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***Pragmatism, Technology and Scientific Inquiry:
Exploring Aspects of the Philosophical Underpinnings
of Institutional Economics***

By

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FOREWORD

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1 INTRODUCTION

The purpose of this paper is to explore the relation between technology and scientific inquiry within the philosophical perspective of pragmatism. The main insights concerning the specific version of pragmatism dealt with here are drawn from contemporary works by scholars belonging to the research community of *institutional political economy*. This approach is also known as institutional economics of the ‘old’ American type. Within this intellectual legacy pragmatic thinking has been developed into a modern approach to social scientific inquiry. As Paul Dale Bush (1993: 59-60) points out,

“the dominant themes in the methodological literature of American institutionalist thought can best be understood as an application of pragmatic instrumentalist philosophy to the study of economics. [In Bush’s view,] the most coherent methodological positions found in the institutionalist literature are derived from American pragmatic instrumentalist philosophy and [...] even positions that appear to have no grounding in this philosophical tradition are quite compatible with it”.

An ongoing discussion within this research community concerns the relative influence of the pragmatic philosophies of Charles Sanders Peirce, William James and John Dewey on this methodological foundation. Following Bush, “[of] these three, it is John Dewey whose work most directly influences contemporary American institutionalist methodology” (ibid.: 60). Based on this, my strategy is to inquire critically into the Deweyan foundation of this political economic methodology. In addition, I also refer to a few ideas from the work of Charles Sanders Peirce with whom Dewey studied logic at Harvard in the first half of the 1880s. Most of the interpretations in this exploration are drawn from contemporary American institutional economy supplied with more philosophically inclined studies of Dewey’s pragmatic instrumentalist perspective.¹

Much has been written on this philosophical perspective in recent years and according to Campbell (1995: ix) the most important factor in the contemporary interest and re-evaluation of Dewey and pragmatism is

“the growing dissatisfaction with much contemporary philosophising, with thinking that neither grows out of the problems and issues of our broader society nor is able to offer any assistance to that society as it attempts to address its difficulties”.

This point is a motivation for exploring pragmatic methodology in this paper. In the following, I show how this approach provides a set of principles, understandings and reflections that can facilitate the conduct of scientific inquiry. As a starting point for presenting this approach, I emphasise a central Deweyan idea underlying the chapter, namely that the production of physical artifacts (technology in the common sense) and mental artifacts (theories, ideas, concepts) are two instances of the same basic process of creative problem solving.

This implies that Dewey’s theory of inquiry grew out of his broader technological conception. Thus, I start with the broader perspective and proceed with what is seen as a special case of the more general principles. In order better to understand the pragmatic conception of technology and social scientific inquiry, I start by introducing two basic elements of Dewey’s work: his view of *human nature* and the role of *instrumental valuation* in his philosophy (part 2.). Second, I give an account of the pragmatic conception of technology (part 3.). Third, I discuss and outline a pragmatic model of social scientific inquiry (part 4.). Finally, I sum up the chapter (part 5.).

¹ Important contributions to Deweyan thinking within the American institutionalist tradition are Tool (1979) and (1986). Among other recent interpretations utilised here are Atkinson and Oleson (1996), Bush (1993, 1995), Campbell (1995), Clark (1995), Eldridge (1998), Fott (1998), Hickerson (1988), Hickman (1990), Jensen (1988), Joas (1993), Miller (1995), Ryan (1995) and Tool (1993a,b, 1994a,b,c). However, according to Westbrook the “secondary literature on Dewey is enormous, though much of it is not worth reading” (1991: 556).

2 PRAGMATISM, HUMAN NATURE AND VALUE

Pragmatism emerged in the United States in the last decades of the 19th century and the first decades of the 20th century. It has been characterised as “the only major philosophical system that is uniquely American” (Hill and Traub 1995: 75). This philosophy of pragmatism, as Kalen (1933, cited in Hill and Traub *ibid.*) argue,

“originated in the United States where it grew out of the historical experience of the American people on their western frontier. Life on the American frontier was a constant struggle for survival, which required many hard choices among alternatives that had to be judged according to their practical consequences. Moreover, the resulting knowledge and understanding of reality had to be used to solve practical problems. In this manner, pragmatism emerged from the historical milieu of the United States to become the folk philosophy of the American people”.²

As Ryan (1995) argues, John Dewey did subscribe to the so-called *myth of the frontier* - advanced by his contemporary, the historian Fredrick Jackson Turner - in developing his evolutionary and processive contributions to the philosophical perspective that became known as pragmatism.³

Based on the works of his predecessors Peirce and James, Dewey and his contemporaries George Herbert Mead, James Hayden Tufts and other members of the so-called Chicago School developed pragmatism as a philosophical view. This view included

“a metaphysics that emphasizes processes and relations; a naturalistic and evolutionary understanding of human existence; an analysis of intellectual activity as problem-oriented and as benefiting from historically developed methods; and an emphasis upon the democratic reconstruction of society through educational and other institutions” (Campbell 1995: 14).⁴

What influenced Dewey in Peirce’s perspective was first Peirce’s emphasis on the engagement of humans in “cooperative attempts to overcome our intellectual problems” (*ibid.*: 15). Second, it was Peirce’s belief that a more adequate theory of meaning should be developed in order to “develop more precision in our philosophical formulations” (*ibid.*: 16). In his own version of pragmatism Dewey combined this inquiring and critical spirit of Peirce - a generally scientific approach - with James’s interest for issues of general and direct human concern like moral, aesthetic, educational and social issues.

In this part, I take as a point of departure pragmatism’s naturalistic and evolutionary understanding of human existence. In order to understand pragmatism both in general, and its view of technology, science and inquiry, I start by focusing on the conceptions of human nature and valuation. These

² James Campbell (1995: 1), in a more detailed account of the same spirit, argue that

“the philosophical work of John Dewey can best be understood - and perhaps ultimately can only be fully understood - when approached through an evolutionary or processive interpretation of the American Experience”.

³ For a well-argued critique of the frontier hypothesis as a basic element of instrumentalism see Dugger (1995). Dugger’s paper, titled “*Beyond Technology to Democracy: The Tool Legacy in Instrumentalism*”, is an acknowledgement of the work that Marc Tool in particular has undertaken to bring the instrumentalism and pragmatism of Dewey and other past institutionalist thinkers like Thorstein Veblen (1899), Clarence Ayres and John F. Foster up to date.

⁴ Mead contributed to developing pragmatic philosophy in a direction that today is quite distinct from institutional political economy. Based on his studies with Mead, the Chicago sociologist Herbert Blumer coined the term ‘symbolic interactionism’ in 1938. Here, pragmatic philosophy became one of three sources of inspiration together with German neo-Kantianism and German historicism. Based on his studies of ‘symbolic interactionism with Blumer, the sociologist Anselm Strauss together with Barney Glaser developed the next branch on this three, namely ‘grounded theory’, a methodological direction promoting intensive analyses of interview texts with a minimum of theoretical preconceptions (Alvesson and Sköldbberg 1994).

conceptions are underlying the pragmatic perspective on people struggling intellectually and practically on the frontier of the New World. It is my view that these conceptions are of equal value when the focus is shifted to people struggling intellectually and practically under other living conditions, like for instance in the modern metropolis. I first present a pragmatic conception of human nature before turning to a conception of instrumental valuation.

2.1 A Pragmatic Conception of Human Nature

Concerning the issue of how pragmatists understand human nature, Hans Joas (1993: 4) argues that

“American pragmatism is characterized by its understanding of human action as creative action. The understanding of creativity contained in pragmatism is specific in the sense that pragmatism focuses on the fact that creativity is always embedded in a situation, i.e. on the human being’s ‘situated freedom’”.

To see this aspect as a mere adaptation to given circumstances is to miss the anti-deterministic thrust of pragmatism. In the pragmatic view actors have no choice but confronting the problems they meet in their course of life. However, reality does not prescribe any solution to these problems. Rather, what is called for is creativity on the part of human beings, an accomplishment that brings into the world something objectively new. As Joas (1993) takes care to point out, pragmatists acknowledged that a subjective component is involved when a situation is defined as a problem situation and that any given worldview is subjectively constituted. However, this does not mean that the emergence of the problems within reality, as subjective as it is, is the results of arbitrary subjectivism. Rather, a basic idea of pragmatism is the creative solution of problems with a specific emphasis on everyday experience and everyday action. I elaborate on this point by taking a closer look at Dewey’s conception of what human nature is like.⁵

In formulating his theory of human nature, Dewey was influenced by Darwin’s evolutionary biology and Hegel’s evolutionary historicism. As Ryan (1995: 82) says:

“The one doctrine Dewey preserved intact from intuitionism, from Hegelianism, and throughout his experimentalism was that the mind was essentially *active*, and knowledge a matter of *doing*. The mind was not a passive reflector; we do not confront the world as a sort of recording device picking up ‘facts’. Rather, we act upon the world, give it sense, explore its meaning, and working out as we go how best to think about it. The ‘world’ in Dewey’s work was always a generic label for ‘what we interact with’”.

In line with Darwin and Hegel, Dewey argued that human beings are biological organisms endowed with certain inherent tendencies “that can be modified in a historical process of social evolution” (Jensen 1994: 339). These inherent tendencies were considered as “loose and undirected traits that are so numerous that they cut across one another” (ibid.). Because the relevant human endowments are not always organised and adapted, he termed these tendencies *impulses* rather than instincts. But these loose and undirected traits cannot be governors of behaviour. Rather, learned habits govern behaviour. As Jensen (1994: 339), points out, the habits emerge out of impulses, however,

“in the sense that the former express the latter in ways that are conditioned by the culture in which individuals live. Moreover, Dewey argued that acquired habits are rigid and unbending because individuals form their personal habits under conditions set by prior customs. Given this rigidity in a setting in which habits and customs are institutionalized, the principal function of institutions is to resist change”.

