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Abstract

This paper has two main purposes: first, to argue against the monovalent conceptualization of knowledge implicitly or explicitly held by many authors and instead to develop a characterization that recognizes the rich and varied ways in which human beings may be said "to know". Second, to point out and conceptualize a fundamental dimension of knowledge that is generally ignored or cursorily treated within the literature, that is, "truth". The paper draws on previous work that developed a theory of information and meaning based on the embodied nature of cognition. It identifies four forms of knowledge – propositional, experiential, performative and epistemological – and explores their characteristics, especially in terms of truth and validity. It points out some implications for knowledge management.

Keywords: Knowledge management, knowledge, information, critical realism, critical theory, truth

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Introduction

Although knowledge management has established itself as a *bona fide* subject both in practice [24] and in the academic world [66], there has been, and remains, considerable debate about the underlying concepts of "knowledge", "information" and even "data".

The purpose of this paper is two-fold. First, to argue against the monovalent conceptualization of knowledge implicitly or explicitly held by many authors and instead to develop a characterization that recognizes the rich and varied ways in which human beings may be said "to know". Second, to point out and conceptualize a fundamental dimension of knowledge that is generally ignored or cursorily treated within the literature, that is "truth". It is fundamental to a proper definition of knowledge as opposed to mere opinion or belief that knowledge has some claim to truth. Indeed, the classical philosophical definition of knowledge, since Plato, is that knowledge is "true, justified belief". In this paper I shall argue that this is an over-simplistic view of truth, particularly given the polyvalent nature of knowledge, and will outline different forms of, or criteria for, truth which may be appropriate for the different forms of knowledge.

The theory developed in the paper draws on previous work concerning the nature of information, data and meaning [17, 46, 47] and the extent to which cognition is embodied [50]. In extending this to consider knowledge and truth it brings in especially critical realism [6, 49, 51, 52] and critical theory [26, 31, 37].

The first section of the paper reviews the knowledge management literature to the extent that it concerns knowledge and truth and includes a brief review of the conception of information and meaning previously developed. The second section develops the polyvalent theory of knowledge; the third reviews theories of truth; and the fourth links truth to knowledge. Finally, the paper discusses the implications for knowledge management.

Current Views of Knowledge and Information

Within information systems it is conventional [2, 9, 15, 21] to draw up a ladder from *data* to *information* to *knowledge*, what Tuomi [72] calls the knowledge hierarchy, and this is mirrored in the move from *data* processing to *information* management to *knowledge* management so pronounced in the history of IS. For example, for Davenport and Prusak [15] *data* are discrete facts about the world which in themselves are meaningless; *information* is data that has been processed or interpreted within a particular context to inform or reduce uncertainty; while *knowledge* is information that is even more valuable because of the addition of insight, experience, context or interpretation [24]. Others who use the same basic model define knowledge in different ways. For example, knowledge is that which enables us to assign meaning to data [73]; knowledge consists of truths, beliefs, concepts, judgements and expectations [75]; or knowledge is tested, validated and codified information [19].

Tuomi [72] actually argues the case for a reversed hierarchy, namely that knowledge precedes information which in turn precedes data. On this view, knowledge becomes articulated within a verbal and textual context to form an information structure. This may be embodied as a document, a diagram, a data structure or information system. Once this has become totally defined the "meaning" of the information is essentially fixed and this allows it to be populated or instantiated with items of data which would, by themselves, have no meaning at all. Put the other way round, data cannot exist without a pre-defined semantic and syntactic structure, which is information; and information is the articulation or explication of knowledge.

Other authors have developed more complex categorizations of knowledge [42]. Millar et al [45] concentrate on what the knowledge is about and specify know-what, know-why, know-how, know-who, and experiential knowledge which can involve any of the others. Blackler [8], drawing on Collins [14], focuses on where the knowledge is situated and distinguishes between knowledge that is embrained (cognitive), embodied (perceptual), encultured (social), embedded (systematized), and encoded (formal or symbolic). Other classifications have been suggested by, for example, Winter [76], Fleck [20] and Benson [3]. Many writers (e.g., [68]) refer to the distinction between tacit knowledge and focal knowledge originated by Polanyi [55] and popularized by Nonaka and Takeuchi [53].

However, as has been pointed out by many commentators [70], the nature of knowledge itself is highly debatable and several authors are critical of the whole emphasis on knowledge as some objective, commodifiable entity. Alvesson and Karreman [1, p. 995] argue that knowledge "is an ambiguous, unspecific and dynamic phenomenon, intrinsically related to meaning, understanding and process and therefore difficult to manage." Marshall and Sapsed [42, p. 12] emphasize the "importance of considering knowledge not simply as a stable and unproblematic object that can be effectively decontextualised and freely circulated, but as a complex, dynamic, and situated series of processes." In addition, they go on to argue that knowing is essentially active – to be able to act effectively within a social situation. In practice, though, the overwhelming approach within knowledge management is to take a resolutely functionalist reading of knowledge as Schultze and Leidner's [66] research showed. They classified research articles on knowledge management between 1990 and 2000 into one of Deetz's [16] four discourses of management – normative (functionalist), interpretive, dialogic (postmodern) or critical. Of the 75 papers, 71% were classified as normative with a further 25% being interpretive.

There is not space in one paper to provide a detailed critique of all these approaches to the definition of knowledge and information, so I shall make some general points that will illustrate what I see as their weaknesses.

1. With respect to the various versions of the knowledge hierarchy I would argue that they all suffer from inadequate and unclear conceptualizations of the nature of information and its possible relationships to knowledge. Mingers [47] carried out a thorough survey of existing theories of information, many based in some way on Shannon and Weaver's [67] information theory, including socially sophisticated models such as Mackay [41] and Luhman [40]. These theories were evaluated in terms of four criteria: the generality of the theory; the pragmatic usefulness for information systems; the degree of integration with other disciplines; and lastly the correspondence with everyday usage. The approach that was judged most successful was that of Dretske [17] and this formed the basis of the theory of information and meaning that is summarized below [46].

