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Management of Potential Innovation

By

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Abstract: *In this article I will interpret John Dewey's perspective on reflective thinking as if he were a philosopher of innovation management. From his pragmatist point of departure, the problems involved in knowledge-processes relevant to innovation are analysed and re-conceptualised. On the basis of the analysis I attempt to identify some categories of general applicability when understanding, designing, and managing radical innovation processes. These categories are useful to conceptualise and talk about innovation, when knowledge is taken seriously, and when managing innovation is also understood as managing the production of new knowledge, that is of making the unjustified justified, and the unknown known.*

The Epistemological Background – Plato Revisited

John Dewey was a pragmatist, as was the founder of pragmatism Charles Sanders Peirce, and William James, and he was one of the first to address the phenomena of reflectivity. He approached reflectivity from an epistemological perspective, calling it reflective thought[i]. Before we can interpret Dewey's thoughts on reflectivity as useful in understanding the management of innovation, we must keep in mind what is at stake in the discussion of knowledge. Therefore this article begins with a thorough presentation of Plato's epistemology and conception of knowledge. The modern conception of knowledge will then be presented. This constitutes the background

from where Dewey develops his thought, which I interpret as relevant to understanding radical innovation and the management thereof.

In traditional epistemology a person's knowledge has, since Plato wrote the dialogue *Theaetetus*, been understood as a certain kind of belief (Plato 1994:206c), (Dancy 2001:23), (Sturgeon 1999:13), (Ayer 1956:34), (Gettier 1963:121). A person may hold many different beliefs, but only those which are true, and can be justified by giving an account of why they are true, count as knowledge. According to Plato, Socrates talked about knowledge as at least "true belief with the addition of an account" (Plato 19941).

The argument goes something like this: In order to make sense of all the discussions we have where knowing and knowledge is used we must have a definition of knowledge; otherwise it would be meaningless to use the concepts (196e). We should not confuse the manifold of objects of knowledge with knowledge (146d-e). Nor are we seeking a description of knowledge, but a definition of knowledge, which can embrace the unity of it and explicate the criteria for it (147b-148e). He argues against relativism, subjectivism, and scepticism by saying that by seeking a definition we are seeking a constant measure against which we can determine if a given belief is knowledge. A radical sceptic would not know whether he was right or wrong, was dreaming or insane. Relativism would make the measure inconstant, and could not provide a definition (154b). Subjectivism makes man the measure of all things, which dissolves the reasons we may have to orient ourselves socially and engage in dialogue with others, e.g., teachers. Why should we listen to others if the truth is given within ourselves? And what should we do with the comparative ignorance, the intersubjectivity, when people disagree? (161d-e). A person like the sophist Protagoras who argued in favour of subjectivism would experience the lack of other people's consensus as a contradiction, because if subjectivism is generalized to a belief that everybody is the measure of all things, then any disagreement would be a problem. What we think, our belief

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1 All the references in the following are to Plato – The Collected Dialogues, (Plato 1994).

or opinion, must necessarily be either true or false, because it is contingent. Admitting that all men are the measure of all things makes Protagoras admit that the one who disagrees has an equally true opinion. Seen from the social point of view, Protagoras' subjectivism is not true to anybody, not even to himself, because it would presuppose that opinion was not contingent, and could not vary as social disagreement (170a-172a). Social disagreement and the truth of subjectivism cannot exist at the same time. Social disagreement regarding personal opinion is inevitable; therefore, subjectivism must be false.

In *Theaetetus,* Plato focussed upon three definitions of knowledge in answer to the question of what knowledge is. The first defining criterion was that knowledge is subjective perception – we know what we see and sense. Plato demonstrates that perception is not knowledge by employing arguments; it is a fact that we can perceive foreign languages, yet we may not have any knowledge of what is said (163b), and we may retrieve knowledge from our memory, which would not be an act of perception (164b). If knowledge is perception, then the contradictory consequence is accordingly that the one and same person can "know something and also not know that which he knows (165b)." Socrates concludes that perception in itself is not knowledge, even though it may be a source of justification and of knowledge.

The second definition Socrates discusses is whether true judgment is knowledge (187b). Socrates makes Theaetetus agree that there is no third alternative besides knowing and not-knowing, and that it would not be possible to know a thing and also not know it, or to not know it and also know it (188a). In this case there would be no room for a false judgment, unless we interpret false judgments as misjudgements confusing or mixing up things, as with the twin brothers (188c-189d). Ignorance, or judgment representing false opinion, is logically excluded if knowledge is defined as true judgement (192c). If we take judgments about the absence of things, that is, of objects one does not know and has never perceived, there is according to Socrates no possibility of error or false judgment. It seems that what makes a judgment false is

not located in thought alone, but in fitting together perception and thought wrongly (196d). Therefore, true judgment is not an acceptable definition of knowledge, to Socrates. Theaetetus then claims that true belief is knowledge, and cannot lead to any mistakes or have any dissatisfactory consequences (200e). Socrates deflates this conception by arguing that true belief and knowledge must be different things, if a jury based on eyewitnesses can come to the right judgment without strictly having knowledge on which to base their true belief (201a-d).

