The Ontology of Innovation: Human Agency in the Pursuit of Novelty

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The Research Problem

There is a lack of ontology in the study and explication of innovation. Does this matter? It matters because ‘innovation’ has become an important word in the 21st Century, reflecting all that is modern, progressive and exciting in a complex world. This is reflected in every phase of daily existence in modern capitalist economies. Firms are urged to be innovative to gain or sustain a ‘competitive edge’, consultants advertise their strategic advice as the essence of innovation, local communities’ survival depend on the capacity building that comes from innovation, schools are exalted to have innovation in their curriculum, universities promote themselves as leaders in innovation. Politicians respond to the need for supporting all the above through policies for enhancing such innovation in the nation.

Ontology is “...the study (or a theory) of being or existence, a concern with the nature and structure of the ‘stuff’ of reality.” (Lawson, 2003, p. 12) Any study or research of a concern has a metaphysical theory of ontology as a precondition to modelling and empirical validation, whether implicitly or explicitly stated. This is the foundation of all inquiry. Ontology illuminates the range of empirical phenomena that potentially can be investigated. When it comes to innovation, the ontology is poorly conceived or implicitly assumed in an extremely simplistic approach. The reason is that the human actions underlying innovation have rarely been explicated in any clear consistent manner. Innovation as a process is complex and poorly understood because it is deeply rooted in the uncertainty of the future world in which each particular innovation will inhabit in the form of a new product, a new process, a new movement or a new organisation. All that is known is that innovation brings change and something ‘new’ emerges, which cannot be modelled (or only very sketchily modelled). As a result, it is often portrayed as exogenous, thus anything that cannot be accounted for by quantifiable measures is called “the residual” and comes about via innovation. Empirical studies from as far back as Denison (1962) clearly show that this “innovation” residual is very significant, accounting for far more than 50 per cent of economic growth. Economic history studies have confirmed the crucial role of innovation in their empirical narratives tracing innovation back in history.¹

The research problem that emerges is how to identify and exposit a realist and sustainable theory of human action in the innovation process. Economics conceptualises a general ontology of the economic agent based on human action, to which innovation is only one specific application. The results of this approach have been inadequate. The next section identifies these inadequacies within the history of economic thought and argues for an ontology that places innovation at the centre of human agency that is in pursuit of novelty. This can form the basis of an endogenous model of innovation and its significant impact on the analysis of economic development. Allen Oakley’s extensive work on the problem of human agency is briefly outlined in the following section with a view to using his theorising as the basis for a realist ontology of innovation. Then, novelty in human agency is specifically addressed, using heterodox economists thought and contributions from a

number of innovation-based sets of literature which provide insights into human agency specifically contextualising innovation in their professional concerns. This produces a human agency path of innovation which is specified and then used in a planning framework applied to the traverse (or structural change path) and for important public policy consequences that such a construction entails.

Inadequate Orthodox Ontology of Innovation

The mainstream orthodox economic view of human action is based on the ontological theory of *homo oeconomicus* (or “rational economic man”). This is the ideal deductivist-logic of an isolated human agent who applies optimal economic rational decision-making calculations to all commercial based alternatives. The representative rational economic agent has the capacity to make all the information processing and computational calculations required to optimise any choice alternative faced in terms of accounting and opportunity costs. The aggregation of these representative agents produces optimal equilibrium outcomes. There have been many critiques of this economic agent, essentially from two perspectives. One is that such calculations require superhuman powers in appreciating all the costs and benefits involved, and then projecting these into the unknowable future (e.g. Simon, 1975). This results in fundamental uncertainty that cannot be reduced to some probability distribution (see Lawson, 1988). The other is the lack of attention this representative agent pays to the real-world content and meaning of human action to the point that a fiction emerges divorced from reality, while advocating a particular idealised view of “free-to-choose” capitalism (e.g. Lawson, 1997; Boland, 1997).

From the innovation perspective, this orthodox view of human agency has produced what Legge and Hindle (2004, p. 25) call an “ignorance” of the “entrepreneur” who brings forth innovation: The general equilibrium approach “...considers the ‘state of the world’ long after the last innovation has taken place and no further changes can be expected.” In essence, entrepreneurs in a perfectly competitive economy have no economic incentive to innovate when knowledge is instantaneously transmitted. Innovation ends up being exogenous in the orthodox economic model and, thus, resolves two problems. It overcomes the inability of human agents to predict the future and it ensures the consistency of their general equilibrium model. However, it sacrifices any claim to analysing innovation within capitalism and its operation in either microeconomic business management terms, or in macroeconomic economic development terms.