One of Dewey’s core concepts, relevant for an understanding of the role of learned or acquired habits for human nature, is that we *learn by doing*, that is, experientially and experimentally. This means that

⁵ For a more detailed account of Dewey’s conception of human nature, see his *Human Nature and Conduct* (1922). See also Campbell (1995: 25-65), Jensen (1988, 1994) and Ryan (1995).

thought and action is essentially intertwined. Dewey views individual motivation and behaviour as diverse, if not dichotomous: it is “combining elements of the rational and irrational, the instrumental and ceremonial, the creative and destructive” (Miller 1995: 52). Things do not tend toward any normal order. Rather, “[r]eality is fashioned by humans, and humans are responsible for its unfolding progress - or retrogress, as the case may be” (ibid.). Thus, the view of reality entertained is that reality is continuously evolving. It is, at all times, constituted by “the interaction of individuals acting within the setting of an inherited and continuously evolving social and economic landscape” (ibid.).

This interaction is characterised by reciprocity between individuals and their culture, something that both stimulates and demands a certain “sensitivity of cultural conditioning” (ibid.). This double character implies that

“[i]ndividuals are seen as creatures every bit as much as creators of the social whole. Each acts on and is acted on by the other; each changes and is changed by the other. Experimentation, trial and error - not formulaic response - is perceived by pragmatists as required for meaningful confrontation of social problems” (ibid.).

This is a central aspect of Dewey’s variant of pragmatism - termed *instrumentalism*.⁶ Historically this has been regarded as a non-idealist system of social philosophy. One of the arguments of instrumentalism is that knowledge has its origins in human practice or experience. Following this, “the veracity of knowledge can be determined only by examining the practical consequences of the application of the ideas to concrete problems” (Shuklian 1995: 782). By applying a generally scientific approach inspired by Peirce to generally moral issues inspired by James, Dewey’s instrumentalist philosophy “offers a kind of logic of practical activity” that can be used “as a means to foster social reconstruction” (Campbell 1995: 22).

According to another Dewey scholar, Michael Eldridge, Dewey “thought one should always be aware of the origins of one’s thinking in actual experience and the effects of one’s thinking on experience. This he recognised in calling his philosophy ‘instrumentalism’” (Eldridge 1998: 40). Following Eldridge (ibid.: 4) on this point:

“The basic notion of Dewey’s instrumentalist version of pragmatism is this: Thinking is not something apart from our lives; it is a very effective way to secure our interests. Thinking, despite its occasional pretensions that it is above it all, is really a tool for solving problems, human problems, and philosophy’s role is to develop this tool”.⁷

With emphasis on the link to *practice*, Hill and Traub (1995: 75) define pragmatism as “that philosophy which holds that all reality has practical consequences and that, therefore, certainly the best way and perhaps the only way to know and understand true reality is through the consideration of practical consequences”. Just as formulaic response to social problems is rejected by instrumentalists, they also reject purely formal systems of logic that are applicable only to abstract, non-existential topics of inquiry. Therefore, in order to be meaningful, “knowledge must transcend purely academic discourse and become a practical guide to conscious human action. Ultimately, the usefulness and validity of knowledge is judged by how well it enhances the quality of human existence” (Shuklian 1995: 782).

⁶ Dewey had his reasons to coin a new phrase. In the introduction to his (1938: iii-iv) he writes:

“The word ‘Pragmatism’ does not, I think, occur in the text. Perhaps the word lends itself to misconception. At all events, so much misunderstanding and relatively futile controversy have gathered about the word that it seemed advisable to avoid its use”.

⁷ Eldridge (1998: 203) considers Larry Hickman’s *John Dewey’s Pragmatic Technology* to be the “best book on Dewey’s instrumentalism and thus, in effect, his philosophy as a whole. [...] By considering Dewey’s work in the context of discussions on technology, Hickman displays the technical character of Dewey’s philosophy”.

One implication of the anti-deterministic thrust of the instrumentalist perspective in social philosophy is that the achievement of particular solutions to problematic situations is due to “the conscious, purposeful efforts of human beings to attain it” (ibid.). This means that the instrumentalist perspective cannot be charged of being teleological. The reason is that

“[t]here are no presuppositions about the existence of immutable, superhuman or suprahistorical forces propelling humanity toward an inevitable destiny. Only human, social action can move society and history in any particular direction. Human beings are the prime movers of social and historical change” (Shuklian 1995: 782-783).

Dewey and the pragmatists early on recognised the purposeful and problem-directed nature of processes of knowledge production and the centrality of such processes in the conduct of human life. In order to understand better what is going on in knowledge production, Dewey developed an instrumental logic termed the theory of inquiry (Dewey 1938). Further, he fully and explicitly recognised the possibility of applying this same logic to the question of *valuation* (Dewey 1939), the next issue on the way to his interconnected conceptions of technology and social scientific inquiry.

2.2 A Pragmatic Conception of Instrumental Valuation

As William Waller (1989) argues, human beings, in their practice and conduct of life, use a number of valuational processes both individually and collectively. The specific kinds of practices focused upon in this chapter are the production of physical artifacts (technology in the common sense) and mental artifacts (theories, ideas). In order to arrive at his statement of the instrumental logic of social scientific inquiry, Dewey rejected two basic canons of positivistic thought (Hickerson 1988). The first idea was that because matters of judgement or valuation are wholly personal and thus unknowable they are not amenable to the methods of science. Dewey’s counter argument was that valuations exist in fact. Thus, these valuations are empirically verifiable (Dewey 1939). The point, as Tool (1977: 829) has observed, is that

“since all social choices require the application of criteria, and since choices produce consequences, one may reflect on the *character* of consequences emerging from the use of a criterion and thus the propriety of the criterion itself. Value judgements are brought within social inquiry”.

The second idea rejected by Dewey was that of a positive/normative dichotomy and a knowing/doing dualism. This is the foundation of his value theory. Following Paul Dale Bush (1993: 81), his rejection of “the Cartesian knowing/doing dualism logically entails his rejection of the value/knowledge dualism in all of its forms. This makes his theory of valuation a special case of his general theory of knowledge”.

In fact, as Bush observes, Dewey’s “theory of value and valuation is incorporated in his theory of knowledge [and he] takes the position that values are a form of knowing” (ibid.). That is, to evaluate something is inextricably intertwined with the knowledge of the matter evaluated and thus the outcome of a process of evaluation contributes to knowledge of the evaluated matter. More importantly according to Bush, in the process of inquiry, in which warranted assertions are produced, valuations are essential. I return to the question of why Dewey preferred the term *warranted assertion* to the term knowledge. Anyhow, this position - the rejection of a positive/normative dichotomy - was based on Dewey’s belief that:

“(1) to conceive of something as an ‘end’ is to conceive simultaneously of the ‘means’ of its achievements and, therefore, (2) it is wholly arbitrary to designate and isolate ‘means’ from ‘ends’ in the continuum of phenomena” (Hickerson 1988: 178).

The sources of both means and ends, in Dewey’s view, are our actual social experiences. In order to emphasise the continuity of experience as we actually find it Dewey criticised two issues. The first was a tendency to “posit a neat and inviolate divorce between worldly and experiential means” (ibid.).

The second was a “conception of ends that are the non-experiential stuff of tastes, utilities, or other metaphysical ultimates” (ibid.).

Following Hickerson again, in pointing out the place of means and ends in the continuity of experience, Dewey realised the need for a value principle that is experimental. Such a principle must be “consistent with the view of social and economic phenomena as an evolutionary process» (ibid.). Dewey saw criteria for valuation as arising within the evolutionary process itself, in contrast with the view that such criteria are «externally imposed as some ‘self evident’ metaphysical ultimate» (ibid.).

The important point here is that when value and valuing are pursued within the social process through the application of intelligence and action to problematic situations, they are regarded as observable phenomena, not as being «transcendent, isolated, or subjective» (ibid.). In this way, «[e]mergent values [...] are objectively tested to determine their success or failure in resolving problematic situations» (ibid.). In such objective tests lies also the truth of ideas. This is because, as Dewey argued, «a true idea must not only correspond to reality, but also prove to be useful in dealing with reality» (Dewey 1938, in Hill and Traub 1995: 78).

Then, by seeking answers to two questions Dewey extended his view to its ultimate conclusion. First, he asked: “What is the origin of true ideas?” His answer to this question was that: “True ideas originate from logical or scientific inquiry, which is open, unbiased, systematic, and creative” (ibid.). Second, he asked: “What is the purpose for which true ideas should be used?” His answer to this question was that: “True ideas are intellectual tools or instruments to be used for the purpose of solving important practical problems” (ibid.). Hereby, a core conception from Dewey’s philosophy can be made explicit:

“The instrumental process always begins with the utilization of logical or scientific inquiry to induce true ideas from experience; it always ends with the instrumental application of true ideas to the solution of important practical problems” (ibid.).

This constant movement between spheres - between scientific inquiry and practical application, between meaning and action, between thought and purpose, between ideas and experience, between the abstract and the concrete - is a basic feature in Dewey's philosophy. Here we find a connecting point in discussions between social theorists with pragmatic/ instrumentalist leanings, for instance institutional political economists, on the one hand, and social theorists with neo-Marxist leanings, for instance more radical political economists, on the other hand.⁸

With these brief points on issues of value, issues that have been shown to permeate the whole of Dewey’s philosophical outlook and, by implication, the American institutional political economics drawn upon here, I now turn to Dewey’s broad and equally influential conception of technology.