The third definition discussed is that knowledge is "true belief with the addition of an account" (201d). The argument is that if "a man gets hold of a true notion of something without an account, his mind thinks truly of it, but he does not know it, for if one cannot give and receive an account of a thing, one has no knowledge of that thing (202b)." Socrates presents three different versions of giving an account: (1) Giving an account may be making it explicit by giving it an overt expression (206d). (2) Giving an account could also be explaining what a given thing is by enumerating its' elements; preferably giving a complete catalogue of the elements, and of how its parts relate to the whole (207a-e). (3) An even stronger version of giving an account is being able to name some mark by which the thing one is asked about differs from everything else (208c). Getting hold of the differences distinguishing any given thing from all others, and in this way putting the differentness into words, and grasping the difference from all other things, is giving an account (208c-209c). Giving an account is then referring the true belief back to an understanding of the thing, preferably a conceptual understanding, which cannot be otherwise. The problem of such a difference is, how could it contain itself? If we seek a correct notion of 'anything,' Socrates argues teasingly, then this notion must itself include the differentness of that thing (209d). But how can we know that this account is an expression of knowledge of the differentness without presupposing the knowledge in need of definition? We must know the differentness in order to give an account of our true belief as being knowledge. But how it this possible without running into a problem of self-reference, or simply presupposing knowledge in the definition of knowledge?

It becomes a circular definition of knowledge because an account presupposes knowledge of the differentness of a thing. An argument of this kind makes Socrates conclude that "neither perception, nor true belief, nor the addition of an 'account' to true belief can be knowledge (210a)." To Socrates, wisdom and virtue are knowledge, and the dialogue *Theaetetus* is constructed by Plato as a search for a definition of knowledge which is never reached. He does not find these conditions sufficient, and gives up the project of finding a definite definition of knowledge.

Plato's main ontological presupposition is that knowledge (*epistêmê*) is about the necessary, universal, and eternal, distinguished from belief (*doxa*), which is about the contingent, particular, and changing. To Plato there is a world of ideas which is eternal (idealistic and conceptual), and an empirical world of phenomena which is changing and in constant flux. The world of ideas is not something we can directly see, but we can access it by insight. It is intelligible, though not sensible. The strength of Plato's conception stems from the fact that the idea of a triangle does not change, although all the triangular objects in the world may disappear or change form. The mathematical relationship in a right-angled triangle may not change, and is eternal, even though triangular objects have contingent size, colour, material, location, etc. Belief (*doxa*) has the changing, the uncertain, the inconsistent and the insecure as its domain. Reason (logos) is reserved to the unchanging, eternal, certain, and secure. Plato understands knowledge as being solely about the unchangeable and necessary. In the dialogue *Timaeus* this is made clear when he says: "First then, in my judgment, we must make a distinction and ask, What is that which always is and has no becoming; and what is that which is always becoming and never is? That which is apprehended by intelligence and reason is always in the same state; but that which is conceived by opinion with the help of sensation and without reason, is always in a process of becoming and perishing and never really is" (27d). We can reconstruct Plato's classification of knowledge, belief,

and ignorance as knowledge being a person actually believing in necessarily true propositions, which can only have the eternal and unchanging as their object.

A systematic linguistic reconstruction of Plato's classification of knowledge, ignorance, and belief. A person's knowledge is a kind of belief, which is at least true and given an account.	**True Proposition:**	**False Proposition:**
Necessary: (Impossible or Necessary) (Can be known a priori[ii])	**Knowledge** (*epistêmê*).	**Ignorance**.
Contingent: (Not impossible and not necessary). (Cannot be known a priori)	**Belief** (opinion, *doxa*). (Beliefs are necessarily contingent and can be either true or false, but can only be knowledge if they are necessarily true)	

The Modern Version of Epistemology

A person's knowledge in epistemology today is still seen as a subset of the person's beliefs[iii], those which are true and justified. This has not changed since Plato wrote *Theaetetus*. The discussion Plato had with Theaetetus where the suggested definitions of knowledge were all rejected has inspired the standard understanding of epistemology today.

If a person is not holding a belief it cannot be knowledge, because our knowledge is a subset of our beliefs. It is therefore a necessary condition that the person is holding a **belief**. The belief must state the fact about things and therefore must be **true**. If a belief does not refer to anything, then it cannot be knowledge, because knowledge is always knowledge about something or the absence of something. To be knowledge, a belief must be true and refer to what is, that it is, or about what is not, that it is not. A person having knowledge about nothing, who is neither affirming nor denying anything, e.g., a predicate as belonging to a subject of a sentence, cannot possibly have knowledge. Finally, someone who accidentally comes to hold a true belief has a problem accounting for and reproducing the reasons why this belief and not its alternatives are true. Someone accidentally holding a true belief is not able to give an account why the belief is true. Plato gives the example of the guide who does not know the way but accidentally points in the right direction (Plato 1994:97b). Even though an accidentally held true belief may work, a justifiable and **justified** true belief is what makes true belief knowledge. We may accidentally hold a true belief today, but is it reproducible tomorrow? Can we teach it to our children and successors? And why should anybody (ourselves and others) reflectively trust a belief if one cannot explain its validity by giving an account for it? In a way a belief becomes true by virtue of being justified. The conclusion is that there are three necessary conditions, though not necessarily sufficient criteria, which must be fulfilled before a person can have knowledge: belief, truth, and justification. This minimal definition of knowledge as justified true belief has formed the basis of

epistemology and the epistemological discourses ever since. Today we say that a person's knowledge is a true belief which is accounted for, warranted, or justified. The formula justified true belief appears as a standard definition of knowledge in most encyclopaedias.

Knowledge as justified true belief has become the basis of epistemology. Proponents elaborate upon the definition by adding further necessary conditions, and opponents critically attempt to deconstruct the necessary conditions as being not necessary at all. The general consensus among philosophers is that false beliefs cannot be knowledge, and that knowledge is restricted to (justified) true beliefs. Most philosophers (and laymen) do classify contradictions as immanently false. What they disagree about is how the truth is constituted, e.g., by being justified, and how strong the criteria should be before we classify a given belief as knowledge. The critique has mainly been directed at the ontological presuppositions Plato's conception of knowledge relies on.

