

Pragmatism, Systems Thinking and System Dynamicsⁱ

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Introduction.

Pragmatism is a branch of philosophy largely defined by Charles Saunders Peirce (1839 - 1914), but articulated and developed by William James, John Dewey, Herbert Mead and othersⁱⁱ. While it may be claimed as a school of thought peculiarly American, major contributions to the field bridge the Atlantic and its elements stretch back to Greek philosophy. As with other schools of philosophy, pragmatism is anything but a homogeneous body of knowledge, and significant differences exist between the various proponents. However, for reasons that will hopefully become clear, this paper will concentrate on the relevance of Peirce's seminal contribution, albeit reconstructed by scholars with the benefit of more than a century of hindsight.

In more recent times, Richard Rorty's "neo-pragmatism" and Habermas' critical theory provide two examples of thinking which draw heavily on the works of these earlier scholars. In the broader debate concerning "modernism" and "post-modernism", pragmatism, especially that associated with Peirce, has been labelled by Griffin, Cobb, Ford, Gunter and Ochs, 1993, as "constructivist post-modernism" to highlight the fact that while it presents a powerful critique of Cartesian rationalism, and for that matter, British empiricism, it proposes an approach that provides real hope for a way forward, and doesn't succumb to the tendencies towards utter skepticism found amongst some post-modernist theoriesⁱⁱⁱ.

Despite something of a scandalous reputation and a failure to publish sufficiently coherent accounts of his work during his lifetime, Peirce is now acknowledged as a "polymath" and by some as the "most profound philosophical thinker produced in America" (West, p43). Recent increased interest in Peirce, and in pragmatism in general, arises from three sources. Firstly, in philosophical terms Quine's challenge to analytic philosophy (Quine, 1953/1980) has produced something of a rebalancing of approaches to philosophy^{iv}. Secondly, the increased access to Peirce's papers at Harvard University since 1990 has allowed the construction of more complete understandings of his architectonic, and thirdly, the profound importance of Peirce's work to contemporary research in artificial intelligence and cognitive science has become apparent. (For example, see Josephsen and Josephsen, 1994).

It is within this admittedly broad context, that a number of direct connections can be established between pragmatism and many of the major contributors to the field of systems thinking including Churchman, Ackoff, Emery and Beer. Connections can also be made to the more recent attempts by Flood, Jackson and Ulrich to develop a critical approach to systems thinking, while Checkland's soft systems methodology's relationship to Churchman and Singer provides a further linkage. System dynamics,

however, remains something of an outlier in this respect. Nevertheless, as this paper will attempt to show, significant synergies do exist which encourage one to attempt a pragmatic description of the system dynamics method. These synergies are implicit in Bell and Bell's advocacy for refutationism as the "best for theoretical progress" of system dynamics (Bell and Bell, 1980).

The reconstruction of Peirce's pragmatism by Hausman, 1993, and others, allows us to more clearly understand these linkages and identify the fundamentals of systems thinking more closely with Peirce.

This discussion leads to the tentative hypothesis that Peirce's pragmatism provides a coherent philosophical basis for contemporary approaches to systems thinking. If this is the case, then pragmatism establishes a powerful organising principle for systems thinkers which can be used to complement if not challenge the current extent to which atomistic thinking is ingrained in our disciplines and institutions. In addition, a number of important principles follow which can help improve systems methodology and, most importantly, define what constitutes valid enquiry.

The core argument of the paper is presented in three parts. The first part describes the key features of Peirce's architectonic and its relevance to systems thinking. The second part makes a start at tracing the extent to which pragmatism has influenced systems thinkers including an introduction to Pepper's world hypotheses (Pepper, 1942). This reference to Pepper notes the usefulness of his world hypotheses as a pedagogic framework for articulating the different fields of systems thinking, while facilitating an introduction to pragmatism. The third part of the paper explores the possible relevance of pragmatism to system dynamics.

The paper concludes with the rhetorical question as to whether or not pragmatism provides the underlying philosophy to systems thinking.

Pragmatism

"Pragmatism" was the term used by James in his 1898 California Union address to describe the ideas of Charles Saunders Peirce. Dewey (1925) explains that Peirce's pragmatism was suggested to him by his study of Kant and the distinction Kant made between *pragmatic* and *practical*. "The latter term applies to moral laws which Kant regards as *a priori*, whereas the former term applies to the rules of art and technique which are based on experience and are applicable to experience"(p3). James emphasised that while there was nothing new in the pragmatic method, the "forerunners of pragmatism used it in fragments: they were preluders only" (James, 1995, p 29). James, however, went on to provide an interpretation of the concept which was broader than what Peirce intended and, to emphasise the difference, Peirce subsequently introduced the term "pragmaticism" as a "term ugly enough that no one would want to use it"^v.