2. With respect to Tuomi's reversed hierarchy there are aspects of this that are valuable. Clearly knowledge does structure that which can be information for us, and conditions the amount or extent of knowledge that is available from a particular source. Equally, data does rely on a pre-existing and consensual semantic and syntactic structure for it to be effective as data. However, I will argue that we need both hierarchies – data can carry information and, in certain circumstances, this information can then generate knowledge. At the same time a subject's knowledge alters the information they can receive, and allows them to access the information in the first place. We thus need more of a interactive view.
3. With regard more specifically to theories of knowledge, then there are three general problems. First, the very large number of papers that take a simplistic and unquestioning view of knowledge as an objective commodity. Second, those authors who do recognize different forms of knowledge point out particular and partial sets of distinctions based either on the object of knowledge, the form of knowledge, or the location of knowledge and do not thereby do justice to the richness of ways in which we talk of "knowing". Third, as mentioned in the introduction, almost none of the literature considers the relation of knowledge to truth.

Data, Information and Meaning

Mingers [46] developed a theory of information and its relation to meaning based on Dretske's [17] idea of the flow of information but incorporating ideas from Habermas's [28] theory of communicative action and embedded within a critical realist philosophy [52]. This is now summarized.

In our daily lives, we continually experience events of all kinds. Such events can be, and usually are, taken as signs that relate to other possible events or occurrences. The paw print in the ground shows that a dog has been around; the darkening clouds portend rain; the blue of a map is taken to symbolize water; the knock at the door shows that someone is there; the petrol gauge tells us the car is nearly empty; the database informs us of 35 widgets in stock; or the cry of "fire" triggers us into action.

All of these events are taken by us as signs and can be said to *carry* information about particular states of affairs in the world. A single event carries information, as Hartley [32] and Shannon and Weaver [67] saw, because it reveals a reduction in the possibilities of what might have happened. With the toss of a dice or the input of a particular data item into a computer, a range of possibilities are reduced to just one. The *amount* of information carried or generated by the event reflects the reduction in possibilities thus brought about. It is important to see that the information that is available from the event is independent of any observer. Indeed, the event might not be observed yet it still carries this information waiting to be tapped.

From a semantic, communicational point of view however, what is important is not the amount of information, but its content – what it means. Dretske argues that the content of the information carried by a sign is *that which is causally implied by the occurrence of the sign*. In other words, what must be the case in the world given that the sign or event has occurred? Interestingly this is an almost identical transcendental approach to that of critical realism [4] – given some phenomena, what causal mechanism must have generated it? This formulation provides a

definition of information - *information is the propositional content of a sign*[1]. Thus, a sign carries information about the particular states of affairs that are implied by the occurrence of that sign. There are a number of consequences of this definition:

1. Information is an objective commodity. It exists whether or not there are people to observe or extract it, and it can be stored and transmitted by artifacts, e.g. books, newspapers, TV sets and computers.

2. However, the amount of information available to a particular person depends on their prior knowledge - in particular, their prior knowledge of the possible states of the world. For example, the message that the winner of a horse race was a grey carries more information for someone who knows there was only one grey than for someone who does not. Equally, a book written in a foreign language or a message in code carries information, but only for those knowing the language or code.

3. Information can be transmitted along a chain provided that there are direct causal links. For example, people walking in a shopping mall cause changes in light waves that cause changes in the CCTV camera that cause changes to the wire that results in pictures on a screen recorded on a tape. The pictures carry information about what went on in the mall and they do so whether or not anyone actually sees them.

At this point, we can introduce a typology of signs or signifiers that is helpful in clarifying the relationship between information and meaning. A simple event is an occurrence that carries information about its cause but is not observed and so is not interpreted by anyone. An event that is observed becomes a *sign* and carries information for the observer. We can say that is *signifies* its cause and has *import* for its observer. Signs bear a direct relation to what they signify – e.g., the paw print, or the darkening clouds. *Symbols* are signs that bear an indirect relation to what they signify. They rely on an agreed *connotative* structure (syntax and semantics) to carry information – e.g., blue on a map; a petrol gauge; numbers; computer data. Finally, *utterances* are actual linguistic communications between people that reveal the *intent* of the speaker and have *import* for the listener.

With this typology we can make a number of important distinctions. First, the distinction between data and information can be made clear. Data is a collection of symbols brought together because they are considered relevant to some purposeful activity. Each symbol, or item of data, *carries some information*. It is not the same as the information, nor is information the result of some processing of the data. In the information systems context, data will usually be symbolic (numeric, linguistic, or graphic) utterances, produced in the system for a particular purpose.

Second, we can distinguish two different usages of the term "meaning," and distinguish them both from "information." There is the idea of a system of meaning – for instance, the publicly available meanings within a language that enable sentences to be meaningful. Within the typology, this is the system of *connotation* that underlies a symbolic message. Second there is

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[1]More formally, Dretske [17, p. 65] puts this as: *A signal r carries the information that s is F if and only if the conditional propability that s is F, given r (and k), is 1 (but given k alone, less than 1).* Where r is a signal; "s is F" means that some particular state of affairs, F, obtains; and k is any prior knowledge of the observer about the possible states of affairs - this may well be zero.

the specific meaning that a listener gains from a particular utterance, and that a speaker intends, which is possibly different. Within the typology, these are the *import* and the *intent* respectively.

The "meaning" (import) of an utterance is clearly distinct from the information (signification) it carries. For example, the utterance "Yes, I killed her" has the same meaning whether spoken in a courtroom or on the stage but carries very different information and can lead to very different outcomes – the actress will not end up in jail. Conversely, in reply to the question "Did you go to the pub last night?" the answers "No, I stayed in" and "No, I went to the cinema" carry (some of) the same information but have different meanings.