Today many philosophers do not accept the idealism following from the existence of an independent platonic world of ideas. Ideas may not exist independently in an ontological sense, but do exist in the form of human reason and rationality. Many philosophers do not accept that knowledge is only about the eternal and necessary, but also include true contingent propositions or empirical knowledge in the conception of knowledge. Empirical knowledge about the contingent must also be justified true beliefs in order to be knowledge. The difference between Plato's conception and the modern conception is thus the inclusion of empirical knowledge in the conception of knowledge[iv].

Plato's constraint that knowledge is about the eternal and unchanging makes knowledge infallible by definition, whereas including contingent empirical true belief makes knowledge fallible, and historically changing. The inclusion of empirical knowledge has as a general consequence that the idea of absolute or secure knowledge has to be given up. Confusing *episteme* and *doxa* has the price of confusing the eternal and unchanging with the contingent and changing in one

category of modern knowledge covering any belief which is justified and true. The modern understanding of knowledge is a three-place conception where someone – knows – something[v].

The modern interpretation understands the argument in a linguistic context. The formula justified true belief seems to be very close to a conception of rationality, that we to ourselves and others are able to give an account, and state the reasons justifying that what we are thinking and doing is cognitively and normatively meaningful (Habermas, 1984), (Scanlon, 1998), (Brandom, 1995). Justification is understood as a dynamical social practice, more than simply a deductive or demonstrative act. In a modern world, there are competing conceptions of truth, and competing conceptions of which justifications are appropriate in a given context. Many philosophers do not accept that truth and justification may be as separate as Plato treated them, because a belief is often conceived as true by virtue of being justified. Different kinds of justification, or different types of rationality, compete in the real world as justification. A cognitive discursive rationality is seeking to establish truth or consensus among the affected according to whether a proposition is justifiable with valid arguments or not. A cognitive-mathematical rationality is seeking to establish deductive consistency according to whether a proposition in an axiomatic system is provable by deductive arguments or not. A pragmatic discursive rationality is seeking to achieve rhetorical effects according to whether a proposition is convincing a given target group or not. Cognitive instrumental rationality is seeking the choice of optimal means judged according to whether a proposition in its action-consequences is efficient or not, relative to a given end. Pragmatic-instrumental rationality is seeking satisfying means to a given end and judges according to whether a realized proposition works or not. The market-instrumental rationality is oriented to a market and judged according to whether a realized proposition will sell or not in a given market. There are also examples of non-cognitive rationality based on, e.g., religious criteria of believe / do not believe. Normative criteria based on ought / ought not, and subjective criteria based on I like / I do not like. These are examples of competing types of justification, which are always in

conflict in the modern society. This pragmatic reality seems to transcend Plato's conception of justification.

Plato was mainly thinking monologically in terms of an isolated thinking subject getting insight into the world of ideas, thereby excluding the social dimension from his definition of knowledge. Plato thereby confronts a paradox that the demand for justification in practice is a demand for giving an explicit account publicly - that is to others. Justification is linguistic practice, and therefore in principle public practice. This was what Socrates did performatively in his own practice when applying the majeutic or Socratic method when entering a dialogue with others. Socrates understood his own behaviour in analogy with the work of his mother Phaenarete who was a midwife (149a). At the end of *Theaetetus* Socrates says: "Are we in labour, then, with any further child, my friend, or have we brought to birth all we have to say about knowledge? (210b)." This analogy is elaborated in his final reply: "...nor have I any of that knowledge possessed by all the great and admirable men of our own day or of the past. But this midwife's art is a gift from heaven; my mother had it for women, and I for young men of a generous spirit and for all in whom beauty dwells (210c)." It is as a midwife of intellectual understanding and reflectivity Socrates understands himself.

According to Plato we can talk about truth when a thing corresponds to its idea. This conception of truth does not leave room for a discussion of whether a proposition is more or less true, more or less appropriate. But an idea may have many empirical instances appearing in the sensible world of phenomena, just like many different bicycles may all conform to the idea of a bicycle. Discussions involving more or less are most often discussions of values, which can not be decided definitely or proven valid or invalid by deductive means. Most importantly, Plato's conception of truth does not take into account the relationship between propositions constituting knowledge in an interconnected network or set of beliefs, and therefore cannot take into account

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that different clusters of propositions may be justified with different strengths, and with different depths of the resulting knowledge.

The more justified a proposition is the more knowledge depth it expresses. Some modern pragmatist philosophers think that the process of justifying beliefs is in principle indefinite and therefore is arbitrarily interrupted when it seems impractical to continue justifying a proposition further (Rorty 1979). The pragmatic question of the depth of the justification and of the knowledge, which was dealt with by Plato by restricting knowledge to the necessary and eternal which has infinite depth, becomes relevant in the modern interpretation. The consequence of including empirical knowledge in our conception of knowledge is that different beliefs may have different degrees of justification. The pragmatic question of knowledge depth follows from the modern conception of knowledge. The modern interpretation of justified true belief connects knowledge not just to the empirical world but also to the social world of intersubjective practices. The knowledge depth relative to a given proposition believed in is, in the social dimension, relative to the criteria of how many other rational beings share the belief. In the cognitive dimension it is relative to how strong the justifications supporting the belief are. If everyone were rationally motivated agents, these two criteria would converge. In a coherence perspective it is relative to how many different justifications support the belief.

