurs within formal grounded theory (Haig, 2005c), a distinction can be made between the open inquiry of grounded theory (Glaser, 1992, 2001; Glaser & Strauss, 1967) and a formal abductive method which is characterized as being more outcome directed and problem specific (Haig, 2008c; Romeijn, 2008).

One of the most interesting observations from this analysis was how within the primary levels of classification there are multiple forms of meta-level recursions. Accordingly, each level of hypostatic observation contains multiple layers of prescriptive abstraction. This reveals the source of a potential conflation error when hierarchies of recursive levels are compared across levels of organization (i.e. essentially combining generalized hierarchies indiscriminately). Meta-theories by recursion are not necessarily forms of generative learning by abstractions.

This form of comparison potentially allows for an examination of the health of our healths when enacting health ethics in sustainability practice (i.e. in the same way that we might ‘learn about learning’ or potentially to ‘think about thought’).

Gregory Bateson (Bateson, 1991), especially in his later writings, considers the nature of the corrective change in human identity required for sustainability from a spiritual and naturalistic perspective (i.e. Learning IV). Of significance is his appreciation that this species level change is not solely at the individual level, but involves a genetic and ecological change in the reciprocities of the environment that contains the living entity that is humankind.

In the 1955 essay, A Theory of Play and Fantasy, Bateson (Bateson, 1972) resolves Whitehead and Russell’s paradox of vitiation where ‘a thing is also its class’ by exploring how animals communicate the non-verbal signal for play in acting out (as learning) instinctual combats and hunting forms. The signalling of a meta-communicative context transforms the barred teeth and extended claws into a different symbol and a different learning space is enacted. Thinking about thought by using levels of abstraction is not a uniquely human trait. It is an evolutionary one.

It is recognized that the formulation and validation of levels of abstraction about abstractions of thought potentially involves something akin to cross-paradigmatic operations of cognition (Commons, et al., 1984). However, it is proposed that the secondary task of the recognition and identification of conceptions is a mere cognitive skill. According to skill theory, people acquire specific skills in particular contexts and ‘they have to work to generalize and differentiate those skills to produce more integrated powerful ways of thinking’ (Fischer, et al., 1984). Prior to that specific skill being acquired the avoidance of complexity may trigger cognitive defences. This may appear as shifting focus, merging distinctions, or reducing the complexity. When a new task
cannot be accomplished immediately by mimicking, instead of simplifying the task to the highest level that can be handled, one form of cognitive defence is to 'reduce the task to something much simpler' by concretization, recitation or reification (Fischer, et al., 1984). For the concept of conceptions we should expect to see in the future both the skill of recognition and various forms of abductive reductions, depending on how different cognitive capacities are applied. Essentially, it is not that such distinctions are too difficult to understand, it is only how we respond to that understanding that makes this task of identification apparently difficult.

19 Other similar units of observation were considered as potential alternatives. The conclusion reached after the analysis was that these alternative forms constitute a level, type, or category of phenomena different to that intended as the observational focus for this research. These potentially useful theoretical objects were primarily not adopted to avoid the error of conflation in the categories of logical-types (Whitehead & Russell, 1927).

20 The use of the homonym of conceptions in phenomenography points to a level of observation that describes the qualitatively different ways in which aspects of reality are perceived in individualized situations. The process relies on second-order "statements-about-perceived-reality", which are contrasted to first-order "statements about reality" (Marton, 1981, p. 188). While such processes may aggregate commonalities of perceptions into abstract structures, this thesis specifically approaches a distinctly different outcome requiring a different form of observation.

21 As an interesting aside, in the course of this comparison of relevant theories I had reason to read the collected published works of Abraham Maslow (including his pre-doctoral studies) and his personal journals for the period 1950-1970, together with his unpublished papers (Maslow, 1936, 1937, 1943a, 1943b, 1959a, 1967, 1973b; 1982, 1996, 1959b; Maslow & Flanbaum, 1936; Maslow & Mittelman, 1951, 1981). The conclusion reached was that the theory of motivational-values could not be equated to the phenomenon of conceptions. The real benefit gained was to follow Maslow’s similar abductive process from formation, to formulation, and into explication over a period of decades. For the abductive researcher, an appreciation of biographical progressions (i.e. the giant strides walked) is equally as informing as the understanding of conceptual gains attained (i.e. the shoulders viewed from).

22 Ackoff and Emery (1972) describe how the process of meaning-making involves beliefs about consequences and actions “expressible as sign complexes that are statements or propositions” (p. 134). The analysis conducted of how conceptions are formed is consistent with their formulation and this distinction.

23 As one example, Morris (Morris, 1991), provides a meta-theoretical analysis of the changing nature of the Western conception of the ‘individual’ in a comprehensive review of multiple philosophical domains, including empiricism, holism, existentialism, structuralism, pragmatism and Hegelian-Marxism. This approach indicates the potential for the study of conceptions to also reveal detail about the structures of the philosophical domains from which they are derived.

24 The premise of an abductive logic as a scientific method is that for discernable effects there are identifiable causes (Haig, 2005a; Peirce, 1957). The process of abductive inference involves reasoning from the phenomena to the theoretical explanation of its causation by identification of underlying causal mechanisms (Haig, 2005a). The primary question in the exploration phase of abductive theory is how to find phenomena of relevance. The goal is a plausible theory of causation for observed effects rather than mere philosophical speculation (Haig, 2005a). This premise changes the role of phenomena-generation away from supporting selective arguments and towards generating potentially wide-reaching propositions.

25 An often use abductive method in empirical psychology is exploratory factor analysis (Bandalos & Boehm-Kaufman, 2009; Haig, 2000, 2008a, 2008b, 2008c). The presently poor accuracy of the initial data generated in the exploratory stage of this thesis means more detailed forms of statistical analysis would have been impractical and counter-productive. However, the
theoretical stages of an abductive method for psychometric analysis are equally sound and so have been adopted noting this limitation, working with the data using less detailed graduations.

26 One early proposal for this research involved examining conceptions of sustainability, being a data set of familiarity. It was noted that the technical and academic terminology of sustainability theory (e.g. resilience, generational equity, carrying capacity, sustainable development, biodiversity etc.) is now frequently used in public conversation, sometimes indiscriminately. In this research, the apparent confusion of content is actually where the real data lies. However, rather than bias the phenomena analysis with a personal preference a different (and even more generic) conception was selected.

27 It is important to note that while the content of the topic of health is immense, the problem-constraint of this research is narrowly focused. The research aim was not to examine and compare the content of all health concepts, but rather the dynamics of the composition of a representative sample of health conceptions. This accords with the selected level of observation for this thesis.

28 Potentially, and not recognizable at that time, these three observations point to a significant finding in the theory of the dynamics of the formation of systems of conceptions. Because this relates to a quality, of an abstract dynamic, between abstract objects, at a specific (and novel) level of abstraction, these principles are not relevant to the analysis at this point of the research. For that reason, merely the fact of the initial observation is noted, providing a future reference for the first intuition supporting subsequent theoretical propositions.

29 The quotes compiled are representative samples of the conceptions. They are not the ‘conception’ itself, only representative evidence of it. The definitional extracts are taken from vast bodies of work and philosophical positions representing complex systems of human thought. The analysis made was of the conception from its source context. The conception itself is not reducible to the content, syntax, or concept described or defined in the extracted quotation. The extract quotes are more like the numeric data recorded from laboratory samples of experiments conducted over an extended period of observation and compiled for analysis purposes. They do not represent (or reconstruct) the actual inquiry undertaken. The format in which they are presented reflects that information without analysis (simply as data).

30 For clarity, a semantic and conceptual distinction is made between ‘definitive characteristics’ and ‘defining features’. The phrase ‘definitive characteristics’ refers to the second-order observations from the data set referring to the phenomena of significance (i.e. definitive). The phrase ‘defining features’ refers to the abductive inference drawn from those observations as to what might be the in-common features that identify and define all conceptions (i.e. a third-order abstraction). The first phrase is data set specific, but leads to the second phrase, which is abductively generic.

31 At one stage of the research the defining feature of centrality was identified by the label ‘directionality’. Subsequently, I realized that this term might imply the observer’s assumption of teleology. Because teleological assumptions were not made out by the data of the observations, the concept of ‘direction’ was instead described by a self-reference to the conception itself. The term ‘centrality’ is used to reflect the absence of an observer attributed direction or purpose (i.e. there is no ‘up’).

32 Significantly, in his early research Engel had rejected psychosomatic studies as a passing trend without substance. He only later became interested in psychogenic pain and the physical correlations of mental states. This led him to subsequently study the effects of grief on biomedical health (Engel, 1962). This reflects the changing and evolving nature of individual conceptions, much like the dynamic phases of the diseases Engel was attempting to describe.

33 Specifically, the biopsychosocial model is sometimes described as representing a positive move towards methodological pluralism in the selection of treatment modalities, while at the same time the model is also interpreted as an invitation into epistemic pluralism in the
undisciplined (or post-disciplinary) practices of complementary modalities (Ghaemi, 2003, 2007). These radically different interpretations possibly represent new adoptions of the central concept of Engel’s conception subsequently applied into new contexts.

34 The original collation matrix used the principles of integral methodological pluralism (Wilber, 2006) and involved ten levels of complexity, reflecting evolutionary developments, coded into four quadrants, across a minimum of eight broad epistemological domains of inquiry. This supported a comprehensive collation of representative conceptions. The only conceptions that coded easily into the collation matrix were those self-identified as integral conceptions. This prompted the early recognition that one cannot code for conceptions using the epistemological premise of an unreflexive conception, as the phenomena simply becomes enfolded into the conceptual domain of the observer. The benefit of this failure in my own assumptions was the source of the origination of a different epistemological premise.

35 This combination of logic, intuition, and practical effect in Peirce’s philosophy enables him to be characterized as an idealist, a constructivist, and a scholastic realist (Boler, 1963). It is his unique combination of nominalist, constructivist and positivist principles resulting in conjunctural forms that makes Peirce’s work specifically relevant to this thesis.

36 It is noted by Luisi (Luisi, 2003) that the extension of autopoiesis theory to social systems, while conceptually feasible, is problematic if one neglects the concept of boundary when defining the ‘limit of a human group’ (e.g. a team in an organization). Luisi quotes Varela as saying that generally these “ideas are based, in my opinion, on an abuse of language” (cited in Luisi, 2003 p. 57). This highlights the need for structural consistency with the foundational principles of autopoiesis so as to retain conceptual validity when applying these concepts across disciplines.

37 The attribution of ‘self-organizing’ to a system relies on an observer-based perspective (i.e. ‘organized’ is an evaluative description). Notwithstanding the use of and reliance on this term in appropriately describing autopoietic systems in many contemporary applications (R. Kay, 2001; Thompson, 2007), this idea potentially constitutes the semantic-coupling of language domains that Maturana explicitly cautioned against (Mingers, 1995). For that reason, the literature on ‘self-organization’ is not relied on in this analysis.

38 In analogical comparison there is no independent way to evaluate whether the inferences drawn are justified (Holyoak & Thagard, 1996). At a minimum, the structural isomorphs must be comparable and the source and target mappings should have a transparency which appears logically coherent (Holyoak & Thagard, 1996; Schurz, 2008). In an analogical abductive process the primary benefit is in the exploration of similarity and difference. By the abductive process new associations may become apparent (Holyoak & Thagard, 1996). This highlights how abductive comparisons differ from rhetorical assertions. In rhetoric we represent ‘it to be’ and in formal abduction we seek ‘what it might be’.

39 Interestingly, a philosophical contemporary of Ockham was philosopher John Duns Scotus, who strongly influenced the work of Charles Sanders Peirce. These principles of stringency and economy in abductive theory may have influenced William James’ own (yet different) philosophy of pragmatism (Boler, 1963).

40 For clarity, a common misconception of the maxim used (but not invented) by English logician, Father William of Ockham, is incorrectly stated as the heuristic principle of ‘tend towards the simplest explanation’. In an abductive theory process involving complex phenomena, gross simplifications may promote forms of naïve reductionism defeating the open investigation deriving explanatory worth (Boler, 1963). The desired research balance is actually to achieve descriptive economy without negation of the complexity.

41 Homeostasis is described by Maturana and Varela (1973) as remaining constant by being static. This can be achieved in two ways, either by maintaining the components constant, or by maintaining as a constant the effect of relations between components otherwise in continuous
flow or change. It is the second more complex description that defines this use of homeostasis for the autopoiesis of the living.

A useful distinction is made between ‘organizational closure’, which defines the moment of formation of the autopoietic entity by its composition, and ‘operational closure’, describing how effects of the dynamic network do not leave that network (Maturana & Varela, 1987). Organizational closure is used when defining autopoietic existence and operational closure is used when describing autopoietic interactions.

The autopoietic distinction and description of these two forms of ‘niche’ has great significance in terms of the development of the proposition of ‘cognitive niches’ in Chapter Eight and specifically with the implication of their enaction and depiction in systems of conceptions.

As sociologist, Niklas Luhmann (Luhmann, 1987, 1989) points out for social autopoiesis theory, the concept of ‘the environment’ in human autopoietic systems as conceptualized in terms of language is within the system of communications. This is an internal representation of the ‘actual’ environment (that which is outside language and exists in a wider reality). The environment external to the social system is one unavailable to the society and its agents in terms of the domain of interactions that constitute communications. The argument is that a social system cannot decide to protect the ‘actual’ environment, rather only the conception of it that is within its domain of discourse. Examining ‘conceptions’ of the environment in the way envisaged by this thesis explicitly discloses what is potentially included and what by implication is unavailable as it is omitted.

In a constructive critique of Luhmann’s reliance on self-reference, Wagner (1997) clarifies that the awareness of the self so as to make an object of the system of communications as a form of self-reference, depends on the construction of a conceptual environment (which is done in a meta-self-referential space). This capacity for self-enacted abstraction is a unique feature of human learning. Our construction of an environment situates the self-system within a context allowing for differentiation of the conceptual self from the self-in-system. Therefore it could be said that: meta-reflection creates a meta-abstraction by way of meta-situation.

As to the conclusion of whether conceptions are autopoietic or only ‘autopoietic-like’, I have intentionally left this question epistemically open as at this stage of development of the theory, quite simply, we do not know enough to know. Instead of observer-based attributions of autopoietic characterizations to systems of conceptions, a better approach may be to assess the phenomena on its own basis, with the analogy used primarily as a means of noticing differences.

The relevance of this original work by Maturana and Varela (1973) is how it enables identification of the minimal conditions for the dynamic formation of enactive systems without a primary dependence on observer-based descriptions. The result is that existence is a question of philosophical fact, rather than observational opinion. This enables the formation of principles of definition, the presence or absence of which provide the factually determinable criteria for existence. The relevance of this criteria-based approach to identifying the composition of conceptions is intensely practical. It means conceptions can be defined by the presence of necessary and sufficient criteria. This is significant in achieving the research aims of this thesis (i.e. disclosure of the dynamics of systems of conceptions without observer-based projections).

The implication of this conclusion is that the negation of any of the compositional elements for conceptions (i.e. loss of composition, loss of configuration, or loss of central-orientation) would involve a loss of conceptual viability. By analogy, in neurobiological terms this loss marks the division between life and non-life. In a theory of conceptions it marks a similar (and possibly no-less dramatic) distinction. In speculation, this would be the distinction between meaningfulness (i.e. sense-making) and meaninglessness. In terms of conceptions, this raises the proposition that the viability of a conception might be judged by whether it continues to be meaningful. If a conception is not meaningful, having failed in terms of its ontological validity, it
may no longer have existential viability. The autopoeisis question is can a conception that becomes meaningless then be said to have ‘died’?

49 In one of his last publications, Varela (Varela, 2000) proposed three simplified conditions for the determination of autopoeisis as it is applied to neurophenomenology (i.e. cognitive biological autopoietic entities). These are: 1) whether the system has a semi-permeable boundary that 2) is produced from within the system and 3) that encompasses reactions that regenerate the components of the system’ (p. 57) (Varela (2000) as cited in Luisi, 2003). Varela also noted two other indicia. These both relate to ‘purposiveness’ and are described as ‘identity (self-production) and sense-making (adaptability and cognition)’ (Thompson, 2007, p. 153). This results in an entity-centered ‘immanent teleology’ (Thompson, 2007), being a directionality that is towards self-maintenance coupled with an adaptive response to the environment (A. Weber & Varela, 2002). It is argued that while these two additional criteria are not necessary conditions for autopoeisis, they point to the establishment of ‘cognition’, being necessary to constitute ‘life’. Cognition (i.e. re-cognition) and adaptive responsiveness are then proposed as being necessary as the additional indicia for sentence, which together with autopoeisis would to be necessary and sufficient criteria for constitution of a ‘living’ entity (Bourgine & Stewart, 2004). This raises the question of what might be the similar categorising principles for the phenomena of conceptions?