The fundamental ideas of pragmatism were set out by Peirce in two key articles: The Fixation of Belief, 1877, and How to Make our Ideas Clear, 1878. Peirce emphasised that these articles were written for popular consumption and therefore understated the significance and depth of the concepts involved. Nevertheless, they remain the most

quoted sources of Peirce's ideas. Translations of these papers appeared in Paris one year after their publication in America, and, when combined with James' contributions, had a major impact in Europe. For example, in a course of lectures delivered in 1913-14, Durkheim argued that pragmatism attacked "traditional rationalism", and the "Cartesian basis to French culture...it would overthrow our whole national culture", and necessitate having to "embark upon a complete reversal of this whole tradition". (Durkheim, 1983).

Hausman observes that the 1877-78 articles reflect Peirce's concern to "incorporate the logic of experimental science into philosophy" (p20). On the surface, this observation suggests that Peirce was simply trying to "scientize" philosophy in a positivist tradition. But what we need to remember is that Peirce's version of science was not in the positivist tradition but in a tradition drawing on a stronger social basis. It is this aspect which in retrospect allows us recognise Peirce's pre-emption of Kuhn.

Compounded by the fact that Peirce wrote extensively on a wide range of topics ranging from geodesy to experimental psychology, and from mathematics to drama, - some estimate that his total collected works would take at least 100 volumes- it has not been easy for scholars to easily describe the complexity of his work. In addition, Peirce reviewed and refined his ideas continuously through to his death in 1914, with a consequence that many versions of his ideas remain extant. Indeed, Hausman describes Peirce's work as "something like entering a labyrinth with almost as many entrances as passages". Furthermore, it appears that it is only since 1990 when limits were removed on the use of Peirce's papers (see Brent, 1998), that the fuller significance of Peirce's work has become apparent and that the illusive architectonic that Peirce was attempting to describe has been made more accessible. Hausman, *op cit*, provides one such account, an account which serves our current discussion particularly well.

Hausman attempts to show that Peirce's pragmatism incorporates four themes or strands- a pragmatic criterion of meaning (the pragmatic maxim) which incorporates reference to underlying rules of inference, a theory of signs (a semiotic), a structure of categories capable of describing all phenomena (a phenomenology), and a theory of continuity (synechism) which describes Peirce's underlying metaphysics.

It will suit our need to give particular emphasis to Peirce's inferential logic to "rebraid"^{vi} these strands under three headings- pragmatic maxim, including reference to semiotic and phenomenological aspects, modes of inquiry and rules of inference, and synechism.

1. The pragmatic maxim.

Peirce described his pragmatic maxim as the "doctrine concerning the meaning, conception, or rational purport of objects, namely, that these consist in the "effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object" (Peirce, 1878).

Murphy, 1990, emphasises a further articulation by Peirce which notes that the nature of belief has three properties-

- “It is something that we are aware of.
- It appeases the irritation of doubt.
- It involves the establishment in our nature of a rule of action, a habit” , p25.

The third of these properties underlines that Peirce’s pragmatism is a theory of action, or in James’ terms- “beliefs are rules of action” and the pragmatic method is “primarily a method of settling metaphysical disputes that are otherwise might be interminable”^{vii}.

Hausman attempts to provide a more succinct statement by describing the maxim as a belief that is either “self-conscience or nonconscious preparedness to act in a certain way”, (p37).

Peirce’s *semiotics* is a theory of signs capable of describing pragmatic meaning. It requires three components- the sign, interpreter, and object, and forms a basis for contemporary theories of language.

Peirce’s *phenomenology* consists of a theory of three categories, *firstness*- the category of quality which is monadic and is embodied in the object , *secondness*- the reaction we encounter to firstness and can only exist with reference to firstness, and *thirdness*, that aspect that mediates between firstness and secondness. Together, these categories are capable of describing the most fundamental features of all experience, as demonstrated when defining the theory of signs above.

Significantly, Peirce’s phenomenology “is opposed to atomism of the sort found in British empiricism. The analysis is not undertaken as if there were discrete bits of sense-data that serve as building blocks of analysis. Sense-data are products of analysis. Instead, Peirce’s phenomenology begins in the midst of things, within a total experiential situation in which phenomena are given as complex wholes”(Hausman, p10). So, Peirce’s phenomenology is consistent with his theory of continuity, and provides the basis of Peirce’s critique of Cartesianism- see below.

2. Modes of inquiry and rules of inference.

Peirce describes inquiry as the “process of struggle to pass from a state of doubting to a state of belief” (Hausman, p20). He describes this as a process involving a “community of inquiry”, and in this sense, pre-empts Kuhn. It is Dewey’s articulation of this process that gives rise to what we know variously as “action learning”, and “action science”^{viii}. Peirce’s strict application of logic to this process gives rise to an evolutionary epistemology which precedes Popper.