⁸ Shuklian has, for instance, pointed out the similarity between the pragmatic analytic device of seeing experience as a continuum of means and ends and the Marxian dialectical method. They are both principles for understanding the interaction between human activity, nature and society: “In both approaches, the focal point is human activity and experience as mediated by social relations and nature” (Shuklian 1995: 786).

3 A PRAGMATIC CONCEPTION OF TECHNOLOGY

As the research into technological change conducted in this dissertation is based largely on Dewey's pragmatic methodology, it is useful to make explicit the theory of technology implicit in his philosophy. As should be expected by now, Dewey's pragmatic conception of technology is based upon his conceptions of human nature and instrumental valuation just discussed. Thus, the basic theoretical elements of his pragmatic conception of technology are already in place. In this part, I elaborate further on Dewey's argument that the production of physical artifacts (technology in the common sense) and mental artifacts (theories, ideas, concepts) are two instances of the same basic process of creative problem solving. Since the purpose of this dissertation is to produce the typical mental artifacts of social scientific inquiry, an account of a proper production process must be provided. As a step towards this, I have the opportunity first to account for a process of producing material artifacts, commonly termed technology or tools. Thereby two parallel and similar processes of creative human effort are accounted for.

It has been argued that Dewey "is, par excellence, the American 'father' of the philosophy of technology" (Ihde 1990: viii). Throughout his long career, he was concerned with technology as a central feature of the development of the society wherein he lived and acted. For Dewey, philosophical inquiry, like any other form of inquiry, takes place as part of, and is directed toward, specific times and places. The problems and opportunities of technology in his age were the concrete point of departure for the development of many of his philosophical insights and he came to see an intimate relation between the problems of technology and the problems of philosophy. Notwithstanding the time and place specificity of inquiry, his conceptions are still relevant to many contemporary questions involving modern science and technology. An example of this is that Dewey, "long before it became fashionable in history-of-technology circles [...] described and analysed the interconnection of science and technology and, simultaneously with Heidegger, argued for a precedence of technology over science, based, in Dewey's case, upon a pragmatic theory of action" (ibid.). I take this to mean that in order to understand the nature of science and scientific activity in a society we should endeavour to acquire an understanding of how technology is produced in that same society.

Dewey's pragmatic conception of technology - and his instrumental philosophy in general, as Eldridge (1998) argues - has been thoroughly inquired into by Larry Hickman in his book *John Dewey's Pragmatic Technology* (1990). Hickman's (ibid.: 1) investigations are based on the thesis that, for Dewey,

"inquiry within technological fields - among which he included science as well as the fine and the vernacular arts - formed the basis of and provided the models for Dewey's larger project: his analysis and critique of the meanings of human experience. And it is no overstatement to say that his critique of technology was the warp on which the weft of that larger project was strung".

In this view, technology, its problems and its opportunities, is seen as a thoroughgoing and underlying theme in Dewey's overall work. Several central themes related to his inquiry within technological fields and his basic technology conception are emphasised in Hickman's account. In the following, I spell out some of the main points.

3.1 Technology as Active Productive Inquiry

The first theme in Dewey's critique of technology focused upon here has direct relevance for understanding his theory of inquiry, accounted for in the next part of the chapter. Hickman argues that Dewey's most insightful treatment of technology is to be found in his "radical reconstruction of traditional theories of knowledge and his replacement of them with a theory of inquiry" (ibid.: 19).

Hickman identifies this theme as a specific feature that renders Dewey's critique of technology unique. More specifically, what Hickman (*ibid.*: xxi) finds unique is Dewey's

“contention that tools and instruments cut across traditional boundary lines such as those between the psychological and the physical, the inner and the outer, and the real and the ideal. This idea, which Dewey cultivated and nourished until it grew into a methodology, was Dewey's instrumentalism”.

My understanding of this statement is that Dewey's methodology or theory of inquiry *grew out of* or *emerged from* his technology conception.

Dewey constantly pointed out that tools and instruments could not be treated as value-neutral. On the contrary, they must be seen as teeming with values and potentialities that form the basis for intelligent selection of ends-in-view, or things to be done. The notion of ends-in-view should be understood as “ends that are alive and active only as they exhibit continuous interplay with the means that are devised and tested in order to secure them” (Hickman 1990: 12). Underlying Hickman's account of Dewey's theory of inquiry is his thesis that Dewey reconstructed inquiry as a productive skill which artifact is *knowing*, something that implies that knowing is regarded as a technological artifact. Hickman's account explicitly introduces and identifies tools and instruments within Dewey's theory of inquiry. Since I find some of his points relevant in this context, I deal with them in little more detail.

Following Hickman (1990), Dewey treated the role of tools in inquiry in a manner that suggested that they should be considered in functional terms. In this way it became unproductive and misleading to talk about the *essences* of tools: “A particular object may be a tool in one situation and not in another. Something becomes a tool only when it is used to do some kind of work” (*ibid.*: 22). This contextual and relative view also concerns knowing, Dewey argued, because knowing “is characterisable only relative to the situations in which specific instances of inquiry take place” (*ibid.*: xii). In this view, knowing becomes an artifact that is “produced in order to effect or maintain control of a region of experience that would otherwise be dominated by chance” (*ibid.*). However, this does not mean that knowing has reached an ultimate stage even if control has been attained: “when conditions change, further inquiry may be called for if control is still required” (*ibid.*). Thus, knowing is always provisional in the sense that it can and should always be reconstructed when needed.

This aspect of Dewey's account of technology - active productive inquiry - is emphasised by Hickman as a very important one. Just as particular objects *may* be tools in particular situations, active productive inquiry is relative to individuals in concrete situations: “It is impossible to say absolutely of a particular situation [...] that it does or does not require inquiry. Seen only from the standpoint of an accomplished goal, a task has been brought to completion (*ibid.*: 23). Since Plato, most of the philosophic tradition has taken the goal of inquiry to be epistemic certainty. This is not the case in Dewey's view, a corollary of which is that inquiry is “a matter of ongoing interaction with novel situations by means of constantly refashioned artifactual tools (*ibid.*: xii).

Dewey did go much further than most philosophers of technology when arguing that “technological instruments include immaterial objects such as ideas, theories, numbers, and the objects of logic (such as logical connectives)” (*ibid.*: xii-xiii). The point is that, seen from the position of what can be termed his “technologized theory of inquiry they are all the same: they are instruments that may be used to resolve problematic situations” (*ibid.*: 25). Neither the realist nor the idealist positions “was capable of developing an adequate understanding of the function played in knowing by tools and media of all sorts” (*ibid.*: xiii). Therefore, they were both rejected on the grounds of Dewey's instrumentalist account of inquiry.

In Dewey's technologised theory of inquiry, a distinction between extra-organic and inter-organic tools is not appropriate. Insofar as controlled thinking uses tools and instruments it is technological: "some of those tools are conceptual; some, physical; some, the hardware that extends our limbs and senses" (ibid.: 36). Within Dewey's theory of inquiry, there is great flexibility in that tools of all types can be utilised. Distinctions between various kinds of tools are primarily made "in terms of the various materials on which they operate and to which they are appropriate, and of the degree of precision required for the task at hand" (ibid.). Eventually, how does Dewey define technology? Not by providing any single definition of the term but rather by using it to characterise a range of activities. As Hickman says:

"Dewey variously writes of technology as the active use of productive skills; as the most satisfactory method of inquiry; as production within the fine, vernacular, and industrial arts; as what distinguished the scientific revolution of the century of Galileo from the science prior to it; as the general use of tools (including language, which he calls the tool of tools); as industry and commerce; as an essential ingredient in education; and as planning in the various forms in which it corresponds to specific human social and political arrangements" (Hickman 1990: 85).

Hickman also points out that this list is far from exhaustive. An addition to this list is Eldridge's (1998) discussion of Dewey's *political technology* that should be interpreted as the political means to achieve social reconstruction or social change. However, as Hickman also remarks, "in at least one important sense technology can be said to be the appropriate transformation of a problematic situation, undertaken by means of the instrumentalities of inquiry, whatever forms those instrumentalities may take" (ibid.: 44-45). Hickman's (1990: 19) summing up of Dewey's instrumentalist account of inquiry is on the mark in stating that:

"for Dewey properly controlled inquiry exhibits the most general traits of all other types of productive skills and that its artifact, knowing, exhibits the most general traits of all other successful artifacts".

In the next part of the chapter, I account in more detail for the productive skill that Dewey termed "properly controlled inquiry". Before that, however, I discuss further aspects of pragmatic technology.

3.2 Further Aspects of Pragmatic Technology

A second theme in Dewey's critique of technology that I want to focus upon here is closely connected to the understanding of inquiry as an active productive skill whose artifact is *knowing*. This second theme is Dewey's more general concern with how *all* sorts of artifacts, tools, media and instruments come to be, how they change human experience and what they portend. However, an even more fundamental issue was that Dewey sought to demonstrate that the methods and means by which technological inquiry takes place are the methods and means by which all knowing is generated. Concerning this important feature of Dewey's inquiry within technological fields, Hickman (1990: xi) points out that it was

"his contention that what lies beyond theory and practice, and what allows them to have commerce with one another, is the production of testable artifacts, among which he includes both those things popularly called 'mental' and those popularly called 'physical'. Dewey's critique of technology is above all a critique of the production of novel and testable artifacts".

Dewey turned on its head the classical Aristotelian view that the theoretical sciences are superior to those that are practical and productive and that the practical sciences, in their turn, are superior to those that are productive.