50 In an interesting extension, Ackoff and Emery (1972) supplement the triad of ideals of the good, beautiful and the true with the ‘quest for plenty’, noting that purposeful systems are ‘ideal-seeking’ enabling multiple path formation. This reflects the integration that occurs in Plato’s ‘true goodness’ (Ackoff and Emery, 1972). Effectively, the coherent triad establishes the need at the next level of abstraction. The result is the ‘omni-potence of plenty’ is immanently available (at each level of coherence) and (also) a never ending quest.

51 By way of contrast, logical positivist Rudolph Carnap (Carnap, 1967) in The Logical Structure of the World (1928) proposed this distinction as three discrete types of objects, being: physical objects (which have spatial location, temporality and empirical qualities), psychological objects (which have temporality, but no spatial location or qualities), and cultural objects (which exist temporally and have to be enacted as artifacts to endure in temporality) (Niiniluoto, 2006).

52 Sorokin (1975) while examining the super-rhythm of the Ideational-Idealistic-Sensate as a process of unfolding proposes that three main systems of truth, being creative intuition, discursive dialectic and sensory experience (i.e. faith, reason, and empiricism). These become irreducible and “with an increase of the domination of each system, its part of truth decreases while the part of error increases” (p. 682). This form of an ‘integral three-dimensional truth’ is stated to have greater adequacy by incorporating the abduction of discovery, the induction of dialectic syllogism, and the deduction of deductive empiricism.

53 Koestler explains how Act of Creation (1964) was first published in two parts (i.e. Book One and Book Two). Book Two of that first edition was subsequently removed and the ‘essential points’ were recapitulated in what became the third in the trilogy, The Ghost in the Machine (1969). The sequel to that work, Janus: A Summing Up (1978), comprises the ‘fifth’ part of this extensive trilogy. It is useful to read all these accounts as a single work on one major theme.

54 Koestler (1970) is direct in pointing out that the act of abductive discovery is a hard fought battle which once won is easily described as inevitable and its creation immediately adopted as if freely available. In his words: “Let me repeat: the principal mark of genius is not perfection, but originality, the opening of new frontiers; once this is done, the conquered territory becomes common property.” (Koestler, 1970, p. 406). The point made is the opening of new territory in humility is not the same act as its occupancy in familiarity (notwithstanding how ‘at home’ one feels in that new discovery). Koestler enumerates the subtle pretensions of false appreciations.

55 An example of this form of hypothesis is the characterization by Ken Wilber of the I-WE-IT (and by extension ITS) as the universal structure of all ‘holons’ (Wilber, 2000d). The individual-
social holon is effectively used as the ontological unit in a narrative theory of consciousness (Wilber, 1998a). The hypothesis statement made is: "There is nothing that isn't a holon (upwardly and downwardly forever)" (Wilber, 2000d) (p. 41). The compositional structure of the nominal holon becomes the definitional representation of the integral (Wilber, 2006).

An example of this form of hypothesis is the characterization by David Bohm (Bohm, 1994) of thought as a system. Bohm’s view describes the personal thoughts of an individual self as a ‘culturally inherited sensibility that over-emphasizes the role of isolated parts’ (p. xi) and that accordingly individual thought is an ‘idiosyncrasy’ of the ‘collective movement of values, meanings and intentions’ (Bohm, 1994)(p. xi). The specific content (and structure) of individual thought is therefore, in a one sense, irrelevant other than for the collective learning of the implicate order.

Peirce intentionally formed new concepts to avoid the presumptions of other philosophies relating to different categories of inquiry. The distinctions Peirce makes are rather unique in their concept and precision. However, they are also confusing when one follows the iterative history of their development. Peirce describes these irreducible phases of phenomena as spontaneity, dependence, mediation [CP 3.422], as feelings, efforts, habits [CP 6.201], as quality, reaction, representation [CP 5.66], and as icon, index, symbol [CP 5.73]. My own (equally obscure) description is that the dynamics of aperception, apprehension, anticipation enact a conception and by their coherence entrain its composition.

There is an important distinction to be made between the formation of conceptions (as phenomena) and the resultant of perception (by that phenomenon). In Peircean terms, Firstness is not the same as sensations or feelings, as it precedes label, memory or differentiation. It represents the enduring quality of the potential qualia and ‘it is only by virtue of quality that anything is accessible to consciousness’ (J. H. Smith, 2000) (p. 70). Importantlly, the realm of Firstness is not an object related to a subject and is the potential state not determined nor identified (Muller, 2000). Secondness is the one to one relational correspondence of an object and its image and ‘puts a boundary around Firstness’ (Muller, 2000) (p. 51). Thirdness, is a category of generality and habit or law, and is required for thinking memory, prediction and any experience with continuity and that occurs in community (Muller, 2000). Thirdness mediates Firstness and Secondness into meaning as habits. Rather than parts of a ‘thing’ these are co-dependent processes of formation. It is only in their coherence that a reality results enabling the phenomenon of perception.

Peirce as a scholastic realist makes the distinction that, in respect of the universals of Thirdness, they are habits or generalizations, but not universal laws that equate to forms of conceptual or Platonic nominalism. Essentially, because his proposition relies on the fact of Secondness, it does not need to assert the existence of realist universals, only their reality as a pattern which appears from what occurs as a fact (Gough, 1969). The implication is that conceptions have some originating premise, but not any pre-determined ultimate form.

For reasons of precision, these source works (rather than the derivative theories which describe and apply Simon’s rationale and terminology differently) are preferred in this context.

Foucault in The Archaeology of Knowledge (Foucault, 1972) proposes levels of organization for the density of discourse, including: emergent statements, types of enunciation, rules of formation, and substitutions of discursive formations. In doing so, he recognizes that the real history of ideas is not found in the narrative of the narrator, but in the patterns of dispersal, differences, and disappearances that comes from ‘opening up possibilities’ for future development (p. 206). The complexity that results has many layers for recovery and uncovering.

This description of subsystems recalls the sub-structures that form relations of processes between components in autopoietic entities (Maturana and Varela, 1973) as discussed in Chapter Three, and also foreshadows the cross-scala nature of adaptive cycles in larger scale systems as forms of panarchy (Holling, 1973), which is discussed in Chapter Five.
63 Simon states, correcting naïve assumptions about the inter-connectivity of hierarchical complex systems (in an accessible simplification of this highly complex work): “Everything is connected, but some things are more connected than others.” (Simon, 1973) (p. 23). In this quote he is describing how most things are weakly connected and how, the discernment of only a few strong connections, can constitute a meaningful pattern for seeing the whole.

64 While the level of observation adopted does not permit an extension into a discussion of semiotics, in an observation on art and creativity Wheeler (Wheeler, 2006) describes how not only environmental objects, but also language, may create cognitive affordances. In this way forms of creativity in content might shift the patterns of history to overcome the ‘law-like directionality’ of Peircean habits (i.e. praxogenesis). It is precisely the causes of the generative enablement of those shifts that this thesis has been structured to examine.

65 Jung wrote the Seven Sermons in three evenings in a sort of flow state perceived as a form of “haunting” (Jung, 1967). Interestingly, Bateson (Bateson, 1972) in Pathologies of Epistemology draws a similar parallel with the plorama and the creatura in isolating ‘difference’; describing the plorama as the world of ‘forces and impacts’ in the hard sciences and the creatura as the world of ‘communication and organization’, which interpretation is inconsistent with Jung’s text. Bateson uses the concepts as metaphors, changing their meaning while also making similarly significant distinctions (Harries-Jones, 1995) (p. 96-99). Bateson insightfully describes how to get from undifferentiated territory to useful map by news of difference in a creatura ‘organized in multiple levels of logical typing’ (Bateson & Bateson, 2005) (p. 14) (see Chapter One).

66 By way of clarification, Koestler (Koestler, 1967) uses the example of driving a car which has motor functions that are subject to ‘sublimation’ until a dramatic change in circumstances (e.g. an animal running across the road) requires re-attention to the lower-order functions with conscious actions. In sustainability theory, like with driving a car skillfully, the real concern occurs when the exercise of ‘flexible-strategies’ requires attention to lower-order functions immediately, only to find they were never present (or are no longer presently available). At this stage the adaptive hierarchy becomes non-responsive.

67 Koestler’s (Koestler, 1978) depiction is highly nuanced, proposing that different forms of holons can be perceived in different conceptual systems, recognizing explicitly biological, cognitive, evolutionary, ontogenic, behavioral, linguistic, functional and social holons (Cf. Wilber, 2000).

68 In this characterization, the most vulnerable structure is the fully-nested definitional holarchy with finite definitional criteria and no interlocking feedbacks. The potential for collapse is increased equal to the levels of transcendence gained by inclusions without supplementary integrations. The inter-relationships of complex structures provide integrity, not mere diversity.

69 This reflects (and is consistent with) the tri-partite hypothesis for necessary and sufficient conditions for the formation (and definition) of autopoietic entities (Varela, 1981). That discussion considers if the inter-related hypotheses for formation apply only to the production of a first-order entity (i.e. an autopoietic entity), to a second-order entity (e.g. a complex living being) or also to third-order entities (e.g. an autopoietic community of sentient beings) (Bourgine & Stewart, 2004); or potentially to all of these forms. Specifically, this raises the question of what is the necessary and sufficient criteria to define the existence of a conception?

70 This form of conjunction is well known in spatial geometry. It is known as the trefoil knot, which is frequently represented in formal (and recreational) mathematics (Fredman, 2002). It requires a form of ‘hyperscoping’ which takes conjunctions of three-dimensional surfaces and extends their perception to different locational configurations (Fredman, 2002). This form of representation has implications for the choices made for depiction in Chapter Eight.

71 This problem of reification in naïve realism is taken from ecological systems theory, where it is noted that “problems arise in disciplines where the object of study is similarly scaled to ourselves or, worse yet, exactly the same as ourselves, as in psychology.” (Ahl & Allen, 1996, p. 390.
38). This difficulty also applies to a conception examining conceptions. This limitation is not resolved, merely acknowledged, and made primary in the consideration of a means of depiction.

In developing this approach Peirce provided an important addition to the philosophy of science at this juncture by arguing against positivist extremes and disputing Auguste Comte's (1798-1857) position that a hypothesis must be capable of verification by direct observation. Peirce proposed that an abductive hypothesis need only provide a present explanation of observed facts to qualify for admission (Peirce, 1960). As Peirce points out, the extreme positivist position of requiring immediate observation of predictions as verification would mean a hypothesis of causation of a past event is logically impossible. This would lead to forms of scientific phenomenalism and a 'solipsism of the present moment' (Fann, 1970). In the study of emergent phenomena (i.e. potential future forms) this challenge to the assumption of observational immediacy is even more significant.

74. The analogy process described is to be distinguished from the isomorphic analogy used in the theory-generation phase to develop preliminary understandings of possible propositions and to derive broad principles from the exploratory phenomena detected (see Chapter Three). Instead of the abstract isomorphic structure being important, it is the iconic characteristics of the imagined model that provide the comparison (Harré, 1970). Rather than a source to subject comparison, this abductive approach confirms when the unknown is found by the matching of iconic criteria.

75. A more detailed discussion of the arguments for comparison and selection of panarchy theory from the alternatives presented by a various integral and ecological systems perspectives is contained in a published conference paper (Varey, 2010b). In that paper the distinction is drawn between the respective uses of definitional, empirical and observational holarchies (each of which is appropriate for different inquiries).

76. There is an obscure reference to Peirce's abductive theory in Martin Gardner's exquisitely annotated notes to Lewis Carroll's The Hunting of the Snark (Tanis & Dooley, 1981). Gardner notes that the 'five unmistakable marks' of the Snark (i.e. thimbles, forks, a railway share, smiles and soap) are the tests of the anecdotal criteria of a resultant imagined form (i.e. an iconic paramorph of an abductive object) (see Fn. 44). Gardner additionally suggests that Carroll's requirement that something is true once stated three times is a direct reference to Peirce's categories of firstness, secondness and thirdness (see Fn. 47).

77. Essentially, the conclusion is that if systems of conceptions were panarchy-like in their structure, this would provide an explanation of the apparent necessity for the causal connection between the three proposed hypotheses. This proposition was confirmed by anecdotal evidence taken from existing research which examines other questions. If there were no evidence of any of the panarchy-like criteria the proposed hypotheses for conceptions might still be valid, only they would most likely be less easy to confirm. Arguments could then be selectively made for admission or dismissal. Accordingly, the process of theory-confirmation proves nothing about the validity of the proposed hypotheses. It merely confirms that the conditional assumptions adopted are consistent with other supplementary observations within existing understandings.

78. The process of theory-confirmation adopted by Dubois used iterative and intuitive stages in a purposeful, yet meandering, pattern of development. In linking the previously separate disciplines of geology and anatomy within evolutionary theory Dubois established a new field. Specifically, he developed a method of cranium volume calculation from partial specimens. This new methodology provided the means to examine the abductive hypothesis (Dubois, 1896). While the initial findings were easily rejected from within existing disciplines, for future evolutionary palaeontologists holding the same questions, his research provided important developments of theory and process for the field.

79. The necessary conclusion is that panarchy theory itself, as a complex socio-ecological psychological system, might equally be subject to panarchy dynamics equivalent to resilience,
connectedness and potential when the patterns of its own evolution are considered reflectively and meta-paradigmatically (Gunderson, Folke, & Lee, 2010; Gunderson, Holling, & Allen, 2010).

Rather than analysing ecological or socio-ecological systems separately, there may be circumstances where it is more relevant to be considering socio-ecological-psychological systems. The argument made is that where the analysis of ecological systems involves human agents (i.e. the necessary actions of reporting on observations, descriptions and predictions) the psychological dynamics of expectation and limitation also operate, constraining and entraining the scope of insights and reflexive perceptions in a panarchy of psycho-social interpretations (Varey, 2011b).

An example of a parallel inquiry is the adoption of the ‘ecosystem’ concept in anthropology (Moran, 1990b). The critical distinction made is that because ecosystems are usually formed at a single level of observation the adoption of ecosystem principles in anthropology potentially obscures relationships observable at other levels (Moran, 1990a). Specifically, biologists and anthropologists deal with systems of very different scales in space and time. Hence, the uncritical adoption of biological principles for social systems is seen as a problematic extension in sociology.

For this reason the term ‘thought-ecologies’ has been adopted as a convention in this thesis. This indicates that the dynamics of systems of conceptions are not reducible to the principles of biological ecologies, even though there may be relational similarities (especially in terms of complexity). A ‘thought-ecology’ is also a much narrower concept than Bateson’s ‘ecology of minds’ which extends beyond the landscape of thought to the pattern that connects all life (Bateson, 1972).

The term resilience is often used as both a single dimension of the adaptive cycle of the panarchy model and interchangeably as a qualitative and descriptive property of ecological systems generally. This can create a logical category error when the two meanings are combined in the one analysis. For clarity, the definition of resilience used for this comparison is as a dimension of observation in a panarchy analysis, and not as an overall qualitative descriptive property of the ecology being observed.

Carpenter et al. (Carpenter, et al., 2001) assert that when moving from a descriptive metaphor to methodical measurements of resilience the researcher must clearly state the time period and scale applicable to the observation. This introduces the idea that resilience involves questions of range in terms of the cross-scalar effects for different spatio-temporal spans and scalar levels of observation. The intended range should be explicitly taken into account and made transparent or that other scales are expressly excluded from the assumptions informing the observations.

Fundamentally, the ‘potential’ of an ecological system may include the available stocks of nutrients, the dispersal of banks of germinating seeds, and the biomass or food resources that constitute the ‘richness’ of the biological conditions for life (Holling & Gunderson, 2002). In a collapse of organization some of the potential resources necessary for system establishment may ‘leak away’, literally, leaving the system and possibly altering the potential for future regeneration, limiting the system’s potential only to further degraded states (Holling & Gunderson, 2002). This can easily be contrasted with the vulnerability to change (i.e. resilience) and control over variability (i.e. connectedness) as being the potential for the change that can occur whether actuated in phases of collapse or growth (Holling & Gunderson, 2002).