Legge and Hindle (2004) identify two attempts at re-introducing innovation into orthodox micro- and macro- economics. At the microeconomic level it is in the form of principal-agent theory, clearly enunciated in the managerial economics literature associated with organisational architecture (for example, Brickley et al., 1997), where the principals are shareholders (represented by the company board) who set up an organisational structure that ensures their wishes are carried out by hired managers. This brings the entrepreneur “owner-shareholder” into direct relation to the original entrepreneur “owner-manager”, both acting as the innovative spur for “the firm”. Legally, a limited liability company is different from its owners (Kay and Silberston, 1995, p.88); and empirically, corporate firms have been measured in terms of co-ordinating and combining core competences as a cooperative process in tune with

market reality (Acs and Audretsch, 1991). Both aspects undermine the principal-agent theory. The problem of human agency in orthodox economics remains.

At the macroeconomic level, the new growth theory led by Romer (1994) relaxes the standard model by focusing on the cost of new knowledge (or innovation) and the time taken to disseminate it. Only part of new knowledge is appropriated internally in the firm, while the rest spillovers into the community to be appropriated by other entrepreneurs. Legge and Hindle (2004, p.32) describe the results as “unexceptional” and consistent with the pioneering work of Smith (1776). However, the two critiques of human agency remain, with no resolution of the uncertainty and representative agent dilemmas in the new growth theory; i.e. the two dilemmas prevent any realist ontological account of the way innovation is endogenous to the economic system.

The Problem of Human Agency: The Oakley Contribution

Allen Oakley has devoted much of the latter part of his scholarly career on unpacking the problem of human agency within the study of economics; from the classical writers, through the Austrians (old and new) to the neoclassical mainstream. In Oakley (2002), the project extends to devising a humanist reality of economic agency as a foundation for a reconstructed economic theory. The first principle Oakley asserts is that empirical research has to be based on some ontology (explicitly or implicitly); otherwise one cannot identify what a researcher focuses on when examining complex data of human activity. The second principle is that this ontological base needs to be grounded in a realist perspective of human activity in which actions are determined by the structured situations *actually* existing, while also affecting this very same structure by the actions taken. (Oakley, 2002, pp. 18-20). For Oakley the problem of human agency in economics stems from orthodox economics rejecting the second principle by adopting a positivist (or physical scientific methodological) view of autonomous existence and inherent orderliness which denies any role for real-world agents in an open system, then constructing complex methods of interpreting data on the implicit acceptance of this very simplistic and normative abstract ontology.

The Oakley contribution is to represent human agents as they have been perceived by philosophers working on the anthropology of social activity, and then to situate such human actions within the economic phenomena of capitalism. This provides the basis for a realist economic ontology and consequently a more appropriate empirical methodology upon which to develop an economic theory. The richness of Oakley’s contribution to this enquiry cannot be adequately summarised, and any brief overview will be inevitably a caricature of the thesis he expounds. What follows is merely some crucial elements of Oakley’s thesis that form the basis for the ontology of innovation to be constructed in the next few sections.

There needs to be, in Oakley’s view, a defensible ontology that can explicate human nature within an economic cosmos. The irreducible aspect of human agency in the economic sphere is centred on choices, decision-making and actions. A satisfactory ontology needs to capture the voluntaristic role of independent human agents in the three aspects of the economic sphere, but also recognise the deterministic social structure that governs all economic phenomena. This is the position developed by the critical realism literature led by Lawson (1997, 2003). Oakley builds on the critical

realism account by introducing a rich vein of constructive philosophic writings by major social theorists, including Alfred Schutz, Karl Popper, Herbert Simon and Anthony Giddens. The following extract encompasses the dualistic relation between voluntarism and determinism:

This social and economic cosmos is the unintended collective product of their individual actions immanently and volitionally guided by the situationally imposed rules, facilities and constraints that shape these actions...But because of uncertainty and the need to depend upon other people within their social environment, the deliberated actions of individuals will for the most part generate phenomena that include outcomes that were not wholly expected and not wholly desired. (Oakley, 2002, p. 192)

The way this dualistic relation occurs within the Oakley constructed thesis is that human agents search for a balance between contingency of human action and containment which limits this human action. Contingency is a “free-to-choose” agency concept that is strongly qualified by what agents know (or have learnt) based on their cumulative biography. Individual capacities emerge from this learnt past. In this concept, history matters in a very personal way and can be linked to Kalecki’s economic growth dynamics, where the long-run is merely the cumulation of a chain of short-period decisions and actions². Thus, there is no long-run optimality in a realist account of history; instead there is a series of short-period events that cumulate as a biography into an ever-changing long-run dynamic. Choice in such a dynamic is contingent on the past and backtracking is impossible³, which results in irreversible change.