Peirce’s articulation of three modes of inference- deduction, induction, and abduction, or retrodution, is central to understanding his concept of inquiry and truth. Indeed, Peirce later identified abduction as being at the heart of pragmatism reflecting Peirce’s fascination with the (cognitive) process by which we are capable of isolating a relatively small number of plausible hypotheses to account for observable facts.

Deduction, induction and abduction can be described as permutations based on the rule of deduction known as modus ponens.

Deduction is defined as:

Statement A is true. (data)

If statement A is true, then statement B must be true (rule).

Therefore, statement B must be true (result).

Induction is defined as:

Statement A is true. (data)

Statement B must be true (result).

Therefore, A must cause B (rule)

Abduction is defined as:

Statement B is true (result)

On the basis of my experience, my best guess is that A causes B(hypothesis/ rule)

Therefore, A must be true.

While abduction is clearly wrong in deductive logic, Peirce argued that abduction was the only form of inference that extends knowledge- deduction simply develops logical results from hypotheses, and induction uses data to quantify arguments^{ix}.

Consequently, a possible cycle of inference is to use experience to develop a small set of hypotheses from what may arguably be an infinite set of possibilities, deduction can be used to reformulate hypotheses into forms suitable for testing using induction, and induction used to test the hypotheses, albeit in a derivative form. This gives rise to Peirce's experimentalism as the pragmatic basis for inquiry.

It is therefore clear that action learning in its various forms, relates to abduction. It is also arguable that, as Beer suggests -see below- management is effectively concerned with abductive processes. On the best evidence, managers make a decision which may or may not achieve the desired outcome. If the initial hypothesis proves to be wrong, then a new hypothesis must be chosen and the process repeated. Merrell, 1992, describes the process as "abductive leaps" and likens the rejection of one hypothesis and its replacement with another as a cusp catastrophe.

The difficulty of applying the full process of inference in practice is that, since we manage open systems, environmental influences will in general affect outcomes, and human behaviour will be influenced by the expression of the initial hypothesis as well as the resulting process. Failure to understand this leads to what Churchman termed "the environmental fallacy" (Churchman, 1979) and confronts "Kant's problem" (Churchman, 1971).

Finally, it is worth observing that while deduction is the form of inference most emphasised by Cartesian logic, inductive logic relates most centrally to British empiricism, and abduction to pragmatism.

Peirce's notion of inquiry and inference have many implications, not the least of which is his case for the rejection of the spirit of Cartesianism which Murphy (1990) summarises as:

- The denial that philosophy must begin with *universal* doubt- we always enter a situation with some knowledge.
- Because of experimentalism, the denial that that the ultimate test of certainty is to be found in the individual consciousness.
- Consequent to this, the denial that philosophical theory should be a single thread of inference, in the manner of Descartes.

3. *Synechism (and tychism).*

Synechism is a theory of continuity which Hausman describes as evolutionary realism, and which allows for novelty and surprises. This world view is essential to the previous strands and lays the foundation for Peirce's anti-Cartesian stance. West (1989) argues that Peirce's synechism was inspired by Emerson, who in turn adopted Goethe's naturalistic worldview, which in turn was developed from Spinoza and Greek philosophy. Tychism refers to the idea that there is absolute chance in the universe, and to the probabilistic and inexact nature of natural laws.

It should be observed that Peirce's synechism is essential to the category of thirdness and so provides a way of describing phenomena that emphasise their inter-relatedness and existence within a context. Similarly, Peirce's semiotic provides a basis for linking symbols into a continuity of meaning- a distinguishing capability of the human species.

It is this web of perception and communication that most essentially attacks the idea that reductionist thinking alone can provide a complete knowledge (explanation *and* understanding) of phenomena.

The Relevance of Pragmatism to Systems Thinking.

It should now start to become obvious, at least intuitively, that Peirce's architectonic allows us to perceive entities which constitute " a logical genus suitable to the treatment of wholes" (Angyal, 1941), and which are *organised* as distinct from being *arranged* and which exist within a dynamic context, and whose meaning results from their emergent properties and how people react to these. We call such entities *systems*.

Organisations provide us with an immediate example of such a system. They represent entities organised according to an organising principle, identifiable through their emergent properties (the pragmatic maxim), and existing as dynamic entities within a dynamic context (environment) in such a way that they cannot be defined separately from that environment, and nor can that environment be defined without reference to the organisation (synechism and phenomenology)^x. We can then represent this organisation with a name (symbol), which contrasts it with its environment, and with the connection between the name and the organisation being made by an intelligent being (interpreter).

Furthermore, we can attempt to study organisations through the application of Peirce's three modes of inference, with the principle mode relevant to the management of the organisation being abduction (action learning), noting that this mode of inquiry requires the involvement of a "community of inquiry", identification of the object of the inquiry, a framework of ideas which may be applied, and a method of applying them.