One characteristic feature of the dimensions of ‘potential’ in a panarchy model is how it changes dramatically in the different phases of the adaptive cycle (Holling & Gunderson, 2002) (i.e. the α - alpha phase of reorganization, the r phase of exploitation phase, the K-conservation phase, and the Ω - omega phase of release). While the forms created by the other dimensions (i.e. connectedness and resilience) may decrease, potential itself may be retained and transformed or even increase (e.g. the release of seed and trace elements in a forest fire). From this feature it is argued that systems without cyclic recurrence may lack temporal robustness.
Ideally, the measurement modality must accommodate data sets from just a few points in the micro up to city-sized population sets in the macro, which can operate independent of cultural or temporal contexts, to enable data gathering pertinent to a broad range of human concerns. For the individual-level categorization of conceptions (reflecting a different measurement question at a different level of observation) the methodologies of phenomenography may provide reliabilist alternatives (Bowden & Walsh, 2000; Marton, 1981, 1986).

Arguably, the converse proposition would theoretically also be true, with a failure to develop adequate GRR in childhood leading to a weak SOC, with less potentiality for the development of a strengthening range of GRR later in life (without subsequent learning interventions). It appears in this conjecture that SOC may work both ways, supporting a model in which coherence forms and ‘uniforms’. This would be reflected by a psychodynamic model of periodic reformulation and reconstruction with SOC scoring differently in different life stages.

Antonovsky (1979) further extended the premise of an individual SOC to the group context, proposing that, just as with the individual, the experience of collective breakdowns will further weaken the dynamic experience of the level of coherence possible for that group. He proposed, in theory, that a group can become demoralized while its members retain their own integrity of SOC individually, even in the face of collective adversity (A. Antonovsky, 1979).

In respect to the applicability of the SOCS test to different societies and cultures, Antonovsky cites his contemporaries in psychology (i.e. Abram Kardiner, Eric Fromm and Erik Erickson) to dispose of the notion that that there is a fixed human nature and finding that each cultural group develops and responds adaptively to their changing environments differently, yet similarly (A. Antonovsky, 1991). On the potential for scalability, Eriksson et al. (2007) notes that while Antonovsky discussed the societal level applications of salutogenesis this theme has not been actively taken forward.

The collation of the original work containing his theory has been subsequently reconstructed and published posthumously from the draft manuscript Graves prepared, voice recordings, private archive records, personal recollections and available published and unpublished papers (Graves, 2005).

This researcher expresses gratitude to Dr. Don Beck and Chris Cowan for their exacting descriptions of Graves’ research derived directly from their work with Clare W. Graves. Their descriptions of this theory in their individual fields of respective interest are commended for those seeking detailed applications of the theory. For the purpose of this analysis, Graves’ own methodology is of primary relevance and so preference has been placed on that original work.

Interestingly, in Graves’ own PhD dissertation he adopts a multi-method approach and developed an innovative form of clinical classifications for the psychotic personality, using the classification of categories and sub-categories of systemic factors (rather than relying on generic symptomatic and descriptive typologies) (Graves, 1946). This early innovation potentially guided the development of his levels of existence theory in utilizing a similar abductive process of discernment of systems of organization by the heuristic use of logical categories of types.

Graves (2005) noted that following the recurrent confirmation of the independently coded categories over a period of years he was forced to conclude: “Therefore, to my mind, there was nothing left to do but accept this mildly peculiar result as a psychological phenomenon suggesting that several discernible conceptions of mature personality do indeed exist.” (p. 93). Instead of existential forms, perhaps an alternative conclusion is that the mature adult human personality can consistently recognize degrees of difference using abstract categories. What is potentially then seen is merely that ‘something meaningful is seeable’ by people equally. This suggests that within the unique differences of personality there is a deeper commonality within our humanity.
Various useful survey instruments have been developed to test for values-based projections and self-identifications in the Spiral Dynamics® formalization of Graves' abstract levels of existence. Because Graves' original theoretical constructs and methods of measurement were so closely aligned with the dimensions proposed in this research, those instruments were considered as potential forms for comparison but were outside the specific research criteria.

Of significance is the fact that in a situational assessment of health conceptions no value or worthiness is placed on one particular orientation over another, with each having its own merit in appropriate situations (Laffrey, 1986).

The argument was made that the previous absence of considerations of greater dimensionality was primarily due to the medical profession's conception of health being situated in an illness-based approach and that this neglects or negates the multidimensional view of health held ordinarily by non-professional individuals (Laffrey & Kilbok, 1999). This professional bias was opened for examination and the scope of health conceptions expanded to include situations where healthcare needs also involved health promotion and prevention, as in the fields community nursing and health education.

The reduced format of the RLHCS creates a more appropriate instrument for the literacy or education needs of certain sample groups. However, the effect is the opportunity to determine dispersals of health conceptions across broad categories of education, age, income and work situation is reduced in simplifying the nuanced distinctions that Smith (J. Smith, 1981, 1983) originally proposed. This highlights that conceptions of health held may influence the design of conception of health research, including in the re-design of its validating research instruments.

Hwu et al. (Hwu, Coates, & Boore, 2001) conducted a meta-analysis of the evolutionary developments in health conceptions in the literature from the nursing field from 1988-1998. This examined the presence or absence of tests for physical, social, and psychological health in 68 studies from two time periods and concluded that health conceptions have become increasingly multi-dimensional in conception and measurement with some clear conceptual absences in existing methodologies. There are also similar phenomenography studies on this specific topic supporting the view of a wider range of health conceptions (McCosker, Barnard, & Gerber, 1999; Sjöström & Dahlgren, 2002).

This finding could be simply explained by reason of the fact that a person will not reasonably choose health behaviors specific to a health conception that is not conceptually available to them, although they may engage in such proactive health behaviors ostensibly for other reasons, such as peer-perception, socialization, or simply for personal enjoyment (Laffrey & Isenberg, 2003).

The assumption of stage-like progressions would be acceptable on pragmatic, not theoretical, grounds. Much like looking for a speeding train, in following its forward and return route the train is in fact only where it is (at any point in time). However, the station stops, while being the least likely place to find the train in terms of actual location at any point in time, is where we feel we have the greatest chance of catching it on the trajectory of its continual passings (and yet the stationary vehicle provides no indications of its probable next direction).

In the context of changing circumstances, the availability of GRR (i.e. general resistance resources) to maintain a SOC, may or may not support an existing Orientation. If one is ill and has social support such that functional roles can be fulfilled, an Orientation for example in a conception of health of flexible and adaptive salutogenesis may remain consistent. It is in the absence of adequate GRR for a specific situation that a salutogenic orientation might alter reactively, resulting in a regression in levels of Integration.

In a panarchy structure, multiple levels of existence will be operating in different spatio-temporal environments simultaneously. An inquiry into similar structures for conceptions might reveal a mix of phasic Orientations within levels of Integration. The design learning is to recognize that states of dynamic transition are the norm, rather than the exception. In Graves’
words: “Change in the centrality of conception was not rare.” (Graves, 2005 p. 103). This questions why we would attempt to look exclusively for levels in a presumption of progressions in set stages when cyclic transition between multi-state regimes is a frequent and naturally occurring dynamic in most other natural systems.

104 Kurt Lewin’s concept of the individual ‘life space’ includes the concept of the adjacent environment being like the ‘foreign hull of the life space’ containing the non-psychological facts of the world. He proposed how the study of these niche spaces would constitute a ‘psychological ecology’ as a topological system of individual conceptions (Lewin, 1952).

105 Hutchinson (1978) attributes the multi-dimensional approach to niche definition originally to Russian, L. G. Ramensky, but for his own influences he notes E. F. Haskell’s contribution (Haskell, 1940) [Fn 25 p. 158]. Coincidentally, Edward Haskell’s (Haskell, 1972) own investigation of Gause’s theorem as applied to multi-scalar co-action analyses has greatly informed my own understanding of the practical effects of ‘cognitive niche’ interactions and the corresponding effects on the ecology of thought (Varey, 2009b).

106 The interactions of multiple species when modeled in a hypervolume is described as ‘niche-packing’. Hutchinson speculates that in hypervolumes of two, three, and greater dimensions the continual pressures would form niches of regular, non-regular, and then semi-regular solids. The greatest volumetric regular ‘niche space’ shape is a tetrakaidecahedron (i.e. a combination of hexagons and squares) (Hutchinson, 1978). This description is reminiscent of Sir Charles Darwin’s allusion that the face of nature may be compared to ‘a yielding surface’ of ten thousand wedges packed close together (Darwin, 2006a).

107 Hutchinson (1961) noted that due to competition in resources and the effects of environmental turbidity the chance of niche stratifications in lakes remaining static would be unlikely. The niches, and the formative conditions of each species as a result, are more often in continuously fluctuating modes of complex change and reformation within the greater contextual dynamics of the forces of stabilization (Hutchinson, 1961). The implication of this portrayal, as an analogical model for a method to conceptualize the causation of layered potentials in multi-leveled psychodynamic systems, is truly remarkable (and potentially is able to be modeled).

108 In this study by Olden et al. (2004) the homogenization of a community of endemic species by an introduced species is modeled to examine the biotic impoverishment of the ecosystem. There is no conceptual reason why a similar analysis could not be conducted for the complex ecology of communities of thought, representing how introduced ideas (when left uncritically challenged) may populate and dominate endemic conception transforming the landscape into new derivations of the original conception.

109 This conflict of a divergence of emphasis reflects the reason for framing the choices in abductive emphasis in each phases of this research. I would argue that the conceptual criticisms of niche theory at that time are a reflection merely of a difference in emphasis from competing paradigms of inquiry, which may similarly occur in a different forms even today. An example is the playful opposition to the ‘guess-and-test’ approach in empirical psychology and the inductive analysis of data generated without a hypothesis (Rozelboom, 1961, 1962, 1982, 1997). These divergences do not need to be resolved, only navigated.

110 Ackoff and Emery (1972) reference Kirk and Talbot (1966) in describing these three forms of representational error by the visual metaphors of ‘stretch, fog and mirage’. The error of ‘stretch’ systemically alters the image, the error of ‘fog’ obscures part of the phenomena, and the error of ‘mirage’ provides additional information that is false.

111 This distinction is explained further by Magnani (2001). Abduction requires a context in which to formulate causal explanations for effects, whereas in induction only the skilful and methodical guessing at random correlations is required. Magnani (2001) notes “induction firstly aims at generalizations, where abduction is focused on particular observations.” (p. 30).
112 Haig (2005b) explains that this approach to abductive rigor assists in partially resolving the problem of indeterminacy. In the appraisal of many competing theories some may be compromized by an under-determination of theory by the lack of empirical evidence. Exploratory factor analysis ‘narrows down the space of potential infinity of candidate theories to a manageable subset’ (Haig, 2005b, p. 320) so as to facilitate judgments of initial plausibility.

113 A considerable period of time was invested in determining and reconsidering if the third dimension of Orientation could be eliminated, as being either an environmental factor or a secondary result of variations in the dimensions of Coherence and Integration. From the analysis in became clear that Orientation operated as an independent dimension and could (and also should) be tested for separately. This itself was felt to be a significant discovery.

114 The dimension of greatest difficulty to delineate was Integration. This was initially because of an incorrectly placed presumption that greater complexity proceeds from a low level to a high level and this represents is the appropriate premise for delineation. This assumption, derived from patterns in developmental psychology, was incorrectly adopted for conceptions. The correct analysis of the dimension was found to be less about the complexity of content included and more about the third-order dynamic of the operational range (i.e. in terms of the number of multi-state configurations potentially available). The assumptions for delineation were altered accordingly.

115 This stage represented a particular conundrum. In the counterpart analogy of developmental psychology there is an assumption of established ‘stages’ and abstract ‘levels’ of development, with distinct sub-phases providing established graduations of variance. A Gravesian (Graves, 2002) analysis of conceptions explains that operant levels of existence are in continual variance, being subject to environmental conditions (i.e. the disturbed lake). It is likely that, for conceptions, there will also be constant changes in the forms of stratification. The conclusion is that in the changing ecology of thought there can be no ‘immutability of species’ (F. Darwin, 1969). The implication is that the appearance of static or stable structures is potentially only due to limitations in the psychological timeframe of the conception of description. This made the adoption of set protocols or stage-exemplars (that are assumed to remain static) untenable.

116 For the prediction of scenarios, Carpenter et al. (2002) offer a simple mathematical model to show how catastrophic events can generate multi-state systems of equilibrium in lake systems. In the formula \( \frac{dx}{dt} = ax - bx^2 \) the unwanted factor \( x \) (e.g. eutrophication causing turbidity) is affected by the rate at which factor \( a \) (e.g. nutrient loading) is mitigated by factor \( b \) (e.g. nutrient removal) subject to replenishing factor \( r \) (e.g. internal nutrient recycling). The effect of internal-cycling (i.e. the system feeding itself) changes the simple equation \( x=a/b \) to a multi-state highly variable scenario. The panarchy structure of multiple bounded spatio-temporal cycles makes the variation of the internal cycling factor potentially continual. A simplistic metaphor for this might be a house-party from which people continually leave, at their next location telling more people to go to the party, which keeps the party going until the total effect of the gradual degradation from new inputs overload the system, at which point the party is permanently over.

117 The illustration provided by Ernst Schumacher (1974) for the semantics of future planning provides for acts and events (i.e. intentional), in the past and the future (i.e. narrational), that are certain or uncertain (i.e. ascertainable). These represent three related and irreducible dimensions. The dimensions of Coherence, Integration and Orientation represent a similar three-dimensional set of semantic distinctions. Like Schumacher’s analysis, the semantic precision of the definition of the dimensions themselves is less interesting than the difference that their resulting forms reveal in their potential possible combinations.

118 I am grateful to sustainability educators and practitioners, Joshua Floyd and (the late) Frank Fisher for introducing me to cartoonist Michael Leunig’s Understandoscope (Leunig, 1991, p. 76). This image of a bemused observer looking at the city of complexity through that so-labelled device represents many of the questions of this thesis. In a critical review of social psychology and the description of social cognition the ‘unafflicted’ and ‘unaffiliated’ observer is seen as
inseparable from the observed and so the view must also be 'focused backwards on the viewer' (Augoustinos, Walker, & Donaghe, 2006). This form of second-order reflexivity is potentially achieved by the process of modeling described.

119 The term 'apitive' derives from 'apical', being a technical term commonly used to denote the point of emergence in living systems (e.g. growth cells, plant stem buds, embryo morphology, estuary outflows in river systems).

120 Korsybski explicitly references American philosopher, Josiah Royce, who had provided the highly nuanced counterpart concepts to the territory and the map contained in the World of Description (i.e. the world of distinct forms) and the World of Appreciation (i.e. the world of interconnections between minds without division) (Royce, 1896).

121 In a wider contextualization of the semantics of representation, Wilber in No Boundary (Wilber, 1979) reminds the reader: "Boundaries are illusions, products not of reality but of the way we map and edit reality. And while it is fine to map out the territory, it is fatal to confuse the two." (p. 30).

122 Hohningen-Huene (1990) considers Kuhn's conception of incommensurability and characterizes this as a theory of 'world constitution' formed by what is "perceptually and conceptually subdivided in a certain way" (p. 129). He clarifies that 'local incommensurability' means not all meanings change in competing paradigms. It is noted that there are many evidentiary continuities that are used equally by competing paradigms, and that by learning the meanings of both theories (i.e. the referents for changed and new concepts), comparison between paradigms is possible based on 'in-common' evidences.

123 It is also noted by Hohningen-Huene (1990) that even after "full mastery of the new conceptual vocabulary" (p. 490) incommensurable paradigms are not to be compared point by point, rather only by a comparison globally "with respect to their simplicity, accuracy, fruitfulness, predictive power etc." (p. 490). Accordingly, a more overarching structural analysis is required.

124 For clarification, the evaluation of 'best' for an abductive hypothesis has two distinct roles in two separate phases of the abductive method. The first occurs at the time of formulation when competing inferences are selected (i.e. internal to hypothesis formulation). The second occurs following formulation, construction, definition and demonstration where the explanatory worth of the proposed hypothesis is appraised (as a totality) in comparison to its pragmatic alternatives (i.e. external to hypothesis construction).