Having done this, Dewey could describe science as a type of productive technology. Even in its most abstract form, this kind of activity involves constructed artifacts. These are tried and tested, first theoretically within a realm of abstract possibilities and then empirically with respect to existential problematic situations. Hickman (ibid.: 15) argues that, to Dewey, theoretical exercises within the

abstract realm “become special tools of activities that are practical”. Following this, because “practice that is intelligent [...] involves the constant production of new artifacts, including ‘internal’ artifacts such as refined habits, production takes precedence over and becomes a guide to practicality” (ibid.). Thus, *pro-duction*, a leading to, and *con-struction*, a drawing together, become the central concepts in instrumentalism. These metaphors, Hickman (1990: 11) argue,

“reflect Dewey’s preoccupation with inference that is warrantable within a community of inquiry. Production and construction, terms that are utilized extensively within technological fields, were carefully chosen and extensively utilized by Dewey to articulate his instrumentalist position. Dewey consistently argued that human beings build their world by building the meaning of their world. His metaphors, from the early essays in the 1890s to those published almost sixty years later, were technological ones”.

To use Dewey’s own metaphors, the ‘pro-duction’, a leading toward, and the ‘con-struction’, a drawing together, of various parts and components in order to make novel and testable artifacts is one of the main themes within science, technology and innovation studies. From a variety of perspectives STI scholars inquire into aspects of the processes through which artifacts are produced, constructed, given meaning, etc. Such inquiry is directed towards a range of different artifacts, both material and immaterial. In very simple terms, on the one hand the production and construction of material artifacts have been the main focus of techno-logy and innovation studies. On the other hand, the production and construction of immaterial artifacts, in the sense of scientific knowledge, has been the main focus of science studies.

A third theme in Dewey’s critique of technology relates to a point made above. Dewey found it unproductive and misleading to talk about the essences of tools and said that they instead should be considered in functional terms. This is an important point that can be elaborated a little further. As Hickman (1990: 202) points out, in Dewey’s view

“technology has no ‘core’, since experience itself, of which technological activities and products are part, is accessible only by shifts of interest and focus. Technology is instead the sum of concrete activities and products of men and women who engage in inquiry in its manifold forms: in the sciences, in the fine and useful arts, in business, in engineering, and in the arts we call political”.

To think of objects as comprising fixed essences indicated to Dewey that investigations carried out at an earlier stage is given too much importance. Technical artifacts are not essential; they are neither found nor discovered as something existing before their construction.

Contrary to an essentialist view, Dewey contended that technological artifacts are constructed using productive skills. Following this, “the construction of theories is a special case of the use of productive skill, that is, a special type of technical production” (ibid.: 18). What is at centre stage for Dewey, then, is active productive skill “because it includes and informs both the theoretical and the practical whenever and wherever they are effective” (ibid.). Therefore, rather than being fixed, completed essences, unalterable for all times, technology was for Dewey “an active method of generating and testing new skills, as well as reconstructing old ones” (ibid.: 19). The question of essentialism, that is, whether technologies have essences, has been a longstanding issue in the field of technology studies. The notion that theory construction is a special case of using productive skills informs the account of pragmatic scientific practice that I give in the next part of this chapter.

A fourth theme in Dewey’s critique of technology to be briefly mentioned here is his treatment of the issue of technological determinism. This concerns the question to what extent technological objects, events, methods, organisations, systems and laws determine human actions, including their modes of relating to one another. In short, Dewey rejected all forms of determinism, including technological varieties. Just as he did not accept the existence of fixed, completed essences he did not accept the

existence of inevitable historical forces that worked beyond human will. Rather, he “argued that technological conditions form the necessary but not the sufficient conditions for technological progress” (ibid.: xiv). To Dewey, this meant that ultimately, the “responsibility for the future lies in concrete decisions made by human beings, both singly and in groups” (ibid.).

To illustrate further this and other themes within Dewey’s technology conception, the point can be made that his philosophy was one of the main building blocks in the work of his student Clarence Ayres. Ayres was one of the founders of American institutional economics and in his theoretical work, several aspects of Dewey’s technology conception can be identified.⁹ As pointed out, this conception grew within the version of pragmatism that Dewey termed instrumentalism that was his lifelong critique of tools and media of all sort (Hickman 1990). For instance, Ayres found Dewey’s instrumental value theory especially relevant when developing his institutional theory of technology (Tool 1994a).

Theorising on technology in the instrumentalist tradition has always stressed that it is a continuing problem solving process and according to Hickman (1990), Dewey understood the term instrumentalism itself as a cognate of technology. Both Dewey and Ayres emphasised that tools or technologies, in the same way as ideas or knowledge, are instrumental in processes of human problem solving. Following this, the success of an idea or its embodiment in technology is the degree to which it solves a problem. They repeatedly emphasised that “the truth and its working out are two aspects of the same process” (DeGregori and Shepherd 1994: 320). Thus, in Dewey and Ayres’s views, technology is primarily ideas.

One point touched upon above is that the continuing problem solving process is neither teleological nor utopian. Rather than focusing narrowly on one “ultimate” end, problem solving rather treats several possible ends-in-view. Dewey acknowledged that technology understood in this sense is both a problem solving and a problem creating process. He was always attentive to the negative aspects of technology. However, he saw human problems, not as a source of despair, but as an opportunity to create. As DeGregori and Shepherd (1994: 321) point out:

“The opening thesis of Dewey’s *The Quest for Certainty* (1929) concerns the difference between responding to adversity by seeking to propitiate supernatural powers through a sheltering belief system or by fashioning the means to overcome adversity and in so doing generate the ideas and technology that enables us to create the arts and civilization. All the vital areas of human endeavour are transformed by technological change and the creative potential it engenders”.

Another point discussed above is that all problem solving involves the value-laden activity of problem definition. If we do not have a theory of value, however, we cannot distinguish tools and technology from trivial gadgets and contraptions. If we *have* a theory of value, on the other hand, we can speak about, for instance, technological progress. In addition, as was one of the main concerns of Ayres, the concept can be used to lay the foundation for a theory of economic development. Ayres attempted to construct, along instrumentalist lines, a theory of political economy appropriate to technologically based democracies.

In this part, I have outlined several aspects of a pragmatic instrumentalist conception of technology. Bearing in mind that Dewey’s theory of inquiry *grew out of* his conception of technology, these aspects also inform the understanding of the theory of science-part of his philosophical work. Thus, it is to an account of a pragmatic instrumentalist conception of social scientific inquiry that I now turn.

⁹ Ayres combined elements of Dewey’s philosophy with elements from the works of Veblen, one of the most influential economists and social thinkers to inquire into the role of technology in society. Thus, Ayres “gave a vitality to the Veblenian branch of institutionalism that has endured for half a century” (Dugger 1995, 1013).

4 PRAGMATIC SOCIAL SCIENTIFIC INQUIRY

From the beginning of pragmatism, its model of inquiry was a group of inquirers trying to produce good ideas and trying to test them to see which ones have value in dealing with reality. In this perspective inquiry is cooperative human interaction with an environment and both aspects - the active intervention in and manipulation of the environment and the cooperation with other human beings - are vital. I take this point of departure because pragmatic social scientific inquiry must be seen as derived from a broader view of the role of inquiry in society. It must also be seen as a special instance of human action in general. In this part, I focus on some relevant guiding principles when the practice of social scientific inquiry is conceived of in a pragmatic way. Moreover, I draw mainly on Dewey's work because it was here that classical pragmatism was brought closest to social theory and social science for the first time. His work has since been a main source of insights into these matters.

Important aspects of Dewey's conception of inquiry are outlined in more detail in the following. To start the exposition, however, what was Dewey's definition of inquiry? He defined inquiry as "the controlled or directed transformation of an indeterminate situation into one that is as determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole» (Dewey 1938: 104-105).¹⁰ The different concepts and ideas contained in this definition are discussed following Dewey's distinction between three phases of the process of inquiry (Dewey 1903 in Field 1996). In the first phase, problematic situations are identified and formulated. In the second phase, the focus is on subject matter pertaining to the problematic situations. The third phase involves construction of hypothetical solutions to the problems formulated.¹¹

4.1 Phase 1: Identification of Problematic Situations

The activity of inquiry is closely connected to dealing with reality and I start this section with some pragmatic considerations on ontological matters. As has been frequently observed across our various social contexts, we share in a fundamental commonality namely that we each will have had, at some point, the experience of an *obdurate reality*. We note a resistance, as the efforts made to execute our wills are at times restricted, often in what is rather predictable ways. From this observation springs the ontological realism associated with the pragmatism of Dewey and Pierce.

It is in exploring those patterns of resistance, in the developing of hypotheses about them, and in testing and evaluating those thoughts, that we develop severally and communally, a complex and

¹⁰ According to Ryan (1995: 72), Dewey struggled for sixty-odd years to develop

“a logic of the processes by which knowledge is reached. [...] His last published attempt to produce such a logic appeared when he was eighty. The book that embodies it, *Logic: The Theory of Inquiry* is very long, very dense, and very difficult. It was unappreciated in Dewey's lifetime, and unlike his ethics, his politics, and his metaphysics, it has not gained new admirers in the last decade and a half. Even so, the project was not a complete failure“.