We can now see the process by which the information carried by a sign or utterance is transformed into meaning (import) for the receiver. This is a process of *digitalizing the analogue.* Signs impinge on the sensory system and carry their information in rich, analogue form (think of a photograph). The nervous system strips away much of the detail to focus on a particular level. The result is the *semantic content* of the information carried by the sign - that information, *and only that information*, held in digital form [17, p. 177]. The latter qualification is important for distinguishing between digitalization carried out in a meaningful, intentional way by humans from digitalization carried out by machines, such as cameras, thermostats, and computers. A further characteristic of the semantic content is that it must have some effect or action within the receiver, even if only internally. This semantic content is the meaning (import) generated from the available information.

This approach suggests that information systems as usually conceived are but a part of the wider systems of "meaning processing" which human beings inhabit.

Forms of Knowledge

From the theory of information and meaning developed in the previous section, we can move on to look at the relation with knowledge and thereby truth. Dretske certainly envisages this connection, titling his book "Knowledge and the Flow of Information" as we will discuss shortly.

The first thing to be said is that, in everyday speech, the word "knowledge", or more actively "to know", are used in a multiplicity of ways: "I know it's raining"; "I know her well"; "I know how to ride a bike"; "I know there's a train at 3.00"; I know I left my key there"; "I know the feeling"; I know what black holes are"; "I know how to make a presentation"; "I know how the system works"; "I know linear algebra". There is unlikely to be a single, uni-dimensional theory that could do justice to all these different semantics, but we can at least present a degree of classification.

Generally, I will be talking about knowledge in the subjective sense, that is, in terms of an individual and what they know. Knowledge also exists in an objective sense as embodied in books, films, organizational practices and procedures, the internet etc. (World 3 in Popper's sense [57]) but this ultimately depends on the knowledge of the individuals and groups who generate it and then access it. The biggest library in the world "knows" nothing even if it contains all knowledge. Polyani [55] argues that all knowledge has a personal dimension; that all knowing is personal knowing; and that all focal knowledge relies on a background of tacit knowledge.

There are some dimensions that all usages of "to know" have in common. First, any form of knowledge must be knowledge *of something.* There must always be an *object of knowledge*

although by no means necessarily a material or physical object. In the above examples, such objects include states of affairs, people, skills, values, feelings and emotions, social practices, organizations and complex physical entities [4]. Nevertheless, there must be some object of knowledge and this connects immediately with critical realism. Knowledge itself, especially as it is an individual person's knowledge, is always in the transitive[2] dimension but the objects of knowledge, even where they are concepts or ideas, are intransitive – objects available for investigation or debate.

Second, there must always be a source of knowledge – knowledge must come from somewhere, generally some aspect of a person's experience. Some possible sources of knowledge are: direct perception, a message or communication, learning as in a language, practice as in a skill, simple experience over time. It is here that the most direct connections with information and meaning come – information can be a source of knowledge, and existing knowledge shapes the information that is available from a source.

Related to this is the third dimension – the way the knowledge is stored or represented, particularly in terms of the degree of tacitness/explicitness. Some knowledge will be entirely conscious and explicit – we know we know it and can express it clearly. Some knowledge will have a degree of tacitness [55] – we have the knowledge but are not necessarily fully conscious of it, or fully able to articulate it. For instance, we can speak a language without knowing the rules that govern it; or we can use a carpenter's plane and know when the blade needs changing. Finally, much of our knowledge, especially at a perceptual/motor level but also at higher levels as well [50], is *embodied* at a pre-conscious level. It governs or shapes what we can be conscious of.

Fourth, and most importantly, they differ in the *nature* or *form* of knowledge involved. It seems possible to identify at least four substantively different types of knowledge that cover the range of common uses of the term. I shall call these: propositional, experiential, performative and epistemological.

One very important facet of knowledge is its *truth*. This is supposedly what distinguishes knowledge from simply belief or opinion. However, the nature of truth is a very complex question and differs between different forms of knowledge so I shall leave this discussion until after I have considered the different types of knowledge.

Propositional Knowledge

This form of knowledge is our everyday, commonsense, relatively direct awareness of the world around us. To know in this sense is to know *that* - to be aware of or to be cognizant of states of affairs. It is to know that it is raining, that there is someone at the door, that there is a train at 12.15, that there are 35 widgets in stock, or that the petrol tank is half-full. I call it propositional knowledge, in comparison with the other forms, because it is generally explicit and conscious, and can be represented in the form of propositional statements: "I know that x is or will be the case".

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[2] Bhaskar [5, p. 10]distinguishes between the *transitive* domain of science – the domain of human production such as theories, papers, experiments which are clearly subject-dependent, and the *intransitive* domain of science – the domain of objects and structures about which we theorize and gain knowledge.

We gain propositional knowledge from several sources. This first is our direct perception of the world, through any of the senses. In philosophy, this kind of direct knowledge of things is called *de re* as opposed to that which we are told about – *de dicto.* In fact, Dretske, whose work we drew on earlier, actually restricts his theory of knowledge to only this kind of direct perceptual knowledge generated by the receipt of signs carrying information. But I shall include more generally knowledge of states of affairs that we are told about through a linguistic (or indeed non-verbal) communication, and knowledge we get through books, papers, timetables and so on.

Such knowledge is generally objective in the sense that the object of knowledge is independent of the particular person involved and could be verified by others.

Experiential Knowledge

We talk about knowing in this sense when we are referring to our own individual previous experience, particularly of people, places, events or feelings. To know in this sense is to be acquainted with or to be familiar with. Thus, I know Mary Scott, I know Birmingham, I know "that feeling", I don't know your school, or I know how bad toothache can be.