125 Harman's dismissal of enumerative induction as redundant was correctly refuted by Ennis (1968) who instead proposes standards of rigor for this form of inference. A useful distinction is made between a 'justified belief' in induction as an expectation (e.g. 'the next A will be B') and an 'explanatory account' in an abductive proposition (e.g. If B, then A). Perhaps these distinctions are as simple as requiring equal clarity in the 'why (it occurs)' (abduction), the 'what (will occur)' (induction), and the 'how (it occurred)' (deduction) as a combinational process of knowing applicable to any phenomenon generally (and systems of conceptions specifically).

126 The appraisal test specified for explanatory coherence involves the configuration of the three appraisal dimensions in a way not dissimilar to the conditionality of the inter-relationship of the hypothesized dimensions for conceptions (Thagard, 1988). This reflects a level of complexity, interdependency, and simplicity commensurable with that of the proposed hypotheses.

127 The inherent limitations of explanatory coherence as an evaluative approach are noted in various critiques (Thagard, 1991). Specifically, these include: vagueness, indiscriminateness, isolation, conservatism, circularity and truthlessness. Thagard explicitly deals with these critiques by accepting the limitations and proposing mitigations in method (Thagard, 2000). These antidotes are (respectively) to take account of: specificity, appropriateness, situation,
iteration, non-linearity, and knowability. This pragmatic approach in practice makes the test of explanatory coherence effective as an abductive method.

128 To assist with different questions of appraisal alternative forms of a theory of coherence are proposed, including deliberative coherence (Thagard, 2000), emotional coherence (Thagard, 1998), ethical coherence (Thagard, 1978), and (prospectively) theological coherence (Thagard, 2000). In this case, the appraisal of explanatory worth for hypothesis formation makes explanatory coherence the appropriate form for selection.

129 To understand this approach the metaphorical example of finding a solution to a cross-word puzzle is provided. Like clues in a puzzle, the abductive propositions must meet positive constraints (e.g. the third letter is provided as ‘e’) and negative constraints (e.g. the total number of letters is not more than 5) as structures of entailment (Thagard, 2000). The problem-constraint and solution-demand of this thesis are examples of this approach in abductive method.

130 Thagard uses this same framework of principles to develop specific principles for each type of epistemological coherence, such as: explanatory coherence (E1-7), analogical coherence (A1-6), visual perceptual coherence (V1-5), conceptual coherence (C1-5), and deliberative coherence (L1-6) (Thagard, 2000). In this context, the principles for explanatory coherence are used primarily.

131 As an example, when evaluating explanatory hypotheses comparisons must be made at the same level of analysis (e.g. evidence, propositions and hypotheses). In levels of abstraction the 'hypothesis' of one theory may be 'evidence' used in a meta-theory. Mistaking the level of abstraction in tests for adequacy leads to the irresolvable error of conflation (Thagard, 1989).

132 Bateson (1972) deals with the problem of conflation of levels explicitly and practically by creating columns dividing 'uninterpreted data', 'heuristic concepts', ' trollsical propositions' and 'fundamental propositions' (p. 24-25). By making these distinctions clear valid comparisons between hypotheses can be formulated on criteria beyond the conflict of cross-level paradigmatic preferences. The undesirable alternative is to simply assert either abstraction or reduction (i.e. higher generalizations or more mundane predictions) as evidence of the greater validity of one theory over a counterpart theory.

133 It is noted that Wilber draws on both Peirce’s semiotics and Suassure’s semiology in amending Whitehead’s depictions into a form of ‘quadratic prehension’ so as to explicitly supplement perceived limitations of Peircian semiotics to include the syntax of ‘systems of semantics’ (i.e. the ‘Lower Left Quadrant’) (Wilber, 2006). This reflects a preference for quadratic (rather than triadic) depictions (and the corresponding resulting implications).

134 The term ‘ontonomy’ is described in the works of Raimon Panikkar (Panikkar, 1995), being a description of the ‘realisation of the relational’ found in an ‘intra-in-dependence’, which is ‘neither autonomy or heteronomy’ (Panikkar, 1973), but more the (ever-changing) music guiding the dancers in the dance (Panikkar, 2010).

135 For clarity, Peirce’s pragmatism (renamed as ‘pragmaticism’ [CP 5.414]) differs from the philosophy of William James of the same name. Peirce’s own philosophy became increasingly nuanced from (what he describes as) his ‘crude’ initial formulations before seeing ‘the unity of the whole thing’ [CP 8. 253]. This unity is how the pragmatist ‘logic’, is ‘found on ethics’, which rests ‘on a foundation of aesthetics’ (i.e. corresponding to a triad of Feeling, Reaction, Thought). Peirce confirms the significance of this inter-relationship by stating: “The true nature of pragmatism cannot be understood without them.” (Peirce, 1960, p. 189) [CP 8.256]. Similarly, my conclusions cannot be understood without also having an appreciation of this premise.

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<tr>
<th>Chapter</th>
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<th>Critical Question</th>
<th>Abductive Phase</th>
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<td>Is it Explainable?</td>
<td>Theory Formulation</td>
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<td>Five</td>
<td>What confirms it?</td>
<td>Is it Confirmable?</td>
<td>Theory Confirmation</td>
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<td>Seven</td>
<td>What measures it?</td>
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### Categories of Learning

Learning is multiple conjunctions of object, activity, mutation, resultant, domain, and recursion generating distinctly different forms of the resultant. Each level of objects can be merged into the meta-theorization of different classes of cases in each level of relations of each level of objects. The effect of such cross-classes result in recursion of the resultant at each level of observation. Different forms of learning may use the resultant of each level of learning within different resultant levels. These represent several domains of inquiry as the various activities of thinking abstractions within a level of learning.

**Notes:** Each level of abstraction in learning utilizes different units of observation. The focus of the function by using different conjunctions will vary.

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<th>Learning V</th>
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<th>Resultant of Function</th>
<th>Conceptions</th>
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### Appendix B – Levels of Abstraction and Forms of Recursion
1. “It is important to determine how and in what manner the various forms of medical knowledge pertained to the positive notions of ‘health’ and ‘normality’. Generally speaking, it might be said that up to the end of the eighteenth century medicine related much more to health than to normality; it did not begin by analyzing a ‘regular’ functioning of the organism and go on to seek where it had deviated, what it was disturbed by, and how it could be brought back into normal working order; it referred, rather, to qualities of vigour, suppleness, and fluidity, which were lost in illness and which it was the task of medicine to restore.” (Foucault, 1973) (p. 40)

2. “We can call this an example of animistic thinking, where in various phenomena are controlled by personalities, by individuals called gods, similar to man but more powerful, who can, by their volition, control the course of events. Nature, the world of the phenomena, is under direct supernatural control.”… A sharply contrasting view we find in the familiar Hippocratic text, “The Sacred Disease,” describing epilepsy. This condition [epilepsy] is not “any more divine or sacred than any other disease but, on the contrary, has specific natural characteristics and a definite cause,” that is, is not due to any volition of the gods.” (L. King, 1978) (p. 17)

3. “I dare say you have heard eminent physicians say to a patient who comes to them with bad eyes, that they cannot undertake to cure his eyes by themselves, but that if his eyes are to be cured, his head must be treated too; and then again they say to think of curing the head alone, and not the rest of the body also, is the height of folly. And arguing in this way they apply their regime to the whole body, and try to treat and heal the whole and the part together. Did you ever observe that this is what they say?” (Plato, 2004) (p. 27)

4. “Scientific medicine, for its part, has as its object the investigation of those altered conditions which characterize the diseased body or various ailing organs, the identification of abnormalities in the phenomena of life as they occur under specifically altered conditions, and, finally the discovery of means for abolishing these abnormal conditions. It presupposes therefore a knowledge of the normal course of the phenomena of life and the conditions under which this course is possible. It is therefore based on physiology. Scientific medicine is compounded of two integrated parts -pathology, which delivers, or is supposed to deliver, information about altered conditions and altered physiological phenomena, and therapy, which seeks out the means of restoring or maintaining normal conditions.” (Virchow, 1958) (p. 27)

5. “It was impossible to analyze statistically many of the ideas expressed by the children because of the abstract, philosophical nature of their comments but a general feeling did begin to emerge. It became clear, as alluded to by one-third of the nine-year-olds and one-half of the twelve-year-olds, that being healthy and being sick were two different things. As one twelve-year-old said, “I can’t exactly say, but I think health is like having a good body and being active. If you have a cold, you get over it quickly. Sick is like having something a long time. You can’t do anything.” (Natapoff, 1978) (p. 998)
6. “The disorders of the body and the mind are to a very large extent the consequences of inadequate responses to the environment. They involve not only a particular organ but the organism as a whole. For this reason, the practice of medicine demands of the physician a holistic attitude that goes beyond that of the experimental scientist.” (Dubos, 1971) (p. 52)

7. “It is safe to begin any discussion of health by saying that health is normality, since the terms are interchangeable in clinical contexts. But this remark provides no analysis of health until one specifies the norms involved... Since statistical normality is therefore neither necessary nor sufficient for clinical normality, most writers take the following view about the norms of health; that they must be determined, in whole or in part, by acts of evaluation. More precisely, the orthodox view is that all judgments of health include value judgments as part of their meaning. To call a condition unhealthy is at least in part to condemn it; hence it is impossible to define health in non-evaluative terms. I shall refer to this orthodox view as normativism.” (Boorse, 1999) (p. 78)

8. “Thus the concept of health involves a descriptive component (what someone is able to do) as well as an evaluative component (what it is important to be able to do, in order to be able to live a good life). Similarly, the concept of disease involves a duality between a description (a physiological or functional difference between the patient and the healthy norm) and an evaluation (the judgment that this difference is abnormal or dysfunctional, and not just different). However, this duality is obscured in everyday practice, in part due to the scientific aspirations of medicine and scientific assumptions built into the medical model.” (Chiong, 2004) (pp. 129-130)

9. “[Health is the] … maximum wellness orientated toward increasing the potential of which every individual is capable.” (Dunn, 1961)

10. “Moreover, as I hope will become clear, disease, as the generic name for the cluster of symptoms and identifiable pathological conditions of the body, is not a notion symmetrical with, or opposite to, health. Health and unhealth – i.e. health and falling short of health – are true contraries, not health and disease.” (Kass, 1981) (p. 11)

11. “To sum up: Health is a natural standard or norm – not a moral norm, not a “value” as opposed to a “fact”, not an obligation, but a state of being that reveals itself in activity as a standard of bodily excellence or fitness, relative to each species and to some extent to individuals, recognizable if not definable, and to some extent attainable. If you prefer ... “the ‘well-working’ of the organism as a whole,” or again, “an activity of the living body in accordance with its specific excellences.”” (Kass, 1981) (p. 18).

12. “Crabgrass only exists in a unhealthy lawn. It is a symptom, not a disease in itself. By providing a fertile soil and giving the desired grasses a good start, it is possible to create an environment in which crabgrass cannot grow, for it requires open space in which it can start from seed year after year.” (Carson, 1962) (p. 67)

13. “Much of this holistic framework is intended to emphasize the interrelationship between the processes taking place in various parts of the human organism – in other words, to make a point that supporters of the analytic method would not necessarily disagree with, namely that man is in a sense a “functional whole.”” (Phillips, 1976) (p. 121)
14. “Obviously, no government can guarantee health to each of its citizens (for one thing, most hereditary disorders are not detectable before birth nor curable by present methods). What citizens can claim is a right to an environment compatible with health and a right to decent care when illness occurs. Such an environment is one where the air is breathable and the water drinkable, and one where shelter is available, where each person is free from assault and treated with respect, and where the community provides health care to all with illness and suffering. Those ideals have yet to be attained in many countries of the world; this report insists that none of us can rest secure until these basic human rights have been assured for all.” (Desjarlais, Eisenberg, Good, & Kleinman, 1995) (p. 12)

15. “Health in an ecological context is that equilibrium between biological processes and the constraints of environment, on the one hand, and between the individual needs and aspirations and the possibility that the environment can satisfy them, on the other hand.” (Bernis, 1999) (p. 155)

16. “Health from a total environment perspective, means on the one hand adequacy of the construction and function of organisms, and on the other the conditions in which organisms are formed and live. Thus health is a state of ‘dynamic balancing equilibrium’ of the organism in relation to environmental conditions. However, this criteria should not be applied rigidly in view of the tremendous flexibility of the human organism. Such adequacy means the satisfaction of both biological needs rooted in the evolution of the species, and of those aspirations arising from the cultural foundations of our society.” (Wolanski, 1999) (p. 91)

17. [Health is] … “a process of both increasing complexity and increasing diversity of human field pattern and organization, emerging out of the continuous, mutual, and simultaneous interaction between the human and environmental fields.” (Rogers, 1980) cited in (Laffrey, 1985) (p. 280)

18. “Health could be understood as a ‘certain’ psych-physical condition of humans determined by a ‘proper’ structure of the organism as well as a result of a ‘dynamic balance’ between the organism and its environment (homeorhesis).” (Wolanski, 1999) (p. 79)

19. “One of the basic questions, when moving from human health concerns (city air pollution) eco-system health concerns, is what exactly constitutes ecosystem health. A daunting problem is the lack of referents. In many places the entire natural community has been disturbed by pollution, logging, hunting, fire, fishing, and agriculture, sometimes to the extent that is difficult to ascertain the original composition of the system before man. In the case of historical disturbances by preindustrial man (e.g. controlled burning) we may never know what the ecosystem was like in man's absence. Trying to ascertain the characteristics of ecosystem health by studying perturbed ecosystems is analogous to the efforts of early psychologists to define human behaviour largely from studying the mentally ill. We are no longer satisfied with a definition of mental health that is stated in terms of the absence of hallucinations. Even when reasonably unaltered referents are available, it is still not easy to define ecosystem health … Thus detection of degrees of ill health in the ecosystem is necessary.” (Loehle, 1991) (p.145)

20. “Ecosystems attain a sustainable level of functioning when, on average, over periods long enough to include their disturbance cycles, rates of loss and gain of organic matter and nutrients are in balance. If decreased biodiversity were to lead
to greater losses of nutrients and organic matter, the long-term effect would be lower average amounts of organic matter and limiting nutrients, which would lead to lower fertility and productivity and likely changes in species abundances and community composition... We need better knowledge of the number of species required to assure the sustainability of various ecosystem functions and how this depends on spatial patterning, spatial scale, and time. The answers to these questions will be of great importance for managing ecosystems to achieve sustainable flows of the goods and ecosystem services essential for human life.” (Tilman, 1997) (p. 109)

21. “The health of humans is determined by their genetic heritage and how they interact with the environments in which they live. These environments provide sustenance and protection, but also present hazards to life and health. Even in primitive communities, human environments are complex, being always made up of many interrelated physical and social elements. Social elements impact heavily on the physical environment, as human activities continuously alter natural conditions. Among these social elements, demographic factors are powerful determinants of the state of the environment and, thereby, the state of human health. Both the environment and human health are now endangered on a global scale, and demographic factors are crucial in this crisis. (p. 103) … The best point of departure in that task may well be to focus it on the highest stakes of all: the integral relationship between the health of the planet and the health of the people. (p. 124) (Schaefer & Kreisel, 1994)

22. “When I was a traditional physician, I was content to regard healing as the restoration of health. But today I know that healing is far more than a return to former condition. True healing means drawing the circle of our being larger and becoming more inclusive, more capable of loving. In this sense, healing is not for the sick alone, but for all humankind... Healing, wherever and however it occurs, brings each person and humanity as a whole toward a more inclusive, more unobstructed relatedness to all that is emerging in this adventure of life.” (Moss, 1989) (pp. 36-37)

23. “In short, the modern conception of illness is a technological achievement. It is based upon a complex set of attitudes toward the body, persons, and society in which the individual alienates his or her own body experience in favor of the judgments of professional practitioners considered the guardians of rationality... Yet we are learning that we need to reject our passivity with respect to medical institutions. To do so, however, we must learn once again to listen to our bodies, to treat our living as an art, to read our soul into the smallest things we do. In this way, we may write ourselves into the Book of Life.” (O'Neill, 1982) (pp. 139 - 140)

24. “Trying to understand the characteristics of ecosystem health by studying perturbed ecosystems is analogous to the efforts of early psychologists to define human behavior largely from studying the mentally ill. We are no longer satisfied with a definition of mental health that is stated in terms of the absence of hallucinations... The general process of regression in response to chronic stress has since been documented for many ecosystems ... This situation suggests criteria for determining ecosystem heath. If a system is going through progression along the expected trajectory, it is healthy. If its progression is slowed or halted, it
is stressed. If retrogression is occurring, stress severe.” (Loehle, 1991) (pp. 145-146)