In summary, it is suggested that a set of touchstones exist which allow us to interpret systems and systems thinking in terms of Peirce's pragmatism. In summary these are:

- The rejection of atomistic thinking and the spirit of Cartesianism, in favour of a structure of thinking which acknowledges the existence of wholes within the context of a continuous world view.
- The pragmatic maxim and the identification of systems by their emergent properties.
- The role of abductive inference and its relation to action learning.
- The implication that a complete methodology for systems inquiry must have a way of identifying systems, the framework of ideas which in particular, express "a logic of wholes", and a method of applying this framework to the system of interest.
- The use of symbols in the description of systems.

Pragmatism and the Systems Thinkers^{xi}.

Pragmatism in one form or another has clearly influenced many of our leading systems thinkers. In some cases this is quite direct, in others it is less direct. This is not to suggest that some other set of influences might be found to have had a significant effect on systems thinking, but one can speculate that pragmatism provides one of the stronger threads that weaves through these approaches.

1. Pepper's World Hypotheses.

Pepper's world hypotheses (Pepper, 1942) provide an interesting, but to some, contentious, metaphysical framework in which pragmatism, or as Pepper referred to it, contextualism, is placed in juxtaposition to other fundamental world hypotheses. The linkage between Pepper's work and system thinking has been recognised by Lilienfeld, 1978, who commented that Pepper's work was an "anticipation" of (general) systems.

It will be argued that, despite some objections to the very concept of Pepper's classification, let alone the details, Pepper's world hypotheses provide a very useful pedagogic framework within which to interpret different fields of systems thinking in addition to introducing pragmatism as a philosophical approach particularly suitable for interpreting human systems.

Pepper identifies world hypotheses as "...objects in the world- Among the variety of objects which we find in the world are hypotheses about the world itself. For the most part these are contained in books such as Plato's *Republic*, Aristotle's *Metaphysics*.... Dewey's *Experience and Nature*, Whitehead's *Process and Reality*. These books are

clearly different in their aim from such as Euclid's *Elements* or Darwin's *The Origin of the Species*".

Pepper identified "two opposite extremities of cognitive attitude: "utter skepticism, and dogmatism" but rejected them as not having any real practical value^{xii} and, instead, chose a middle path of partial scepticism which he labelled as "world hypotheses". He then goes on to show "there is nothing cognitively legitimate in these claims which is not accepted also by our attitude of partial skepticism". Employing the "root metaphor method" Pepper, distilled the known world hypotheses down to four from which all other metaphysical positions could be derived and identified a root metaphor corresponding to each of the four hypotheses as well as corresponding categories. The four world hypotheses and corresponding root metaphors are^{xiii}:

Formism, or realism, or Platonic realism, associated with Plato, Aristotle, the scholastics, neoscholastics, neorealists, and modern Cambridge realists. "Objects of experience are seen as copies of ideal forms, and a total world view can be built up along lines of such essences or categories" (Lilienfeld, p9). The root metaphor is *similarity*;

Mechanism, or naturalism or materialism, being associated with Democritus, Lucretius, Galileo, Descartes, Hobbes, Locke, Berkeley, Hume, and Reichenbach. The root metaphor is a *machine*, whether it be mechanical or electrical.

Contextualism, or pragmatism, associated with Peirce, James, Bergson, Dewey and Mead. The root metaphor is an *historical event*, but interpreted, not as an isolated past event, but as an "act in its context". "The world is seen as an unlimited complex of change and disorder. Out of this total flux we select certain contexts as organizing gestalts or patterns that give meaning and scope to a vast array of details that, without the organizing patterns, would be meaningless or invisible" (Lilienfeld, p9).

Organicism, or absolute idealism, associated with Schelling, Hegel, Green, Bradley, Bosanquet, and Royce. The root metaphor is an *organism*, but noting that the term "organism" is "too much loaded with biological connotations, too static and cellular, and integration" is only a little better.

Pepper acknowledges that "some of the ascriptions are, no doubt, controversial", and is at pains to emphasise that the four hypotheses are strongly inter-related. Formism and mechanism are *analytic* theories, while contextualism and organicism are *synthetic*. Mechanism and contextualism "complement each other in the sense that mechanism gives a basis and a substance to contextualistic analyses, and contextualism gives a life and a reality to mechanistic syntheses.... Yet when mixed the two categories do not work happily, and the damage they do to each other's interpretations does not seem to me in any way to compensate for an added richness".

Furthermore, formism and contextualism are "*dispersive theories*"-showing inadequacy of precision, and mechanism and organicism are "*integrative theories*"-showing inadequacy of scope.