Knowing in this sense is a statement about the experience that someone has had, or not had, in the past. The depth of knowledge concerned is very variable – in saying "I know Mary Scott" I might just mean I know who she is, or I might mean that I know her very well. This form of knowledge is not primarily propositional. We can always make a propositional statement about it – "It is true that I know Mary Scott" but this is a second level statement the object of which is our first level experiential knowledge. We do not say "I know *that* Mary Scott."

Knowledge in this sense can be much richer and deeper than simple propositional knowledge. To know someone is not simply to know that they exist, it is to have a complex set of understandings, experiences, feeling and beliefs about that person. Much of this may be tacit and difficult to express explicitly. It is also deeply personal or subjective since my experience of a person or place may be very different from someone else's.

Performative Knowledge

Performative knowledge involves having some skill or competence in order to be able to do something – it is to know *how* rather than to know or to know that [55, 64]. I include in this category much more than simple physical skills. So, we can talk of knowing how to ride a bike; knowing how to play the piano; knowing how to speak a language; knowing how to "play the game" as in office politics or a sport; knowing how to parent; or knowing how to cook.

What distinguishes this type of knowledge is that it goes beyond simple experience of something to involve particular skills and abilities that have to be learnt over a period of time. It generally involves explicit training in order to develop the necessary skills. I call it performative because it usually involves some kind of physical motor skills, some kind of performance – it goes beyond knowledge in a purely conceptual sense. For example, one could know plenty of the theory of music without being able to play the piano, and in its turn playing the piano does not mean that you can play the violin. Each skill has to be learnt over time and through practice – it is inscriptive rather than intellective [33].

This in turn means that performative knowledge is inherently embodied [50, 74] – that is it exists as dispositions or connective states of the body and nervous system itself and may well be pre-

conscious. Even higher level skills such as language [39, 43, 44] or cognitive/ mathematical activities such as navigation [35] have significant bodily aspects. I once observed, at an airport, an English girl talking to her English friend. Their conversation was typically quiet and low-key. She then struck up a conversation with an Italian woman and it turned out she was herself half-Italian and could speak Italian. Her whole manner and disposition changed instantly becoming louder, more emotional, and much more animated as she unconsciously switched from *being* English to *being* Italian.

Generally, experiential knowledge is evaluated in terms of practical success or failure rather than truth. Can one actually ride the bike; play the piano or converse in Italian? Although of course, there will be degrees of ability in many of these activities. Dreyfus [18] presents a useful analysis from a phenomenological viewpoint of the development of skills from novice to expert.

Epistemological Knowledge

By epistemological knowledge, I am signaling a move away from the everyday *knowing that* things are the case towards deeper understandings of *why* things are as they are. It is to know *why*, to be knowledgeable about, to know the truth of, to be certain of, or to understand. It can be seen as related to or a development of propositional knowledge and I would include within this category what we call scientific knowledge – very much the subject of critical realism. I have called it epistemological knowledge to indicate that it is the most self-conscious about its validity and, more than the other forms of knowledge, is centrally characterized by its concern for truth.

This form of knowledge goes beneath the surface of what appears to be the case, the domain of the empirical, to be able to account for the empirical in terms of underlying reasons or causes. I would not want this to be seen in terms of some simple-minded, linear model of cause and effect. It is also useful to draw on Aristotle's Four Causes (Physics II, 3) or ways of explaining why things are as they are. The formal cause or underlying nature of something - what is it to be an x? The material cause or structure of something – what is x made of? The final cause or purpose of something – what is x for? And the efficient cause or causal grounds for something – what has generated x. Examples here are: to know how a diesel engine works, to know why inflation is falling, to know the difference between right and wrong, or to know "What Freud Really Said" to quote a well known book.

This type of knowledge is in some ways the obverse of performative knowledge as it is almost entirely explicit and discursive and is judged in terms of its correctness rather than its success. It can be knowledge of an everyday kind – knowing how something works, but in the main it refers to scholarly knowledge that is generated according to well-defined procedures or methodologies. However, I do not only include knowledge of material things. Of equal importance [28, 30] is knowledge of the social world and the personal world, both valid interpretations of others and undistorted understanding of one's self [65].

Truth

Continually underlying this discussion of knowledge has been the implicit question of the relation between knowledge and truth. One of the most traditional debates in philosophy has been that of epistemology – that is the study of knowledge (*episteme*) as opposed to mere belief or opinion (*doxa*). When are we entitled to say I know something to be the case rather than merely I believe it to be so? We may all believe certain states of affairs to be the case, or that we

know how to do certain things, but ultimately in order to be *knowledge* these beliefs must be testable or able to be validated in some way, that is, there must be grounds for them to be considered to be *true*.

We will now consider the main theories of truth as found in philosophy. Note that most theories concern the truth of propositions, and so only really apply to propositional and epistemological knowledge in our terms.

The most common view, in Western philosophy anyway, is that knowledge is *true, justified, belief (TJB).* This stems from Plato's *Theaetetus* where Socrates argues that:

> "When, therefore, anyone forms the *true opinion* of anything without rational explanation, you may say that his mind is truly exercised, but has no knowledge; for he who cannot give and receive a reason for a thing, has no knowledge of that thing; but when he adds rational *explanation*, then, he is perfected in knowledge" (my emphases)

Although going on to point out the self-referential difficulty of "knowing" what is a rational explanation. These three conditions have been taken to be both necessary and sufficient for a proposition to count as knowledge. In other words, to validly assert "I know that p …" implies:

- You must sincerely believe that p is the case.
- You must have justifiable grounds, evidence, or explanation for p.
- p must, indeed, be true.

Although this sounds clear, there are in fact many problems with each condition as well as their conjunction. For instance, there is much debate about what would constitute proper justification for such a belief - empirical evidence, rational argument, personal experience, perception or what? How in any case can we determine if something is actually true? There are a whole range of theories of truth – correspondence, confirmation, coherence or consensus, not to mention sceptics (e.g., [62]) who would deny the possibility of truth in the first place. Indeed we might say that the question of truth is actually the same question as that of knowledge so defining knowledge in terms of truth makes little progress.

