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Reassessing the Nature of IS

Introduction

This is a paper, firstly, about 'nature'. But, as Stengers points out, in her book about British mathematician and philosopher Alfred North Whitehead: "If nature is (all) we are aware of in perception, then: 'everything perceived is in nature'" (Stengers 2011:33). So it is a paper not so much about nature itself, as it is about how we conceive nature, which, as we shall see, depends upon how much of it we are prepared to include as 'perceived'. Secondly, this is a paper about the 'nature' of IS, or, more pointedly, what kind of 'nature' is assumed by which kind of IS.

IS research has suffered for many years from the standoff between positivist and more interpretivist/constructivist approaches, suffering on both sides of the divide. Positivism in IS has its roots in attempts by US Business Schools in the 1960s to move away from merely vocational training and gain the respectability of academic rigour through the mathematical and analytical precision of scientism (Mingers 2015). Interpretivism in many ways is founded in a reaction to the discovery that people don't fit well into such mathematical precision, and the voices of the 'users' must be heard for information systems to work as intended (Klein and Myers 1999). Critical IS seems largely born of European Business Schools: Kalle Lyytinen in Finland, and Heinz Klein in Germany, penned what many regard as seminal papers in critical IS in the mid 1980s (Klein and Lyytinen 1985; Lyytinen and Klein 1985). Habermas was their theorist of choice and the focus of what Myers and Klein regarded as an entire stream of critical IS research thereafter (Klein and Huynh 2004; Myers and Klein 2011). The influx in the 1980s of sociologists into the world of British Business Schools, who brought Foucault, and later Bourdieu, with them (Carter 2008), marked a broadening of critical IS into new areas.

In this paper, I wish to suggest that critical IS could benefit greatly from a more thorough exploration of philosophical schools of thought, rather than merely continuing the streams that happenstance – the preferences of respected early IS scholars and the closure of sociology departments in the 1980s – has brought into the field. What, for example, are the roots of the scientism that the positivist school adopted? How should we understand interpretivism after the development of critical IS? What philosophical grounding is most appropriate for critical IS?

These are fundamental questions, and in a conference paper I can only hope to begin a discussion. In this paper I wish to focus on three philosophical critiques of the specific claims of scientism to determine exclusively the nature of Nature. In so doing I hope to point out new directions that IS research might usefully devote its energies to. I will not be addressing the discussion around the theorising of the IT artefact itself (Orlikowski and Iacono 2001; Benbasat and Zmud 2003) directly, but will suggest that the three traditional branches of IS research (Chua 1986) might better be conceived as circling around the IT artefact and, working jointly, might bring to IS research a more coherent focus.

To give it a very brief background summary, 'scientism' is not as old as the scientific approach itself. Descartes (1596-1650) was a devout Christian. But when he spliced the universe in two, setting the world of thought and theology on one side as 'unknowables,' with the ordered and lawful world of science on the other, the latter was uniquely susceptible to scientific experiment and – within a few decades, to Newton's Laws of Motion. This divide allowed the majority of lively minds to concentrate exclusively on science, and leave theology to the parish priest (Warburton 2008:49). Immanuel Kant (1724-1804) sealed the door, in effect, when pronouncing that as the existence of God could never be proven empirically, only reason could guide us morally (Warburton 2008:127). Thus, information derived from sensory experience, giving empirical findings, is deemed by this approach to be the exclusive source of evidential knowledge (Klein and Lyytinen 1985). This stance rejects all introspective or intuitive knowledge, and all metaphysics, as effectively theological (Russell 1914). Comte (1798-1857) described this 'derived' knowledge as 'positive' knowledge, giving birth to 'positivism' (Comte 1865).

Nature, therefore, is defined, by this scientific positivist approach, as something that does not include *us:* meaning not our bodies or brains, but the *persons* who observe, and experience the sensations we label 'empirical.' Amongst philosophers there is both support for, and rejection of this view that the only reality is an 'objective', as opposed to 'subjective', reality. In this paper I wish to draw attention to the philosophical support for the reality of subjectivity, as a part of nature in itself. I wish to draw attention to

the thrust of process philosophy, which is to heal the rift between the 'objective' and the 'subjective,' to challenge positivist science to see the subjective as a *scientific* part of nature.

I believe that a greater awareness of this more inclusive philosophical stance could be quite significant for IS. In this paper I wish to outline how this stance is in fact already very closely related (i) to interpretivism (broadly interpreted): that IS is IT *and* people, and that a true realism needs to see 'both/and,' not 'either/or'; and also (ii) to the critical stance, where social critique highlights the humanity more positivist approaches tend to ignore (Richardson and Robinson 2007; Stahl 2008). More significantly, I will argue that IS as a whole might benefit from a more inclusive stance that combines the strengths of positivism, interpretivism and critical approaches. The process of combining requires some changes to each; the result will continue to be blurred, allowing many "flowers to bloom" (Banville and Landry 1989); but the result may offer IS, as a scholarly pursuit, both a direction and coherence to make it far more relevant to the world at large. As the paper unfolds I hope to show how positivist approaches, no longer seeking to be definitive, but allowing partnership with other approaches, might confine themselves to the *What* of IS, creating IT artefacts; interpretive approaches might then partner with the positivist *What*, as the *How* of IS, situating the IT artefact in social and organisational contexts and, most importantly, in continuously iterating and unfolding processes; and critical approaches might then provide the *Why* of IS: encouraging a range of reasons for making and improving IT artefacts at all – that they contribute to general well-being and emancipation.

In the first section of the paper I will introduce three different supports for this alternative philosophy: the views of contemporary American philosopher Thomas Nagel on the reality of subjectivity, as expressed in his book, *The View from Nowhere* (Nagel 1986)*;* the metaphysics of perception and memory by which we might reimagine the nature of Nature, as found in late 19th / early 20th century French philosopher Henri Bergson's book, *Matter and Memory* (Bergson 1908)*;* and a reassessment of the bifurcation of nature by early-to-mid 20th century British philosopher Alfred North Whitehead, in his book *The Concept of Nature* (Whitehead 1920). These are three different views, and will be treated as such, but are clearly very closely related. The following three sections outline, in light of these philosophical views, how we might newly understand positivism, interpretivism, and the critical stance, in IS, and the outline of a new conception of the three together.