Containment is what Oakley calls the “situational conditioning of human agency”. Agent’s decisions and actions are conditional on the extant information, available facilities, and imposed rules (or conventions) that particular societies develop and implement. This is the institutional framework of society that arises out of the situational conditioning. As societal beings, human agents learn that it is in their best interests to co-operate by habits and routines with the institutional manifestations of the collective society. This containment of “the free spirit” has two important implications. One is the recursive (or feedback) effect in which the endogenous cumulative biography of individuals both shape and are shaped by the institutional constraints learnt (or understood). The path of economic development and transformation is “locked-in” on the basis of this recursive effect. The other implication is that society is prevented from chaos by institutional containment and reasoned agent behaviour in the face of these containments (we generally drive on one accepted side of the road). This is the “complexity” concept of an open system in which “...the collective behaviour of many basic but interacting units” evolves over time, with self-organisation and adaptation (Coveney and Highfield, 1995, p. 7).

If society is totally contained by its institutional manifestations, without any room to move outside the given information, facilities and rules; society is in a closed system like a chess game where all the rules are structured and unchangeable. Human action would then be limited to whatever can be created within these highly structured limitations. Chaos occurs if, on the other hand, there is no containment of rules and structures. A completely open system emerges as with children playing their own developed games where the rules are changed in an *ad hoc* fashion as these games progress in a highly creative way.⁴ Economic phenomena rest on situations that exist between these two extremes. Oakley argues that it is the relative weighting of the

balance between contingency and containment in any specific real-world setting that explicates the sources human agency and determines their nature. If the weight of containment is greater than contingency, then the system favours generalisability based on strict logical arguments. If the weight of containment is less than contingency, then the system favours less generalisability leading to more complexity-based arguments which overall create and dissolve patterns over time. The crucial issue for Oakley is to capture the right balance between contingency and containment in any particular phenomenon under investigation (Oakley, 2002, p. 216). In the discussion below, this question of balance is referred to as C&C.⁵

From this ontological basis, Oakley identifies three research enquiry agendas in economics. The first is to “...seek out any ontologically occurring regularities and universalities that characterize the generation of a particular type of phenomenon.” The second is based on where such characteristics are not found, “...to supply the regularity and universality that scientific inquiry demands”. This requires much deeper research insights that can be ascertained from complexity-type modelling. Finally, the researcher needs “...to design interventions that maximize the containment and minimize the contingent remainder affecting agents’ deliberations and decisions” (Oakley, 2002, pp. 215-7). This latter enquiry is into *praxis*, where change comes from understanding how processes work. Policy design strategies should aim to allow agents volitionally to be directed and contained towards desired outcomes; otherwise the policy changes would not be sustainable. By combining this agenda with previous work on Adolph Lowe (Oakley, 1987 and 1994), a traverse (or structural change path) can be devised by working backwards from desired end to required means in a search procedure referred to as retroduction. Lowe uses this approach to make “regressive inferences” and so derive necessary links back to motivational patterns that can be successful in achieving the desired end.⁶

Novelty as the Basis of Innovation

Innovation can be defined as the application of knowledge in a new form to increase the set of techniques and products commercially available in the economy. These techniques can be technological or organisational based. Forms innovation can take, in order of their impact on economic development (from low to high), are: (i) continuous (or “Kaizen”) occurring daily at the work place; (ii) incremental based on research and development (R&D); (iii) radical discontinuous based on entrepreneurship (both corporate and individual/team); (iv) technological systems change based on a cluster of innovations; and (v) techno-economic paradigm shift due to major structural change (e.g. steam engine, information technology). Each form of innovation can dovetail into higher order innovation, thus becoming increasingly more important to society. The essence of this definition is novelty in terms of knowledge applied (or commercialised) in the economic sphere of human activity.

The ontological question is why do human agents carry out innovation? The exogenous explanation as “*manna* from heaven” fails on the realist ontology framework. Non-mainstream (or heterodox) economic paradigms are attempting to develop alternative perspectives to rational economic man, but they all “...work with different strategies for explaining agency.” (Davis, 1999, p.464) This results in diverse and arbitrary explanations that, when applied to innovation, lack coherence. Nevertheless, from these diverse views can emerge a realist ontological account.

Outside the economics discipline there are a number of innovation-based sets of literature which provide insights into human agency specifically contextualising innovation in their professional concerns. All the professional literature has useful insights without providing an ontological foundation to innovative behaviour.⁷ There is an implied *homo oeconomicus* assumption in the business professions coming from its roots in orthodox microeconomics, with the uncertainty and representative agent dilemmas remaining intact. Despite this, the strong empirical basis of their research provides a rich source of data that can inform a realist ontology of innovation.

Oakley opened his own investigation of human agency by stating that “...it is this capacity [of agents] for dealing with novelty that is most relevant.” (Oakley, 2002, p. 31, fn3). This section aims to look directly at novelty as the basis for innovation in theorising a sustainable endogenous ontology of innovation using both heterodox and professional innovation-based literature. Oakley (2002, p.31, fn.4) notes “...the agents and strategic actions in focus...are confronted with the problem of adapting habits and routines in order to make decisions in the face of novel situations.” Only the successful adoption of the new routines can lead to the wide diffusion of innovation. Novelty brings into play the balance between C&C.