There is also the Gettier problem that provides cases where each of the conditions holds but we would still not wish to call it knowledge [23]. For example, suppose you walk in to a room and think you see your friend John. You believe it to be John; you have grounds for believing it (he looks like John); but suppose you are mistaken and it is actually John's twin brother Mark. It would appear that the third condition is not met and you do not therefore "know" that John is in the room even though you believe it to be the case. Suppose however that John *is* actually in the room but hidden round the corner so you do not see him. Now the third condition becomes true, even though you are not aware of it, and so you are entitled to say you know, even though you are actually mistaken! One way out of this problem is provided by Dretske's theory as will be shown below.

General Theories of Truth

I shall briefly summarize the main philosophical theories of truth:

- Correspondence theories [56, 63, 71, 78] are the main and most obvious view of truth. They hold that truth (and falsity) is applied to propositions depending on whether the proposition corresponds to the way the world it. It thus applies to the relationship between a proposition and the states of affairs it describes. Problems with this view are: i)

in what sense can a linguistic statement be said to correspond to something quite different – an occurrence in the world? ii) We cannot directly access the external world so we are only ever comparing experiences and statements with other experiences and statements, so that we can never actually determine if a proposition is, in fact, true. Most other theories stem from the problems in maintaining a correspondence theory.

- Coherence theories [10, 58, 59] stress the extent to which a proposition is consistent with other beliefs, theories and evidence that we have. The more that it fits in with other well-attested ideas the more we should accept it as true. This approach avoids the need for a direct comparison with "reality". However, it is more concerned with the justification of beliefs rather than their absolute truth. From a Kuhnian [38] perspective, fitting in with the current paradigm does not make the current paradigm correct. Quine held that coherent systems of beliefs were under-determined by empirical data and thus that no theory could ever ultimately be verified or falsified.

- Pragmatic theories [36, 54, 61] hold that truth is best seen in terms of how useful or practical a theory is - that which best solves a problem is the best theory. A version of this is instrumentalism, which holds that a theory is simply an instrument for making predictions, and has no necessary connection to truth at all. This also leads into consensus theories. An obvious argument against this view is that a true theory is likely to be most useful and powerful[3] and therefore should be an important component of a useful theory.

- Consensus or discursive theories [26] accept that truth is that which results from a process of enquiry resulting in a consensus amongst those most fully informed – in the case of science, scientists. At one level, we can see that this must be the case if we accept with critical realism the impossibility of proving correspondence truth. But, today's accepted truth is usually tomorrow's discarded theory and so this does not guarantee truth. See the discussion below about Habermas' more recent views.

- Redundancy and deflationary theories [22, 34, 60] argue that the whole concept of truth is actually redundant. If we say "it is true that snow is white" we are saying no more than that "snow is white", the two propositions will always have the same truth values and are therefore equivalent. This seems to me largely a linguistic move as it does not touch upon the question of how we might know or believe that a proposition is actually the case.

- Performative theories [69] also deal with the linguistic use of the term. The suggestion here is that by saying "p is true" we are not so much commenting on the truth of the proposition as such but on our willingness or intention of accepting it as true and commending it to someone else. Again, this just seems to ignore large areas of the question of truth.

Critical Realism and Truth

Turning now to critical realism, what view of truth does it espouse? The first thing to say is that in general the whole approach is "fallibilist". That is, since it accepts epistemic relativity, the

[3] Although postmodernists argue that it is the theory that is deemed most powerful that is accepted as true.

view that all knowledge is ultimately historically and locally situation, it has to accept that theories can never be proved or known certainly to be true. Thus, if provable truth were to be made a necessary criteria for knowledge there could be no knowledge within critical realism.

Bhaskar does briefly discuss the notion of truth and comes up with a multivalent view involving four components or dimensions [7, p. 62] that could apply to a judgment about the truth or falsity of something:

A. *Normative-fiduciary:* Truth as being that which is believed from a trustworthy source – "trust me, I believe it, act on it." This sense would typically occur within a communication where the speaker states a proposition and the listener accepts their sincerity.

B. *Adequating:* Based on evidence and justification rather than just belief – "there's sound evidence for this." This goes beyond just the speaker's belief to warranted assertability but can still, of course, be false.

C. *Referential-expressive:* Corresponding to or at least being adequate to some intransitive object of knowledge. Whereas the first two dimensions are clearly in the transitive dimension and strongly tied to language, this aspect moves beyond to posit some sort of relation between language and a referent.

D. *Ontological and alethic:* This final level is the most controversial as it moves truth entirely into the intransitive domain. The truth of things in themselves, and their generative causes. It is no longer tied to language although expressible in language.

Several comments need to be made here. First, the first three are relatively unproblematic and quite similar to the TJB formula although set within a communicative context. "This proposition is believable" (B); "don't just listen to me there is some evidence for it" (J); and "it fits the facts" (T); none of these in themselves or, indeed, together *guarantees* that it is true.

Second, Bhaskar sees them as ordered or progressive. Thus, the weakest form of truth is simply to have to believe someone with no further justification. Better, is to have some sort of warranted assertability, some evidence justifying the claim, although what the evidence is and how strong it is are debatable points. Better still, there should be some theory, description, or model that can be related to real-world structures. This obviously moves in the direction of some sort of correspondence theory of truth. Critical realism does tend towards this view whilst accepting inevitable limitations on it [65].

Third, the ontological/alethic aspect marks a major shift as it no longer concerns propositions at all. It is not predicated of a proposition but is said to be a characteristic the "real" nature and causes of things in themselves: "truth as *alethic*, i.e., the truth of or reason for things, people and phenomena generally (including in science most importantly causal structures and generative mechanisms), not propositions." [7, p. 64].