25. “In the new view of health we cease to see disease as entirely negative. Health, too is not altogether positive for us. The fact is, the distinctions between health and disease at a point begin to blur. Why? For one reason, we have come to see the impossibility of events such as health and disease as being “local”—i.e., they are connected and dependent on all distant happenings in the universe. This degree of connectedness suggests that “good” or “bad,” “health” or “disease” are capricious and arbitrary judgments. In the new view we attach little value to health and disease. Rather than seeing them as good or bad, to us they seem to be simply a statement of the way things are. For us this is not a statement of passivity and blind acceptance, for we can still act to change the physical state of the body. It is merely a feeling born of the recognition of the interpenetrating oneness of all things.” (Dossey, 1982) (p. 145)

26. “The distinguishing feature of public health is its focus on populations rather than individuals. Public health studies the distribution of disease and positive attributes of health in whole populations. Clinical work is based on work with individuals who are either at high risk for a disease or who have a disease. Treating high-risk or diseased individuals does not have much impact on population health levels overall, but changing a risk factor across a whole population by just a small (and often clinically insignificant amount) amount can have a great impact on the incidence of a disease or problem in the community.” (Baum, 2002) (p. 14)

27. “In fact, if one is interested in species survival, one will wish to have a number of individuals poorly adapted to their present environment so that the species can draw on them in the future, should the environment change. Thus, health as successful function or adaptation must be specified with respect to the circumstances (that is, environment), the goals sought, and whether the bearer of such functional success is the species or the individual.” (Caplan, Engelhardt, & McCartney, 1981) (p. xxv)

28. “An ecological system is healthy and free from “distress syndrome” if it is stable and sustainable— that is, if it is active and maintains its organization and autonomy over time and resilient to stress.” (Costanza, Norton, & Haskell, 1992) (p.9)

29. “Bateson’s work (1975b, 1979) links these two theoretical strands by providing the idea of pattern. Health would not then be defined in terms of host and agent, person and environment or cause and effect, but as the pattern that connects. An ecological theory of public health must be based on this idea.” (Kickbausch, 1999) (p. 45)

30. “The issue that ecosystem approaches to human health—the Ecohealth approach—address is no less than humanity’s place in its environment... For those with a holistic vision, humanity with its aspirations and its cultural, social, and economic universe is at the heart of the ecosystem, on an equal footing with biophysical parameters. The living and the nonliving elements of nature interact toward a dynamic equilibrium that, better managed, should ensure the sustainable development of human communities.” (Lebel, 2003) (pp. 2-3)

31. “Healthy ecosystems and landscapes are those that, on some regional scale, maintain their full functions, unimpaired, while, at the same time, making it
possible for human settlement. Ecosystem health is the study of the circumstances that enable ecosystems to maintain their full functionality while providing sustainable livelihoods and conditions that favor cultural wellbeing and public health... From the ecosystem health perspective, the maintenance of the health of ecosystems, so that they maintain their full potential to sustain life itself, is the primary focus.” (Rapport, 2007) (p.78)

32. “I think it is instructive to discuss health in relation to something other than people, just to give us some perspective. A recent veterinary dictionary has defined health as “a state of physical and psychological well-being and of productivity including reproduction”. This definition combines what philosopher Larry Haworth (1994) has termed ‘flourishing’, that is, the development of the animal according to its genetic inheritance, with the ability of the animal to perform functions which are desired by people. Similarly, plant health has been defined as “the relative freedom of the green plant and its ecosystem from biotic and abiotic stresses that limit its producing to the maximum of its genetic potential over time”. As with plant, animal and human definitions, those of ecosystem health and agroecosystem health which have appeared in the past few years appear to include a component which emphasizes organizational maintenance or integrity, and a component which suggests effectiveness, resilience, or capacity to respond.” (Waltner-Toews, 2000) (p. 657-658)

33. “A distinction between mental and physical illness is still made, both by the lay public and by many doctors, and the terms ‘mental disorder’ and ‘mental behavioural disorder’ are still used in the two most widely used official nomenclatures, the World Health Organization’s International Classification of Diseases (ICD) and the American Psychiatric Association’s Diagnostic and Statistical Manual (DSM). This has the unfortunate effect of helping to perpetuate two assumptions that have long since been abandoned by all thinking physicians, namely that mental disorders are disorders of the mind rather than the body, and that they are fundamentally different from other illnesses. In reality, neither minds nor bodies develop illnesses. Only people (or, in a wider context, organisms) do so, and when they do both mind and body, psyche and soma, are usually involved.” (Kendell, 2004) (p. 112)

34. “We thus experience a range of somewhat similar circumstances that we identify as states of illness, deformity, dysfunction, abnormal pain, or defect, and in which we experience ourselves as failing with respect to an implicit norm of physiological or psychological function, of form or grace, or of freedom from pain. These disparate realities constitute for us states of affairs in need of a solution or address through medicine. They are not simply there, they are given to us originally as wrong, as sufferings, as losses, as failures to achieve a taken-for-granted state of painlessness or of proper function or form.” (Engelhardt, 1982) (p.145)

35. “We now realize for example that some of the most important links between our health and living conditions are psychosocial: that is, many of the biological processes that lead to illness are triggered by what we think and feel about our material and social circumstances. Rather than simply having a direct effect on health, as does, say exposure to radiation or lack of adequate vitamins, our circumstances also affect health indirectly through their influence on our subjective experience of life.” (Wilkinson, 2000) (p. 2)
36. “The very word *pathology* which we use for these troubling experiences demonstrates the role medicine plays in psychology’s viewpoint toward the psyche. By far the majority of the specific terms of psychopathology, such as *paranoid, schizoid, psychopathic*, have entered our speech via psychiatric medicine, so that when we think of psychopathology we think immediately of illness... Slowly we have been led to conclude that perhaps these conditions that we have been calling psychopathologies are not true pathologies in the medical sense. ... Today psychotherapy seeks to understand the soul’s disorders as snarled communication, or as a disrupted social nexus, or as frustrated spiritual fulfillment, and is shifting away from the medical toward other models – linguistic, sociological, and especially religious... In order to approach the psychology of pathology afresh, I am introducing the term pathologizing to mean the psyche’s autonomous ability to create illness, morbidity, disorder, abnormality, and suffering in any aspect of its behavior and to experience and imagine life through this deformed and afflicted perspective... Our aim is to see them, and see through them, as perspectives, while maintaining another view that differs from theirs and is psychological. Were we able to discover its psychological necessity, pathologizing would no longer be wrong or right, but merely necessary, involving purposes which we have misperceived and values which must present themselves necessarily in a distorted form. These are the sort of questions that lie before us.” (Hillman, 1975) (p. 56-57)

37. “For example, the personality of a person my be influenced by being well or ill, an internal consideration, but in the final analysis the personality is a matter of how the individual relates to the outside environment through words and action.” (Allen & Hoekstra, 1992) (p. 29)

38. “To heal is not merely to heal the body but to heal the humanity of the person which has been wounded by illness. The assault of illness on humanity is not simply physical, it is ontological, affecting our very image of ourselves – our being – and our circumstance – our world. Illness is a transformation of our being-in-the-world, but not only that; it is an attack upon it, a deformation of it, because it threatens our integrity. This integrity includes that of the self and body and that of self and world. With the loss of these forms of integrity we lose our freedom.” (Kestenbaum, 1982) (p. 33)

39. “*Health* can be defined as the status of ‘being’; how we feel inside ourselves, and how we are seen from outside, at a cosmic level and in comparison to others. *Being* encompasses the totality of our relationships with ourselves and with all else. Therefore the health of human beings is contained in the nature of relationships to whatever surrounds them; the environment as totality- all there is.” (Honari, 1999) (p. 19)

40. “The term *health* in this regard covers a wide spectrum, including health policy making, health research and development, health care delivery, as well as defining the health status of individuals, families, communities and the globe.” (Honari, 1999) (p. 21)

41. “I would like to restate my definition: health is defined here as a sustainable state of total well-being, within sustainable ecosystems within a sustainable biosphere. The creation and maintenance of healthy homes, within healthy communities, within a healthy world is the major objective of human ecology.” (Honari, 1999) (p. 21-22)
42. “This suggests that our dreams are dreamings of the ‘other’. This other is not merely the other parts of myself (‘my unconscious’) or the other as the repressed, forgotten, distorted, disguised. Rather, the dream brings in the fundamental other – the ‘not me’ of the world and the specifics of how I am with it, in it. The world’s soul echoes and moves its imagination in my dream… Today, the symptoms are everywhere. The anima mundi is sick and the ‘other’ cannot be contained within the consulting room. After one hundred years, illness permeates the planet itself.” (Hillman, 2001) (p. 237)

43. “Mental health is not simply the absence of detectable mental disease but a state of well-being in which the individual realizes his or her own abilities, can work productively and fruitfully, and is able to contribute to her or his community.” (Desjarlais, et al., 1995) (p. 7)

44. “It is inappropriate – so the argument goes – to allow such imaginative ideas to become confused with the perceptible realities of disease. “Disease” and “health” are nothing but the products of human minds. They are not ontologically real. They are ideological constructs, convenient for argument and action, but signifying only a nominal reality.” (Burns, 1975) (p. 30)

45. “Although ‘wellbeing’ is increasingly referred to in policy papers this is often in an unreflective way, which assumes its definition is uncontested and that it has a shared meaning. We contend that clearer understanding is needed of what wellbeing means and how it should or should not be used... Two recent research trends within quality of life research have had important implications for understanding wellbeing. The first is a much broader definition and understanding of quality of life so that, in addition to health, such research now includes social, psychological, interpersonal, emotional, cultural, spiritual and environmental dimensions... SWB [Subjective wellbeing] is considered to be a component of, but not synonymous with, mental or psychological health... The second research trend is a growing recognition that subjective conceptualizations, or the ways in which people make sense of their own lives, are central to understanding quality of life from the individual’s perspective. Starting from the premise that quality of life is a dynamic interaction between the external conditions of an individual’s life and the internal perceptions of those conditions, the subjective approach assumes that the perceptions of what constitutes ‘good’ and ‘quality’ are embedded in the context of personal values, goals, talents, histories, and life experiences. [References omitted] (Cronin de Chavez, Backett-Milburn, Parry, & Platt, 2005) (p. 71-73)

46. “In most of these programs, though, health maintenance is still viewed as the prevention of organismic dis-eases and not the establishment of life styles that produce states of “complete physical, mental and social well-being.”... Mental health was the result of constructive activities that were self-fulfilling and societally enhancing. Mental health was an active adaptation to one’s environment, not a passive adjustment.” (Burns, 1975) (p. 43)

47. “The basic needs approach is both more complicated and more ambiguous that the resource approach. It allows, however, for a fuller consideration of the necessary conditions for human development. A basic needs approach focuses on conditions without which human beings are unable to survive, avoid misery, relate to other people, avoid alienation. Having, Loving and Being are catchwords for central necessary conditions for human development and existence... Having refers to those material conditions which are necessary for survival and for avoidance of
miser... Unfortunately a great deal of social science research has continued in its traditional path without measures of the quality of the biological and physical environment... Loving stands for the need to relate to other people and to form social identities... If the physical environment clearly deteriorates, people might lose some of the abilities for companionship, solidarity, and love... Being stands for the need for integration into society and to live in harmony with nature. The positive side of being may be characterized as personal growth, whereas the negative aspect stands for alienation... When the division into Having, Loving and Being is cross-tabulated with the dichotomy of objective and subjective indicators, a six-field table is obtained.” (Allardt, 1993) (p. 89-93)

48. “I have called the basic needs instinctoid or biologically necessary for many reasons but primarily because the person needs the basic gratifications in order to avoid illness, to avoid diminuation of humanness, and positively stated, in order to move forward and upward towards self-actualizing or full humanness. It is my strong impression that something very similar holds true for the meta-motivations of self-actualizing people. They seem to me to be also biological necessities in order a) negatively, to avoid “illness” and b) positively, to achieve full humanness. Since these meta-motivations are the intrinsic values of being, singly or in combination, then this amounts to contending that the B-Values are instinctoid in nature... I will call these “illnesses” (or, better, diminuations of humanness) “metapathologies” and define them as the consequences of deprivation of the B-Values either in general or of specific B-Values.” (Maslow, 1971) (p. 316 - 317)

49. “As Elmer Green has pointed out, if there is such a thing as psychosomatic illness (and no one doubts it), there must also be such a thing as psychosomatic health. If we can make ourselves sick (unintentionally), the we can- with intentionality – make ourselves well.” (Norris, 1989) (p.160)

50. “Subjective well-being is not a single construct, but comprises three distinct and to some extent independent dimensions: a cognitive aspect; life satisfaction; and pleasant and unpleasant affect (moods and emotions)... It differs from the concept of ‘health’ in excluding physical health and in including positive emotions; it is thus less focused on illness and disease (both physical and mental).” (Eckersley, 2001) (p. 61)

51. “The healthy individual is well-functioning as a whole, in harmony physically and mentally with himself and with his surroundings... However, the crux of a concept of health, and its greater meaning or value, is health as a means. Health is viewed as the experience of life as a promise of good; the ultimate good that is hoped for is the full life – this we refer to as plentitude.” (Mordacci & Sobel, 2004) (p. 108)

52. The area of subjective well-being has three hallmarks. First, it is subjective... Second, subjective well-being includes positive measures. It is not just the absence of negative factors, as is true of most measures of mental health... Third, the subjective well-being measures typically include a global assessment of all aspects of a person's life. Although affect or satisfaction within a certain domain may be assessed, the emphasis is usually placed on an integrated judgment of the person's life.” (Diener, 1984) (p. 543-544)

53. “Illness behavior constitutes that set of activities and meanings which people, families, and communities exhibit when bodily changes (pain, shortness of breath,
rash or fatigue) are perceived as symptoms of illness. The process begins when a person who experiences these changes interprets them as meaning he or she is ill and seeks remedy for them. If those who are sick are children, their mothers are the key providers of care and serve as the decision makers about seeking outside help. This is one reason the health of children varies directly with the years of education their mothers have received.” (Desjarlais, et al., 1995) (p. 254-255)

54. “Health policies can be distinguished from “healthy” policies at the level of the state. “Healthy” policies are those government programs that, while not specifically aimed at fighting illness an disease, nonetheless have positive consequences for health.” (Desjarlais, et al., 1995) (p. 203)

55. “Thus in addition to evaluating and explaining reality, in the process of authenticating illness and disease states, physicians and other allied health professionals create social reality.” (Caplan, et al., 1981) (p. xxviii)

56. “In conclusion, health and disease are not symmetrical concepts, nor are they things, though important confusions have arisen from conceiving of them as such... And while there are many diseases, there is in a sense only one health – a regulative ideal of autonomy directing the physician to the patient as person, the sufferer of the illness, and the reason for all the concern and activity.” (Engelhardt, 1974) (p. 43)

57. “The concept of disease is used in accounting for physiological and psychological (or behavioral) disorders, offering generalizations concerning patterns of phenomena which we find disturbing and unpleasant. The concept of disease is a general scheme for explaining, predicting, and controlling dimensions of the human condition. It grades into other concepts which are political, social, educational, and moral.” (Engelhardt & Spicker, 1974) (p. 126)

58. My argument is this paper is one has to go beyond the whole organism as well, and that the locus of medical practice extends to the social, historical and cultural contexts of good health and ill-health.” (Engelhardt & Spicker, 1974) (p. 67)

59. “There are, then, two sense of “health”. In one sense it is a theoretical notion, the opposite of ‘disease”. In another sense it is a practical or mixed ethical notion, the opposite of “illness”. (Boorse, 1999) (p. 81)

60. “Illness and disease are closely related, but diseases – more robust ontologically than illnesses – are regarded as entities having characteristic signs and symptoms (for example, a cervical cancer detected by a Pap smear), though they nearly always lead to manifest symptoms. In illness, by contrast, symptoms are predominant and the underlying pathogenesis is almost ignored; for example, it seems appropriate to speak of a ‘disease process’ but not of an ‘illness process’. Thus disease at the pre-symptomatic stage (whether cancer or tooth decay) would not generally be regarded as illnesses. And someone who was poisoned (for example, by an overdose of aspirin) would generally be regarded as being ill, but not as having a disease.” (Clouser, Culver, & Gert, 2004) (p. 91)