Using C&C, a spectrum can be identified that encapsulates all forms of innovation. At one end of the spectrum is the entrepreneurship literature that espouses spontaneous responses to economic and social conditions in the way contingency far outweighs containment, resulting in radical innovation (or significantly different incremental innovation). Human actions by agents at this end are strongly influenced by what Keynes (1936) calls “animal spirits” (p.137) in an environment where containment is relatively weak. Society encourages the “spontaneous urge to action” (p. 144) of entrepreneurs. At the other end of the spectrum is the technology management and organisational behaviour literatures that espouse key management practices (or rules and conventions) to economic and social conditions in the way containment far outweighs contingency, resulting in continuous and incremental innovation. Human actions by agents at this end are strongly constrained by history with the individual and institutional biographies derived from the past, but still within what Keynes called “the entrepreneur economy” in which “entrepreneurs” are compelled to make investment decisions (Keynes, 1936, p. 150).⁸ Complexity allows the arbitrary typology of this simple C&C spectrum to be used in any real-world situation. For example, an initially constrained innovation can over time shift to the spontaneous end of the spectrum as society and its participants in entrepreneurial decision-making become more open in the systems employed.

Two major contributions are identified and examined in Oakley (2002) to the concept of novelty. These contributions by Choi and Shackle can be grafted onto the C&C spectrum to derive ontology of innovation. Choi (1993) recognises uncertainty as the stimulus for innovation.⁹ Opportunities arise with the uncertainties of life (‘disequilibria’ in orthodox economics). Choi identifies the sources of these uncertainties as: (i) ontological complexities, (ii) unpredictability of the future, (iii) interdependence between agent and others, and (iv) limitations of the mental capacities of agents.¹⁰ With such difficulties, any situation in which agents need to make a decision and act into the future requires a set of guidelines provided by a “repertoire” of habits and routines established from the past. Choi calls these

“paradigms” that have evolved from experience. The more novel the situation, the more agents need to search for the most appropriate paradigm and then modify it to best address this situation. Innovation comes out of this process. This “search and modify” behaviour can fit into the C&C spectrum, by recognising the extent of contingency and containment in each decision. The more modification is done to any paradigm, the further the agent is on the spontaneous end of the C&C spectrum.

The deeper ontological question that Choi’s analysis brings forth is to explain how “search and modify” behaviour operates in a world of fundamental uncertainty to produce innovation. This behaviour cannot be based on any calculation of what is objectively probable, but instead on the subjectivity of what is deemed possible. This is the starting point for Shackle to explore the role of imagination in this “search and modify” agency process. Shackle has published a significant body of work on the role of imagination, driven by inspiration, as the source of creative solutions to the problem of fundamental uncertainty when it comes to making decisions into the future and acting on them. In the process of devising such inspirational solutions, novelty and innovation are introduced into the system. From this proposition, it is clear why the “...world in which enterprise is necessary and possible is a world of uncertainty” (Shackle, 1967, p. 133). As Oakley (2002, p. 111) notes: “For Shackle, the very existence of profit as capitalism’s *raison d’être* stems from uncertainty manifested in expectations of value”, where “...the differences between the value of a current stock of goods and their expected future value...[are] subjectively assessed by the holding agent.”

Placing future time into a reasoned rational space through imagination, Shackle turns “mechanical man” into “inspired man”, without giving up formalism. This Shackle does by identifying degrees of potential surprise that form a sequel in any contemplated course of decision and action. Oakley (2002) develops this account of Shackle’s work in three detailed chapters. In the context of innovation, what Shackle contributes is a subjective (yet formal) process of innovation by handling uncertainty through the imagination. Shackle’s weakness on the situational conditioning of agents (identified by Oakley) can be overcome by incorporating Choi’s paradigms within the C&C spectrum. This then provides a thorough ontological theoretical construct from which to understand innovation and its diffusion.

For completeness, the diverse heterodox and professional contemporary literatures on innovation are briefly placed within this C&C construct. None of these sets of literatures establish any clear prior ontology that encapsulates the whole spectrum. Their own respective limited rationales situate innovation only on one part of the C&C spectrum.