The Reality of Subjectivity

Unfortunately, much of the traditional positive scientific approach relies upon what contemporary philosopher Thomas Nagel describes as the "denial that certain patently real phenomena exist at all" (Nagel 1986:7). This applies in many disciplines, including the philosophy of mind, where the influence of a positivist neuroscience strives to be definitive, and exclusive. In his book, *The View from Nowhere,* Nagel shows that the objective stance of many in the philosophy of mind is an "assumption that what there really is must be understandable in a certain way – that reality is in a narrow sense objective reality" (Nagel 1986:7). This objective reality, moreover, is defined as the world according to physics, a world that is 'superveniently' determined – causally closed - all the way up, by its lowest level laws. Physics is, however, as Nagel points out, "the science in which we have achieved our greatest detachment from a specifically human perspective on the world. But for precisely that reason physics is bound to leave undescribed the irreducibly subjective character of conscious mental processes, whatever may be their intimate relation to the physical operation of the brain" (Nagel 1986:7). As the radical contemporary neuroscientist upsetting the status quo, Benjamin Libet, stresses, the "determinist materialist view" that would reduce us to 'a pack of neurons' "is a belief system; it is not a scientific theory that has been verified by direct tests" (Libet 2005:5). As Nagel points out, such a stance imagines, "we, at this point in history, are in possession of the basic forms of understanding needed to comprehend absolutely anything" (Nagel 1986:10).

In contrast, the motivation behind Nagel's, and my critique, is precisely that I *believe* that the universe is *not* causally closed in this manner. There is not the space here to explore notions of strong emergence or complex systems, two areas where such causal closure is challenged. Fundamentally, the 'objective,' for all its utility as a method for understanding the world "as it is in itself", is "overrated by those who believe it can provide a complete view of the world on its own" (Nagel 1986:5). In the philosophy of science, the voice of Nancy Cartwright in her book, *The Dappled World,* rings loud and clear against supervenience: "The laws that describe this world are a patchwork, not a pyramid" (Cartwright 1999:1).

How, then, are we to understand the world? As Nagel puts it, "We place ourselves into the world that is to be understood" (1986:4); it is, in short, with our subjectivity that understanding takes place, and that understanding is "apportioned into disciplines…governing sets of properties at different levels of abstraction; pockets of great precision; large parcels of qualitative maxims resisting precise formulation; erratic overlaps; here and there, once in a while, corners that line up, but mostly ragged edges" (Cartwright 1999:1). Amongst this dappled world, as Nagel says: "The subjectivity of consciousness is an irreducible feature of reality – without which we couldn't do physics or anything else – and it must occupy as fundamental a place in any credible world view as matter, energy, space, time and numbers" (1986:7-8).

Bergson's Matter and Memory

Bergson's argument in his famous book, *Matter and Memory* (1908) is about the relation between the that subjectivity and the body, taking on Descartes' dualism, but seeking to confront it without suggesting a divinely created spirit in man (as Descartes had done, differentiating it and setting it to one side), but suggesting to us, nevertheless, that the profundity of human nature really is beyond what mechanistic science and the positive philosophy of the nineteenth century could envision.

He contends that previous philosophical approaches to this problem have mostly proposed some vague thesis of union between the two – mind and body - without ever being particularly precise. Ideas current in Bergson's era, he tells us, fall into two categories: epiphenomenalism, and parallelism (Bergson 1908:x). The first – still perhaps the default, determinist position of scientific realism and most neuroscience to this day - suggests that human thought is a function of the brain, that consciousness is somehow an epiphenomenon of the brain, a non-functional supplement that is caused by brain events but has no causal effect upon brain events. The second suggests that mental states and brain states are merely two languages for the same thing. For Bergson neither of these explanations is satisfactory. He certainly believes there is a connection between brain and mental states, but denies that this implies a parallelism. Memory, he suggests, is the key to unlocking this problem, as it is situated at the intersection of mind and matter. Contrary to the assumptions of much positivist neuroscience, for Bergson, memory is not - cannot be - physical. If memory is not physical, then much else that goes on in the mind must be of a similar ilk, and then we are faced with something that is not physical, which is not matter, but which is intimately associated with and couples to it.

Our psychical life, while bound to its motor accompaniment, is, for Bergson, not governed by it (Bergson 1908:83). Consciousness – the ability to know, and to choose – and perhaps much of the unconscious processes that surround and support it, must, on the contrary, be quite separate from the more straightforwardly physical nature of perception. Consciousness, on the contrary, must not be physical – susceptible to quantitative measure - at all: it must be a quality, something different in kind. As neuroscientist Libet puts it, a hundred years later, "It is true scientific discoveries have increasingly produced powerful evidence for the ways in which mental abilities, and even the nature of one's personality, are dependent on, and can be controlled by, specific structures and functions of the brain. However, the nonphysical nature of subjective awareness, including the feelings of spirituality, creativity, conscious will, and imagination, is not describable or explainable directly by the physical evidence alone" (Libet 2005:5). The biological and synaptic-electrical arguments, concerning spatial, measurable reality that is susceptible to the scientific method, in other words, occur on the mechanical 'outer' to our conscious 'inner.' As Bergson says, "it is the sensation which is given to us in consciousness, and not this mechanical work" (Bergson 1889:7).

Bergson maintains that the physical apparatus of perception, the nervous system and the brain – the entire body in fact - is merely a "centre of action" (Bergson 1908:5) where perceptions trigger reactions, which in turn trigger movement. Perceived images of the outside world are thereby sketches of potential action. This purely physical, biological perception-action flow is interrupted by consciousness, to enable comparison between several different options, and choice between them, before either proceeding or shelving a reaction. The brain is thus the action centre, ready to proceed or shelve a reaction to perceptions – whether from the external world or from consciousness. But if perception, linked in this perception-action flow in a biological chain from the external object on the periphery to the action centre in the brain and thereby back through the nervous system into action, is essentially physical, a part of the material world, and something which is interrupted by consciousness in order that a choice may be made,

what, then, is consciousness? For Bergson it can only be something that is not material, that is different in kind from the matter that it interrupts, albeit but one side of the coin of existence. "I will not give a definition," of consciousness, he says in a later essay, "for that would be less clear than the thing itself; it means, before everything else, memory" (Bergson 1920:7). "Memory" he continues, "may lack amplitude; it may embrace but a feeble part of the past; it may retain only what is just happening; but memory is there, or there is no consciousness. A consciousness unable to conserve its past, forgetting itself unceasingly, would be a consciousness perishing and having to be reborn at each moment: and what is this but unconsciousness?" All consciousness, then, for Bergson, is memory, the "conservation and accumulation of the past in the present" (Bergson 1920:8).

Using his characteristic supposition of two extremes which do not occur in reality, but whose mixture is better understood if we imagine them, for a moment, apart, Bergson posits two things: pure perception, and pure memory. Pure perception, he argues, is always in the absolute present, existing ultimately outside of us – in the objects that we perceive. Pure memory, by contrast, is entirely in the past. Of course, as Bergson asserts, "There is no perception which is not full of memories. With the immediate and present data of our senses we mingle a thousand details out of our past experience" (Bergson 1908:24). But in order to understand the nature of consciousness, and how it relates to perception, Bergson enjoins us to imagine a pure perception, and a pure memory.