61. “ “Quality of life” is a telling phrase, because it reveals how concepts like health and disease, function and dysfunction, are interwoven with conceptions of the good life. Indeed, what counts as health and disease have changed over time to fit changes in value judgments and therapeutic options. [Birth control and reproduction control now being normal and impotence now being curable]... Thus the concept of health involves a descriptive component (what someone is able to
do) as well as an evaluative component (what it is important to be able to do, in order to be able to live a good life). Similarly, the concept of disease involves a duality between a description (a physiological or functional difference between the patient and the healthy norm) and an evaluation (the judgment that this difference is abnormal or dysfunctional, and not just different). However, this duality is obscured in everyday practice, in part due to the scientific aspirations of medicine and scientific assumptions built into the medical model.” (Chiong, 2004) (p. 129-130)

62. “Functionings represent parts of the state of a person – in particular the various things that he or she manages to do or be in leading a life. The capability of a person reflects the alternative combinations of functioning’s the person can achieve, and from which he or she can choose one collection. The approach is based on a view of living as a combination of various ‘doings and beings’, with quality of life to be assessed in terms of the capability to achieve valuable functionings. Some functioning’s are very elementary, such as being adequately nourished, being in good health, etc. and these may be strongly valued by all, for obvious reasons. Others may be more complex, but still widely valued, such as achieving self-respect or being socially integrated.” (Sen, 1993) (p. 31)

63. “Outside the significance that man voluntarily attaches to certain conditions, there are no illnesses or diseases in nature.” (p. 121) … All sickness is essentially deviancy. That is to say, no attribution of sickness to any being can be made without the expectation of some alternative state of affairs which is considered more desirable. In the absence of this normative alternative, the presence of a particular bodily or subjective state will not in itself lead to an attribution of illness.” (p. 123) … The existence of common or even universal illnesses testifies, not to the absence of a normative framework for judging pathology, but to the presence of very wide-spread norms.” (p. 124) … Provisionally, it is possible to suggest that illness is set apart from other deviancies insofar as the description (or at a deeper level, the explanation) of the sick state is located within a relatively restricted set of causal factors operating within the boundaries of the individual human being. …Each culturally specific account of illness must involve a theory of the person, of the boundaries between the person and the world “outside” him, and of the ways in which adverse influences can trespass over these limits and besiege or grip him.” (Sedgwick, 1981) (pp. 121-125)

64. “The dichotomy given in experience, then, is not between mind and body but between the lived body – the subject of gestures, movements, desires, commitments, and attentions – and the objective body of physiology, which can “break” and obstruct one’s intentions... Illness names that experience in which our everyday embodied capacities fail us. Illness obstructs our ordinary access to the world and presents the body as a signifier for the way in which we are limited and can be impeded in our encounter with the world. Illness alters ordinary space and time in at least two ways. First, the horizon of the world constricts, that is, one’s sight and one’s reach constrict... Second, illness confounds our capacity to expect. Our embodiment seems unreliable and unpredictable... Finally, illness distorts our ordinary relations with others insofar as it debilitates, humiliates, and isolates. Illness always involves some degree of unusual incapacitation and dependence. (Rawlinson, 1982) (p.73-75)
65. “The framing premise for these five ideas is that knowledge about Wellness is a process of inquiry that is cross-disciplinary and is a process that defines research as a personal relationship. This is so because to understand Wellness means understanding the varied ways in which persons construct meaning, create social ties, and establish a workable culture. In this sense, the Wellness scholar also has the potential to be a resource for healing when understanding the various sources of social cohesion.” (Kelly, 2006) (p. 200-201).

66. “As in the medical case, a view of the good human life that seems to human beings, on reflection, to deliver a life that would be extremely painful, or impoverished, or meaningless, not worth the choosing or the living, will be rightly rejected, and rejected not just as difficult to realize, but as false. Just as an intolerably crippling condition of body cannot be what health is, so an unacceptable monotonous or impoverished or painful way of life cannot be what the good human life is.” (Nussbaum, 1994) (p. 22)

67. “Biological illness is the signifier of our unsatisfactory relationship with society, through it we express a weariness with life or a values crisis, but our conception of it first of all takes the form of a causal theory; modern life style engenders illnesses. Here meaning is hidden under a cause, or rather it can only find expression in seeking a cause... When we speak of illness as being produced by society we do not just intend to add to its aetiological model social or psychological factors which might be forgotten by the organicist approach. Through this identification of a causal factor we are giving expression to a much wider expression to the crisis of meaning in present day society. Health, illness, the body are treated in it as metaphoric objects, the bases and crystallization of the most acute questioning of social evolution.” (Auge & Herzlich, 1995) (p. 15)

68. “A sufficiently complex system will generally be in a metastable state. The value of the threshold of metastability depends on the size of the coefficient appearing in the stochastic equation. This coefficient, as we have seen, is the measure of the coupling of the fluctuating system with the outside world. This point of view seems to be in agreement with the one held by sociologists who conclude that a society has a limited power of integration. If the perturbation exceeds that power of integration, the social system is destroyed or gives way to a new organization.” (Prigogine, 1976) (pp. 123-4)

69. “It seems what is more informative is seeing how many different patterns of wellness are prevalent in any community in contrast to focusing on what are the modal patterns of wellness.” … “Premature celebration of modal patterns of wellness behavior can inadvertently communicate a monolithic, unintended preferred standard for behavior rather than expressing the variety of potentially valid wellness behaviors.” (Kelly, 2006) (p. 199)

70. “There is not one sense of illness, disease, or sickness. … The reality of illnesses, the presented senses of physical or mental deficiencies, themselves a family of different sense, become further constituted as realities through theoretical and social expectations. To be seen as ill, to experience oneself as ill, is to have a lived experience of a state of “deficiency-or-abnormality-likely-to-be-due-to-medical-causes-and-warranting-a-sick-role.”” (Engelhardt, 1982) (p. 142)

71. “I shall argue that any definition of health incorporates values that bear on ethics, and that these definitions vary as values vary. The definition of health depends on
who is defining it. I aim to show also that the search for the components of health definitions is not a mere exercise in speculative metaphysics. The values that underlie different health definitions do indeed provide a code, or rationalization, for the conduct of health professionals, and hence for the differing content and quality of health services they provide.” (Susser, 1981) (p. 94)

72. “In the postmodern position, the interest is in how beauty, fitness, couture and coiffure, diet, gesture and posture and sexual arousal inscribe bodies. Marking them and enabling them to serve as markers. By this I mean how bodies serve as signifiers, just as a text in a book or a piece of film. They have been attributed meaning, and they can be read by others, and rewritten, they are texts, carrying knowledgeability and power. If fitness and beauty are powerful markers of the body, then surely the same must be said of health and illness… Consequently we may begin by recognizing a politics of health and illness, or, as one might say, of how health and illness become attached to bodies.” (Fox, 1993) (pp. 26-27)

73. “The native medicine man does not and cannot work in simply the context of the disease. His history and heritage do not give him a technology for isolating disease, and his ethics teach him the danger of isolated consequences. He has little interest in the abstract prolongation of life; he prolongs life in the act of restoring balance. His skill is in effecting an actual and total cure. He takes the patient out of dysfunction back into society, and both are changed by the experience. (p.34) … What’s missing in the West is an understanding of the full consequences of an individual human life, to say nothing of entire communities and societies or of the species and life itself. Native medicine stakes its reputation on curing people who must return to spiritual battle, and this means all people, not just priests. Western medicine is based on healing people to beck to jobs and niches …” (Grossinger, 1982) (p. 101)

74. “The assumptions of the Integrative Model (see Figure 1) are as follows:
   • The newly emerging health care system requires greater integration of care.
   • The biological, psychological, sociological, and spiritual individual is an inseparable part of the family, aggregate and community system.
   • The foundation of the system is health potential, which is maximized by health promotion interventions.
   • Levels within the community health system can be identified as targets of care, with the awareness that they are only parts of the whole system.
   • Care directed to any part of the system must be provided with consideration of its effects on the health of the whole system.
   • Holistic community health care requires a team approach, with all members of the team identifying what contributions they will be make to the overall health of the system.” (Laffrey & Kilbok, 1999) (p. 91)

75. “Alongside the three ‘states’ of health commonly identified – freedom from illness, ability to function, and fitness – the idea of health as ‘reserve’ has been found to be very prevalent. This reserve – like an economist’s stock of capital – can be diminished by self-neglect and accumulated by healthy behavior. It is largely determined by heredity, influenced by childhood and traumatic events. Once spent, it leaves generalized weakness or vulnerability … It can be exhausted, a state described by Williams’ elderly respondents as being ‘done,
broken down, finished, cracked up, washed out’, with some implication of irreversibility. Thus ‘good’ health is the power of overcoming disease, even if that disease is actually present: ‘bad’ health is being at risk, the loss of resistance even before disease is absent.” (Baxter, 1990) (p. 16)

76. “Subjective well-being is not a single construct, but comprises three distinct and to some extent independent dimensions: a cognitive aspect; life satisfaction; and pleasant and unpleasant affect (moods and emotions) … It differs from the concept of ‘health’ in excluding physical health and in including positive emotions; it is thus less focused on illness and disease (both physical and mental).” (Eckersley, 2001) (p. 61)

77. If I were permitted in this usage, I should say simply that a healthy man is primarily motivated by his needs to develop and actualize his fullest potentialities and capacities. If a man has any other basic needs in any active, chronic sense, then he is simply an unhealthy man. He is as surely sick as if he had suddenly developed a strong salt-hunger or calcium hunger. [Footnote:] If we were to use the word “sick” in this way, we should then also have to face squarely the relations of man to society. One clear implication of our definition would be that (1) since a man is to be called sick who is basically thwarted, and (2) since such basic thwarting is made possible ultimately only by forces outside the individual, then (3) sickness in the individual must come ultimately from a sickness in the society. The “good” or healthy society would then be defined as one that permitted man’s highest purpose to emerge by satisfying all his prepotent needs. (Maslow, 1973) (p. 171)

78. I said that the answer to life that corresponds to the reality of human existence is conducive to mental health. What is generally understood by mental health, however, is negative, rather than positive; the absence of sickness, rather than the presence of well-being. Actually there is even very little discussion in the psychiatric and psychological literature of what constitutes well-being. Well-being I would describe as the ability to be creative, to be aware, and to respond; to be independent and fully active, and by this very fact to be one with the world. To be concerned with being, not with having; to experience joy in the very act of living – and to consider living creatively as the only meaning of life. Well-being is not an assumption in the mind of a person. It is expressed in his whole body, in the way he walks, talks, in the tonus of his muscles.” (Fromm, 1959) (p. 163)

79. “Pathology, health, and wellness all arise from the interaction of innate propensities – including the increasing agency that accompanies progressive development – and from environmental conditions. Deprivation and trauma relative to the needs at a given level of functioning contribute to the formation of relatively nonviable schemas at each level: physical, emotional, conceptual, social, autonomous, existential, manifest, subtle, and causal.” (Holden, 2004) (p. 217)

80. “In answer to the prayer Apollo let fly his arrows and afflicted the Grecian host with a grievous pestilence, affecting both animals and men. The Greeks, in despair, sought counsel from their own priests. A soothsayer indicated that the cause of the pestilence was Apollo’s anger at Agamemnon... By an act of will of the god can bring about events that without his express intent would not have happened. Equally important, the will of the god can be influenced by appropriate
human behavior such as a prayer or sacrifice.” (Engelhardt & Spicker, 1974) (p. 13)

81. “The holistic premise is that most dysfunctions and their symptoms are resolved in the course of restoring or engendering wholeness, which is far more than a cure. Any dysfunction is itself viewed as a symptom – of compromised or unrealized wholeness. In a successful pathology-approach, in contrast, pathology is cured by wholeness is rarely achieved or even attempted.” (Plotkin, 2008) (p. 21)

82. “By healthy, I mean a personality that, by the end of the Nest, can be self-directed, and goal-directed, as well as present-centered, persevering, curious (about self, others, and the natural world), and reasonably resilient (much of the time able to respond flexibly, resourcefully, and persistently).” (Plotkin, 2008) (p. 86)

83. “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standards of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition. The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest co-operation of individuals and States. The achievement of any State in the promotion of health is of value to all. Unequal development in different countries in the promotion of health and control of disease, especially communicable disease, is a common danger. Healthy development of the child is of basic importance; the ability to live harmoniously in a changing total environment is essential to such development. The extension to all peoples of the benefits of medical, psychological and related knowledge is essential to the fullest attainment of health. Informed opinion and active co-operation on the part of the public are of the utmost importance in the improvement of the health of the people. Governments have a responsibility for the health of their peoples which can be fulfilled only by the provision of adequate health and social measures.” (World Health Organization, 1958) (p. 459) [Annex 1]

84. An ecologically informed or process view of optimal health implies the self-regulation and maintenance of all relevant systems promoting ongoing physical, psychological and social well-being. This latter definition gives us a sharper understanding of what ill health is. Namely, loss, for an individual or a community, of the ability to self-regulate and the dis-integration of support systems leading to the necessity for intervention. In a process view, intervention is directed towards restoration of all relevant support systems in order for health again to be self-generated and self-regulated. Maintenance of health requires balance in the support systems; health recovery requires detailed knowledge of the dynamics leading to loss of self-regulation so as to intervene in a way that fosters a return to balance.” (Albrecht, Freeman, & Higginbotham, 1998)

85. “The goal or telos of medicine includes motives and ends. The motive for seeking help minimally involves a sign or symptom in the lived body with which one cannot cope; an interruption in the ability to function as a “lived self” (which includes one’s historical identity and values); a deviation from one’s concept of wellbeing, a value-laden concept including social function, identity, and interpersonal relationship; or fear in which one seeks confirmation of pathogenesis. The end minimally involves a personal and organic restoration to a
former or better state of perceived health or well-being. Information valued for preventative action against community disease is also sought.” (Pellegrino & Thomasa, 1981) (p. 72)

86. “Rothschuh defines disease as the presence of a subjective, clinical or social need for help in persons whose physical, psychic or psychophysical balance of boundaries in the organism are disrupted. Health or wellbeing on the other hand, is characterized by the presence of order and balance in the organism and no perceived or actual need for help. This analysis recognizes the primary referent of health and disease as conditions of the body... However, social perceptions, and perceptions of the lived body, and lived selves, also enter into the notions of health and disease... In other words, the lived body forms dis-ease, an experience of disruption. This experience is distinct from scientifically explained disease.” (Pellegrino & Thomasa, 1981) (p. 75)

87. “Whenever evolution produces a new differentiation, and that differentiation is not integrated, a pathology results, and there are two fundamental ways to approach that pathology. One is exemplified by the Freudian notion (introduced by Ernst Kris) of “regression in service of the ego.” That is, the higher structure relaxes it [sic.] grip on consciousness, regresses to a previous level where the failed integration first occurred, repairs the damage on that level by relieving it in a benign and healing context, and then integrates that level – embraces that level, embraces the former “shadow” – in the new and higher holon of the ego (or total self-system). .. Thus the cure: regression in service of higher reintegration – a regression that allows evolution to move forward more harmoniously by healing and wholing a previously alienated holon. The other general approach is the retro-Romantic, which often recommends regression, period... That will indeed get rid of the new pathology, at the cost of getting rid of the new depth, the new creativity, the new consciousness. By that retro-Romantic logic, the only way to get rid of pathology is to get rid of differentiation altogether, which means everything after the Big Bang was a Big Mistake.” (Wilber, 2000) (pp. 100-101)

88. “The concept of health is more readily measured in terms of physical, psychological, social and spiritual aspects, although the four are interwoven and eventually must become integrated. The parts are manifestations of the whole and together they disclose the whole. The whole is more than the sum of the parts and emerges from them [16]: study of the parts illuminates understanding of the whole. Thus, nursing researchers have not only tried to explore the multifaceted nature of health, but also to measure the multidimensional nature of physical health, psycho-logical health and social health, respectively.” (Hwu, Coates, & Boore, 2001) (p. 111)

89. “Health is the natural state of humanity. It means being in harmony with ourselves and our universe. When we are in harmony, we feel better, feel more joy, and feel healthier. If we don’t recognize that state, we need to. That is what healing is all about. The more we are able to align ourselves with who we are, the healthier we are. As we work on this alignment, it prepares us for healing. I see healing as a positive feedback system and illness as a form of negative feedback.” (Simonton, 1989) (p. 48)