At the extreme spontaneous end of the C&C spectrum exists the neo-Austrian literature (see Kirzner, 1973), in which the entrepreneur is seen as alert to opportunities for taking advantage of discrepancies and gaps in the market system. In this sense, the neo-Austrian version of the entrepreneur is an arbitrager; a persona embodying foresight, knowledge and willingness to act in situations of widespread ignorance of the disequilibria that exist (Canterbery, 1995, p. 262). Exploiting opportunities in a rational planning manner adds to the value of the final product by the techniques that are ‘put to use’. The appropriation of monopoly power in the

market is evidence of creative and successful entrepreneurship. Such monopoly power is not seen as permanent by neo-Austrians unless such power is underwritten, subsidised and otherwise supported by governments and their regulatory agencies. Shackle would feel comfortable within this body of literature, if not for him recognising that action of entrepreneurs must be ontologically situated within a social, conditioning and regularising environment. The entrepreneurship business literature is based on the same human agency rationale, but at the implementation (“how to do it”) level. Not surprising that the role of containment (especially government) is seen as part of the exogenous environment rather than situated inside the agency ontology.¹¹

At the other constrained extreme of the C&C spectrum exist the Institutional and neo-Schumpeterian literatures. Innovation in this approach comes from the “technostructure” of the large corporations that form the planning system of capitalist economies and which guides economic development. This agency group embraces specialised knowledge, talent and experience (especially through R&D) in specific technology-based areas where the market system (and its small enterprises) is symbiotically subservient to the decisions of large corporations, while governments need to acquiesce to the planning system’s power and influence. This exemplifies a highly constrained innovation process. Galbraith (1967) developed this large firm dominance approach from Schumpeter (1942) with a managerial class concerned to protect and support increasingly sophisticated technology in a planned approach. Power lies with the technostructure that serves partly the capitalist-owners through share price and dividend sustainability, with increasingly generous serving to themselves via remuneration packages and perquisites of office.

The mainstream business management literature is compatible with the Institutional approach, but with a microeconomic perspective of the firm as an administrative unit that develops a ‘life’ of its own and is not distinguished from the actors who operate inside this organisation. Penrose (1959) is the major inspiration for this perspective.¹² The focus is on the firm’s internal development through a dynamic capabilities framework. In this approach, it is human agency itself that gets sublimated under the co-ordination of core competencies. The human agency rationale at the management level remains essentially *homo oeconomicus* as explained above. At the level of the general employees in an organisation, Amabile (1988, p.55) addresses the ability of workers to be creativity by asserting: “...do what you love and love what you do.” This creativity comes from internal motivation to engage in rewarding and challenging work, which is cultivated through organisational creativity management. Locked-in to the containment end of C&C, agents’ ability to be creative and then take the innovation through to implementation can only be seen as exogenous i.e. internal motivation comes from outside the research agenda. It follows that the problematic with the management construct is its inability to relate what are very useful observations to capitalism’s *raison d’être* in matching expectations with time-bounded uncertainty.

A new set of innovation literature based on the notion of the “Creative Class” provides a more complex problematic for the C&C ontological construct. The major theoretical and empirical work is based on Florida (2002) that identifies innovation in the creativity of an elite class of talented individuals. These elite prefer places that are diverse, tolerant and open to new ideas. Such regions develop effective, speedy and

concentrated flows of knowledge - which Florida calls “creative capital”, as it is the prime asset in the region’s economic development. Entrepreneurship and business development is attracted by these elite. Regions throughout developed economies are promoting themselves as centres with a particular unique blend of creative capital, but its diffusion quickly dissipates over distance significantly limiting the spillover effects to nearby regions. The creative elite are at the spontaneous end of the C&C spectrum, and are attracted by a broad set of social and cultural conditions that reside within specific geographic boundaries. This makes the creative elite highly contingent on what attracts them to the region, yet the elite themselves create the innovative environment. There is an ontological problem in having regional development authorities searching for and supporting this elite when it is this very elite that creates the appropriate environment. Regional policies based on attracting and retaining this elite need to develop a “containment” environment which works against the elite’s own predilections and is exogenous to their own creativity. Also, the footloose nature of these elite implies that another region may find it easy to ‘poach’ such highly prized individuals.¹³

Overall, the C&C spectrum provides a way of understanding innovation across the whole breadth of innovation forms. It also indicates the specific ontological limitations of various approaches to innovation proffered by scholars from different research disciplines. The remaining part this chapter examines how this ontological account of innovation can provide a sound basis for examining the endogenous paths of economic development that innovation has the potential to create. This path development accords with Oakley’s scholarly concern for Adolph Lowe’s political economics.

The Human Agency Path through Innovation

The ability to move forward from the ontological exposition of innovation above to a realist human enquiry of various aspects of innovation identified by the diverse sets of innovation literatures needs a human agency path to be revealed. Oakley (2002, pp. 6-7) explains that “...full appreciation of the reality around us requires us to adopt a ‘three-level’ perspective on how it is structured and grasped.”¹⁴ This section adopts Oakley’s three levels to appreciate the structure of the human agency path of innovation and its progress through it.