¹¹ Dewey maintained but modified and developed this distinction throughout his career. Since this early formulation, his conception of inquiry has been outlined in several ways, both by himself and by his interpreters. Fott (1998: 43), for instance, emphasise the variant from *Democracy and Education* (1916: 157):

“Dewey's notion of scientific method is that of a reflective process consisting of several steps: (a) ‘perplexity’; (b) ‘a conjectural anticipation’; (c) ‘a careful survey’ of all considerations; (d) ‘elaboration of the tentative hypothesis to make it more precise and more consistent’; (e) acting on the hypothesis in order to test it (*DE*, 157). These steps are guidelines, not rigid rules to be followed in every scientific inquiry. The exact method of one inquirer will vary from that of another ‘as his original instinctive capacities vary, as his past experiences and his preferences vary’ (*DE*, 180)“.

highly elaborated understanding, a sense of an independent reality. That resistant reality is what sets the parameters of our non-social problem situations and sets several of the constraining parameters of our social problem situations as well. In so doing, that resistant reality provides the occasion and the motivation for the efforts we make to apprehend the real significance of things and thus to acquire knowledge.

First, the realism of Dewey's philosophy should be pointed out. Much misconceived critique of Dewey for being an anti-realist has been put forward. However, as Tiles (1988) points out, «Dewey insisted on the right of his own version of pragmatism to be regarded as a 'realism' (ibid.: 142). In the same vein, Bush argues that «Dewey believed in a reality that is independent of inquiry» (Bush 1993: 72).¹² The basic point here is that the indeterminate situations that motivate subsequent inquiry arises out of existential circumstances that exists *before* the process of inquiry start. It is these existential circumstances that are transformed as a result of inquiry, not the state of mind of any involved actors.

The ontological hypothesis incorporated in Dewey's philosophy is manifest in his *Logic: The Theory of Inquiry* (1938).¹³ To illustrate this ontological position, Bush (1993: 73) interprets it to entail among other things, the following views:

«(i) society, as a system of institutions, is real and not merely a figment of the intellectual imagination [...] (ii) continuity in human experience is not only a convenient theoretical construct but is a real process, the disruption of which has consequences independent of our ability to conceptualise them in deterministic mathematical models [...] (iii) social and individual value formation are real processes and [...] must be subject to investigation rather than postulation [...] (iv) the process of institutional change is not merely a matter of shifting ideologies, or changes in linguistic conventions, but changes in real habits of behavior that have real consequences which may or may not be captured in discourse [...] (v) physical and cultural processes are part of a contingent universe that guarantees nothing, thereby imposing the necessity of choice on the human agent [...] (vi) human choices have real consequences for the physical and cultural processes of which they are a part.»

The realism in question here is an entirely ontological doctrine that material objects exist externally to us and independently of our sense experience. The classic case for this position, termed *pragmatic realism* was made by Charles Sanders Peirce. This realist position emerges early and explicitly within Peirce's work and it is retained throughout. In 1905, in summarising the basic ideas of his position, Peirce (1934: 5.453 in Peirce 1931-1958) writes,

“Another doctrine [...] which is involved in Pragmatism as an essential consequence of it [...] is the scholastic doctrine of realism. This is usually defined as the opinion that there are real objects that are general [including] the modes of determination of existent singulars”.

In short, to use Peirce's terminology, there are *existent singulars* or *Firsts*; there are real relations between and among them, termed *Seconds*; and there are real general laws of relation termed *Thirds*. Moreover, Peirce is explicit as to the mind-independence of the real: "That is real which has such and such characters, whether anybody thinks it to have those characters or not. At any rate, that is the sense in which the pragmatist uses the word" (Peirce 1990: 132).

¹² This issue is discussed in Samuelsen (1994 and 2003) where I point out the similarities between the pragmatic realism of Dewey and Peirce, on the one hand, and the critical realism that Bhaskar (1986) has derived from Marx, on the other hand. The common ground is, at least, a naturalistic and evolutionary understanding of human existence, as pointed out above with regard to pragmatic instrumentalism (Campbell 1995). As also pointed out, there is a similarity in the principles at work concerning the understanding of the interaction between human activity, nature and society (Shuklian 1995). This feature allows for fruitful combinations within both the epistemological and ontological domains of these philosophies.

¹³ Campbell (1995: 68) writes that the “central source for Dewey's understanding of metaphysical inquiry is his monumental, although tremendously difficult, *Experience and Nature* of 1925 (revised edition, 1929)”.

When we encounter the obdurate reality, we are motivated to acquire knowledge based on our beliefs about that reality. The method of establishing beliefs that serve us best in the project of locating stable, long-lasting (or gradually evolving) beliefs, and the only one endorsed by Peirce, is of course the method of science. This is a method “by which our beliefs may be determined by nothing human, but by some external permanency - by something on which our thinking has no effect” (Buchler 1940: 18). It is exactly this determination of belief by that which is objective that gives the method its merit.

The *permanency* that Peirce speaks of is *external* in the sense that it is not in any way affected by the thoughts that any person might have about it. Further, it is not limited in its effects to any one individual. This permanency affects all persons equally, although each individual is affected according to his or her particular sets of relationships to that external permanency. In other words, although it can appear differently to each one of us, we all experience the appearance of one thing - the Real.

Although some pragmatists are also realists, they do not believe that the formulation of eternal verities, first principles or essences is of any assistance in the pursuit of inquiry. In this sense pragmatism is a non-foundationalist philosophy. As an alternative to foundationalism, pragmatism is a contextualist approach in which knowledge is not deduced from first principles. Rather, it is developed out of a consideration of the context of which a purported fact or idea is considered to be a coherent part. For Dewey the relevant context was *the problematic situation*, which arises out of the effort to apply inquiry to what he called an *indeterminate situation*. These situations arise out of encounters with resistant reality and are experienced as different patterns of resistance varying according to the details of the situation.

Following Field, the first phase of the process of inquiry begins with the problematic situation. According to Field (1996: 4), this is

“a situation where instinctive or habitual responses of the human organism to the environment are inadequate for the continuation of ongoing activity in pursuit of the fulfilment of needs and desires. Dewey stressed [...] that the uncertainty of the problematic situation is not inherently cognitive, but practical and existential. Cognitive elements enter into the process as a response to precognitive maladjustment”.

In this connection, Bush (1993: 63) terms an indeterminate situation “a precognitive state of affairs in which individuals have a sensed awareness that something is wrong.» An indeterminate situation, which «is not itself a mental condition», is *the source of doubt* «which is the starting point of inquiry» (ibid.). In Dewey’s words (1938: 107) an

“indeterminate situation comes into existence from existential causes, just as does, say, the organic imbalance of hunger. There is nothing intellectual or cognitive in the existence of such (indeterminate) situations, although they are the necessary condition of cognitive operations of inquiry. In themselves they are precognitive”.

Following Bush (1993: 64) again, a problematic situation is termed “a cognitive construction that comes into focus as inquiry is brought to bear on an indeterminate situation.» Rather than define themselves pre-cognitively, then, problems are conceptualised through the utilisation of all the theoretical and observational tools of coordinated inquiry (Bush 1993).

Problematic situations, in short, necessitate choice, and choice requires criteria for valuation, which arise from within the process of inquiry itself. According to Tool (1994c: 407-408) such instrumental valuing

«encompasses the knowledge-guided use of conceptual tools and analytical skills as means to transform an indeterminate situation - don’t know, don’t understand, can’t explain, can’t act - into a

more ordered and determinate end-in-view where consequences are observed, unknowns become knowns, and greater congruency between expectations and outcomes is achieved».

This method for selecting criteria depends upon intellect, creativity and cognitive perception of the whole system of relations among the elements of the situation and the possible outcomes of various different courses of action. This means that in Dewey's theory of knowledge, the practical activity of the inquirer is critical to the process of inquiry and the creation of knowledge. As Dewey says in *The Quest for Certainty* (1929: 57) - his critique of foundationalist metaphysics: "[If] we see that knowing is not the act of an outside spectator but of a participator inside the natural and social scene, then the true object resides in the consequences of directed action".

Another point to be made here is that the resistant reality that actors experience is constituted by a continuity of the types of situations discussed here. In the process of inquiry we deal with consecutive histories of situations experienced as indeterminate - problematic - determinate - indeterminate - problematic - determinate, etc. In addition to situations following one another in time, actors will of course also experience several situations in parallel at the same point in time. In any case, all current and past situations are the result of human activity, historical processes and cumulative change and we need to understand this character of the settings to be investigated. In order to achieve this, the inquirer has to use theoretical tools to reconstruct particular sequences of situations that are thought to contribute to the end-in-view of inquiry.

Following Dewey, an "indeterminate situation becomes problematic in the very process of being subjected to inquiry" (Dewey 1938: 107). In Dewey's (1938: 37) words, to "find out *what* the problem and problems are which a problematic situation presents to be inquired into, is to be well along in inquiry". When we have a problem, we do not have to grope blindly in the dark, he says. The institution of a problem has practical import for the process of inquiry:

"The way in which the problem is conceived decides what specific suggestions are entertained and which are dismissed; what data are selected and which rejected; it is the criterion for relevancy and irrelevancy of hypotheses and conceptual structures" (ibid.: 107).

A point established above, namely the important role of valuations in Dewey's conception of the process of inquiry that produces warranted assertions.

In a rough approximation, Bush has pointed out the logic Dewey uses to reach this position: «the rejection of the knowing-doing dualism places 'doing' within the process of inquiry. This means that practical judgements of 'what should be done' are essential to the process of inquiry» (Bush 1993: 82). To Dewey (1938: 174), then, "[t]here is no inquiry that does not involve judgments of practice". At every critical point in the process of inquiry, the inquirer makes judgements of practice:

"The scientific worker has continually to appraise the information he gathers from his own observations and from the findings of others; he has to appraise its bearing upon what problems to undertake and what activities of observation, experimentation and calculation to carry out. While he 'knows', in the sense of understanding, systems of conceptual materials, including laws, he has to estimate their relevancy and force as conditions of the particular inquiry undertaken" (ibid.: 174).