The depth of knowledge, that is the number and relative strengths of justifications supporting a given belief, is one important factor. The scope of knowledge, that is how much and how universally does the knowledge cover a given domain, becomes an important factor. The social diffusion of knowledge regarding how many subjects share the belief considered true and justified is also an important factor. Finally, the social validity or social robustness measured relative to the depth of the consensus making the belief diffused is important. Beliefs can be held by a person or a single subject, or can be intersubjectively shared among many subjects holding the same belief. In the social dimension, agreement or consensus is a measure of the degree in which beliefs are

shared. How many of the implicated parties share a given belief? And how deep is the foundation for their consensus? The depth of the consensus, the degree of rationality, and depth of shared justification become relevant factors. Plato seems to miss the fact that concepts do not exist in a separate world, but are shaped socially in cultural processes of communication. The implication that knowledge is a kind of belief which is true and justified, is that only persons can have knowledge. The reality is that communication between persons shapes and reshapes these personal beliefs.

John Dewey's Perspective on Knowledge and Discovery

It is upon this background that John Dewey reflects on knowledge and learning. Dewey introduces his book *How We Think2* by saying, "In some cases, a belief is accepted with slight or almost no attempt to state the grounds that support it, In other cases, the ground or basis for a belief is deliberately sought and its adequacy to support the belief examined. This process is called reflective thought; it alone is truly educative in value, and it forms, accordingly, the principal subject of this volume (p. 1-2)."

We act on behalf of beliefs. Acting on the grounds of ignorance is risky and dangerous. Peirce said "Belief consists mainly in being deliberately prepared to adopt the formula believed in as a guide to action (Peirce 1958:V§27) (Habermas, 1987:120)." Adopting a belief entails a propensity to act according to the belief. It is thus in the beliefs held by a person that thinking and acting are synthesized. As long as actions are successful in practice, a person's beliefs are usually not revised or changed. Failure in practical action and disappointed expectations are the main reasons for revising one's beliefs.

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2 All the references in the following are to John Dewey – How We Think, (Dewey, 1910:1997).

Seen in this way, beliefs are a person's motivating ideas of reality. Beliefs are crystallized in concepts, and when made explicit they take the form of propositions about reality (Habermas, 1987:121).

What Dewey is saying is that we are acting in a social practice where we actively seek knowledge. Some beliefs are actively justified; others are adopted without active justification. The pragmatic question is, how justified are the beliefs we are acting on? I think that we need to distinguish between rational, non-rational, and irrational action and behaviour, to make this insight operational. The philosopher's models, like Peirce's conception, most often presuppose that people are rationally motivated. But a motivational gap occurs when a person has knowledge, but does not act according to the justified belief held. Some people know, e.g., that smoking is not healthy, but smoke anyway. Aristotle called it weakness of will, or involuntary or incontinent action, but there is more to it than that. Rationality is a normative idea, which prescribes that we ought to act on the grounds of knowledge. Irrationality is when we act despite having a justified false belief. Non-rational action is when we have no justification and do not know whether the belief is true or not. In practice many beliefs we might hold are on probation and are non-rational in the above sense. We may act on them, but they are not rationally motivated. Absolutely rational persons would not have any motivational gaps, but will always act according to their knowledge. Empirical analysis of motivational gaps can be used as an indication of the degree of prevailing rationality. I think that Dewey is pointing to the fact that we can have different strengths of rationality in action. And that this rationality has to do with how actively we have sought justification for the beliefs we are holding. Therefore we can speak of knowledge being more or less actively justified, and of different knowledge depths.

Dewey was certainly a pragmatist, and understood what Peirce tried to say when he defined pragmatism as also taking the effects and practical consequences of a proposition into account when discussing the truth of a proposition. When Peirce defined pragmatism he stated that: "In

order to ascertain the meaning of an intellectual conception, one should consider, what practical consequences might conceivably result by necessity from the truth of that conception; and the sum of these consequences will constitute the entire meaning of the conception (Peirce 1958:V.§9)."

Dewey points out the essence of Peirce's conception of pragmatism, when he says: "Reflection involves not simply a sequence of ideas, but a *con*sequence - a consecutive ordering in such a way that each determines the next as its proper outcome, while each in turn leans back on its predecessors (p.2-3)." There is a relationship of time, causal, and functional relations present in our personal knowledge, which are ignored by Plato because the dimension of time is irrelevant when knowledge is defined as necessary knowledge about eternal objects.

As persons we hold a network of beliefs, some of them interrelated logically, historically, and according to our personal experience, others being not consistent with the rest of our beliefs. We thus have a network of beliefs as persons, some of them constituting the rational side of our motivational structure. Accordingly we also have a subset of beliefs, which are true and justified in a similar kind of network, which we might call a person's knowledge network. Expanding and deepening the justification of such knowledge networks is the essence of learning.

Dewey points out very clearly that reflective thoughts are directed not at external objects but at our beliefs held about them. As he says: "Even when thinking is used in a broad sense, it is usually restricted to matters not directly perceived: to what we do not see, smell, hear, or touch (p.3)." The point is that reflexivity or reflective thought does not have reality as its object. It has the beliefs about reality as its object. Even though we may justify a belief with reference to sensations, it is not the sensations which are the object of reflection, but the beliefs they lead to. Having a belief as an object of thought must be distinguished from generating beliefs creatively.

As Dewey says: " . . . imaginative enterprises3 often precede thinking of the close-knit type and prepare the way for it. But *they do not aim at knowledge, at belief about facts or in truths*; and thereby they are marked off from reflective thought even when they most resemble it (p.3)."