The path begins where human action is “...conceived of as a self-conscious, subjective and cognitive being.” (Oakley, 2002, p. 9) The realist ontology specified earlier rejects the *homo oeconomicus* instrumentalism psychology. In its place Oakley substitutes “folk psychology” of thoughts shaped by agents’ mental makeup.¹⁵ For innovation, at the cognitive level there are specific mental qualities, disposition, intention and purpose that are reflected in the characteristics of entrepreneurship discussed earlier. Out of the “endless list” that can be made up of these characteristics, Schaper and Volery (2004, p. 36) identify three valid traits: (i) need for achievement, (ii) internal locus of control and (iii) risk-taking propensity. These traits are inevitably subjective and can never be reduced to physical sciences-type elements. These three traits provide the pre-existing cognitive qualities that allow sensory data to be processed so that opportunities for innovation can be identified. For Oakley (1994, fn 19), this “...demands a significant degree of creativity and independent insight on the part of the agent, as well as a deep knowledge of existing

and potential future production techniques and/or product outputs.” Agents with strong concentration of the three traits develop strategic sequence of proposed actions that are resource-using while incurring both sunk and transaction costs. Examples of such *ex ante* decisions and actions in the innovation field are R&D, education and training, technological management, new product marketing, and crucially, investment in new capital goods.

At the second level, the omnipotent optimising (substantive) rationality of *homo oeconomicus* is replaced by procedural rationality. Vercelli (1998) argues cogently from first principles that fundamental uncertainty makes any optimisation algorithm based on substantive rationality impossible to be expressed in any way that would have operational significance. The elements of irreversibility and complexity that arise over historical time imply that an adaptive procedural rationality is required.¹⁶ This means that creativity and innovation can only be achieved in a cumulative process of learning by doing and acquiring knowledge through implementation of acceptable adaptive (non-optimal) conventions and rules. The crucial aspect of this rationality is that innovation is a contingent process which achieves outcomes “...that cannot fully realize any imposed notion of an optimum.” (Oakley, 2002, p. 168) Innovation is a business risk related to changing a product, process or organisation which is a matter of fundamental uncertainty, which is different from the chance-type financial risk of capitalists when speculating, lending or gambling.¹⁷

Situational analysis is the final perspective level which folds into the previous two levels. Here, the “free-to-choose” market situation must be replaced with an *in situ* action process where autonomy is counter-balanced by contingent containment. Autonomous subjectivism of Austrian economics needs to be weighted up against Marxist determinism. In the innovation process, the opportunities and options that confront the entrepreneur are bounded by the folk psychology of the entrepreneur(s) and the particular procedural steps they take, as well as the actions of other agents in response to the same opportunities and the initial actions of the original entrepreneur. All this is bounded by the specific institutions and political frameworks that influence the development of any particular innovation.¹⁸ Often it is the second or third entrepreneur who follows the initial entrepreneur in the same innovation process that succeeds in the long term diffusion of the innovation.¹⁹ Also, sometimes innovations (and creative ideas) appear independently of each other around the same time because the *in situ* is very similar, with the first two levels of this agency path being congruent.²⁰ The above *in situ* circumstances narrow the possibilities from which innovation is ‘chosen’ and shapes the mentality of the participants in the innovation process and its diffusion.

The Traverse in the Political Economics of Innovation

Enhancement of innovation has become a commercial and political quintessential for economic and business development. However, the diverse views and applications of the term innovation have shown very little understanding of what innovation is all about and how best to enhance its processes. This section will take the ontological human agency path of innovation as the fundamental sequential process (or traverse) and develop a coherent systems approach to innovation policy for public and private sectors within capitalism. The result is a comprehensive political economic intervention that enhances innovation systems within a particular geographical

boundary; be that sub-national region, national, cross-country regional or even global (in terms of, for example greenhouse emission protocols).

The *observed* traverse is defined as a sequence of irreversible events within the structure of production. When a change occurs (or is induced by policy) to alter the level of demand or supply in the economy at a macro level, there is a sequence of slowly evolving production decisions made by industries and firms in response to such changes. An innovation is a disruptive change to the structure of production, which results in an observed traverse that requires empirical analysis both from the perspective of the behaviour of the change agents involved and the strategies and processes that created the traverse path identified.

Confirmed from the ontological discussion up till now is that innovation does not come ‘out of the air’. The previous section identified the complex *in situ* human agency path of innovation. Thus, innovation is contingent on this path, which includes the institutional and political frameworks of the specified geographical boundary under consideration. All innovations come out of a subjective, but tractable, complexity-type process. Intervention in the economics of innovation is highly commercial (e.g. Bill Gates monopolising information technology) and political (e.g. warfare needs for military technology). The task of the political economics of innovation is to devise policy-induced interventions that serve the best interests of the broader community and not purely the narrow interests of some powerful commercial interests and their political supporters.

Adolph Lowe set himself the task to develop an *instrumental* traverse which is a policy-designed trajectory that is based on specified end target goals. Lowe considered that these goals must be determined by grass roots support (voluntary conformity) and have the supporting systems and ‘instruments’ to deliver what is demand-determined. This strategy needs a carefully designed adjustment process with targets for each stage of the traverse to be supported by investment perspective planning as set out by Michał Kalecki. This Lowe-Kalecki planning framework provides the instrumental policy approach for the political economics of innovation incorporating the three-level human agency perspective. This planning framework can be adjusted to accommodate any balance of C&C in a particular administrative region.