90. “In English, health is defined as a condition of wholeness, or freedom from defect or separation. It is therefore akin to the word harmony. “To heal” means to make whole or to bring back together that which has been separated (as in healing a
wound or a relationship). “To harmonize” would be a good synonym... Putting it all together for the sake of discussion, let’s call health “a state of harmonious energy” and healing “to harmonize and energize” For sickness/illness/disease we’ll use the word “disharmony” and for that which causes such a condition we’ll use the word “distress” meaning excessive stress or tension... What brings about distress? … Stress, whether distress or eustress (pleasurable stress), occurs as a natural effect of resistance to change. Resistance, like stress, is not bad in itself. …Distress comes from rigid resistance, the kind that continues beyond the point of effectiveness and into the range where function breaks down.” (S. K. King, 1989) (pp. 27-29)

91. “This wholeness, however, depends on an internal congruence – an agreement between what we think, feel and say, so they all fit together without contradiction. This internal harmony, in turn, is only possible when one acts from the deepest part of one’s being, from what we are referring to as the essential self. In this way we can see that true health is a natural by-product of honest self-expression or integrity.” (Miller, 1989) (p. 123)

92. “The basic thesis is that if individuals extended their identification outward, finally encompassing all life-forms, ecosystems and the Earth itself, there would be no need for environmental ethics, ‘altruism’ or ‘self-sacrifice’. This is because the separation between self and other, ‘ego’ and ‘alter’, is blurred or dissolved. ‘Self-interest’ would motivate people to act on behalf of the larger, ecological self, rather than the biographical, personal self. Individuals would ‘naturally’ take care of and defend the Earth, without feeling any moral pressure to do it, just as we ‘naturally’ take care of our individual, small selves.” (Bragg, 1996) (p. 96)

93. “There have been several firm conclusions, however: firstly, it has been shown that health is – as lay people clearly believe – multi-dimensional. Different groups or individuals can lay emphasis on different aspects or be unhealthy and healthy in different ways: circumstances and health –related habits can affect one dimension of health rather than another. In considering whether there are any practical or policy implications, therefore, this first point must be made: recipes for a healthier society must be clear about what they mean by “health’, and what aspect of health they are directed at.” (Baxter, 1990) (p. 235)

94. “Health is not, in the minds of most people, a unitary concept. It is multi-dimensional, and it is quite possible to have ‘good’ health in one respect, but ‘bad’ in another. Its components commonly vary together, but they do not necessarily do so: if one has a serious disease, then it is likely that one will ‘feel ill’, and suffer lack of general well being, but there are many examples of people who say they are ‘healthy’ despite disease. Psycho-social malaise is defined as ill health, even if the individual’s physical health is apparently good. An implication of this multi-dimensionality is that health status is unlikely to be susceptible to measurement along one linear scale” (Baxter, 1990) (p. 36)

95. “As previously indicated, the literature on hygiene – bodily or mental – is so impractical. On the one hand, it is a literature that has no meaning without reference to the prevention of diseases. On the other hand, it is a literature of ideals – exhortative, inspirational, humanistic. This idealism and its unitary tendencies are symbolized by the absence of a classification of healths, physical or mental... They self-consciously included so many value judgments in their idea of
health and hygiene that, historically speaking, there were almost as many “healths” as there were human values.” (Burns, 1975) (p. 45)

96. “One general remark: Every creature is, so to speak, simultaneously perfect and imperfect. Regarded in isolation each creature is, within itself perfect, well organized, and alive. With regard to the entirety, however, it is imperfect to various degrees: the individual creature, as compared with the entirety of nature, shows the same sort of being that an isolated process in the organism reveals in comparison with the whole of the organism, imperfection, rigidity, existence only in being within the whole, only by support of the whole, like a reflex. Therefore, it is doomed to die as soon as this support ceases. Therefore, it is by its very nature transitory and on the road to death.” (Goldstein, 1995) (p. 375)

97. “Now that you are determined to seek immortality you should quickly eradicate all the ailments latent in the body; and it will not be late to practice the Tao after you are free of all of them. The saints and sages of old did not wait for illness to manifest and then cured them; they cured them while they were latent. If you look at people they all seem to be in good health and free from sickness but in reality they have in their bodies the roots of illness which have not yet developed.” (Lu, 1970) (p. 48)

98. “Thus it can be seen that mental health is based on a certain degrees of tension, the tension between what one has already achieved and what one still ought to accomplish, or the gap between what one is and what one should become. Such a tension is inherent in the human being and therefore is indispensable to mental wellbeing. We should not, then, be hesitant about challenging man with a potential meaning for him to fulfill. It is only thus that we evoke his will to meaning from its state of latency. I consider it a dangerous misconception of mental hygiene to assume what man needs in the first place is equilibrium or, as it is called in biology, “homeostasis,” i.e., a tensionless state.” (Frankl, 1984) (p. 127)

99. “What we are dealing with here is akin to the original meaning of compassion: “suffering with.” It is the distress we feel on behalf of the larger whole of which we are a part. It is the pain of the world itself, experienced in each of us. No one is exempt from that pain, any more than one could exist alone and self-sufficient in empty space. It is as natural to us as the food and air we draw upon to fashion who we are. It is inseparable from the currents of matter, energy, and information that flow through us and sustain us as interconnected open systems. We are not closed off from the world, but integral components of it, like cells in a larger body. When that body is traumatized, we sense that trauma, too. We it falts and sickens, we feel its pain, whether we pay attention to it or not. That pain is the price of consciousness in a threatened and suffering world. It is not only natural, it is an absolutely necessary component of our collective healing. As in all organisms, paid has a purpose: it is a warning signal, designed to trigger remedial action. The problem, therefore, lies not with our pain for the world, but in our repression of it. Our efforts to dodge or dull it surrender us to futility – or in systems’ terms, cut the feedback loop and block our effective response.” (Macy & Brown, 1998) (p. 27)

100. “The image of the self is a complicated pattern, an artistic endeavor, as I have suggested, to which we are committed whether we will or no. In psychological sickness our image of oneself blurs, the colors run, it is not integrated or beautiful.
We become conscious of existence momentarily, and hence awkwardness ensues. But in health there is no awkwardness, for the moment of health is the moment of unconscious creative synthesis, when without thinking about it at all we know that we make sense to ourselves and to others... When such simplicity amid complexity has been achieved, I think that two new and most important affects come into existence in the individual’s experience. One of these is the feeling that one is free and that life and its outcome are in one’s hands. The other is a new experience of the passage of time, and a deeper sense of relaxed participation in the present moment.” (Barron, 1969) (pp. 20-21)

101. “Summing up, it can be said that the concept of mental health follows from the very conditions of human existence, and it is the same for man in all ages and all cultures. mental health is characterized by the ability to love and to create, by the emergence from incestuous ties to clan and soil, by a sense of identity based on one’s own experience of self as the subject and agent of one’s powers, by the grasp of reality inside and outside of ourselves, that is, by the development of objectivity and reason.” (Fromm, 1973) (p. 69)

102. “Accordingly, nursing practice is seen as involving the cultivation of “self-care,” the dissemination of knowledge concerning disease prevention, the instruction of the patient in the maintenance and promotion of health, the motivation of the patient for active application of this knowledge, and the cultivation by the patient of the life styles and behavior conducive to health. Socially orientated nursing implies environmental policies bearing on the conditions in modern industrial society.” (Smith, 1981) (p. 5)

103. “ The pathogenic orientation asks: What causes a person to become ill with a particular disease? The salutogenic orientation, by contrast, asks: Whatever the person’s particular location at any given time on the health ease/dis-ease continuum, what are the factors that facilitate his or her remaining at that level or moving toward the more salutary end of the continuum? Thus no assumption is made that one is well and becomes sick. On the contrary, the commitment is to seeing people at some point on the health continuum at any given time and continually confronted with stressors and hence with the problem of preventing tension from becoming stress. In this way, the sense of coherence is always hypothesized to be a relevant factor.” (Antonovsky, 1979) (p. 196)

104. “But the existing biomedical model does not suffice. To provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he lives, and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physician role and the health care system. This requires a biopsychosocial model.” (Engel, 1977) (p. 132)

105. “Positive health… is the provision of a complete diet, an environment that is optimal for the animals physiological needs, comfortable to the animal’s senses, in which the animal is secure and free from fear, and with no undue challenge by pathogenic micro-organisms or predators.” (Sainsbury, 1986) cited in (Gunnarsson, 2006) (p. 5)

106. “I argue that disorder lies on the boundary between the given natural world and the constructed social world; a disorder exists when the failure of a person's
internal mechanisms to perform their functions as designed by nature impinges harmfully on the person's well-being as defined by social values and meanings. The order that is disturbed when one has a disorder is thus simultaneously biological and social; neither alone is sufficient to justify the label disorder... To construct a more adequate analysis and resolve the act/value debate, I propose a hybrid account of disorder as harmful dysfunction, wherein dysfunction is a scientific and factual term based in evolutionary biology that refers to the failure of an internal mechanism to perform a natural function for which it was designed, and harmful is a value term referring to the consequences that occur to the person because of the dysfunction and are deemed negative by sociocultural standards.” (Wakefield, 1992) (p. 373-374)

107. “It is this concept which should dominate our teaching and our approach to medicine. In brief, it may be stated thus: (a) disease indicates deviations from the normal – these are its symptoms and signs, (b) symptoms and signs are commonly found to recur in constant patterns; these are the “syndromes” or “symptom complexes”, (c) these syndromes always indicate one or more of three aspects of disease: (1) its site, (2) associated functional disturbances, (3) causative factors in terms of (i) morbidity anatomy, physiology and psychology, and (ii) aetiology.” (Cohen, 1981) (p. 219)

108. “Job 7.1 Is there not an appointed time to man upon Earth? Are not his days also like the days of a hireling? As a servant earnestly desireth the shadow, and as an hireling looketh for the reward of his work, so am I made to possess months of vanity and wearsome nights are appointed to me. When I lie down, I say, when shall I arise, and the night be gone? And I am full of tossings to and fro unto the dawning of the day. My flesh is clothed with worms and clods of dust; my skin is broken, and has become loathsome. My days are swifter than a weaver’s shuttle, and are spent without hope... 7. 13 When I say, my bed shall comfort me, my couch shall ease my complaint; then thou scarest me with dreams, and terrifiest me through visions: so that my soul chooseth strangling, and death rather than my life. I loathe it; I would not live always. Let me alone; for my days are vanity. What is man, that though shouldest magnify him? And that thou shouldest set thing heart upon him? And that thou shouldest visit him every morning?... 7.21 For now shall I sleep in the dust; and thou shall seek me in the morning, but I shall not be.” (Stirling, 1953) (p. 417)

109. “The term normal or healthy can be defined in two ways. Firstly, from the standpoint of functioning society one can call a person normal or healthy if he is able to fulfill the social role he is to take in that given society – if he is able to participate in the reproduction of society... Secondly, from the standpoint of the individual, we look upon health or normalcy as the optimum of growth and happiness in the individual.” (Fromm, 1941) (p. 138)

110. “Health as such does not exist. It is your goal that determines what health ought to mean even for your body. The concept of normal health... should be given up... Of course, health might appear, in one case, like the opposite of health in another.” “Health and sickness are not essentially different...We must not make distinct principles or entities of them... Actually there are only differences in degree between these two kinds of existence.” (Jaspers, 1965) (p. 112)

111. “The need to apply a holistic definition of health which encompasses the social, emotional, spiritual and cultural wellbeing of individuals and communities
in health services, policies and programs in order to improve health outcomes is well documented (National Aboriginal and Torres Strait Islander health Council, 2001). A genuine commitment to this would include recognition of Aboriginal governance and community capacity, of cultural and spiritual obligations to the land and the importance of honoring, facilitating and celebrating the important transition points in each person’s life journey from conception to death.” (Dudgeon & Walker, 2011) (p. 117-118)

112. “Well-being and distress are opposite poles on a single continuum: more well-being means less distress and more distress means less well-being. Well-being is a general sense of enjoying life and feeling happy, hopeful about the future, and as good as other people. Lack of these positive feelings is related to depression and anxiety. It is useful to think of a continuum from happy and fulfilled at the well-being end to depressed and anxious at the distress end. As well-being goes up, distress goes down.” (Mirowsky & Ross, 2003) (p. 26)

113. “Global health is the science and art of preventing disease, prolonging life and promoting physical and mental health through global efforts for the maintenance of a safe environment, the control of communicable disease, the education of individuals and whole populations in principles of personal hygiene and safe-living habits, the organization of health care services for the early diagnosis, prevention and treatment of disease, and attention to the societal, cultural and economic determinants of health that could ensure a standard of living and education for all that is adequate for the achievement and maintenance of good health.” (Benatar & Brock, 2011) (p. 14)

114. “Related to that difficult issue of how to define or even locate “illness” is the converse and equally impossible dilemma: what do we mean by “health”? Once it is understood that a human being is not simply an assemblage of physical parts, but contains emotional, mental, and spiritual dimensions that cannot be reduced without remainder to material processes, then what exactly does “health” mean in such a multidimensional being? How many levels of being—physical, emotional, mental, spiritual—should a doctor treat? Can I be healthy if I am spiritually malnourished? If a Nazi’s blood tests come back completely normal, is that person healthy? … This is one of the defining ways that sets integral medicine apart from both conventional medicine and alternative medicine. It is sometimes said that conventional medicine treats the illness and alternative medicine treats the person. That’s fine, and I personally believe both of those are very important. But integral medicine goes one step further: it treats the illness, the person, and the physician.” (Wilber, 2005) (p. xxi)

115. “The predominant criterion of health emerging from this review is a person’s ability to interact with and function in a changing environment. Health is viewed as a personal process characterized by meaning, pattern, and continuing development throughout the life process. The major difference in the conceptualization of health lies in whether the process is viewed in a polarized, quantitative way, moving back and forth between higher and lower levels of wellness and illness, or as a unidirectional, unitary process of development. The research findings emanating from both paradigms reveal the human being’s power to transcend the limitations of disease, disability, and death. Life satisfaction and sense of well-being were used as indicators of health and were more important than physical ability but may not be essential to health. Increasingly disease and
disability, and the problems associated with them, have been described as opportunities for personal transformation, which shifts the way the experience is viewed.” (Newman, 1999) (p. 238)

116. “The doctor considered his next topic, then resumed. “The definition of health, according to Ayurveda, is when the three biological humors of Air (vata), Bile (pitta), and Phlegm (kapha), digestive fire and enzymatic functions (agni), waste products (malas); tissues (dhatus); soul (atma); and mind (manas) are in balance.” (p. 70) … Agni is the universal thermogenic power that catalyzes matter from one state to another; Agni functions physiologically as the enzymatic and cellular fire that releases the light, energy, and warmth stored within food and leaves residual wastes for elimination. These two processes, which cover the scope of all metabolic activities, are the basis of health. When they are disordered, they become two primary roots of disease; decreased vitality and increased toxicity. Our health is entirely dependent on Agni’s harmonious functioning. All illnesses, especially those that affect the abdomen, are associated with disturbances in Agni’s activity.” (Crow, 2000) (p. 170)

117. “Health, according to the ancient doctor-sages, goes far beyond the treatment of symptoms.; it is defined as a state of equilibrium among the doshas, dhatus, and malas (humors, tissues, and wastes), along with happiness of mind, senses and soul. Ultimately, the aim of Ayurvedic and Tibetan healing arts is enlightenment and salvation. As a result, these healing systems are primarily concerned with attaining wellbeing and longevity through balance, harmony, rejuvenation, and transcendent wisdom, and are therefore predominantly sattvic in quality.” (Crow, 2000) (p. 261)

118. “Attempts to define disease have traditionally been categorised as evaluative and naturalistic strategies. An evaluative strategy seeks to define disease partly or wholly in evaluative terms, by appealing to the evaluative judgments a person or group of persons would make involving the concept. This framework is similar to frameworks that have commonly been used to analyse sickness and illness. Having a sickness, it is often held, is to be judged by the community as having a certain role (Marinker, 1975; Nordenfelt and Twaddle, 1993). Illness, on the other hand, is supposed to reflect experiences from a first-person perspective. Correspondingly, it has been suggested that disease reflects a third perspective, namely the perspective of the medical profession.” (Nordby, 2006) (p. 172-173)