Habermas's Theory of Truth

We can now move to consider Habermas's theories of knowledge and truth. His early work is known as the theory of knowledge-constitutive interests (KCI) [26]. This suggested that humans, as a species, had needs for, or interests in, three particular forms of knowledge. The *technical* interest in moulding nature led to the empirical and physical sciences. For Habermas these were underpinned by a pragmatist philosophy of science (inspired by Peirce) and a consensus theory

of truth. The *practical* interest in communication and mutual understanding led to the historical and interpretive sciences underpinned by a hermeneutic criterion of understanding. And the *emancipatory* interest in self-development and authenticity led to critical science which identified repressions and distortions in knowledge and in society. Its criterion of success was the development of insight and self-expression free from constraint.

This theory of transcendental interests was the subject of much criticism (see Mingers [48] for a review), and Habermas later transmuted it into the theory of communicative action (TCA) [28, 29]. Utterances and, I would argue, actions as well raise certain validity claims that must, if challenged, be justified. These claims are *comprehensibility*, *truth*, *rightness* and *truthfulness* (*sincerity*). This is premised on the argument that utterances stand in relation the three different "worlds" – the objective or material world that consists of all actual or possible states of affairs; the social or normative world that consists of accepted and legitimate norms of behavior; and the subjective or personal world that consists of individuals' experiences and feelings.

When such a claim is challenged, the process of justification must always be discursive or dialogical. That is there should ideally be a process of open debate unfettered by issues of power, resources, access and so on until agreement is reached by the "unforced force of the better argument" [25, p. 240, 31, p. 37], what Habermas calls the "ideal speech situation". Thus, Habermas held a consensus or discursive view of truth both in the moral or normative domain of what ought we to do, as well as in the material domain of external reality. To say of a proposition, "it is true" is the same as saying of an action, "it is right", namely *ideal, warranted assertability.*

However, more recently Habermas [31] has returned to the issue of truth and now rejects his discursive theory for propositions about the material world in favor of one with an irreducible ontological component. In essence, Habermas now maintains that there is a substantive difference between the moral domain of normative validity which can only ever be established through discussion and debate within an ideal speech situation, and the domain of propositional truth where properly arrived at and justified agreement may still be proven wrong by later events.

> "I have given up an epistemic {based on reason and discussion – JM} conception of truth and have sought to distinguish more clearly between the truth of a proposition and its rational assertability (even under approximately ideal conditions)." [31, p. 8]

Habermas accepts the basic realist view that there is a world independent of humans, that we all experience the same world, and that this places constraints upon us, whilst accepting that our access to this world is inevitable conditioned or filtered through our concepts and language. This, of course, leads to the age-old dilemma of trying to discover some external standpoint, outside of language and cognition, from which to judge the truth of one's propositions. The idea of ideal rational discourse is not wholly wrong, but is insufficient for the task (p. 252). Whilst it is necessary that we come to believe or accept the truth of propositions through a thorough process of rational discourse, that we do so is not sufficient to guarantee their truth. Even the most strongly held and well-justified views may turn out to be false.

> "These objections have prompted me to revise the discursive conception of rational acceptability by *relating* it to a pragmatically conceived, nonepistemic concept of truth, but without thereby assimilating 'truth' to 'ideal assertability'" [31p. 38] (original emphasis)

The basic outline of this nonepistemic concept of truth has a very Popperian ring to it. If we begin with our everyday purposeful activities within the lifeworld, we can see that our perceptual

and conceptual apparatus unavoidably shapes our access to reality – we never meet it naked – but at the same time our interactions, and particularly our failures, lead us to revise our conceptual structure. In the lifeworld, whilst engaged in action, we presume and do not question the truths of the propositions we operate under. Only when these break down do we move from action to discourse and offer our beliefs up for debate and justification. Once we have become convinced of the truth of a proposition through the process of rational discourse we can then move back and adopt it within the sphere of engaged action. It is important in this process that the reasons we adduce for coming to believe a proposition are actually related to the experiences that have led us to question and debate. Within the true, justified belief definition of knowledge, the justification must stem from the actual experiential learning that has occurred rather than being ad hoc or coincidental as in the Gettier example above.

Habermas's move away from an epistemic conception of truth is actually towards an ontological one. When we make what we take to be true assertions we are expressing beliefs that certain states of affairs do actually exist, and these in turn refer to entities or relations that do actually exist and establish a relation between truth and reference; between the truth of statements and aspects of an objective world. This is so even between different linguistic communities (spatial or temporal) where the same referents, the same objects of discourse, may well go under different descriptions. "The experience of 'coping' accounts for two determinations of 'objectivity': the fact that the way the world is is not up to us; and the fact that it is the *same* for all of us" [31, p. 254].

This does not of course guarantee that the "knowledge" is true – Habermas is fallibilist in the same way that Bhaskar is:

> "Insofar as knowledge is justified based on a learning process that overcomes previous errors but does not protect from future ones, any current state of knowledge remains relative to the best possible epistemic situation at the time" [31, p. 41].

Habermas's move is certainly welcome from a critical realist position. One criticism was always that his view of natural science was overly pragmatic or even instrumental. He tended to call it "empirical-analytic" and this, combined with the consensus theory of truth, lost touch with a realist view of ontology. It also meant that he was essentially anti-naturalist, seeing a radical disjunction between natural science and social science. This shift to some extent addresses both issues: accepting a causally constraining reality as discussed above; and accepting a "weak naturalism" [31, p. 22] that there is an underlying evolutionary continuity between the objective world and the lifeworld, between nature and culture.