Lowe (1976) established an instrumental analytical framework designed to enable rules of formal behavioural logic to be applied to economic cause and effect sequences over historical time. This framework is particularly aimed at using such cause-effect principles to communicate to agents concerned about the goal-directed outcomes desired. Agents who want to be involved in entrepreneurial activity need to convert these “control design” principles into behaviour and actions that “add-up” to the desired macro-level outcomes. For Lowe, the patterns of conduct for innovative agents need to deliver a sustainable, equitable and ecologically supportive economic environment.²¹ Once the desired patterns have been identified, then it is critical to ensure communication and implementation requirements are accurate and effective. This approach directly addresses innovation through the contingent folk psychology in the human agency path.

Procedural rationality is needed to “handle” fundamental uncertainty that inevitably will confront with the future pattern of desired conduct. Analysis and evidence show that uncertainty by the “mistake-ridden private sector” causes investment instability, thus undermining economic activity and competitive advantage (Courvisanos, 1996, pp. 190-2).²² Private corporate investment strategy that is best suited to innovation needs a secure business environment, but one which has public policies which support continuous development and change (see Kay, 1993). This situation potentially offers the opportunity to influence (through containment) agents in their innovation activities towards a sustainable outcome. In market-based economic regions or nations that lack relevant supportive physical and social infrastructure, there is insufficient order and coherence (or containment) to impel the creation of innovative sustainable investment projects by the private sector without a state structural adjustment policy.

Michał Kalecki’s ‘perspective planning’ (Kalecki, 1986) can provide a specific situational analysis into the framework through an investment strategy that establishes motivation and voluntary conformity towards goal-directed appropriate goals. A path of dynamic diffusion of new technological and organisational systems needs to be established that are conducive to innovation for a sustainable physical environment. This requires long-term investment strategies to have an incrementally adjusting *perspective* planning approach.²³ To achieve this it is necessary to establish specific practical short-term goals to induce innovation in investment decisions that eventually adds up to the long-term goals specified. The plan must be continually assessed at every short-term end-point to see whether it is necessary to revise the goals and the strategy for reaching the broad-based long-term scenario. A perspective plan with these goals is set up to form a specific investment program in consort with agreed human agency rules that deliver the type of sustainability determined by Lowe’s ‘instrumental analysis’.

Economics and Innovation

Innovation is central to the study of economics, both in terms of behavioural processes and economic development. No innovation and society stagnates. Scarce resources can only be distributed more effectively by innovation, both organisationally and technologically. Yet, innovation remains poorly analysed and even more poorly modelled into the economic ‘science’. Major economic thinkers have placed innovation at the centre of their analysis (e.g. Smith, Marx, Schumpeter), and others have seen innovation as an important long run development (e.g. Hayek, Kalecki, Lowe). A view that innovation can not be modelled because its processes are complex, uncertain and therefore indeterminate has dominated economics. Innovation can only be seen *a posteriori*, and this inductivity is unacceptable to economists who see their ‘positivist science’ as deductivist and objective.

This chapter adopted the Oakley human agency analysis to show how a reconstruction of economic theory using a realist ontology can be applied to developing a model of innovation decision-making and action. Oakley models human action by capturing the right balance between contingency and containment. This provides the basis for understanding the wide gamut of entrepreneurial activity that can be seen as innovation: from strongly contingent to heavily contained. A three-level perspective of the human agency path provides an approach to modelling an agent’s innovation

process. Once this path is appreciated, then, Lowe's instrumental analysis can be adopted to seek the co-operation of entrepreneurs and other agents in the path of innovation and its diffusion along generally accepted economic goals. The Kaleckian perspective planning of investment can be used to support and guide this innovation strategy. With such a process model, the innovation issues and policy debates around what sort of society we want in the future becomes a realist ontological necessity.

Economists need to see change agents as operating in a messy world of uncertainty in which agents use bounded rationality to satisfice behaviour in a complexity-based world. The science of complexity allows investigation of innovation as an open system in which the collective behaviour of many basic but interacting units evolves over time, with self-organisation and adaptation. A formal process of innovation by handling uncertainty through the imagination allows economists not only to appreciate how innovation happens, but also to identify systemic failures and government intervention can be developed to make change agents balance equitably and effectively their crucial decisions and actions.

Notes

¹ For example, in chronological order: Landes (1970), Rosenberg (1976), von Hippel (1988), Freeman and Soete (1997). Many more exist. Quite a few are listed and discussed in Freeman and Soete (1997).

² The appropriate quote from Kalecki (1968, p. 263) is: "...the long-run trend is only a slowly changing component of a chain of short-period situations; it has no independent entity".