Pepper suggests that Dewey, for example, provides a little more emphasis on integration in his pragmatism, while Royce places less emphasis on final integration in organicism and called himself a "pragmatic idealist". Similarly Rescher- A System of

Pragmatic Idealism, 1992, uses the terms “pragmatic idealism” to describe his synthesis of European continental idealism and American pragmatism.

Hartshorne, 1984, is critical of Pepper’s approach, and amongst other things, is critical of the use of metaphors because it assumes that we know what the metaphor means and fails to recognise the differences within a metaphor- “The quantum mechanical view of ‘mechanism’ is basically different from that of classical mechanics” (Hartshorne, p205). But this can be a calculated price to pay for the insights provided by Pepper- Pepper’s hypotheses do provide a useful starting point for discussion, even if they are eventually discarded as being overly simplistic. In addition they bear a strong correlation to Boulding’s hierarchy of systems complexity (Boulding, 1956).

Accordingly, while we can conceive of systems thinking within each of the world hypotheses, for example, classification systems correspond to the world view of formism, engineering (hard) systems to mechanism, autopoietic systems to organicism, contextualism provides the philosophical framework most relevant to the discussion of human systems.

Pepper, 1966, later tried to reconstruct the contextualism as world hypothesis using purposeful behaviour as the root metaphor. In doing so he attempted to search for synergies with the philosophy of Whitehead^{xiv}.

2. Emery- Open Systems Approach.

Emery appears to be the only systems thinker to have sustained the reference to Pepper’s world hypotheses, using Pepper’s framework as a way of introducing the contextualist/ pragmatist hypothesis as the basis of open systems thinking^{xv}. Significantly, the intensity of these references appears to have increased over time, starting with an apology for not having the space to include a contribution by Pepper in his readings in systems thinking (Emery, 1969), to a typical reference in his discussion of policy in De Greene (1993), and finally, a paper drafted in 1989 and completed by his wife, Merrelyn, and published posthumously in 1997, which explains the basis of action research in terms of Peirce’s three forms of logical inference.

However, the secret to Emery’s interest in pragmatism is included in his apology for not being able to include Pepper in his readings. Emery wrote- “This is of particular importance because the ‘root metaphors’ he (Pepper) identifies and rigorously defines are all clearly operating in different systems theorists and account for much of the mutual incomprehension that exists among them. ‘Contextualism’ is the root metaphor which comes closest to our bias in selecting this volume”.

Emery argued that it was only contextualism that facilitated the proper consideration of organisations as *open* systems. While the notion of open systems is applied to mechanistic systems in the thermodynamic sense, and to organic systems in the biological sense (ie, in the sense of Bertalanffy), neither of these is particularly appropriate for human organisations. Consequently, Emery referred to systems relating to formism, mechanism, and organicism, as being *closed* because none of these systems describe a relationship between the environment and an organisation in

which their interrelations are mutually determining and governed by laws which are able to be known. Specifically, these laws relate to the intra-relations which exist within the organisation and within the environment, and the planning and learning relations which define the interaction between the system and the environment. Contextualism is the only world view which adequately accommodates human activity as purposeful behaviour. It is this argument which explains Emery's doubt, raised in his review of Checkland, 1981, that the classical operations research/ management science/ hard systems approaches can really be made "soft" by simply imbedding them in a learning framework, and his criticism that making the distinction between hard and soft systems focusses on the wrong agenda- the real issue is between open and closed systems (Emery, 1982)^{xvi}.

3. Churchman and Ackoff.

Pragmatist philosophy is the basis of the contributions of Churchman and Ackoff, although it is through the work of Churchman's professor at Pennsylvania- Edgar Arthur Singer, rather than through Peirce directly. (This influence is documented by Britten and McCallion , 1994).

What is significant to understand is that Singer was a student of William James, a life-long associate of Peirce. Nevertheless, the connection between Singer and Peirce seems tenuous, despite the fact that we can now recognise Singer's instrumentalism as an articulation of Peirce's pragmatism. Perhaps this particular synergy is not hard to explain given that both were strongly aware of laboratory science.

Singer's earliest encounter with pragmatism is recorded in his book, *Modern Thinkers and Present Problems*, Singer, 1925. In this account Singer describes an evening in 1896 in which he attended a reading of William James' essay *The Will to Believe*, "the essay which, as far as James was concerned, opened the campaign for pragmatism". "No one was more bitten than I with this first feeling of the absurd....But I do recall that we were very much bewildered and not a little shocked by the reading" (p169). But Singer (p188) goes on to describe pragmatism as "a moment in the swing of thought from realism to idealism, and how for it the most vital, that is to say, the moral and religious, aspects of our world are things to work and fight for, to make and to mould, not just to find and come across".

This is a significant statement because it emphasises the possibility and the importance of human endeavour in creating our future, a fundamental tenet of systems thinking.