Now, for Bergson, the sheer quantity of memory would be impossible to somehow store, chemically, biologically, within the brain. Most of what we know about memory, in scientific circles, comes from problems with memory – in particular cases of brain injury where partial memory loss has resulted. These kinds of experiments, and case histories of brain-injured patients, were already well underway in the late 19th century and Bergson uses a great range of such scholarship in his argument. In particular the idea that recognition precedes recollection – a favourite among many scholars studying the subject both then and now – is refuted by Bergson (see Buckner 2000). Among others, he puts forward the case where the visual memory of a town a patient had lived in was easily recalled, eyes shut, and described in detail, yet when the subject was placed in the town itself, she did not know where she was, and could not find her way (Bergson 1908:108). Recognition, then, in this case, could neither precede, nor indeed be particularly important in the process of recollection. He cites other, similar cases, too. Memory, therefore, is not *directly* connected to perceived experience, but exists apart from it, albeit all too often in relation to it.

So, for Bergson, the present – pure perception – is a physical consciousness of the body. The past – pure memory – is an unconsciousness of the body, the realm of fancy and dream. The reality of the human condition is, of course, always a blend of the two. Memory, in the human being, is something that gives the flow of our perceptions from periphery through the centre to periphery, the possibility of choice. We can pause, in the centre of action that is our body, and compare the motor mechanism action ready to react to our perceptions with previous ones, in our memory, and weigh up the pros and cons of different outcomes. We may, indeed, choose not to act at all, which is where Bergson refers to the 'virtual' – actions that are potential, neither occurring, nor merely memory. These separations and distinctions are not absolute, but merely useful: all is, in reality, for Bergson, fluid, interpenetrating. What we actually perceive is always a mixture of the 'pure perception' coming to us from our senses, ready to translate into action, and the images from memory that we project upon the objects we are perceiving, pausing action for the possibility of choice. At this junction, then, between memory, perception and action, "the hyphen which joins what has been to what will be" (Bergson 1920:9), consciousness acts as a bridge between the past and the future, neither a part of the physical, objective world of perception, nor wholly divorced from it in the temporal field of the past; neither wholly physical, nor wholly virtual. What better example of our patchwork, as opposed to pyramidal, world, of the lack of causal closure, of the failure of the supervenience of low-level physical laws that would otherwise determine everything, with no possibility of choice?

For Bergson consciousness is that which exists in the moment, in the now that links past and future, and can only be something on the other side of a dualistic conception of existence: on the one side matter, on the other, for want of a better word, spirit. Yet unlike Descartes and any other dualistic conception of existence, unlike nearly every other conception of 'spirit', these two are never apart, never distinct, always indissolubly concurrent, coexistent, and coterminous. The very moment this dualistic conception of existence – matter and spirit - is posited, as it were, it is immediately merged into a monistic conception that *moves* from the past into the present, pregnant with potential futures.

Whitehead's Concept of Nature

British mathematician turned philosopher Alfred North Whitehead began his journey co-authoring with his former student Bertrand Russell the first volume of the famous *Principia Mathematica* (1910). This was an immensely laudable contribution to the philosophy of logic, but ultimately a failed attempt to found mathematics in philosophy. Unfortunately, in Russell's hands, thereafter, this project, in its second and third volumes, rendered philosophy the handmaiden to science, and was taken up by the Vienna School of 'logical positivists' in the 1920s, whose strict verificationism insisted that any proposition has no factual meaning if no evidence of observation can count for or against it. That all ethics, aesthetics and romance are merely meaningless "pseudo-statements" (Carnap 1932) continues to be the assumption of some in positive scientific circles whose philosophy stems from this bleak period, and the American logical empiricism that followed when these central European thinkers fled across the Atlantic to escape the ravages of war (e.g. Carnap, Reichenbach, Hempel).

Whitehead, however, understood the implications of the failure of this project, and went on to become the father of process philosophy. In one of his first books in this latter period, *The Concept of Nature* (1920), he acknowledged his debt to Bergson (1920:54), and underlined the unity of a monistic conception of the world. What Whitehead protests against, in this book, "is the bifurcation of nature into two systems of reality, which, in so far as they are real, are real in different senses…Thus there would be two natures, one is the conjecture, and the other is the dream. Another way of phrasing this theory … is to bifurcate nature into two divisions, namely into the nature apprehended in awareness and the nature which is the cause of awareness. The nature which is the fact apprehended in awareness holds within it the greenness of the trees, the song of the birds, the warmth of the sun, the hardness of the chairs, and the feel of the velvet. The nature which is the cause of awareness is the conjectured system of molecules and electrons which so effects the mind as to produce the awareness of apparent nature" (Whitehead 1920:29-31). Whitehead sets himself the task of resisting and avoiding all theories that make nature bifurcate, to approach, as best as he is able, a concept of nature that is monistic, unified, and comprehensive.

For both Bergson, and Whitehead, (and incidentally for neuroscientist Libet), one of the principal answers to the questions they raise is a reconception of *time* as *duration*. Bergson argues that the idea of a homogeneous and measurable time is an artificial concept, formed by the intrusion of the idea of space into the realm of duration (Bergson 1889; Boland 2001; Kreps 2015a). He terms it the *durée réelle* and argues that our conscious states are basically qualitative, and cannot be adequately described or measured in terms of quantities, and that quantities are understood only spatially, and qualities only durationally. Whitehead's approach is similar but subtly different. Rather than distinguishing between quantities and qualities, Whitehead focuses upon the notion of the 'event' as a core unit of existence, in a "structure of events" (Whitehead 1920:52), but which contains both the physical and nonphysical elements we currently describe in separate ways, *as they unfold*. "What sense-awareness delivers over for knowledge is nature through a period" (ibid p57). Using the term by which Bergson's *durée réelle* is most often translated, Whitehead speaks of 'a duration' as "a concrete slab of nature limited by simultaneity which is an essential factor disclosed in sense-awareness" (ibid p53). This 'duration' is something that is both our subjective experience of an event, *and* what the physico-chemical sciences would say about the materiality engaged in the event, all wrapped in a *flow* of on-going reality. Hence the term, 'process' philosophy, often used to describe Whitehead's approach.

In summary

Thus through the eyes of Nagel, Bergson and Whitehead, and with reference to some other philosophical and scientific work, I have tried to introduce what I believe is not merely a promising thread of understanding through 20th century science and philosophy – and philosophy of science - but a thread which is increasingly defining the 21st (Cartwright 1999; Stengers 2011). The determinist, materialist, positive scientific approach to a bifurcated nature that was defined by its lack of attention to subjectivity, at its height in the 19th century but challenged in the 20th, is progressively giving way to an appreciation of reality that is far more inclusive, less certain in its overarching claims of supervenience, less inclined to oppose the objective and the subjective when so much more can be understood by taking approaches that embrace a range of different perspectives.