³ "I should have..." is pointless, "I can learn from this..." is a useful addition to a person's biography.

⁴ Both examples of chess (closed system) and children's games (open system) are provided by Oakley (2002, p. 209).

⁵ Oakley (2002) acknowledges the work of Anthony Giddens in identifying this C&C mechanism.

⁶ For a detailed exposition, see Forstater (1999).

⁷ Over the last fifteen years, the entrepreneurship discipline has developed much empirical research on the characteristics that make up an entrepreneur who introduces novelty into an economic activity. Despite this effort (and its reproduction *ad nauseam* in textbooks), Storey (2000, p. 137) comments that "...the identikit picture of the entrepreneur whose business is likely to grow is extremely fuzzy". The management of technological innovation literature has developed a long case study tradition in this aspect of strategic innovation that is led by Chandler (1990) and more recently supporting this with quantitative measures of change (Ettlie, 2000). As professional guides to strategic management this literature has provided a powerful framework for technological commercialisation (see especially, Jolly, 1998), but there is no ontological account of what drives this innovation. Organisational behaviour literature has argued strongly that innovation comes from engaging individuals in creative organisational climates that influence and support creativity, especially in terms of continuous innovation (Amabile, 1997). Establishing an environment (or climate) that employees love to work within provides support for creativity but does not explain the motivation for such creativity.

⁸ This C&C spectrum resolves the problem of using the term "entrepreneur" in two distinct ways. The entrepreneurship literature assumes all entrepreneurs are on the spontaneous end of the spectrum, whereas the Post-Keynesian literature assumes all entrepreneurs make investment decisions in the creation of new plant and equipment from profits. Such investment decisions are implicated throughout the spectrum, with the nature of this investment reflecting the form of innovation undertaken (see Courvisanos, 2003).

⁹ This is in stark contrast to the ostensibly financial incentive (or greed) of *homo oeconomicus*, which has been ontologically rejected earlier in this discussion.

¹⁰ Adapted from Oakley (2002, p.31, fn3).

¹¹ As a result, the textbooks on entrepreneurship ignore totally the role of government and the play scant attention to the creativity environment that can nurture innovation (see for example, Kuratko and Hodgetts, 2004).

¹² A significant contribution to this perspective by economists working in this field is Dosi *et al.* (2000).

¹³ Empirical and policy critiques of this "Creative Class" literature have been cogently developed. For an outline of these critiques see Rainnie (2005).

¹⁴ Oakley (2002, p. 6) calls this "transcendental realism". It is based on mechanisms of structure, rules and power that generate events and states of affairs.

¹⁵ Oakley identifies Karl Popper at the self-identity mental level (Popper and Eccles, 1977) and George Shackle at the economic actions level (Shackle, 1972) as major contributors to this concept of folk psychology.

¹⁶ Oakley identifies Herbert Simon as the major contributor to the concept of procedural rationality in many of his writings (see for example, Simon, 1986).

¹⁷ On the specific procedural rational steps that need to be followed by an entrepreneur when conducting an innovation process, see Legge and Hindle (2004, pp. 161-88).

¹⁸ For example, the innovation path of military technology is heavily circumscribed by the particular needs of warfare, from Spartan hoplite to US stealth bombers. Jones (1987) explains these processes.

¹⁹ Legge and Hindle (2004, pp. 74-6) call this the ecological model of innovation, where an initial inventor or researcher "discovers" a logical relationship or a physical phenomenon that seems to have limited practical applications. The broader innovation applications are provided by the initial entrepreneur (or "intrapreneur" in a large corporation), but it is the other entrepreneurs that follow and diffuse the innovation who create the larger market possibilities. For example, Henry Ford's Model T

Ford introduced in 1908 was the start of the great technological thrust of mass-motor vehicle market, but it was General Motors and Alfred Sloan (and then many other motor vehicle companies with minor innovations) that made the motor vehicle ubiquitous.

²⁰ Some examples of simultaneous discoveries are food canning, aluminium smelting (Hall and Heroult), counter-cyclical government macroeconomic policy (Keynes and Kalecki).

²¹ See Courvisanos (2005) for a full account of this ecologically sustainable innovation policy framework.

²² See also Richardson (1960) for details on lack of co-ordination in markets for investment and the systemic failures that this creates. Richardson goes on to specify how investment co-ordination through information agreements and industrial concentration can assist in developing micro-goals in policy-oriented strategies.

²³ Vercelli (1998, p. 274) in his conclusion explains why long-term goals need to be established:

One of the main reasons for the deterioration of environmental problems may be ascribed precisely to the myopia of economic agents increasingly obsessed by very short-run objectives. Short-run rationality produces a profound irrationality in the longer run. Only a broader long-run rationality may produce a process of sustainable development avoiding deep regrets.

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