It is also significant that neither in *Modern Thinkers* nor another of his major works, *Experience and Reflection*, Singer, 1959, does Singer refer to Peirce. This same pattern of lack of systematic reference to Peirce was continued by Churchman and Ackoff. In fact, Churchman and Ackoff, 1950, did write explicitly about early pragmatism, and in recognising "the synthetic character of pragmatism", described it as borrowing "from practically every development in science and philosophy" (p194).

Significantly, Churchman and Ackoff saw the early exponents of pragmatism such as Peirce and James, as being “at the same time profuse and unsystematic” and concentrated their attention on Dewey and Singer. (p194).

One can only speculate as to where Churchman and Ackoff would have taken systems thinking if they were more completely aware of the work of Peirce (and James).

4. Checkland’s Soft Systems Methodology (SSM).

Checkland makes strong reference to the influence of Churchman and Singer in the design of his system of inquiry, but makes no direct reference to Peirce.

Nevertheless, it would appear that Checkland is very much closer to the views of Peirce, than is initially evident. In this respect, Emery’s criticism of SSM mentioned above appears to mis-interpret Checkland- Checkland recognises the “open socio-technical systems” approach’s “core paradigm is one of *learning* rather than *optimization* and that is where lies the resemblance to soft systems methodology” (Checkland, 1981, p258). In another sense, Emery’s view may be better understood by recognising that the process of obtaining root definitions and rich picture diagrams as a means of establishing a mode of inquiry in the sense of Singer and Churchman, is heavily dependent on machine metaphors to describe the system as an input-output transformation. One then has to switch to what Emery would describe as an open systems framework to incorporate Checkland’s learning process as a way of establishing an “appreciative system”.

Checkland’s action learning process, involving a Framework of ideas, a Methodology, and an Area of application (FMA), corresponds to both Peirce’s phenomenology and the application of his abductive inference.

5. Beer’s Viable Systems Diagnosis (VSD).

In *Decision and Control*, Beer, 1966, sets out to show how science can be used to solve problems of decision and control. His words ring with a certain resonance in today’s world where we need to replace the hierarchical approach to decision and control with one which uses communication technology in the non-hierarchical structures of the new organisational forms. The principles of requisite variety and the ideas of attenuation and amplification take on a new application.

Similarly, Beer recognises that management is not about deduction and proof, nor the “application of facts”: “When we speak of management and its decisions we are really speaking of the settling of opinion or belief” (p16). He goes on to argue that “it is not true that belief is settled either by rigorously scientific method on the one hand, or by erratic and emotional caprice on the other”. Beer then proposes reference to Peirce’s paper *On Fixing Belief* and enters into a discussion of Peirce’s four approaches- tenacity based on conditioning stakeholders, authority, apriority or reliance on axiomatic belief of “self-evident” proposition, often couched in the latest language describing a new (short-term) fix for our businesses and economic systems. and finally, the method of science. Importantly, Beer reminds us that scientists are also prone to “fixing belief” through the application of the first three non-scientific approaches.

Nevertheless, like Peirce in relation to philosophy, Beer is concerned to introduce into management some of the rigour which scientists bring with them.

6. The Critical Theorists- Flood, Jackson and Ulrich.

Despite their different emphases on critical theory- Flood and Jackson on complementarism, and Ulrich on emancipation, all acknowledge their debt to Habermas' communicative action, and in the case of Ulrich, to Peirce directly. For example, see Flood and Romm, 1996 (a), Flood and Romm, 1996 (b), and Ulrich, 1983.

However, Habermas in turn acknowledges his debt to Peirce and to Mead in particular. See Habermas, 1968, 1989.

System Dynamics (SD).

As mentioned at the outset, there does not appear to be any obvious formal interaction between the development of SD and some aspect of pragmatism.

Richardson's history of feedback thought, Richardson, 1991, provides the principal account of the deeper historical background to SD, but no formal links to pragmatism are apparent. Nevertheless, as pointed out by Ryan, 1996, consideration of the characteristics of SD and the characteristics of pragmatism reveal a number of synergies:

- SD adopts a continuous view of events, corresponding to synechism. Feedback structures are an integral part of this world view. Furthermore, surprises are contemplated through the operation of feedback loops.
- SD uses reference modes to define a system of interest in the context of a problem focus. This corresponds to the pragmatic maxim of meaning.
- SD places a heavy reliance on the use of symbols to describe systems- the stock-flow diagram provides a very simple language (a semiotic).
- More contemporary approaches to SD emphasise group model building- representing a "community of inquiry".