That we may have non-rational beliefs held on probation, seems to be Dewey's point as well. His example is: "When we say, 'Men used to think the world was flat,' or, 'I thought you went by the house,' we express belief . . . . Such thoughts are prejudices, that is, prejudgments, not judgments proper that rest upon a survey of evidence (p.4)." Such beliefs are not justified, because no justification was established.

It is precisely when we actively seek justification of beliefs that the beliefs held become more rational, by what Dewey calls reflective thinking. "*Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends*, constitutes reflective thought (p.6)."

Actively seeking justification is the key to justifying formerly not justified beliefs. "Reflection thus implies that something is believed in (or disbelieved in), not on its own direct account, but through something else which stands as witness, evidence, proof, voucher, warrant; that is, as *ground of belief* (p.8)." Unfortunately we mix senses in ordinary language. One can say 'I believe' and refer to an unjustified hypothesis, or to knowledge, because the person knows how to justify the belief. We do not know in daily language whether the belief is the beginning or the end of a justification process. We do not know whether the belief referred to is understood in a context of discovery or in a context of justification. This is because knowledge is a subset of beliefs - the justified and true ones. The difference between believing and knowing is that knowledge is justified. Justification is thus in practice relative to the zeal with which we actively seek justification. Justification is not a static thing, but pragmatically something we act to get. It takes

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3 We often speak about the role of creativity or creative thinking, e.g. brainstorming, in the innovation process. According to Dewey creativity or imaginative enterprises cannot be the object of reflective thought. This is a reason to distinguish creativity from active knowledge building. Knowledge building, which is the systematic application of thinking and reflective thoughts in Dewey's sense, seems to be the rational approach to the innovation processes.

time and energy to justify. The more in depth we seek justification, the deeper the knowledge we generate. And, I would add, the deeper the justification the more valuable and competitive the knowledge will potentially be.

Dewey defines thinking as a process where we form beliefs on the basis of justification. "Thinking, for the purposes of this inquiry, is defined accordingly as *that operation in which present facts suggest other facts (or truths) in such a way as to induce belief in the latter upon the ground or warrant of the former* (p.8)." Reflective thinking is when we seek further justification for the beliefs we hold as a product of our thinking.

We may have many sources and internal reasons as persons to hold our beliefs. Observation, other people's reports of observations, logical arguments, etc. But we may also generate beliefs by combining already held beliefs, and generate beliefs by inference. "We do not put beliefs that rest simply on inference on the surest level of assurance. To say 'I think so' implies that I do not as yet *know* so. The inferential belief may later be confirmed and come to stand as sure, but in itself it always has a certain element of supposition (p.9)." We may even apply a procedure to produce new beliefs. Such internal processes may belong to creativity or a logic of discovery more than to a logic of justification (Popper 1959). Charles Sanders Peirce, e.g., defined a certain kind of inference, the abduction[vi], to answer this question.

As persons we are always facing areas where we have not yet formed beliefs and where we have no justification. There are phenomena and things in the world we know and others we do not know, as well as areas in the world where we haven't even formed any beliefs yet. We can classify our reflective knowledge about the world in four categories: (1) We do know what we know. (2) We do know what we do not know. (3) We do not know what we know. (4) We do not know what we do not know.

Dewey gives an example of a man traveling in an unfamiliar region who comes to a branching of the roads where he must either blindly and arbitrarily take his course, trusting to luck for the

outcome, or he must discover grounds for the conclusion that a given road is right. Any attempt to decide the matter by thinking will involve inquiry into other facts, whether brought out by memory or by further observation, or by both, according to Dewey (p.10). The man is in a situation where he knows that he does not know the way. But he may actively find justification and change the situation epistemically to a situation where he knows that he knows the right way. If he is traveling north he may, e.g., look at the stars, or a compass. If the road turns too much, or seems wrong for some reason, he may go back and try another route. This situation is very much in analogy to the situation where the aim is a radical innovation, and one does not know which path to take, but one needs to make a justified choice of direction. The general direction may be given by a company vision, and by abstractly envisioning the type of innovation sought. But it can also be specified in more detail.

Much of our thinking is teleologically structured in such a way that the end is given and the means for the end are sought for. A fixed *telos*, goal or end, may guide our thinking in a desired direction, but may also imprison our thinking as such because the end constrains the possible thinking too much. This is what Argyris and Schön have understood when they distinguish between single-loop learning which is instrumental and takes place within the normative framework of a given set of goals, and double loop learning which not only provides the means but also changes the fundamental values and ends. The teleological means-end structure may be efficient, but is not always optimal. Learning within a teleological means-end framework differs radically from learning not constrained teleologically (Argyris & Schön 1996). Dewey expresses this as: "A traveler whose end is the most beautiful path will look for other considerations and will test suggestions occurring to him on another principle than if he wishes to discover the way to a given city. *The problem fixes the end of thought* and *the end controls the process of thinking* (p.12)." Dewey says more than that teleology may be too constrained a structure for thinking. He also

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explicates that there are always problems to solve or implicit interests involved in the production of knowledge. It is one of the pragmatist's core assumptions that knowledge is inseparable from our social practices. The way we think is always guided by interests (Habermas, 1987). It is furthermore a fact that application of knowledge is always guided by specific interests, as are judgments about the relevance of a given knowledge. Making the implicit interests explicit is important in order to understand the pragmatic judgment of relevance guiding the production of knowledge. Most of us do recognize the difference between the type of person who hurries in a straight line from point to point, and the one who takes the most beautiful path. Product-orientation vs. process-orientation is often a hidden source of conflict between people in organized activity.