In the words of neuroscientist Benjamin Libet, "conscious mental phenomena are not reducible to or explicable by knowledge of nerve cell activities" (2005:5). The reality of subjective consciousness, for all the links with physico-chemical processes in the brain, is not reducible to them, fundamentally nonphysical in relation to them, and wrapped up, somehow, with the unfolding of time itself. This durational and holistic grasp of reality that is at once physical and nonphysical, at once the world as it is and how it is experienced by us, Whitehead characterizes as a focus upon the 'event'. Any 'event', in this sense, will comprise physical and chemical processes as well as personal subjective experience, and be part of a 'structure of events' that contain, are contained by, and overlap or interpenetrate it. The example Whitehead uses is that of Cleopatra's Needle: an old piece of rock mounted on a plinth by a river (in this case The Thames, in central London, England), yet steeped in a myriad timelines of history, politics, cultural significance, tourist attraction, graffiti, and the ravages of different eras of pollutants[1]. The Needle is not merely the old bit of north African rock – indeed "daily it has lost some molecules and gained others," (Whitehead 1920:167) - nor solely any one of the many stories that course around it: it is all these things, and also only those which come to mind as I see it, sitting on the bus crossing the river, on a winter's afternoon; and this experience of the Needle is an 'event' within a 'structure of events', a "concrete slab of nature" that includes the personal and the time it takes to unfold (Whitehead 1920:53).

I now move on to a discussion of the implications of these insights for all three 'standard' approaches in IS, following Chua's (1986) classification of research epistemologies into positivist, interpretive, and critical.

Implications for Positivist IS

In their famous paper outlining principles for conducting interpretive research, Klein and Myers offer the following definition of positivism in IS (*pace* Orlikowski and Baroudi 1991): "Generally speaking, IS research can be classified as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a stated population" (Klein and Myers 1999:69). One might regard this as perhaps a standard definition, and IS journals are prolifically populated with this kind of scholarship: quantitative, formal, practical, and focussed upon 'getting things done.' This is clearly the main strength of Positivist IS - that it clusters around formal, mathematical processes and remains focussed upon practical concerns.

Sadly, however, there are weaknesses, too, to this approach. As has been pointed out quite often, some of this work, so strict in its formal processes, turns out to be quite "irrelevant" to real problems in business contexts (Checkland 1980:230). A deeper characterisation comes from Mingers, in his reference to the problem of Business Schools attempting to attain academic rigour, that such rigour was based upon "a positivist philosophy that generated research which was rigorous in the sense of being highly quantitative and mathematical, but which was far from the practical messy problems faced by real managers" (Mingers 2015).

How might attention to the 'structure of events' approach, outlined through discussion of Nagel, Bergson and Whitehead, above, help us to address such a weakness in Positivist IS, or at least promote better use of its strengths? Firstly, we must understand where the formal quantitative approach comes from, and why it can end up so irrelevant to "problems faced by real managers." Then, perhaps, we might be able to see how this weakness might be addressed.

The positivism in Positivist IS

The high respectability of the physical sciences – the "academic rigour"" Business Schools in the 1960s began to wish to emulate – derives, in fact, from the period of logical positivism, influenced by Russell, in

[1] 'Cleopatra's Needle' is in fact the name given to three such obelisks, the other two being in Paris and in New York, carved at different periods of the ancient Egyptian civilization, but none having anything to do with the famous late Pharaoh Cleopatra. Paris gained the first in 1826, London the second in 1877, and New York the third in 1881. https://en.wikipedia.org/wiki/Cleopatra%27s_Needle

the 1920s. Economic historian Mirowski, in his *Machine Dreams,* (2002) suggests that a story can be told of how throughout the middle of the 20th century the primacy of physics and mathematics can be linked to this very school of thought, and the military-political usefulness of those engaged in it. Some pertinent elements of this story are worth including here, as they concern the history of Business Schools – the context in which IS grew up – and continue the story begun above concerning Whitehead's background.

Perhaps the greatest ever concentration of gifted mathematicians was David Hilbert's Göttingen School, including Hilbert's personal assistant, John von Neumann. Hilbert's programme – following on from Whitehead and Russell's *Principia Mathematica* - was to find a complete and consistent set of axioms for all mathematics. Gödel's incompleteness theorems, published in 1931, and Hitler's rise to power, brought Hilbert's programme to an end. Von Neumann left Hilbert – and pure mathematics - in 1933 and went into applied science, becoming an explosives expert in the employ of the US Defence Department. Here he contributed to Norbert Wiener's (one of Russell's students) cybernetics project in the RAD Lab at MIT, helped Oppenheimer's Manhattan Project, and sponsored Marschak and Koopman's computational and market-fundamentalist economics at Cowles (Mirowski 2002:157). By the end of the war von Neumann had penned the world's first comprehensive description of the design of an electronic stored-program computer, *First Draft of the Report on the EDVAC*, which "rapidly became the design bible of the nascent computer community" (Mirowski 2002:176).

So in the person of von Neumann, as with his fellow émigrés Carnap, Reichenbach, and Hempel, we can see Hilbert's project of axiomatising mathematics, and the logical positivism that went with it, were not altogether abandoned, but lowered to an applied science that still seemed to hold onto Hilbert's dream nonetheless. Von Neumann's background in mathematical logic, indeed, led him to believe fundamentally that both politics and economics were also simply problems of logic. The notion of rationality adopted by Marschak and Koopmans' Cowles Commission – one of the most influential schools of economic thought in the 20th century - and its thorough reconception of post-war economics, derived from von Neumann's influence. A "profound sea change in the type of research being done at Cowles" took place, in which there was "a noticeable turn away from the earlier quest for an econometric validation of neoclassical theory and toward a reconceptualization of the 'rational' economic agent as an information processor" (Mirowski 2002:215). This was von Neumann's influence.

So, we can see that the influence of logical positivism, where philosophy was but the handmaiden of science, and all ethics, aesthetics and romance merely meaningless pseudo-statements, was not only pervasive, but directly involved in the social context in which computing – and IS – emerged: Business Schools, where the discipline of economics became, in the post-War period, the primary field. Now as Mirowski points out, one of the most pressing issues in the history of science is 'Who pays?' The second question is, 'What do they pay for?' It was Project RAND who funded the Cowles Foundation after the Second World War, at the very same time that its sea-change in approach took place. The RAND Project was, in turn, funded by the Ford Foundation, who also paid for Gordon and Howell's *Higher Education for Business* report in 1959, which had a profound influence on the history of US Business Schools (RAND 2016; University of California Regents 1980).

As Mingers (2015) reminds us, Gordon & Howell's report, "proposed that business schools needed to gain academic rigour and credibility by moving away from the vocational emphasis towards a strong disciplinary base with an empirical and scientific grounding – essentially economics" – and Cowles economics, at that (Mingers 2015:317). The interests of the Ford Foundation, in other words, were being pursued by economists in Business Schools whose 'academic rigour' was to be found in their methods, and theirs alone.