From this statement, Bush has made some points that are important for a pragmatic conception of inquiry. First, the behaviour of inquirers are directed by judgements of practice «both in the formulation of hypotheses and in the testing of their consequences» (Bush 1993: 82).

Second, without such judgements of practice by inquirers «the warranted assertions that are the outcome of competent inquiry cannot be formulated» (ibid.). By arguing that judgements of value are a form of practical judgements, Dewey is incorporating valuations into the pragmatic conception of

inquiry. Having done this, he points out that his “theme is that a judgment of value is simply a case of practical judgment, a judgment about the doing of something” (Dewey 1915: 29). Hereby, the place of valuations and value judgements has been incorporated into the *practice* of doing inquiry. Now, this is carried a step further as the activity of evaluation is seen as an integrated part of the activity of appraising empirical subject matter pertaining to the problematic situations instituted.

4.2 Phase 2: Empirical Aspects of Problematic Situations

In seeking causal comprehension of that which produces indeterminate situations, inquiry is purposive. In order to provide for the disclosure of the character of, and problems within, the experienced continuity of situations inquiry must focus on data or subject matter (Tool 1994b). According to Field (1996: 4),

“the second phase of the process involves the isolation of the data or subject matter which defines the parameters within which the reconstruction of the initiating situation must be addressed”.

Throughout his writings, Dewey’s position is that the facts do not speak for themselves. To get started, “inquiry requires empirical evidence; but to qualify as evidence, factual propositions must be functional within the scope of the theory developed to guide the solution of the problem under consideration” (Bush 1993: 66-67). The function of factual propositions “is to serve as evidence and their evidential quality is judged on the basis of their capacity to form an ordered whole in response to operations prescribed by the ideas they occasion and support” (Dewey 1938: 113).

A recurring theme in Dewey’s writings on inquiry (Dewey 1938) is his discussion of the *conjugate relation* or *conjugate correspondence* that must hold between the empirical and theoretical dimensions of inquiry. He expresses this relation as follows: “Observation of facts and suggested meanings or ideas arises and develops in correspondence with each other” (ibid.: 109). In the following, as Bush (1993) point out, Dewey (1938: 133) expands on this idea:

“Inquiry demands [...] operations of both observation and ideation. There would be no control of the process of inquiry if each of these operations were not expressly formed with reference to the other. [In] controlled inquiry, the entire object (of theoretical formulations) is to attain *that* meaning or conceptual structure which is best adapted to instigate and direct just those operations of observation that will secure as their consequences just those existential facts that are needed to solve the problem in hand”.

This relation between ideas and facts or theory and empirical matter implies the following notion: “factual propositions are theory-laden since a theoretical formulation is required to transform data into evidence” (Bush 1993: 67). Another important point drawn from this perspective is the following: “theoretical formulations that fail to contribute to the end-in-view of providing a unified whole, including empirical observations that lead to that end, must be abandoned in favour of alternative hypotheses that do” (ibid.). This point motivates conducting theoretical inquiry in the sense of alternative solutions to the problem at hand. However, to move the inquiry further towards solutions, empirical subject matter must be appraised. In order to accomplish this, a methodological tool is needed to construct evidence from data.

Dewey argues that valuations are critical to the determination of what the relevant facts are. The theoretical frame of reference in which facts are converted into evidence is a normative frame of reference. This point has particular relevance for the determination of the facts in any given inquiry. The relevant practical issue to focus upon in this phase is the mode of data collection pursued, data that are the subject matter of subsequent evidence construction.

A well known mode of data collection that fits in with pragmatic inquiry is the research strategy case study. According to Platt (1992: 46), the case study strategy begins with “a logic of design [...] a strategy to be preferred when circumstances and research problems are appropriate rather than ideological commitment to be followed whatever the circumstances” (cited in Yin 1994: 12). Yin’s technical definition of this logic of design begins with the scope of a case study: “A case study is an empirical inquiry that i) investigate a contemporary phenomenon within its real-life context, especially when ii) the boundaries between phenomenon and context are not clearly evident” (ibid.). The ambition to cover *contextual conditions* is thus a motivation for using the case study method.

Because of the two noted features, a whole set of other technical characteristics, including the collection of data and strategies for data analysis, must be included in Yin’s technical definition. In his view, the case study inquiry

- “copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result
- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis” (ibid.).

With these two elements in place, case studies are a broad research strategy comprising an all-encompassing method that incorporates specific approaches to data collection and analysis.

Concerning their purpose, case studies can be descriptive, exploratory or explanatory. Descriptive case studies aim to describe the incidence or prevalence of features pertaining to problematic situations. Exploratory case studies focus mainly on *what* questions pertaining to problematic situations. Such questions can be a justifiable rationale for developing pertinent hypotheses and propositions for further inquiry into the situations. Explanatory case studies focus mainly on *why* and *how* questions pertaining to problematic situations. Such questions deal with operational links between components of the situations needing to be traced over time.

In the next section, I turn from issues of subject matter pertaining to problematic situations towards the phase where empirical and conceptual subject matter is used in combination for construction of solutions in the process of inquiry and the existential resolution of problematic situations.

4.3 Phase 3: Hypothetical Solutions to Problematic Situations

Following Field, in “the third, reflective phase of the process, the cognitive elements of inquiry (ideas, suppositions, theories, etc.) are entertained as hypothetical solutions to the originating impediment of the problematic situation, the implications of which are pursued in the abstract” (Field 1996: 4). Concerning the cognitive elements of inquiry, Dewey maintained that “knowledge [...] is a name for the product of competent inquiry” (Dewey 1938: 8). However, due to all the metaphysical connotations the term knowledge carries in traditional philosophy Dewey hesitated to use it. Rather, he talked of successful inquiry as producing *warranted assertions*. “In selecting this language”, Bush argue, Dewey “sought to emphasize the idea that inquiry is an ongoing process” (Bush 1993: 64).

Warranted assertions are beliefs that function as the starting point of the next stage of inquiry. This is so, because there is “continuity in inquiry. The conclusions reached in one inquiry become the means, material and procedural, of carrying on further inquiries” (Dewey 1938: 140). But this does not mean that warranted assertions, once established, are beyond further scrutiny. Rather, he says (ibid.: 8);

“Attainment of settled beliefs is a progressive matter; there is no belief so settled as not to be exposed to further inquiry”. Thus, its correspondence to an ultimate, comprehensive truth cannot be the basis for appraising the value of knowledge.

Rather, as Bush (1993: 64) argues, knowledge “is to be appraised for the instrumental capacity it possesses for the solution of problems”. He has termed this pragmatic position on knowledge “the antithesis of foundationalism” (ibid.). This derives from “a fundamental tenet of pragmatism”, namely that “all propositions are subject to revision as theoretical and empirical inquiry moves forward” (ibid.: 59). Therefore, Bush argues, methodology must be under constant scrutiny in order to conduct required revisions at any given stage of inquiry.

A central activity within social inquiry involves the creative generation of hypotheses of possible and plausible causal determinants. Following Tool, the most dynamic and critical function of hypotheses is their directive role; “to guide inquiry and suggest what sorts of evidence to gather and the testing of hypotheses by overt or imaginative action to assess their explanatory capabilities” (Tool 1994b: 153). Dewey (1938: 506) emphasised three aspects of conceptual subject matter (or theory) that start with:

“(1) the status of theoretical conceptions as hypotheses which (2) have a directive function in control of observation and ultimate practical transformation of antecedent phenomena, and which (3) are tested and continually revised on the ground of the consequences they produce in existential application”.

In the words of Bush (1993: 74), Dewey “regarded the capacity of a hypothesis to offer coherence and understanding as more important than its ability to formulate descriptive propositions that could be tested by their correspondence with the facts”.

At this point in the exposition of the process of inquiry, I take a very brief but possibly informative detour. This is in order to bring attention to a conception of knowledge production based on social practice introduced by Dewey’s teacher in logic at Harvard, the highly original thinker Charles Sanders Peirce. Following Tanner and Josephson (1994: 5), Peirce argued that

“there occurs in science and in everyday life a distinct pattern of reasoning wherein explanatory hypotheses are formed and accepted. He called this kind of reasoning ‘abduction’, a form of inference that goes from data describing something to a hypothesis that best explains or accounts for the data. Thus abduction is a kind of theory-forming or interpretive inference”.

As Campbell (1995) has pointed out, Dewey was particularly interested in Peirce’s emphasis on the engagement of humans in “cooperative attempts to overcome our intellectual problems” (ibid.: 15). This has been shown throughout this chapter. He was also shared Peirce’s belief that a more adequate theory of meaning should be developed in order to “develop more precision in our philosophical formulations” (ibid.: 16). This is reflected in his concern with reconstruction of philosophy and the idea that philosophy and thinking should make practice more intelligent. Although Dewey hardly uses the term, I think the notion of abduction fits well with his own version of pragmatism. Herein he combined the inquiring and critical spirit of Peirce with a generally scientific approach to social and moral issues, initially inspired by his acquaintance with the thinking of fellow pragmatist William James (Campbell 1995).

Concerning explanatory reasoning, a distinction is usually made between induction and deduction as mutually exclusive alternatives. In induction, the inference is from particular instances to general rules, while in deduction the inference is from general rules to particular instances. Most significantly, Peirce (1934) stated that induction and deduction, either jointly or severally, could not account for the progress of scientific inquiry. That effectively was preserved for the third mode - abduction. As Peirce wrote (1934: 106):

“Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea; for induction does nothing but determine a value, and deduction merely evolves the necessary consequences of a pure hypothesis”.