When facing a choice between two unfamiliar paths, we are rarely in a cognitive vacuum. "Given a difficulty, the next step is suggestion of some way out – the formation of some tentative plan or project, the entertaining of some theory which will account for the peculiarities in question, the consideration of some solution for the problem. The data at hand cannot supply the solution; they can only suggest it. What, then, are the sources of the suggestion? Clearly past experience and prior knowledge (p.12)." We may, as Dewey suggests, creatively apply the experience and knowledge we already possess. What we can learn from this story is that justification is used in two very different roles. In one role in the context of discovery, where the belief is the end of a process, and in another in the context of justification, where the belief is the beginning of the process. When we constructively produce new beliefs we may induce or infer these from our past justifications. When we seek knowledge we begin with the beliefs and look for possible justifications. The beliefs and the justifications may be the same – just acting in different roles and occurring in different orders in time. This suggests to me that the distinction we often make between old and new knowledge may be counterproductive. We should instead distinguish between knowledge and not-knowledge, and then see it pragmatically in a time-perspective

whether we are discovering or justifying it. Remember that the knowledge produced which in the past was new, now is just knowledge. New is not a quality of knowledge, but of the situation or situatedness.

It depends on the practical situation whether the justifications play the role of a source of inspiration creating and suggesting beliefs, or play the role of the basis for believing, justifying an existing belief. It is when we are about to learn something new, or revise our formerly held beliefs, that reflective thinking applies. It puts us in a situation where we cannot trust or haven't yet formed our beliefs. From an action-perspective and to a pragmatist this is painful. As Dewey says: "Reflective thinking, in short, means judgment suspended during further inquiry; and suspense is likely to be somewhat painful (p.13)." This is what makes decision-making in innovation management so difficult. Every time a decision about the unknown or the future path taken must be made, further justification is needed, and the behavioral side of the process of innovation is suspended for the time being, until a decision is made.

When attempting the invention of something radically new, that is not formerly known, whether it is a product, a process, a service innovation, or a social innovation, we are always in a position where we are in a context of discovery. The new is located outside our knowledge, until it is invented and becomes part of our knowledge. The unknown or backside of our knowledge constitutes a domain of our latent potential knowledge. "Where there is thought, things present act as signs or tokens of things not yet experienced. A thinking being can, accordingly, *act on the basis of the absent and the future* (p.14)." When we are attempting a radical invention, we begin by acting on the basis of the absent knowledge and the future knowledge.

Invention is an act of creation, either by combining elements in new ways, or by producing something radically new. Dewey's diagnosis is very much like J.B. Say's definition of entrepreneurship as changing the yield of resources. Dewey said that: "All forms of artificial apparatus are intentionally designed modifications of natural things in order that they may serve

better than in their natural estate to indicate the hidden, the absent, and the remote (p.16)." This is why it is important for innovation managers to break down teleological structures of thought and habits which constrain the active seeking of new knowledge and the identification of latent innovation potential.

It is also important for managers of innovation to be aware of culturally shared ignorance, that is, false beliefs most people believe in at a given time. "At present, the work of teaching must not only transform natural tendencies into trained habits of thought, but must also fortify the mind against irrational tendencies current in the social environment, and help displace erroneous habits already produced (p. 26)."

When taking an unknown path we know that we should not take the one we know is false and wrong. Following everybody else does not guarantee that the choice of paths is right. Just arbitrarily taking a path does not manage the decision-making process, only attempting to justify which path is taken is management. In short, self-inflicted cognitive boundaries to thinking and reflective thought block potential innovation, and become counter-productive.

In the social dimension, e.g., in organizational settings, an organization may be seen epistemically as a giant interrelated network of beliefs, some shared, others not shared, some true, others not true. We can call the threshold in a person determining whether to act according to one's beliefs or not, the motivational value of a belief. This is determined by whether a person is motivated rationally, non-rationally, or irrationally. Strong beliefs have more motivational value than weak beliefs. Knowledge in itself has a motivational value because justifications are also motivation to the rational person. In organizations, some shared beliefs may become the basis for decision-making, others not. Managing innovation consists of making decisions regarding whether a given unknown path should be taken or not. Such a process cannot be designed with a guarantee of leading to successful innovation, but applying knowledge reflectively can increase the probability of coming up with something new and useful, and may increase the speed relatively to

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those taking all the wrong paths. Managing the knowledge processes in innovation processes means directing the decision-making processes so that decisions are based as much on knowledge as possible. Innovation management is a tricky job, but optimizing rationally motivated decision-making optimizes the probability of success.

We can combine action motivation and epistemic states[vii].	**Believe – Think** (holding a belief about something)	**Know** (having justified true belief about something)
Irrational Action:	We unjustifiably believe it is false, but act on it anyway.	We act despite the fact that we know it is false.
Non-rational Action:	We do not know whether it is true or false. We take a chance and act arbitrarily.	We know that we do not know whether it is true or false. We act arbitrarily.
Rational Action:	We think our belief is true. We act without sufficient justification.	We know our belief is true, because it is justified. We act on knowledge.

When managing an innovation process where the goal is to come up with a radical innovation, we are in the situation Dewey sees as facing the choice of which path to take. There are many choices to make before a situation of need, one of opportunity, or changes in culture, knowledge, or markets can be coped with successfully by introducing an invention of something new and useful. The actual

probability of succeeding with a radical innovation is rather low and improbable, even though it happens all the time. Knowledge-based innovation management and rational decision-making supported by thinking and reflective thought will increase the probability of success. A universal fact is that all innovation presupposes knowledge, even though not all knowledge becomes innovation. The harder the competition is, the more the competition on knowledge matters. Strong competition thus forces the locus of competition towards competing on the production of knowledge – especially the creation and building of justification and knowledge.