But, as we have seen, the philosophy this particular brand of economics which dominated Business Schools for the coming decades adhered to, derived from von Neumann among others, was a verificationist logical positivism that denied the existence of "certain patently real phenomena" (Nagel 1986:7) such as the subjectivity of human existence.

Positivist IS Within the 'Structure of Events'

It is clear then, that the history of IS – and especially of its Positivist branch – is immersed in the very philosophical approach that Nagel, Bergson and Whitehead are critical of. So now that we understand where the formal quantitative approach comes from, it is also clear why it can end up so irrelevant to

"problems faced by real managers:" personal subjective experience – the people who make use of, and can be understood as a part of, information systems – form no part of this formal, mathematical approach. There is, in short, a dearth of information about the initial and on-going states of these systems, because the personal is deliberately, completely left out. A strictly positivist approach in IS encounters problems with "real managers" because it continues a verificationist discounting of the reality of subjectivity.

For example, the problem of 'requirements capture' followed by one-off build, when requirements are in fact continually evolving, and builds need to be iterative, is a clear example of how such positivism bifurcates nature to see only the IT, and not the people using it, and where it could learn a good deal from a better understanding of time (MacLeod 2008; Folkerd and Spinelli 2009; Kulak and Guiney 2012).

The 'structure of events' approach, not discounting the strengths of the formal, mathematical elements of Positivist IS, would seek rather to contextualise those strengths by *adding* subjective experience – which is necessarily durational – and thereby timelines upon which information systems are contingent, into the modes of understanding systems. This approach would suggest, in fact, that Positivism in IS should embrace the limits of logic in computing's origins, and follow Whitehead beyond Russell, where Gödel understood the path should be, and realise that von Neumann, in truth, never let go of Hilbert's dream. As von Neumann himself characterised his 'second phase,' as a US citizen and military advisor from 1937 to 1947: "My personal opinion, which is shared by many others, is, that Gödel has shown that Hilbert's program is essentially hopeless… I think that [this story] constitutes the best caution against taking the immovable rigor of mathematics too much for granted. This happened in our own lifetime, and I know myself how humiliatingly easy my own views regarding the absolute mathematical truth changed during this episode, and how they changed three times in succession!" (Mirowski 2002:119). Even great mathematicians, after all, are only human.

Positivist approaches in IS, in this light, one might conclude, could be considered as the *What* of IS, in a 'Structure of Events' approach, focussed upon the formal, mathematical processes - the IT in the IS - using the precision of von Neumann's mathematical logic and all the developments in computing over subsequent decades to establish rigour and procedure in the translation of computer science into IT artefacts. The main implication of the 'Structure of Events' approach for Positivism is that for all its utility it is only a partial view, which must be supplemented, for a broader view to emerge that is useful for "real managers."

Implications for Interpretive IS

Interpretivism in IS evolved as early as the 1970s, but perhaps most substantively with the work of Peter Checkland and the notion of 'soft systems.' (Checkland 1980). In a deliberate move away from the engineering focus of previous work in IS, interpretivism honed in on the social aspects of information systems, and - after our discussion of positivism in IS, above - this is clearly the great strength of this approach. Interpretive IS research is concerned with "human thought and action in social and organizational contexts," according to Klein and Myers (1999:67), and if IS is considered as a spectrum between computing and sociology, then interpretivism is certainly anchored at the latter end.

This strength is also, however, if the more practical concerns are not given proper weight, at the same time, a weakness. As if in deliberate opposition to the positivist stream of research in IS, interpretivism can be said in some circumstances to have set itself the task of discounting the objective as much as positivism discounted the subjective – as if the nonphysical nature of consciousness divorced it from physical reality altogether. Klein and Myers, indeed, almost define interpretive IS as such, when they say: "IS research can be classified as interpretive if it is assumed that our knowledge of reality is gained *only* through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (Klein and Myers 1999:69) (*my emphasis).*

How might attention to the 'structure of events' approach, outlined through discussion of Nagel, Bergson and Whitehead, above, help us to address such a weakness in Interpretive IS, or at least promote better use of its strengths? I believe the philosophical grounding of interpretivism in IS will give us a clue, and the 'structure of events' approach might help to improve that grounding.

The positivism in Interpretive IS

Though there have been some very interesting critiques of the position that our knowledge of reality is gained *only* through social constructions, and attempts to move on from it (Hacking 1999; Schatzki et al 2001; Barad 2007) noted by some IS scholars (e.g. Orlikowski 2005; Mingers 2015), a good deal of interpretive IS research has focused upon the human almost to the exclusion of the IT artefacts themselves (Orlikowski and Iacono 2001; Benbasat and Zmud 2003). Interpretivism essentially promotes a worldview in which events can never be objectively observed from the outside, but can only be observed from inside through the direct experience of people involved in those events. The Cartesian bifurcation of nature, which Nagel, Bergson and Whitehead critiqued, is thereby in fact maintained, and no resolution achieved. Bergson, for example, defending the richness of the 'inner life' we all experience, and the variety of choice, desire, and agency expressed by it in the ways in which we engage the 'outer' world, and affirming that such richness makes the 'realist' position, which discounts it, untenable, nonetheless equally affirms that to suggest, as the 'idealists' have done, that the only reality is within the mind, is really just as reductive and distorting (Bergson 2004:12-13). As stated in the introduction, it is surely to a both/and rather than to an either/or perspective that the most inclusive stance should lean.

As Klein and Myers point out, a fundamental principle in interpretivism concerns the hermeneutic circle, which "suggests that we come to understand a complex whole from preconceptions about the meanings of its parts and their interrelationships" (Klein and Myers 1999:71). Here, perhaps, interpretivists might take pause. As we have just seen there are preconceptions – philosophical groundings, or 'fore-projections' in hermeneutical terminology (Hassan 2014) - about the bifurcation of nature, derived from positivism, which many interpretivists in fact, albeit unwittingly, continue and support, when they perpetuate the divide between the objective and the subjective. The principle of contextualisation is key here, for as Klein and Myers point out, it, "Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged" (Klein and Myers 1999:72). A proper contextualisation, in the 'structure of events' approach, then, should include the background of bifurcation by which a whole range of decisions – a veritable scrabble-board of determinations (Akrich et al 2002) – based on 'objective' phenomena to the exclusion of 'subjective' phenomena, or *vice versa,* have predetermined both the context and its modes of interpretation. The hermeneutic circle, in other words, sometimes carries 'fore-projections' just as positivist as the positivists, when it is assumed "our knowledge of reality is gained *only* through social constructions," albeit that the bifurcation of nature is here upheld from the opposite side of the divide.