However, I would argue that he does not go far enough in this direction, and more specifically remains too strongly wedded to the idea that validity claims, including those of (nonepistemic) truth, are validated linguistically. In the model described above, problems and failures in the world of action lead to a switch to the world of discourse wherein questions of truth are decided through debate. Now whilst I accept that humans do always interact within language that is not to say that all activity is linguistic. Within the realm of epistemological knowledge (i.e., science) experimental activity is clearly the cornerstone of progress. With performative knowledge, the measure is successful performance whether it is a motor skill such as riding or a social skill such as conducting a meeting. And with experiential knowledge claims to have had a particular experience can be investigated forensically, i.e., through some form of "detective" work. Thus, the results of activity and action will inform the linguistic debates.

Summary

As can be sees, truth is a highly complex and debatable concept. I would like to pull out the following general conclusions in leading on to consider the relations between knowledge and truth.

- The underlying conception of truth, supported by both Bhaskar and Habermas, is a limited form of correspondence theory. As realists, we accept the existence of an independent or intransitive domain of objects of knowledge that have causal effect and thereby confirm or disconfirm our knowledge. We also have to accept, however, that we can never have pure unmediated access to this domain and thus that our knowledge is always provisional and subject to change.
- This places the emphasis on the degree of warrantability or justification that there is for something claiming to be knowledge. Is it a matter of believing a trustworthy source? Seeking supporting evidence? Witnessing a demonstration? Or conducting extensive scientific research?
- Here, some of the other theories of truth come into play. As Habermas emphasizes, all truth claims are ultimately validated discursively through discussion and debate. Even when the intransitive world appears to refute some theory, say through failed experiments, it is the community of scientists who decide why the experiment is failing and at what point it becomes conclusive [13]. Thus, there is always an element of consensus about truth claims.

  Another form of support is the extent to which a theory is consistent with other well-attested knowledge – i.e., its coherence. But of course we have to recognize that innovations often contradict the perceived wisdom.

  Success in practice (i.e., pragmatism) also provides support for a theory although whilst a true theory should be successful it does not follow that a successful theory is true.
- Another type of validity, particular for proposition knowledge, is that it is caused by information in the sense described above since information is only information if it is true. Or put the other way round, the information that a sign or messages carries is that which is true, given the occurrence of the sign. This is discussed more below as an answer to the Gettier problem.

Knowledge and Truth

In this section, I want to put forward ideas about how the different forms of knowledge relate to truth.

There is not one form of knowledge but several distinct types with different characteristics. These differ in terms of their nature, their source, their form of representation, and their criteria for validity. Truth as usually understood does not apply equally to all of them. See Table 1 for a summary.

Table 1 Forms of Knowledge and Truth

Actual human knowledge can never be certain or known to be correct (even an actually true theory could not be proved to be true). From a critical realist perspective, this is because we can never have pure unmediated access to the intransitive domain; from a Habermasian perspective, ultimate truth could only emerge from a never-ending, impossibly perfect discourse although now mediated by interactions with a constraining outer world. We therefore need to think of knowledge in terms of degrees of confidence and warrantability or justification rather than pure truth.

We can ally the different forms of knowledge with the different validity or truth claims.

Performative knowledge can best be judged by its actual success or failure. A claim to be able to do something, whether a physical skill or a social role, can only be vindicated by a performance. In some ways, this is actually quite close to Bhaskar's concept of alethic truth that I critiqued above. To demonstrate that one is a pianist by actually performing validates itself without need of propositions or assertions. Even here, there are of course degrees of performance and competence. We can also bring in here Habermas's validity claim of comprehensibility. Before a speech act or indeed any other social action can be judged it must be understood, that is it must be performed in a competent manner. Habermas draws on Chomsky's [12] notion of a competent speaker of a language [27, p. 29] but this can be enlarged to cover all the aspects of performative knowledge.

Experiential knowledge must ultimately come down to a matter of Habermas's truthfulness or sincerity (normative-fiduciary in Bhaskar's terms) since it concerns a particular person's experiences or feelings. Of course, one does not just have to accept a person's discursive justification, one might try to discover or provide some sort of evidence or justification as well which could include documentary evidence – letters, photos, transcripts, etc., or corroboration from other people.

Propositional knowledge is explicit knowledge concerning the presence or absence of particular states of affairs – truth for Habermas, referential-expressive for Bhaskar. Here we can go beyond belief and even justification towards confirming a relation between the proposition and the intransitive world to which it refers. Indeed, if we follow Dretske we can see a direct *causal* relation between information and the knowledge that it generates. The information carried by the petrol gauge (which must be true to be information) leads us to know that the tank is nearly empty and so our knowledge in this case is true justified belief.

Indeed, this is a potential way out of the Gettier problem mentioned above and in relation to Habermas's theory. If we take the example of the twins above, the problem was that whilst it was true that John was in the room it was not this fact that actually caused it to be believed. Rather it was the mistaken sighting of Mark. Following our theory of information we can say that a belief is only justified if it is actually caused by information (which by our definition must always be true – false information is not information but misinformation). Thus, we are not entitled to claim we *know* John is in the room, even though he is, since our belief was generated by a misinterpretation of information from the sight of Mark rather than actual information from a sight of John.

Even so, we cannot finally prove our knowledge is true for we might be mistaken either in our interpretation of the sign (the gauge might actually read half full), or in believing it was (true) information when in fact it was not (the gauge was faulty).

Epistemological knowledge takes us to the realm of science where its primary characteristic is the huge effort in trying to ensure that the knowledge generated is reliable even whilst accepting that we can never be certain of it. This is ontological (incorporating a causal explanation) truth for Bhaskar. The key feature distinguishing this from propositional knowledge is the need to go beyond immediate appearances to form an underlying explanation of *why* might be as they appear. This is not confined to the material world but applies equally to Habermas's social and personal worlds. In the social world we are interested in explaining why certain norms or patterns of behavior exist and are maintained, and perhaps why others are not. In the personal world we want to understand why a person behaves as they do, why they do certain things and not others.