Mapping Innovation Potential

Being aware of the roles knowledge and the management of knowledge processes play in the innovation process leads us to the question of directing what I will call epistemic attention. An existing company operates on a given market with a given product or product portfolio. Managing the invention of new knowledge leading to a new product involves managing the epistemic attention of the organization, e.g., the research and development team.

All persons and companies have a limited span of attention. This insight is cemented by phenomenology. Resources of attention must therefore be rationally allocated by the innovation manager. Directing attention is in fact all the manager can do when approaching the unknown and seeking radical invention. But how can we allocate resources and take the right path in an unknown territory? And how can we conceptualize the unknown territory? We can adapt Dewey's scheme towards the problem of how to manage processes aiming at radical invention as the basis of innovation. We can systematically map the innovation potential on a level of abstraction where it has general applicability.

Innovation and Epistemic Attention.	*We do not know what we do not know:*	*We do not know what we know:*	*We do know what we do not know:*	*We do know what we know:*
The epistemic attention is not directed towards the fact that:	(a) Latent innovation potential	(b) Latent innovation potential	(c) Latent innovation potential	(d) Latent innovation potential
The epistemic attention is directed towards the fact that:	(e) Latent innovation potential	(f) Latent innovation potential	(g) Potential innovation Here knowledge-building can lead to incremental and radical innovation and taking the right path.	(h) Actual innovation potential. Here incremental invention can happen and knowledge can be applied.

The concepts of latent, potential and actual can be defined, such that actual action is when we are aware what we are doing. Potential action is when we are aware what we could do something but are not doing it. Potential is according to the concise oxford dictionary, having the capacity to develop into something in the future, that is being capable of coming into being or action. Latent action is when we are not aware that an action is possible, but could become aware of it, making it a potential. The latent is, according to the concise oxford dictionary, the existing but not yet developed, manifest, or active. Impossible action is when we are not aware and could not become aware of an action. The fields (a)- (f) in the above scheme contains six different forms of innovation potentials, which seen from an action perspective are latent, and contain innovation potential. It is outside the scope of this article to go into a deeper analysis[viii] of the differences among these potentials, but some very general action strategies can be outlined.

Latent Innovation Potential:

(a) When the epistemic attention is not directed towards the fact that we do not know what we do not know, then innovation is necessarily and logically outside our reach. The situation can be improved by redirecting attention and by finding out what we do not know.

(b) When the epistemic attention is not directed at the fact that we do not know what we know, then a potential innovation is blocked by internal organizational problems. The situation can be improved by redirecting attention to the internal organization and getting knowledge of what we already know. Knowledge management may be a way to organize these processes.

(c) When the epistemic attention is not directed at the fact that we do know what we do not know, then it is not possible to actively use the unknown to guide the direction of knowledge-building and to create reflective thought in a context of discovery.

(d) When the epistemic attention is not directed at the fact that we do know what we know, then organizationally available knowledge is simply left ignored and unused. Knowledge management is needed.

(e) When the epistemic attention is directed at the fact that we do not know what we do not know, then awareness may arise that mapping the unknown is needed, and a process of seeking new knowledge may begin.

(f) When the epistemic attention is directed at the fact that we do not know what we know, then awareness may arise that mapping the existing knowledge is needed. Knowledge management may be a solution.

Potential Innovation:

(g) When the epistemic attention is directed at the fact that we do know what we do not know, then an active search for new knowledge and radical invention can be done by taking the context of discovery and building knowledge in the fields where knowledge is lacking. Exploration of knowledge is needed.

Actual Innovation Potential:

(h) When the epistemic attention is directed at the fact that we do know what we know, then the knowledge can be applied, becoming a source of incremental invention and a means to innovation. This is when the knowledge is in organizational control, and can be seen as a resource. Exploitation of knowledge is possible.

Of the eight fields constructed in the matrix, field (g) supports radical invention, and field (h) supports incremental innovation. Knowledge can be produced and applied, but logically it has to be produced first. Radically new knowledge does relate to the field of where we know what we do not know, and decide to actively pay it attention and seek new knowledge by actively building knowledge. There is a point to seeking radical new knowledge in the areas not yet mapped by existing knowledge. This is done by systematically building knowledge and changing the status from not known to known. We can be conscious of ignorance and map the fields where we do not have sufficient knowledge, as Socrates reminds us in the following quote from *Apology*: "However, I reflected as I walked away, Well I am certainly wiser than this man. It is only too likely that neither of us have any knowledge to boast of, but he thinks that he knows something which he does not know, whereas I am quite conscious of my ignorance" (Plato 1994:21d). We may paraphrase Socrates and say that the unexamined opportunity or potential knowledge is not worth rejecting or pursuing[ix].

From the scheme two surprising conclusions may be derived. (1) The scheme does imply something to the often repeated debate about basic research and applied knowledge. The prevailing ideology that all knowledge produced should be instantly applicable is not supported by the scheme, because only (h) support applicability. The rest of the fields are presupposed in radical innovation. Thus an ideology which demands direct applicability of knowledge production is

a serious block to radical innovation processes. (2) Only in fields (b), (d) and (f) is knowledge management traditionally conceived as organizing what we know, relevant to the innovation processes. This scheme can therefore also be used to demarcate and distinguish the differences between innovation and knowledge management. The conclusion is that innovation is much more than knowledge management, and that knowledge management can not in itself (unless it is contradictorily expanded to include ignorance management as well) guarantee successful radical innovation.