Interpretivist IS Within the 'Structure of Events'

Perhaps one of the best attempts in IS to address these disjunctions is that by Ray Paul, in his editorial piece in the *European Journal of Information Systems* in 2007, where he offered the following definition of information systems: "The IS *is not* the IT and the formal processes being used. The IS *is not* the people using the IT and the formal and informal processes. The IS is what emerges from the usage and adaptation of the IT and the formal and informal processes by all of its users." (Paul 2007:193) This statement seems best to capture the spirit of avoiding bifurcation – acknowledging both the objective and subjective in a more unitary and inclusive grasp of the nature of IS – and indeed, of its *movement*. As Paul said in his 2007 editorial, immediately following the above definition of IS: "Note therefore that the IS is constantly adapting to need as the users change their usage and the IT is updated or extended." Klein and Myers also point out, interpretivism already acknowledges that IS is a moving target: "as Parmenides observed, 'you cannot swim in the same river twice.' Interpretivists argue that organizations are not static and that the relationships between people, organizations, and technology are not fixed but constantly changing. As a consequence, interpretive research seeks to understand a moving target" (Klein and Myers 1999:73). In other words, as both Bergson and Whitehead stress, nature, and therefore IS, is dynamic, subject to continual change - in ways even faster and more profound than perhaps Paul, or Klein and Myers were implying - and the 'structure of events' approach may be one way in which IS practice might be improved. Processes, in other words, even those understood by interpretivists, need to be seen as themselves in process, contingent upon a structure of other processes, rather than as anything that could be optimally set. As Ciborra put it, "Forget, then, process as an object you design or re-engineer according to the latest methodology. Rather, consider and dwell on your daily business of existence at work: a process of unceasingly recombining resources" (Ciborra 2009:120).

This is perhaps the key improvement which Interpretivist approaches, already (at best) combining both IT and People, in motion, could gain from a 'structure of events' approach. It includes one of the most important insights from Bergson and Whitehead's notions of duration, and is closely related to Cartwright's *Dappled World*. It is the lack of causal closure, the fuzzy and uncertain nature of a non-bifurcated Nature, which is not computable in the manner von Neumann imagined, unverifiable after the manner of the positivists. On the contrary, Bergson and Whitehead's universe is making itself up as it goes along, impossible to definitively predict, unfinished and never finishing, and therefore always capable of surprise. What an information system *is* – the physical hardware, the bodies of those engaged with it, and *how* it works – the processes and practices both physical and virtual, organizational and personal, that unfold through it, both by design and by accident, are subject to constantly changing contexts and circumstances. The more complex the system the more likely one iteration will impact upon others. Systems, indeed, are increasingly driven by the patching of bugs, rather than by coherent design: especially in collective development models and perpetual beta approaches, each new version reveals a new set of bugs, discovered through use, which, in their patching, open up new functionalities and new problems, and new bugs (Gregg 2010; Lin 2006). As we have seen, research methodologies that foreground and privilege mathematical precision and logic in IS inevitably fall into the traps of scientism that imagine people – and bugs - are as predictable as the axioms of mathematics: albeit, as Gödel proved, causal closure is not even possible there. But so too do research methodologies that ignore or at least downplay the physical realities that set boundaries upon human cognition, the closeness of the link between brain and mind, for all that the latter may not be reducible to the former. Interpretivism is on the right track when it acknowledges the complex interplay of IT, people, and processes as they unceasingly unfold, and could benefit from embracing the flow of change still further.

Interpretivism in IS, in partnership with positivist mathematical formalism rather than against it, in a 'structure of events' approach, then, could bring with it both the personal and movement, adding the human and the social where positivism discounts it, and turning its own hermeneutic circle by changing preconceptions about the bifurcation of nature into new understandings of complex wholes as unfolding totalities. Interpretivist approaches in IS, in this light, one might conclude, could be considered as the *How* of IS, in a 'Structure of Events' approach, focussed upon continuous iteration of the IT artefact produced by the positivist *What* of IS, through user research and continuous interaction between use cases and IT development, developing and improving the artefacts, and the civic, business, social and domestic formal and informal processes of the IS. The main implication of the 'Structure of Events' approach for Interpretivism is to understand that it is a partial view, dependant upon albeit not governed by the realities of the IT, and that as well as partnering with Positivist approaches it is at its best when focussed upon open, contingent, and continuously evolving processes.

Implications for Critical IS

In many respects "the conservatism of the IS discipline" (Walsham, 2005a) belongs most obviously in its positivist wing. However, although often "interpretivist methods have been used to gather material for critical analyses" (Richardson and Robinson 2007:260), most interpretivist IS research fights shy of critique, preferring to leave such conclusions to the reader: one might say that many interpretivists can be in some ways as conservative as the positivists. But what of those scholars engaged in critical IS? As McGrath describes, "Research methods informed by an interpretive stance would look for multiple interpretations and deep understanding of the often conflicting rationalities of the people involved in IS innovation. Critical researchers, on the other hand, often have a cause – for example, feminism, environmentalism, less developed economies – so they may see a particular conflict and focus on that, downplaying other potential interpretations" (McGrath 2005:86). This would suggest, perhaps, that at least some critical IS scholars are interpretivists with a particular 'beef,' who wish to make a political point through their scholarship in support of their particular passion. This is perhaps the greatest strength of critical IS – that significant agendas can be foregrounded and pursued through it.

More broadly, critical IS research, as Myers and Klein put it, "can be classified as critical if the main task is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light" (Klein and Myers 1999:69). Orlikowski & Baroudi (1991), Walsham (2003) Lyytinen (1992) and Avgerou (2002) have all identified particular critical theories and concepts as promising ones for the discipline, and have argued that "although there are no critical methods as such, interpretive

methods can help in the field (University of Salford, 2001)" (McGrath 2005:86). Now, critical IS has a long pedigree, with its nascent stirrings as early as those of interpretivism. As McGrath points out, the proceedings of the Human Choice and Computers conference of 1974 include an encouragement by editors Mumford & Sackman "to engage with the way that computer applications were being developed and deployed, and to make the human choices necessary to ensure that democratic values and ideals were preserved for the benefit of everyone" (McGrath 2005:87).

However, as highlighted in the introduction to this paper, it was not until the 1980s that critical IS really began to flower, with the use of Habermas by Lyytinen and Klein (1985), and the arrival of sociologists in British Business Schools bringing with them the ideas of Foucault and Bourdieu (Carter 2008; Myers and Klein 2011:19). The aim, as Richardson and Robinson put it, was to undertake a "critique of the illusions and contradictions of social existence with a view to enabling and encouraging social change" (Richardson and Robinson 2007:254). A weakness of Critical IS, then, may be that it is focussed upon the concerns of those who in the 1980s arrived in Business Schools and brought their favoured critical thinkers with them. Are these, in other words, the right, or best concerns that Critical IS should be addressing?