I should like to end with one final comment. The paper has been concerned with analyzing several different forms or types of knowledge but of course, in real-world situations and activities these different types will typically be involved together and will interact with each other. To take just one example, suppose you are chairing a meeting. This will draw on propositional knowledge about particular facts and states of affairs; experiential knowledge of people, events, and practices; performative knowledge, perhaps of body language and physical gestures; and epistemological knowledge perhaps of economics or a particular industrial process.

Conclusions

The contributions of this paper have been primarily theoretical.

The first is to recognize the multidimensional nature of what we can know. Most KM literature implicitly assumes that knowledge is an integral, easily definable, commodity that can be extracted, stored and transmitted relatively easily. The literature that does not either presumes it to be some form of processed information; or categorizes it on a single dimension such as tacit/explicit; or argues that it is too complex to manage at all. In contrast, this paper has proposed a polyvalent view of knowledge that recognizes four distinctively different forms of knowledge – propositional, experiential, performative and epistemological – based on several different dimensions. It is argued that this typology does justice to the rich and varied ways in which people may be said "to know" something.

The second is to point out the intimate connection between knowledge and truth which is rarely discussed in the KM literature. Knowledge, to be knowledge rather than simply opinion, raises claims as to its truth or validity. Truth, too, turns out to be a complex concept and within the paper it has been explored from a critical realist perspective. This grounds its concept of truth in terms of correspondence to an external, independent reality but recognizes that epistemologically knowledge is always provisional and relative. If truth can never be known with certainty then great emphasis must be paid to questions of justification and warrantability. What would lead us to accept a knowledge claim – accepting the trustworthiness of the source; witnessing an event; gathering evidence; or its consistency with our other beliefs?

This leads to the view that the different forms of knowledge imply different forms of truth or, rather, different way of justifying their claim to truth. Propositional knowledge of day-to-day states of affairs can be directly justified in terms of the (true) information that generates it. Performative knowledge can be justified by a successful performance. Experiential knowledge can be justified through the sincerity of the claimant or the discovery of adequate evidence.

While epistemological knowledge brings in the full force of science, whether it be natural or social.

Before moving on to some practical implications I would like to make it clear that although this paper has concentrated on the subjective aspects of knowledge – the knowing subject, and has primarily developed somewhat static categorizations, I see this as only part of a much broader domain that is both processual and social. In terms of process, events in the world carry information and lead to experiences that generate meaning, ideas and knowledge for individuals. At the same time, as Tuomi [72] indicated, our knowledge, and more generally our cognitive structure, conditions both how we experience events and what information is available to us from them. This dynamic interactive process involves the material world but even more significantly the social world. As individuals, we exist in multiple social networks or forms of life [77] and much of our everyday knowledge is actually intersubjectively shared knowledge about acting effectively within these social systems.

In terms of the practice of knowledge management, I would draw two general conclusions. First, there is the sheer richness and variety of forms of knowledge and, significantly, the fact that in real situations they all interact together. This means that, except for fairly well-defined domains where knowledge can be easily codified and represented, managing knowledge is vastly different from managing information and requires sophisticated and people-intensive activities that can only be mediated or facilitated by information and communication technologies. It is interesting to realize that the major form of institutionalized knowledge management is actually education. Here we have a massively complex and highly resourced system devoted entirely to generating knowledge, capturing and storing knowledge, instilling it into pupils and students over many years, and finally testing and certifying their capabilities and competencies. This gives some idea of the difficulty of the task, and should make us wary of those who peddle quick-fix knowledge management systems to unwary organizations.

Second, stemming from considerations of truth, is the importance of the whole process of validating and warranting knowledge claims in order to ensure that we are working with genuine "knowledge" rather than simply unsubstantiated belief or unwarranted contentions. In February 2004, Google [11] estimated that it now covered 4.3 billion pages of information on the internet. Certainly, you can search for any topic imaginable and almost certainly discover many pages devoted to that subject. So, there is no shortage of putative knowledge but the question becomes, how reliable is any of it? Is a particular page the polemical beliefs of someone with extreme views? Is it well meaning but unsubstantiated suppositions? Is it reasonably well accepted commonsense advice? Or, is it substantive theoretical conclusions based on peer-reviewed research? Internet sites need certificates of validity in the same way that they have certificates of safety.

The importance of reliability and trust can also be exemplified with the operation of the e-Bay auction site. One of the strongest features of this is the feedback process that occurs after every transaction. Both buyer and seller are expected to complete feedback on each other detailing how happy they were with the transaction. This feedback then becomes publicly available as a record of the trustworthiness of each person. Once built up reputations become very important, especially for sellers, and have a very strong effect in ensuring good behavior all round.

Knowledge is certainly a vital resource in today's world but we must recognize its complex nature if we hope to make use of it more successfully in our institutions and organizations.

Type of Knowledge	Object of Knowledge	Source of Knowledge	Form of Representation	Criteria for Validity
Propositional I know it 's raining I know there's a train at 3.00 I know there's someone at the door	States of affairs in the physical and social world. *To know that x*	Direct perception, receipt of information, communications, the media	Generally explicit and propositional although some may be tacit	*(Ontological) truth* Referential-expressive
Experiential I know her well I know the feeling I know I left my key there I know how the system works	People, places, events we know through personal experience. *To know x*	Personal experiences	Memories, some aspects of which may be tacit and embodied	*Sincerity* Normative-fiduciary Adequating
Performative I know how to ride I know how to read an X-Ray I know how to present	Skills, abilities and competences. *To know how to do x*	Personal experience, learning, training	Embodied	*Competence, (Epistemic) rightness* Alethic
Epistemological I know what black holes are I know linear algebra	Reasons for the (non-) occurrence of things and events. *To know why x*	Formal methods of discovery e.g., in science	Explicit, discursive, "objective", open to debate.	*Truth, rightness, sincerity* Ontological, alethic

Habermas's validity claims
Bhaskar's four dimensions

Table 1 Forms of Knowledge and Truth

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