Inductive inference starts from empirical material, while deduction starts from theory. Abductive inference starts from empirical facts as induction, but does not reject theoretical conceptions, and is therefore closer to deduction. However, abduction includes aspects of understanding in addition to pure explanation. I do not pursue the concept of abduction any further here, but just argue that this mode of reasoning most probably was an important influence on the development of Dewey’s own theory of inquiry. My point is that an account of the practice of doing inquiry as understood by Dewey also means to elaborate on what is implied in reasoning abductively or hypothetically in solving scientific or everyday problems.

Now, I return to an elaboration of the practical implications of conducting inquiry provided by Marc Tool. He says that this process “consists mainly of a continuous ordering and juxtaposing of explanatory constructs and factual evidences of indeterminateness in quest of that causal accounting that most adequately and simply explains observed phenomena” (Tool 1994b: 153). In this process of combining theoretical and empirical subject-matter, the instrumental character of pragmatic inquiry is clear because the

“[i]nquiry tools are borrowed or created and employed as instruments of disclosure and appraisal; they are revamped as required to facilitate the inquiry process. Instrumental inquiry encompasses those activities which create and facilitate the application of warranted knowledge as outcomes of prior inquiry” (ibid.: 153-154).

To bring the process of inquiry forward, one must make judgements about how this is accomplished. Judgements with these consequences are instrumentally warranted and reflect «the creation and/or selection of the relevant constructs and intellectual tools [...] for inquiry. Such judgments define the need for, and direct the creation of, new conceptual tools as required to move the inquiry along” Tool (1993b: 130).

In this work, the creation, in imaginative ways, of analytical constructs that become operational tools of new theoretical inquiries is of central importance. Such analytic constructs must, following Dewey’s *Logic of Inquiry* (1938), satisfy the *conjugate relation* or *conjugate correspondence* that must hold between the empirical and theoretical dimensions of inquiry. Dewey expressed the relation between these dimensions as follows: “Observation of facts and suggested meanings or ideas arise and develop in correspondence with each other” (ibid.: 109). The pragmatic instrumentalist view on the choice of ideas or theories in the social sciences comes down to one thing according to the Dewey scholars Tool and Bush.

In Tool’s words, the «choice of a conceptual tool is determined by its ability to function appropriately to inform, and instrumentally to correct, in the role assigned» (Tool 1993b: 131). In Bush’s (1993: 96) words “competing theories must be judged on their capacity to transform an indeterminate situation into a unified whole; that is, they must be evaluated for their capacity to contribute to the problem-solving processes of real, living communities». However, formal criteria by which to select among competing theories should not be searched after. Rather, the focus in pragmatic instrumentalism is on «a means-end continuum in which theories are viewed as a means to the ends-in-view of inquiry» (ibid.). Concerning the choice of theories as problem solving tools, Field (1996: 4) argues that

“The final test of the adequacy of [...] solutions come with their employment in action. If a reconstruction of the antecedent situation conducive to fluid activity is achieved, then the solution no longer retains the character of the hypothetical that marks cognitive thought; rather, it becomes a part of the existential circumstances of human life”.

Therefore if inquiry is successful, the indeterminate situation is transformed into a *determinate whole* and inquiry is terminated “in the institution of conditions which remove need for doubt” (Dewey 1938: 7). To sum up the point that connects part 4.2. and 4.3., the main reason that inquiry can be called technological is that

“it is the means of effective control of an environment that is not what we wish it to be. Inquiry is in this way differentiated from other forms of activity. It produces something new as a means of changing situations that are not what we wish them to be” (Hickman 1990: 41).

By taking this view, I think that the pragmatic theory of inquiry provides relevant insights into the issue of what is the nature of creativity in the conduct of social life.

5 SUMMING UP ON PRAGMATISM, INQUIRY AND TECHNOLOGY

This paper has been an inquiry into technology and inquiry based on the pragmatic instrumentalist methodology of American institutional economy. I have drawn on a set of contemporary interpretations of classic pragmatist writings that has showed how pragmatism has been developed into a modern approach to social scientific inquiry. After providing some basic understandings of pragmatic conceptions of human nature and valuation, I accounted for two instances of using active productive skills in inquiry. Then, based on interpretations of some of the core tenets and basic aspects of Dewey's philosophy, I focused upon active productive skills in the production of material artifacts, termed technology. I also focused upon active productive skills in processes where the artifact is *knowledge*, namely social scientific inquiry.

Through these accounts, the technological character of inquiry that Dewey thought significant has been disclosed: "Dewey thought that *every reflective experience is instrumental to further production of meanings, that is, it is technological*" (Hickman 1990: 40-41, original emphasis). Moreover, as Michael Eldridge has pointed out "Dewey regarded inquiry as a way to transform our experience. It occurred in time and made a difference existentially" (Eldridge 1998: 24). The theme of transforming experience, understood as a continuity of situations, is expressed in Dewey's idea that "scientific subject matter grows out of and returns into the subject matter of the everyday kind" (Dewey and Bentley 1949: 291).

In his account of Dewey's instrumental philosophy, Hickman has conceptualised this *growing out of and return to* everyday experience as the *excursus* and *recursus* of productive inquiry, as Eldridge observes (ibid.: 40). In Eldridge's (ibid.) words, then, pragmatic instrumentalism can be usefully summed up as

"the awareness that one's ideas are mental products drawn from life, and also the commitment on the part of the inquirer to return them to everyday experience. He or she uses hypotheses, theories, or ideals to inform the problematic situation, making it more satisfying. Instrumentalism is the opposite of the decontextualized thinking that Dewey deplored".

Such use of hypotheses, theories and ideas to inform problematic situations was what Peirce had in mind when he coined the term abduction.

Following Hickman's account of Dewey's notions of *excursus* and *recursus*, "scientific inquiry functions as an *excursus* from concrete problematic situations to the realm of the type of practice he calls theory, and a *recursus* back to the data of concrete situations in order to check the warrantability of results obtained by acts of production that are abstract" (Hickman 1990: 134-135).

"the technological *excursus* by which new tools are produced with which to control problematic situations" (ibid.: 137).

"constitute[s] the *recursus* by means of which [new tools] are tested against existential situations" (ibid.). Here scientific subject matter is brought to bear on the research questions stated at the beginning of the process of inquiry through *application*. More specifically, a set of hypotheses and theories developed and discussed in the *excursus* are used to inform the problematic situations that the posing of the research questions has confronted the inquirer with, thus aiming at making these situations "more satisfying" (Eldridge 1998: 40).

In order to serve its pragmatic purposes, knowledge must be codified in the form of conclusions or *warranted assertions* as Dewey termed the ultimately *provisional* results of social inquiry. These pragmatic purposes is based on the idea that philosophy and thinking should make practice - both

everyday and *scientific* - more intelligent and informed. Thus, inquiries should make a difference existentially.

In part 2.4. I elaborated on the pragmatic conception of scientific inquiry - consisting basically of *excursus* and *recursus* - by outlining the continuous process of contextualised, instrumental, productive inquiry as consisting of three phases. There the focus was on social scientific practice. However, given that Dewey's methodology or theory of inquiry grew out of his technology conception, it is my conjecture that the three-phased conception of a process of scientific inquiry is also applicable to a process of producing technological artifacts. This means that the two different instances of using active productive skills - in producing both concrete, physical and abstract, mental artifacts - can be understood in the same basic way. They are both continuous, problem-solving processes in which successive phases can be identified. The three phases in this process can be summarised in the following general terms:

The first phase of inquiry starts with an *indeterminate situation*. These situations arise out of encounters with what has been termed resistant reality, constituted by a continuity of situations. Moreover, they are experienced as different patterns of resistance varying according to the details of the situation. Out of the effort to apply productive skills to such situations, the *problematic situation* emerges.

The main part of this first phase of inquiry is based on the central point that problematic situations are *cognitive constructions* that come into focus as inquiry is brought to bear on the indeterminate situations experienced in the conduct of life. Since problems do not define themselves precognitively, they must be *conceptualised* through the utilisation of all the theoretical and practical tools of coordinated inquiry. Thus, problematic situations should also be seen as conceptual and discursive constructions within specific theoretical perspectives (ref. *excursus*).

The second phase of inquiry consists mainly of the collection of the empirical data or subject matter that defines the parameters or framework within which the reconstruction of the problematic situation must be addressed.

In the third phase of inquiry, the cognitive elements of the inquiry (ideas, suppositions, theories, etc.) are entertained as *hypothetical solutions* to the originating resistant conditions of the problematic situation. This involves the creative generation of hypotheses of possible and plausible causal determinants. The most dynamic and critical function of hypotheses are their directive role in guiding inquiry; in suggesting the kind of evidence to gather; and in testing hypotheses by overt or imaginative action to assess their explanatory capabilities (Tool 1994b). This implies imaginative analytic work where theoretical and empirical material is played out against each other. This work is characterised by a continuous ordering and juxtaposing of explanatory constructs and factual evidences which implies that the tools of inquiry are borrowed or created and used as instruments of disclosure and appraisal. They are revamped as required to facilitate the process of inquiry.

As pointed out in part 2.4., the institution of a problem situation has practical import for the process of inquiry. This situation has to be cognitively constructed out of the indeterminate situation and implies clarifying what is to be inquired into in the investigation. An important methodological point in this paper is thus that indeterminate situations dealt with should be pragmatically re-formulated as the need for more comprehensive knowledge pertaining to the problematic situations stated in terms of a set of research questions. As inquiry based on various conceptual approaches is brought to bear on them,

these questions - and the answers to them - emerge out of the continuous ordering and juxtaposing of explanatory constructs and factual evidence in analysis (ref. *recursus*).