How might attention to the 'structure of events' approach, outlined through discussion of Nagel, Bergson and Whitehead, above, help us to address such a weakness in Critical IS, or at least promote better use of its strengths? I believe the philosophical grounding of Critical IS will give us a clue, and the 'structure of events' approach might help to improve that grounding.

Conservatism in Critical IS

My question is whether a certain 'conservatism in IS' is affecting critical IS, too. Although there have been other critical approaches put forward (Fournier and Grey 2000; Howcroft and Trauth 2005), the streams identified by Myers and Klein (2011) around Habermas, Foucault and Bourdieu seem to be creating strong clusters of scholars speaking to one another. Whether this can develop into a "political movement" as Grey (2005) suggests, "challenging the direction of IS both as an academic discipline and as applied outside the academy" remains to be seen. I believe that critical IS needs to become more relevant outside of its own internal discussions, but am unclear how the streams identified by Myers and Klein are likely to achieve this.

The patterns of this research, as Richardson and Robertson point out, seem broadly to have settled into a three part format: insight, critique and transformative redefinition. Insight, "helps to highlight hidden or less obvious aspects of social reality;" critique, "challenges many of the taken-for-granted assumptions, beliefs, ideologies, discourses;" and transformative redefinition, "is the development of critical, relevant knowledge and practical understanding to facilitate emancipatory change" (Richardson and Robinson 2007:255).

I believe in the light of the philosophical understandings of Nagel, Bergson and Whitehead, outlined above, that critical IS, in search of insight, can and should go deeper than Habermas, Foucault, or Bourdieu. Critical IS research should delve into the philosophy of science and the concept of Nature, as I have attempted to do in this paper, to challenge the assumptions upon which positivism is based, and challenge the status quo that some interpretivism merely observes, if it is to begin to have real impact outside of scholarly discussion.

Critical IS Within the 'Structure of Events'

There are three points here that I wish to make; firstly about the systems positivist IS produces for our societies, which a 'structure of events' approach could greatly improve; secondly about Foucauldian subjectivity, and how a 'structure of events' approach favours Foucault's later, over his earlier, work; and thirdly about critical IS as a political project, and how a 'structure of events' metaphysics might help underpin and broaden it.

Firstly, positivist systems are ubiquitous in our societies and need to be challenged for the way in which they can depersonalise those who use them. A 'structure of events' approach acknowledges that positivist systems in fact promote their own (philosophical and economic) agenda, and foregrounds the need for genuine personalisation in systems.

The bifurcation of nature at the root of positivism, as we have seen, is very closely associated with the computational market-fundamentalist form of economics (von Neumann, Cowles). This computational market fundamentalism is an approach to economics, moreover, that has coloured not only the reach for academic rigour in Business Schools, but the positivist stance in IS in those same schools. With the reality of subjectivity discounted by such positivist approaches, many of the systems embedded in our organisations and social lives can be depersonalising. We use such systems every day – each moment of use an 'event' within its 'structure of events' incorporating both the physical systems and our own experience of them – and we arguably become used to being treated in such an impersonal fashion, often leading, in capitalist economies, to self-identification as a consumer rather than as a citizen (Norgaard 2011; Kent 2009). Such self-identification foregrounds the 'rational agent' model of von Neumann's economics – an image of the human viewed only from without, according to the doctrines of behavioural psychology, in which personal subjective experience is discounted. A 'structure of events' approach acknowledges that positivist systems are promoting such an economic agenda, and foregrounds the need for genuine personalisation – a de-commoditising of the self - in such systems.

Secondly, a Foucauldian understanding of subjectivity is not at odds with the subjectivity described by Nagel, Bergson and Whitehead. Foucault moved as his oevre developed from what he saw as a highly disciplinated social structure, towards the possibility of shaping the self through key choices made within the contingent milieu of an otherwise co-determined subjectivity. A 'structure of events' approach accentuates the contingency of subjectivity – the mind determined albeit not governed by the brain, situated at every point within interlocking and interpenetrating events that are both personal and concrete, chosen and determined. An early Foucauldian understanding of a disciplinated and de-centered subjectivity might suggest that the context of any subjective experience within such panoptic social conditioning renders some kind of behavioural psychology potentially more plausible than an Enlightenment-style individual subjectivity. However, Foucault, in his later work, explored the personal project of attempting, through 'techniques of the self', to undertake self liberatory improvements in the unfolding of character – 'taking care of the self' – for all that the contents of that subjectivity might ultimately be defined by, and consist in, socially constructed elements (Foucault 1988). Foucault was also very focussed upon the micro-politics of the individual, rather than the possibilities of social organisation for broader liberatory or revolutionary change (Kreps 2015b). (Indeed it was here where the sociologist Bourdieu and the philosopher Foucault arguably most differed.)

Neither the above pictures of subjectivity – disciplinated or 'taken care of' - conforms, at any rate, to the 'rational agent' / 'information processor' of von Neumann's market-led economics. Such an 'agent' is an isolated and mathematically predictable automaton, and 'his' rationality seems, in economic terms, to be rather paranoid (Mirowski 2002; Scott and Lyman 1968) and selfish (Curtis 2011) and more akin to a game theory actor than a human being. Corporatist and elite agendas are arguably well served by this approach to *homo economicus*, but many other people find it dehumanising, disenfranchising, and disempowering. As Walsham memorably describes, "the 'why' of critical engagement essentially derives from the enormously asymmetric world in which we currently live" (Walsham 2005b:242) (although my own take upon the 'what' and 'how' are not 'what' projects or 'how' to engage with them critically, as with Walsham's focus.) A 'structure of events' approach ultimately promotes an understanding of subjectivity neither as a distinct individual cognitive Subject, so heavily critiqued by Foucault, nor as a "rational agent" in the economic game of a positivist social setting, but as a radically contingent self, embedded within, determined but not governed by, both the concrete and all other selves whom its 'structure of events' touches, shaped – and personalised - by its own attempts at coherence.

Thirdly, Critical IS as a political project can sometimes be guilty of somewhat parochial concerns – focussed in some Green IT upon the preciousness of the natural environment at the expense of the people living there; focussed in some ICT4D on either the benefit to the Western economy of third world development, or the benefits locally to small communities; focussed in World Systems Theory upon the shifts and movements of commodities at the expense of the environment (although Lennerfors et al 2014 are beginning to address this). A 'structure of events' approach might help contextualise all these Critical IS concerns within an openness characteristic of the metaphysical – and thus ontological – concerns upon which it rests, far deeper and more inclusive than the more parochial concerns above. The fundamental questions raised by Nagel, Bergson and Whitehead on the nature of Nature, of time, and the relation between objective and subjective may seem to be questions beyond the remit or purview of IS, but as ubiquitous information systems increasingly contextualise our everyday lives the philosophical

assumptions underpinning them also determine the nature of the world that we live in – both socially and physically. The 'structure of events' approach, for critical IS, as with the implications for Interpretivism, seems perhaps at its strongest in the question of causal closure versus 'dappled' openness and contingency: between the closed, and the open.