However, the history of SD makes frequent reference to the problems of model validation and the acceptance of the outcomes of SD modelling in terms of "conventional" science, for example, Forrester, 1968, and Forrester and Senge, 1980. Despite the important discussion on model validation contributed by Homer, 1996 and 1997, Barlos, 1996, and others, SD will always struggle for full acceptance within logical positivism, because it essentially starts with a non-atomistic world view. Indeed, while the work on group model building and evaluation featured in the Summer, 1997, edition of the System Dynamics Review probably fits uncomfortably with the positivists, it will find great synergy with the pragmatists. Lyneis's most welcome article on business strategy, Lyneis, 1999, would find similar acceptance.

This discussion reflects two possible options for SD. On the one hand, modelling and model validation can be emphasised in their own right, with the prospect of SD being

considered a piece of classical management science, operations research, or feedback control theory. Regrettably, in this case issues relating to implementation and learning can be made secondary to the primacy of “the model”. On the other hand, simulation models can be interpreted as devices for helping refine causal hypothesis within a learning community. Models still require rigorous validation, but this process can be seen within a broader context in which problem identification and “ownership” and “learning laboratories” and evaluation take on an equal importance. These aspects are integrated in Diagram 1, which is clearly inspired by Checkland’s roadmap for SSM. While the first approach reflects attempts to apply deductive logic and induction in the sense of positivist science, the second reflects the idea of abduction, particularly when the policies designed using this tentative hypothesis are put into practice.

Similarly, SD can quite easily adopt an open systems view in the sense of Emery, and not attempt to associate itself with open systems in the thermodynamic sense as it appears to be prone. If we take the beer game as an example, this means that the beer producers and distributors etc will not just wait for exogenous shocks from the consumer, but will actively attempt to “co-evolve” with the consumer; ie, consumers would become endogenous to the model. This does not imply that the endogenous view is no longer relevant, but rather that it is reserved for truly exogenous effects, such as changes in the weather.

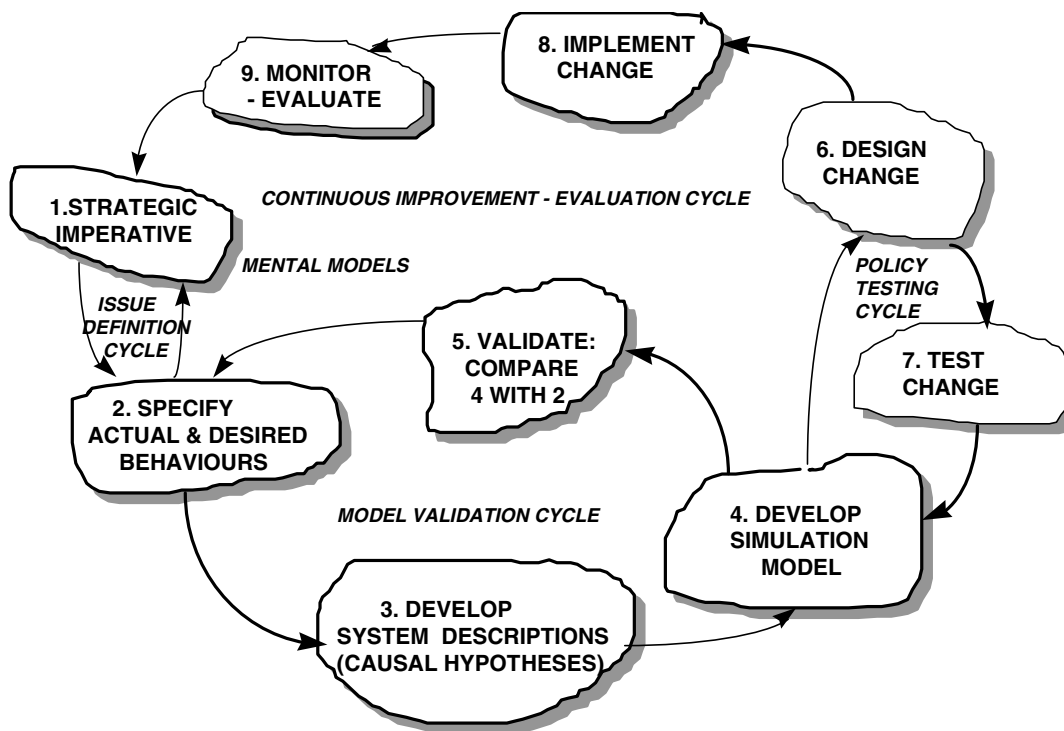


Diagram 1. A Systems Methodology Involving Four Learning Cycles

Conclusions.

A prima-facie case is established for the relevance of Peirce's philosophy of pragmatism. This case is presented at two levels. At the first level is the nature of pragmatism itself, with the pragmatic maxim having a close synergy with the concept of emergence, and its application of semiotics and phenomenology providing a basis for both communication and description, the importance of abduction as the basis to action learning and its relevance to management, and finally, the adoption of synechism as a world view. At the second level, we have the links, both direct and indirect, between the various systems schools and pragmatism.