119. “But as public health workers we can and must do so. It is not enough to define disease as the absence of health. Disease is a social and political category imposed on people within an enormously repressive social and economic capitalist system, one that forces disease and death on the world’s people.” (Navarro, 2009) (p. 440)

120. “Planning of personal health services can be based on analysis of either the performance or the structure of the system. The latter deals with the internal relations among the system's parts, while the former refers to the acquisition of inputs and their transformation into outputs [5]. In performance methods the required resources are determined by the amount and type needed to achieve a defined output measured in terms of performance, such as reduction or control of death, disease, disability, or discomfort; whereas in methods based on the system structure the output is given in terms of number of services provided. In the system-performance method, the relation-ship between input and output is defined
as effectiveness; in the system-structure method, as efficiency.” (Navarro, 1969) (p. 98)

121. “The project is rooted in a concept of what a city is and a vision of what a healthy city can become. A city is viewed as a complex organism that is living, breathing, growing and constantly changing. A healthy city is one that improves its environments and expands its resources so that people can support each other in achieving their highest potential. This general principle is expressed more specifically in a description of the 11 qualities that a healthy city should strive to achieve. These appear in Fig. 1. The healthy city concept means process, not just outcome. A healthy city is not necessarily one that has achieved a particular health status. It is conscious of health as an urban issue and is striving to improve it. Any city can be a healthy city if it is committed to health and has a structure and process to work for its improvement... Fig. 1 - A city should strive to provide: 1. A clean, safe physical environment of high quality (including housing quality); 2. An ecosystem that is stable now and sustainable in the long term; 3. A strong, mutually supportive and non-exploitive community; 4. A high degree of participation and control by the public over the decisions affecting their lives, health and wellbeing; 5. The meeting of basic needs (for food, water, shelter, income, safety and work) for all the city's people; 6. Access to a wide variety of experiences and resources, with the chance for a wide variety of contact, interactions and communication; 7. A diverse, vital and innovative city economy; 8. The encouragement of connectedness with the past, with the cultural and biological heritage of city-dwellers and with other groups and individuals; 9. A form that is compatible with and enhances the preceding characteristics; 10. An optimum level of appropriate public health and sick care services accessible to all; and 11. High health status (high levels of positive health and low levels of disease).” (World Health Organization, 1997) (pp. 7-9)

122. “This is a rather simple example [dietary change]. But it reminds us that there is social, historical and evolutionary depth to most human diseases. It also reminds us that changes in human culture, technology and environmental incursions nearly always have consequences for health and disease. In order to understand and foresee the likely health impacts of today’s unfamiliar large-scale changes, both in the global environment and in the urban social environment, we must think within an ecological ‘systems’ framework. The ideas of ecology, of interactive interdependent systems, have begun to influence many areas of human endeavour and enquiry. There is now a need to consummate the mid-twentieth-century stirrings towards an ‘ecology of health.” (McMichael, 2001) (p. 339)

123. “Health is a process of constant adjustment to changing circumstances to maximize self-regulation and self-fulfillment of human potential. Ill health, by contrast, is the loss of the ability to self-regulate and a loss of the ability to achieve full human potential.” (Albrecht, 2001) (p. 246)

124. “Clearly, health and disease cannot be defined merely in terms of anatomical, physiological, or mental attributes. Their real message is the ability of the individual to function in a manner acceptable to himself and to the group of which he is part.” (Dubos, 1959) (p. 214)

125. “Men naturally desire health and happiness. For some of them, however, perhaps for all, these words have implications that transcend ordinary biological concepts. The kind of health that men desire most is not necessarily a state in
which they experience physical vigor and a sense of wellbeing, not even one giving them a long life. It is, instead, the condition best suited to reach goals that each individual formulates for himself.” (Dubos, 1959) (p. 228)

126. “Thus the sages do not treat a formed disease, but treat an unformed disease; they do not treat a formed disorder, but treat an unformed disorder. That is just so. If medicines are only used once a disease has formed, or treatments are only taken when a disorder is formed, this condition is just like digging a well when one is thirsty, or like casting knives when one is about to fight. It is late, isn’t it.” [8.2.3] (Ming, 2001) (p. 295)

127. “For the past one hundred years, health has been defined negatively as the absence of illness; health and illness have been seen as largely the province of the health care system and the medical profession. Health thus becomes a commodity, to be purchased from the medical profession when running-repairs are required. The positive view of health is of an asset, a state of physical, mental and social wellbeing that facilitates personal fulfillment and enjoyment of life. Certainly, the achieving of positive health is a formidable social goal. But as we come to adopt health as a basic and positive social value, so the actual and equitable attainment of good health will come more within our grasp.” (Hetzel & McMichael, 1987) (p. 3)

128. “Whoever wishes to pursue the science of medicine must proceed thus. Therefore on arrival at a town with which he is unfamiliar, a physician should examine its position with respect to the winds and to the risings of the sun. For a northern, a southern, an eastern, and a western aspect has each its own individual property... Through these considerations and by learning the time beforehand, he will have full knowledge of each particular case, will succeed best in securing health, and will achieve the greatest triumphs in the practice of his art.” (Hippocrates, 1923). (p. 71)

129. “And if one is investigating natural activities with a view to treatment? If the stomach is, in a particular case, unable to exercise its peristaltic and grinding functions, how are we going to bring it back to the normal if we do not know the cause of its disability? …But how on earth are the follower of Erasistratus going to act, confessing as they do that they make no sort of investigation into the cause of disease? For the fruit of the enquiry into activities is that by knowing the causes of the dyscrasiae one may bring them back to the normal, since it is of no use for the purposes of treatment merely to know what the activity of each organ is. Now, it seems to me that Erastratus is unaware of this fact also, that the actual disease is that condition of the body which, not accidentally, but primarily and of itself, impairs the normal function. How, then, is he going to diagnose or cure diseases, if he is entirely ignorant of what they are, and of what kind and number.” (Galen, 1916) (p. 199)

130. “Health,” after all, is simply an everyday word that is used to designate the intensity with which individuals cope with their internal states and their environmental conditions. In Homo sapiens, ‘healthy’ is an adjective that qualifies ethical and political actions. In part at least, the health of a population depends on the way in which political actions condition the milieu and create those circumstances that favour self-reliance, autonomy, and dignity for all, particularly the weaker. In consequence, health levels will be at their optimum when the environment brings out autonomous personal, responsible coping ability. Health
levels can only decline when survival comes to depend beyond a certain point on the heteronomous (other-directed) regulation of the organism’s homeostasis. Beyond a critical level of intensity, institutional health care – no matter if it takes the form of cure, prevention, or environmental engineering – is equivalent to systemic health denial.” (Illich, 1976) (p. 7)

131. “Two kinds of phenomena have a central place in traditional holistic accounts of health and illness. First a certain kind of feeling, of ease or well-being in the case of health, and of pain or suffering in the case of illness; second the phenomenon of ability or disability, the former being an indication of health, the latter of illness. These two kinds of phenomena are in many ways interconnected. There is first an empirical, causal connection. A feeling of pain or suffering may directly cause some degree of disability. Conversely, a subject’s perception of his or her ability or disability greatly influences his or her emotional state... A person cannot experience great suffering without evidencing some degree of disability. But the converse relation does not always hold: a person may have a disability, and even be disabled in several respects, without suffering... In short, therefore, wherever there is great suffering there is disability, but the converse is not true.” (Nordenfelt, 2006) (p. 13)

132. The sociocentric conception of the individual-social relationship lends itself to an organic metaphor. Indeed in holistic sociocentric cultures like India the human body, conceived of as an independent system, is frequently taken as a metaphor for society (and society, conceived as an organic whole, is sometimes taken as a metaphor for nature). The human body is a pregnant metaphor. It has its ruler (the brain), its servants (the limbs), etc. Political affairs, interpersonal dyads, family organization are all easily conceived after a model of differentiated parts arranged in a hierarchy of functions in the service of the whole.” (Shweder & Bourne, 1982) (p. 129)

133. “It may be helpful in appraising the following review of concepts to keep in mind that one has the option of defining mental health in at least one of two ways: as a relatively constant and enduring function of personality, leading to predictable differences in behavior and feelings depending on stresses or strains of the situations in which a person finds himself; or as a momentary function of personality and situation. Looking at mental health in the first way will lead to a classification of individuals as more or less healthy; looking at it in the second way, will lead to a classification of actions as more or less healthy.” (Jahoda, 1958) (p. 8)

134. “The living organism so rarely presents itself, at all times or in all ways, in a complete state of biological, physiological, psychological, and-in-sum-ecological harmony, and yet so characteristically strives for such a balance, that the clinician may still hold to his view that the absence of illness and capacity for achieving or restoring balance are consonant with sound health principles, as he must apply them. The pathologist at autopsy frequently observes so much pathology that he is far less struck that a patient died than that his disease organs functioned as long as well as they did.” (Barton, 1956) (p. 112)

135. “The author uses this phrase [“relative freedom from need-distortion”] in suggesting that mentally healthy perception means a process of viewing the world so that one is able to take in matters one wishes were different, without distorting them to fit these wishes – that is, without inventing cues not actually existing
(Jahoda, 1953). To perceive with relative freedom from need-distortion does not mean, of course, that needs and motives are eliminated; nor that they have no function in perception. The requirement is of a different nature; the mentally healthy person will test reality for its degree of correspondence to his wishes or fears. One lacking in mental health will assume such correspondence without testing… As a mental health criterion, perception free from need distortion reveals itself in a person’s concern for evidence to support what he sees and anticipates… The major requirement of the healthy person in this area is that he treat the inner life of other people as a matter worthy of his concern and attention.” (Jahoda, 1958) (p. 51-52)

Note: The preceding short quotes are data-artifacts representing the more complete and coded conceptions of health derived from the complete source works referenced.

References: (Health Conceptions Data Set)


**Normalization & Preformatted Benchmark:**

1. For each dimension, the score is calculated based on the correlation of the data set of all concepts. This results in a linear scoring for the entire set instead of a non-linear scoring.
2. The dimension of the score is based on the explicit interaction of the concepts and not on the correlation.
3. The dimension of the score is based on the explicit interaction of the concepts and not on the correlation.

**Notes:** The coding categories in each dimension were derived from the health concepts. Scoring divisions were approximated to 0.5 of a category for each dimension.

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Appendix F - Transcript Samples of Conception Data Set Final Depiction
Note: The 0-0 score reference point is the center of the 3D graph. View F depicts the dimensions of inclusion (e.g., axis length) and direction (e.g., axis direction).
<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Qualification</th>
<th>Attraction</th>
<th>Preparation</th>
<th>Direction</th>
<th>Investigation</th>
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<tbody>
<tr>
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<td>Orientation</td>
<td>Integration</td>
<td>Coherence</td>
<td>Preparation</td>
<td>Direction</td>
</tr>
</tbody>
</table>

Appendix G - Summary of Argumentation Scheme Interrogatives
Appendix H – Research Article: Viability of Psychological Panarchy (Varey, 2011)

Document Reference:
Viability of Psychological Panarchy: Thought as an Ecology
Author: Varey, William
Systems Research and Behavioral Science
Published online 10 October 2011 in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/sres.1112

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Resource: Care W. Greve: Measuring Information
from hip/!alexa.phantommedia.com:3000/lesssamples3062 BackendAPI/2006/1229753480
I
adapting (pp. 277-302). New York: Springer.
46. Gravens, C. (1982). What the research of Clare W. Graves says a model of healthy maturity in psychoanalytic behavior should resemble. Proceeds
42. Gravens, C. (1979). Let us bring humanistic and general psychology together: A research project needing to become Paper presented at the
41. Washington, DC.
### Appendix J – Matrix of Dimension Combinations for Sustainability Discourse

<table>
<thead>
<tr>
<th>Combination</th>
<th>Description of Conception</th>
<th>Resultant Space</th>
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</thead>
<tbody>
<tr>
<td>I. ---</td>
<td>Low Coherence, low Integration and low Orientation. Disconnected sporadic formations.</td>
<td>Reformation</td>
</tr>
<tr>
<td>II. +--</td>
<td>High Coherence, low Integration, low Orientation. Initial differentiations formed in ambiguity and uncertainty.</td>
<td>Innovation</td>
</tr>
<tr>
<td>III. -++</td>
<td>Low Coherence, high Integration, low Orientation. Instability of present position with defensive actions taken.</td>
<td>Reaction</td>
</tr>
<tr>
<td>IV. --+</td>
<td>Low Coherence, low Integration, high Orientation. Potential exists in effects of disconnected accumulations.</td>
<td>Preservation</td>
</tr>
<tr>
<td>V. -++</td>
<td>Low Coherence, high Integration, high Orientation. Maintaining gains made by ongoing adaptive responsiveness.</td>
<td>Adaptation</td>
</tr>
<tr>
<td>IV. ++-</td>
<td>High Coherence, low Integration, high Orientation. Continuation of success building on specific confirmations.</td>
<td>Generation</td>
</tr>
<tr>
<td>VII ++-</td>
<td>High Coherence, high Integration, low Orientation. Active measures to lessen impacts of potential problems and sustain value.</td>
<td>Mitigation</td>
</tr>
<tr>
<td>VIII. +++</td>
<td>High Coherence, high Integration, high Orientation. Expansion and extension within existing conducive conditions by continuation of proven actions.</td>
<td>Consolidation</td>
</tr>
</tbody>
</table>
knowledge. The beads of knowledge are already encoded nothing more than our already-agreed-upon assumptions and other principles of knowledge (from physics to biology to psychology, and in between there are also layers of integrally-agreed-upon generalizations from the various orientating generalizations to which the important forces are located, even if we can't agree on how many forces they contain). My point is that if we take these largely-agreed-upon orientating generalizations from the various branches of knowledge (from physics to biology to psychology to theology), and if we string these orientating generalizations together, we will arrive at some astonishing and coherent conclusions about the areas of their own approaches that are less than integral or less than comprehensive, and this acts as a guide for reorganizing these disciplines; it simply shows them the areas of their own approaches that are less than integral or less than comprehensive, and this acts as a guide for reorganizing these disciplines; it simply shows them

The point is that every event in the manifest world has all 3 of those dimensions. You can look at any event from the point of view of the "I" (or how I personally see and feel about the event); from the point of view of the "we" (how not just I but others see the event); and as an "it" (or the objective facts of the event). (Wilber, 2006) (p. 19)

These are the orientating generalizations: they show The beads of knowledge and proposed theory correspond Consistency

The phenomena seen and the explanation correspond Completeness

The problem-definition and the resolution correspond C1

The problem-definition and the resolution correspond

Source Relevance Confirming Criteria

Description of Criteria of Explanatory Worth

Criteria Component

Appendix K - Inventory of Coherence Criteria for Integral Hypotheses
The Kosmos is a series of nested within nested, and all are holons, so the standard "whole-part" can be understood neither as things of process. This is true of atoms, cells, symbols, ideas... Reality is not composed of things or processes; it is not composed of wholes nor does it have any parts. Rather, it is composed of whole/parts, so that standard "atomistic" and "wholistic" attempts are both off the mark. There is nothing special about anything... what their "laws" or "patterns" or "tendencies" or "habits" are. And this gives us a clue to something new: rather than an a priori approach, we can attempt to discern what positionist evidence, we can attempt to discern what a combination of a priori reasoning and a sharing with the notion of holons and procedurally downwardly defended (Wilber, 2000) (p. 49)
We inhabit these spaces, these zones, as practical realities. Each of these zones is not just a perspective; but in action, an injunction, a concrete set of actions in a real world. Each injunction brings forth or discloses the phenomena that are apprehended through the various perspectives. It is not that perspectives come first and actions or injunctions come later; they simultaneously co-arise, or actually tetra-arise (because becoming is their way of making for much sense). Nonetheless, this broad orientating map is nowhere fixed and final. In addition to being composed of broad orientating generalizations, I would say that the AQAL matrix (Wilber, 2006) (p. 19) is a book of a thousand hypotheses. I will be telling the story as if it were simply the case (because telling the story as if it were simply the case makes for much better reading) but not a sentence that follows is left open to contradiction or revision by the others. (Wilber, 2000) (p. xii)
Chapter Abductive Phase

Critical Question Potential Research Omissions and Assumptions

Abductive Error Adopted Approach

Appendix L – Summary Table of Abductive Errors and Adopted Approach