Addressing all three of these points together – a 'self-personalising' notion of contingent subjectivity open to the widest influences - in his final work, *Two Sources of Morality and Religion,* Bergson – the political philosopher - defined humanity as caught between the notion of societies, and of society; between that which is closed, and that which is open. Prefiguring, in some ways, elements of the later Foucauldian disciplinarity and network of power relations, Bergson offered a description of the social as a system of obligation. A great believer in free will, Bergson nonetheless was all too aware that choice is soon overlaid by the necessary co-ordination required of social grouping. "While his consciousness, delving downwards, reveals to him, the deeper he goes, an ever more original personality, incommensurable with the others and indeed undefinable in words, on the surface of life we are in continuous contact with other men whom we resemble, and united to them by a discipline which creates between them and us a relation of interdependence" (Bergson 2006:14). This discipline and interdependence comprise a foundational moral obligation to one another that forms the glue of social grouping. But these groupings are always, by definition, ultimately, closed. Any individual grouping, be it family, clan, tribe, academic discipline, nation, or even a grouping of nations such as Europe, or 'the West,' is "to include at any moment a certain number of individuals, and exclude others" (Bergson 2006:30). For Bergson this is a 'natural' state, akin to the societies created by that other most social of Earth's creatures, the ant. Yet this is no simple biodeterminism, for Bergson is clear on the essential point that human consciousness not only marks a fundamental distinction between us and the ant, but that consciousness itself is of a radically different nature to anything that science has yet approached: in part because it lies on the other side of a divide at the foundation of modern science itself. Having carved out his belief in human choice in his first book *Time and Free Will*, in his last book *The Two Sources of Morality and Religion* it is in the distinction between the closed and the open that Bergson finds choice at its most powerful, and its most human. "Between the society in which we live and humanity in general there is…the same contrast as between the closed and the open; the difference between the two objects is one of kind and not simply one of degree" (Bergson 2006:32). The spirit of the League of Nations, with which Bergson was intimately involved, still alive in the United Nations, and in UNESCO, is imbued with just this very openness, an expansive inclusivity very different from the closed inclusivity of nationalism. For Bergson it is a spiritual aspect of our humanity that we become open to 'society' rather than merely 'societies,' a recognition of our commonality in consciousness that sponsors empathy, understanding, and community across the boundaries more 'closed' approaches set up.

In sum, calling attention to the agendas within positivist IS, and encouraging personalisation, understanding subjectivity as radically contingent yet incorporating – by metaphysical necessity – the freedom of the will, however curtailed, and promoting an openness not just to incorporating the subjective within our scientific understanding of reality, but to each other, across the boundaries we are otherwise wont to place between our groupings, a 'structure of events' approach in Critical IS promises a transnational emancipatory social critique, applicable to the entire range of information systems at work in our societies.

Critical approaches in IS, then, in light of these three points, one might conclude, could, in a 'structure of events' approach, be considered as the *Why* of IS, focussed upon the reasons behind the *What* of IS - the creation of *which* IT artefacts in the first place - and the priorities in the *How* of IS that guide the iterations interpretivist studies bring to IS development, and the choices concerning the physical materials of the artefacts. The main implication of the 'Structure of Events' approach for Critical IS is in the 'dappled' openness and contingency of open systems – that a global perspective beyond Foucault's more narrow anti-European Enlightenment project might offer a human commonality through metaphysical underpinnings we all share.

Conclusion – what, how and why

As Stahl argues, critical scholars "want to make a difference, but there is no agreement on what this difference is" (Stahl 2008:191). My contention is that the Habermasian and Foucauldian streams of critical social thought in critical IS are partly to blame for this impasse. Both thinkers concentrate

primarily upon discourse (Stahl 2008:15), arguably to the detriment of their grounding in more material reality. Durational, non-bifurcated process philosophy, by contrast, with its foundational critique of the philosophy upon which both positivism and interpretivism stand, and its enjoinder to unify our concept of nature – to approach the world with both/and rather than either/or - offers a potential way forward.

As is often the case, elements of the business world are already ahead of the curve in this respect. The "Tech for good" movement is an outward-facing, business innovation cousin of critical information systems research, focused on devoting the skills of IS professionals to projects that make a positive impact in society (TechforGood 2016; Hull and Berry 2016). Here there are carefully and cleverly worked out systems with robust coding (the positivist *what)* that have been rigorously user tested with UX research techniques and are in continuous beta constantly iterating and improving (the interpretivist *how),* geared towards improving people's lives in one way or another (the critical *why).* Just two examples are, in the health sector, Sentimoto – "a smartphone app that utilises existing smart watches to allow older people to access health and wellbeing information more clearly. By monitoring, processing and displaying key health metrics seamlessly and intuitively, their technology will allow older people and their families or friends to manage health conditions more easily and effectively" (Firman 2016) There is also highly topical Techfugees – "a non-profit social enterprise co-ordinating the international tech community's response to the needs of refugees fleeing war, famine and persecution. It has grown to 11,000 members. Successes include bringing wifi to the refugee camps in Calais" (Firman 2016). There are numerous other examples at the TechForGood website. Indeed, once the inclusive 'structure of events' approach is understood and embraced it becomes clear that there are already a great number of projects that could be understood as examples of work that would issue from such a stance. Given the metaphysical stance outlined in this paper, such work could be made even stronger, and more of it could be encouraged.

My intention in this paper has been to offer (i) insight – through the eyes of Nagel, Bergson and Whitehead – into philosophical underpinnings of an alternative view to mainstream positivism; (ii) a critique of both positivism and interpretivism from the deepest level of their bifurcated concept of nature; and (iii) a route to transformation, moving on from the narrowly social critiques of Habermas, Foucault and Bourdieu towards aligning itself to the 'Tech for Good' movement, and striving for fundamental social change. My conclusion, in this light, is that the three standard types of IS identified by Chua (1986) can, through a 'structure of events' approach, going forward, be combined into a more coherent whole, re-envisioned as the *What* (positivist approaches to the creation of IT artefacts), the *How* (continuous iterations of IT artefacts in human contexts), and the *Why* (reasons behind the creation of IT artefacts and priorities in the iterations.) This is not a unificationist suggestion that the famed "fragmented adhocracy" of IS (Banville and Landry 1989:56) need tighten itself into a monolithic discipline, or that only one 'flower' should bloom. But mixing already abounds between positivist and interpretivist methods (Kaplan and Duchon 1988; Johnson and Onwuegbuzie 2004); joined with reasons from the critical stance, such combinations could offer a welcome coherence to (at least some practitioners of) IS.

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