In the abductive spirit, this case provides us with an informed basis within which to better understand systems thinking and the relationships between the various schools. It may encourage us to stop "managing events" and look more carefully at underlying logics and beliefs. If the initial hypothesis proves acceptable to the community of systemic inquirers, then systems thinking has found an important organising principle with which to approach the issues that surround us. Such a position is to be strongly preferred to the "my approach is better, or more general than yours" approach we have witnessed in the past. Obviously, this does not mean the end of rigorous debate between our various approaches, however. Instead it represents the start of a debate which can seek reference to a higher order of logic.

Pepper's world hypothesis provides us with a pedagogic device for introducing pragmatism in juxtaposition with other world hypotheses. It also provides the basis for an articulation of systems approaches which illustrate both colloquial and technical usage and somewhat overcomes the difficulties inherent in the use of the dichotomous language of hard and soft systems, and open and closed systems etc.

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ⁱ This paper was to be developed jointly with Professor Tom Ryan from the University of Cape Town but circumstances defeated the best of our intentions. The author is indebted to his colleagues at Monash, Dr John Selsky, who was particularly helpful with references and advice on the early work of Churchman and Ackoff, and Dr Tim Haslett who endured many of the authors attempts to explain the possible importance of pragmatism to system dynamics. A special debt is due to the late Professor Fred Emery who introduced the importance of pragmatism to the author, and to Dr Merrelyn Emery who continues to define the relevance of pragmatism to the theory and practice of open systems thinking.

ⁱⁱ Mounce (1997) provides a brief and accessible perspective of the development of pragmatism from the works of Peirce to the contemporary work of Rorty.

ⁱⁱⁱ Rescher, 1992, provides a refreshing perspective in this respect. Joas, 1993, Diggins, 1994, and Shusterman, 1992, discuss extensions of pragmatism into social and aesthetic fields. Houser and Kloesel (Ed), 1992, and the Peirce Edition Project (Eds), provide an accessible collection of Peirce's papers.

^{iv} Putman challenges the simple view that philosophical debate in the US has simply moved through phases of pragmatism, led by James and Dewey, up until WW2, then analytic philosophy led by Carnot and ... etc, and now something of a swing back to pragmatism, through the neo-pragmatists, including Putman himself. Putman still sees the philosophical schools being much more fragmented with if anything, still a strong emphasis on analytic philosophy in the American universities. (Putman, 19..).

^v We will continue to use the more commonly used term, *pragmatism*.

^{vi} I am indebted to John Selsky for suggesting this discription.

^{vii} James uses a debate about whether a person chasing a squirrel, which remains positioned on the other side of a tree trunk, ever goes around the squirrel or not, to demonstrate this point. The argument is resolved by clarifying what is actually meant by "goes around" (James, 1907/1997, p 17).

^{viii} Argyris, C, Putman,Action Science provide a useful account of this connection.

^{ix} It is worth noting that abduction has become an extremely fundamental logic in the development of expert systems and artificial intelligence.

^x Bohm's whirlpool in the river metaphor captures this idea admirably- Bohm, 1980.

^{xi} This is clearly a very subjective path to follow, and the reader is encouraged to amend this list in the light of their own knowledge.

^{xii} Some would link much of current post-modernist thinking to Pepper's interpretation of utter skepticism.

^{xiii} Discussion of Pepper's categories corresponding to his world hypotheses is omitted in the interests of brevity.

^{xiv} In essence, Emery and Ackoff, 1972, attempts a similar argument.

^{xv} A useful source of Emery's earlier papers can be found in Trist and Murray, 1993, and Trist, Emery and Murray, 1997. etc

In *Pragmatic Thinking and Learning*, Andy Hunt does an excellent job of exploring how to transition to the next level of understanding regarding any specific domain, with scores of practical tips and exercise. Of course this book focuses mainly on programming, but the lessons taught here apply to any skill. Andy Hunt, the author, elegantly and logically builds a story about how the human brain thinks and learns. This book offers a great deal more than a common "how to" book in that Hunt provides a great deal of context associated with the topics that he covers. *Principles of Systems Thinking*. This topic forms part of the Systems Thinking knowledge area (KA). It identifies systems principles as part of the basic ideas of systems thinking. Some additional concepts more directly associated with engineered systems are described, and a summary of system principles associated with the concepts already defined is provided. A number of additional "laws" and heuristics are also discussed. Pragmatics is a subfield of linguistics and semiotics that studies the ways in which context contributes to meaning. Pragmatics encompasses speech act theory, conversational implicature, talk in interaction and other approaches to language behavior in philosophy, sociology, linguistics and anthropology. Unlike semantics, which examines meaning that is conventional or "coded" in a given language, pragmatics studies how the transmission of meaning depends not only on structural and linguistic knowledge