We may use the scheme to map which fields support incremental and radical innovation, and those fields which cannot support innovation without active knowledge building and actively directing epistemic attention, by the innovation management. The fields which contain latent innovation but do not directly support innovation can be managed by managing the epistemic attention and focus given. We can actively seek out fields of ignorance such that they become fields of knowledge about what we do not know. The epistemic attention plays a central role, and it is detrimental whether it is there or not, and how and where it is directed. This is what is always managed by innovation managers, who in fact decide where the resources of thinking and reflective thought should be applied. Managing innovation does have implications as to the direction the knowledge production takes, the fields of exploration chosen, the depth of the knowledge produced, and the diffusion of the knowledge produced.

Radical innovation takes radical new managerial techniques. When it is understood that the innovation manager when it comes to radical innovation manages by directing epistemic attention, choosing the future path is important. It is also important that the innovation manager understands that even though the justifications in the formula justified true beliefs may appear in two different roles in the context of discovery and in the context of justification, they are nevertheless the same justifications (arguments, observations, pieces of already possessed

knowledge, communication etc). This is why directing epistemic attention and actively building knowledge is the rational method with which to improve the probability that the right path is taken. Very often the path divides, a decision must be made, and the process is stopped (judgment is suspended) until knowledge has been produced which can make a decision justified.

From reading Dewey as a philosopher of innovation management we can learn to ask some questions when trying reflectively to manage the innovation processes.

(1) Is there an implicit or explicit problem we need to solve which is guiding the knowledge we produce? Can we explicate the problem and get a deeper understanding of it, using it as an explicit frame of reference and as a pragmatic guideline?

(2) What are the implicit interests guiding the discovery and production of new knowledge? Can we agree on these?

(3) Do we have sufficient knowledge to judge which path to take? Should we suspend judgment and built knowledge before taking any path?

(4) How can we actively, reflectively, and critically examine what we currently believe?

(5) How can we increase active knowledge seeking and minimize decisions based on unjustified habits and beliefs?

(6) How can we create a track-record of the justifications we make in order to be able to go back and take another path, if the one taken turns out to be a wrong path?

An innovation manager may according to this, actively (1) create a vision (2) create explicit shared interests (3) manage the creation of beliefs and knowledge systematically, by building knowledge before a path is taken (4) create a forum for critique and reflective thinking (5) manage the allocation of epistemic attention using the above scheme translated into a practical context (6) make the implicit justifications explicit, so that a cognitive map covering the paths

taken in the innovation process becomes available as a tool for managing the innovation process, e.g., making it possible to take an alternative path when the one taken seems inappropriate.

Accordingly, managing innovation has everything to do with knowing and reflectively knowing what path to take, and where to direct the limited epistemic attention available. The means to success is in knowing how knowledge is operative in the innovation process, and how to extract justification from the communication taking place inside and outside the organization in a context of discovery which may guide and justify the formation of beliefs and the choice of the path to take. Only by actively changing fields of ignorance into fields of knowledge, by building knowledge, can radical invention and innovation occur. Competing for knowledge is today's main locus of competition. Producing new knowledge and acting on knowledge is the key to winning. Radical invention and innovation are what makes a company market-leader – in case you forgot.

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Notes:

[i] Dewey uses in his other writings concepts like reflective operation, reflective thinking, reflective thought, reflective consideration, reflective activity, genuine thoughtful, thinking reflectively, and reflection.

ii. A priori, that is, can be known independently of any particular experience(s). A posteriori knowledge is on the other hand empirical and based on grounds of experience.

[iii] What we think of when we talk about knowledge in a book is the representation of knowledge, and what we call knowledge when it is embodied in products, or artefacts, is the application and representation of knowledge. What we call knowledge in a culture is the distribution and sharing of justified beliefs. What we call knowledge in organizations is knowledge carried by the persons acting therein. Talking about knowledge must thus be methodologically traceable back to a person who has a justified true belief about something.

[iv] Immanuel Kant operates with analytic and synthetic judgments and kinds of knowledge (Kant, 1988). Edmund Gettier does not take over Plato's episteme but includes contingent facts in the construction of his argument (Gettier, 1963).

[v] The object of knowledge can today be anything including knowledge itself or the criteria of knowledge. Thus it is possible to talk about knowledge about knowledge about knowledge, etc.

[vi] According to Peirce the inference called abduction is characterized by the following features: "Abduction seeks a theory. Induction seeks for facts. In abduction the consideration of the facts suggests the hypothesis" (Peirce, 1958: VII§218). 2. "Abduction is the inference of the truth of the minor premise of a syllogism of which the major premise is selected as known already to be true while the conclusion is found to be true. Abduction furnishes all our ideas concerning real things, beyond what are given in perception, but is mere conjecture, without probative force" (Peirce, 1958: VIII§209). 3. "This step of adopting a hypothesis as being suggested by the facts, is what I call abduction." (Peirce, 1958: VII§202).

[vii] The model may be interpreted from a decision-maker's perspective as an action model. If we are positioned in the category irrational, then the action suggested is do not act. If we are positioned in the non-rational category then the recommended action is to built more knowledge, get more information and data before acting. If we are positioned in the rational belief category the suggestion is to get some justification. If we are in the rational knowledge category the suggestion is: act now! Take the path suggested!

[viii] Some means to bring the latent innovation potential into use by directing the epistemic attention could be (a) Creating a shared vision or shared storytelling locally to set a direction (b) Entering and handling chaos and complexity (c) Actively and systematically building knowledge (d) Making tacit knowing explicit (e) Strengthening the rationality of communication, (f) Move attention, e.g. regarding areas of knowledge, markets, stakeholders, technologies, etc., etc.

[ix] Socrates said in Apology: "the unexamined life is not worth living" (Plato 1980:38b).