REFERENCES

- Alvesson, M. and Sköldbberg, K. (1994) *Tolkning och Reflektion. Vetenskapsfilosofi och Kvalitativ Metod*. Studentlitteratur, Lund.
- Atkinson, G. W. and Oleson, T. (1996) "Institutional inquiry: the search for similarities and differences". *Journal of Economic Issues*, XXX (3).
- Bhaskar, R. (1986) *Scientific Realism and Human Emancipation*. Verso, London.
- Buchler, J. (1940) *The Philosophy of Peirce: Selected Writings*. Harcourt, Brace and Company, New York.
- Bush, P. D. (1993) "The methodology of institutional economics: A pragmatic instrumentalist perspective". In M. R. Tool (ed.) *Institutional Economics: Theory, Method, Policy*. Kluwer Academic Publishers, Boston.
- Bush, P. D. (1995) "Marc R. Tool's contributions to institutional economics". In C. M. A. Clark (ed.) *Institutional Economics and the Theory of Social Value: Essays on Honor of Marc R. Tool*. Kluwer Academic Publishers, Boston.
- Campbell, J. (1995) *Understanding John Dewey: Nature and Cooperative Intelligence*. Open Court, Chicago.
- Clark, C. M. A. (ed.) (1995) *Institutional Economics and the Theory of Social Value: Essays on Honor of Marc R. Tool*. Kluwer Academic Publishers, Boston.
- DeGregori, T. and Shepherd, D. (1994) "Theory of technology". In M. R. Tool et al. (eds.) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar, Aldershot.
- Dewey, J. (1903) *Studies in Logical Theory*. University of Chicago Press, Chicago. Reprinted in J. A. Boydston (ed.) (1977) *The Middle Works of John Dewey, 1899-1924, Vol. 3: 1903-06*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1915) "The logic of judgements of practice". *Journal of Philosophy, Psychology and Scientific Methods*, 12. (Revised and reprinted 1916 in *Essays in Experimental Logic*). Reprinted in J. A. Boydston (ed.) (1979) *The Middle Works of John Dewey, 1899-1924, Vol. 8: 1915*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1916) *Democracy and Education. An Introduction to the Philosophy of Education*. Free Press, Macmillan Inc., New York. Reprinted in J. A. Boydston (ed.) (1980) *The Middle Works of John Dewey, 1899-1924, Vol. 9: 1916*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1922) *Human Nature and Conduct*. Henry Holt and Company, New York. Reprinted in J. A. Boydston (ed.) (1983) *The Middle Works of John Dewey, 1899-1924, Vol. 14: 1922*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1925) *Experience and Nature*. Open Court, Chicago. 2. edition 1929. Reprinted in J. A. Boydston (ed.) (1981) *The Later Works of John Dewey, 1925-1953, Vol. 1: 1925*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1929) *The Quest for Certainty*. Minton, Balch & Company, New York. Reprinted in J. A. Boydston (ed.) (1984) *The Later Works of John Dewey, 1925-1953, Vol. 4: 1929*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1938) *Logic: The Theory of Inquiry*. Henry Holt and Company, New York. Reprinted in J.A. Boydston (ed.) (1986) *The Later Works of John Dewey, 1925-1953, Vol. 12: 1938*. Southern Illinois University Press, Carbondale.
- Dewey, J. (1939) *Theory of Valuation*. University of Chicago Press, Chicago. Reprinted in J. A. Boydston (ed.) (1988) *The Later Works of John Dewey, 1925-1953, Vol. 13: 1938-39*. Southern Illinois University Press, Carbondale.

- Dewey, J. and Bentley, A. F. (1949) *Knowing and the Known*. Beacon Press, Boston. Reprinted in J. A. Boydston (ed.) (1990) *The Later Works of John Dewey, 1925-1953, Vol. 16: 1949-52*. Southern Illinois University Press, Carbondale.
- Dugger, W. M. (1995) "Beyond technology to democracy: the tool legacy in instrumentalism". In C. M. A. Clark (ed.) *Institutional Economics and the Theory of Social Value: Essays on Honor of Marc R. Tool*. Kluwer Academic Publishers, Boston.
- Eldridge, M. (1998). *Transforming Experience: John Dewey's Cultural Instrumentalism*. Vanderbilt University Press, Nashville.
- Field, R. (1996) "John Dewey 1859-1952". *The Internet Encyclopedia of Philosophy*, <http://www.utm.edu/research/iep/d/dewey.html>
- Fott, D. (1998) *John Dewey: America's Philosopher of Democracy*. Rowman and Littlefield, Lanham.
- Hickerson, S. (1988) "Instrumental valuation: the normative compass of institutional economics". In M. R. Tool (ed.) *Evolutionary Economics. Vol. 1 Foundations of Institutional Thought*. S.E. Sharpe, Armonk, NY.
- Hickman, L. A. (1990) *Dewey's Pragmatic Technology*. Indiana University Press, Indianapolis.
- Hill, L. E. and Traub, R. M. (1995) "Pragmatism as a normative theory of social value and economic ethics". In C. M. A. Clark (ed.) *Institutional Economics and the Theory of Social Value: Essays on Honor of Marc R. Tool*. Kluwer Academic Publishers, Boston.
- Ihde, D. (1990) "Editor's foreword". In L. Hickman *Dewey's Pragmatic Technology*. Indiana University Press, Indianapolis.
- Jensen, H. E. (1988) "The theory of human nature". In M. R. Tool (ed.) *Evolutionary Economics. Vol. 1 Foundations of Institutional Thought*. S.E. Sharpe, Armonk, NY.
- Jensen, H. E. (1994) "Human nature". In M. R. Tool et al. (eds.) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar,
- Joas, H. (1993) *Pragmatism and Social Theory*. University of Chicago Press, Chicago.
- Kalen, H. M. (1933) "Pragmatism". In *Encyclopedia of the Social Sciences*. MacMillan Company, New York.
- Miller, E. S. (1995) "The instrumental efficiency of social value theory". In C. M. A. Clark (ed.) *Institutional Economics and the Theory of Social Value: Essays on Honor of Marc R. Tool*. Kluwer Academic Publishers, Boston.
- Peirce, C. S. (1931-1958) *The Collected Papers of Charles Sanders Peirce*. Harvard University Press, Cambridge, Mass.
- Peirce, C. S. (ed. K. L. Ketner.) (1990) *Reasoning and the Logic of Things*. Harvard University Press, Cambridge, Mass.
- Platt, J. (1992) "Case study". In American Methodological Thought. *Current Sociology*, no. 40.
- Ryan, A. (1995) *John Dewey and the High Tide of American Liberalism*. W. W. Norton & Company, New York.
- Samuelsen, R. (1994) *Selv-organisering: Et Evolusjonært Perspektiv på Relasjoner Mellom Læring og Kontekst*. University of Oslo, Oslo.
- Samuelsen, R. (2003) *Constructing Urban Technology – Producing Urban Space. The Case of Geomatics in the Transformation of Water and Road Infrastructures*. University of Oslo.
- Shuklian, S. (1995) "Marx, Dewey, and the instrumentalist approach to political economy". *Journal of Economic Issues*, vol. XXIX, no. 3. September.

- Tanner, M. C. and Josephson, J. R. (1994) "Conceptual analysis of abduction". In J. R. Josephson and S. G. Josephson (eds.) *Abductive Inference: Computation, Philosophy, Technology*. Cambridge University Press, Cambridge, UK.
- Tiles, J. E. (1988) *Dewey*. Routledge, New York.
- Tool, M. R. (1977) "A social value theory in neoinstitutional economics". *Journal of Economic Issues*, vol. XI, no. 11. December.
- Tool, M. R. (1979) *The Discretionary Economy: A Normative Theory of Political Economy*. Goodyear Publishing Company, Santa Monica, CA.
- Tool, M. R. (1986) *Essays in Social Value Theory: A Neoinstitutionalist Contribution*. M. E. Sharp, Armonk, N.Y.
- Tool, M. R. (ed.) (1988) *Evolutionary Economics. Vol. 1 Foundations of Institutional Thought. Vol. 2 Institutional Theory and Policy*. S.E. Sharpe, Armonk, NY.
- Tool, M. R. (ed.) (1993a) *Institutional Economics: Theory, Method, Policy*. Kluwer Academic Publishers, Boston.
- Tool, M. R. (1993b) "The theory of instrumental value: extensions, clarifications". In M. R. Tool (ed.) *Institutional Economics: Theory, Method, Policy*. Kluwer Academic Publishers, Boston.
- Tool, M. R. (1994a) "Clarence E. Ayres". In M. R. Tool et al. (eds.) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar, Aldershot.
- Tool, M. R. (1994b) "John Dewey". In M. R. Tool et al. (eds.) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar, Aldershot.
- Tool, M. R. (1994c) "Instrumental value theory". In M. R. Tool et al. (eds.) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar, Aldershot.
- Tool, M. R. et al. (eds.) (1994) *Dictionary of Institutional and Evolutionary Economics*. Edward Elgar, Aldershot.
- Veblen, T. B. (1899) *The Theory of the Leisure Class: An Economic Study in the Evolution of Institutions*. Macmillan, New York.
- Waller, W. (1989) "Criticism of institutionalism, methodology and value theory: a comment of Langlois". *Journal of Economic Issues*, vol. XXIII, no. 23. September.
- Westbrook, R. B. (1991) *John Dewey and American Democracy*. Cornell University Press, Ithaca and London.