JIT

Commentary on Debates and Perspectives Paper

Journal of Information Technology
1–4


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DOI: 10.1177/0268396220945719
Journals.sagepub.com/jinf
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Thoughts on Siponen and Klaarvuniemi's 'Demystifying Beliefs about the Natural Sciences in IS': The way forward

John Mingers

Abstract

This is a comment on the paper by Siponen and Klaarvuniemi concerning the natural sciences. It argues that many of their points are correct but have been made before, particularly within critical realism. It suggests that the way forward is via a 'mechanisms' view of natural (and social) science.

Introduction

Siponen and Klaarvuniemi's paper (henceforth S&K) is interesting and useful in correcting many misunderstandings about the nature of natural science (NS) and its relation to social science. I do not find much to disagree with in the main content of the paper but I would like to make some consequential points about, or following on from, its arguments. These are, first, that in fact much of this is not new, and it is a shame that the authors do not acknowledge this prior work. In particular, I will discuss the work of Roy Bhaskar, known as critical realism (CR), which has already been well taken up within IS. Second, the authors provide a good critique of the existing situation but they do not really put forward a substantive alternative approach. The starting point for such an approach can again be found in the work of Bhaskar and particularly the 'mechanisms'-based view of scientific explanation.

The first section of the paper will outline S&K's primary arguments. The second section will show that much of this has already been proposed (more comprehensively) by Bhaskar. The third section will consider the extension to social science and the fourth section will outline the mechanisms approach to scientific understanding.

S&K's argument

We may very crudely summarise S&K's arguments as follows:

1. There is a view within IS that for research to be valid, it should aspire to the natural science model (positivism), although there is an alternative view that social science is significantly different to natural science (interpretivism) and should have quite a separate methodology.
2. There is a common characterisation of the NS model, each element of which does not in fact necessarily apply in natural science:
   - 2.1. Generally, a quantitative/statistical/mathematical approach is required but,
     - The distinction between quantitative and qualitative is itself problematic.
     - Much natural science, for example, biology, is in fact observational and qualitative.
     - Little NS is actually statistical and many NS phenomena do not fit with mathematical models.
   - 2.2. It is based on objective, observer-independent observations and theories that can be proved to be true but,

University of Kent, UK

Corresponding author:
John Mingers, Kent Business School, University of Kent, Canterbury, CT2 7FS, UK.
Email: j.mingers@kent.ac.uk

- Scientists are not independent but often intervene in their experiments.
- There is no objective observation, everything is theory-laded.
- NS is fundamentally hermeneutic – observations have to be interpreted. Science is therefore cultural and historical.
- It is not possible to prove theories true and there are many 'unreal' concepts such as ideal gases.

2.3. It aims to discover universal laws, based on a deterministic world and laboratory experiments but,

- Almost no true universal laws have been identified; it is better to look for mechanisms.
- Generally the world is not deterministic, see, for example, quantum effects.
- Lab results often do not transfer because the real world is multi-causal.

3. The conclusions are that IS should not follow a mistaken view of natural science, and that, in any case, there is no single model of natural science that covers all its domains.

CR and natural science

Bhaskar's (1978) first book, titled *A Realist Theory of Science*, was a sustained critique of the positivist view of natural science, and his second (Bhaskar, 1979), *The Possibility of Naturalism*,[1] considered the social sciences and proposed that there could be a single approach to science across both domains although the special nature of the social world meant that the approach must be modified in various ways. This philosophy, currently known as 'critical realism', has been taken up in IS to a significant degree (Aaltonen and Tempini, 2014; Bygstad et al., 2016; Carlsson, 2010; Mingers, 2004a, 2004b; Mingers et al., 2013; Mingers and Standing, 2017; Smith, 2006; Volkoff and Strong, 2013; Williams and Karahanna, 2013; Williams and Wynn, 2018; Wynn and Williams, 2012, 2020; Zachariadis et al., 2013).

For CR, any science consists of two domains – the transitive and the intransitive. The transitive domain consists of all the human activities involved in science – experiments, observations, theories, data, papers, grants, etc. The transitive domain recognises that science is essentially a human activity. Conversely, the intransitive domain consists of the *objects* of knowledge, the structures or processes about which we observe or theorise. These objects are independent of the way we may conceptualise them at any particular time. They are nevertheless real and objective even though we cannot access them directly. This allows CR to accept epistemic relativity, that is that we cannot make pure, unmediated observations – they are always perceptually, linguistically and theoretically constrained. Our knowledge is always culturally and historically relative; and knowledge is always essentially fallible – that is, cannot be proven to be true. It does not mean that we have to accept judgemental relativity – that is, that all views are equally valid and we cannot choose between them. These arguments cover the points made in 2.2 above.

CR also rejects the idea that science should be about the search for general, universal laws, and the Humean view of causation as constant conjunctions of events which underpins most statistical methods, for example, regression. Constant conjunctions of events are extremely rare in the real world, and in fact, it is the purpose of laboratory experiments to bring them about. The real world is intrinsically open with many multi-causal factors generating actual events. CR distinguishes between the Real domain of interacting causal mechanisms with their particular powers (affordances and liabilities); the Actual domain of events that result from the interacting mechanisms; and the Empirical domain – the subset of events that we actually observe of record. These arguments cover the points made in 2.3 and 2.1 above.

CR and social science

The main conclusions of S&K's paper are that IS should not follow a mistaken model of natural science and that, in any case, no one model of NS would fit its many different fields. However, they do little to propose a positive model for IS research.

In contrast, Bhaskar (1979) proposes a very general methodology based on 'retroduction'[2] that can be applied across the physical sciences and, with some modifications, across social science as well. It is essentially qualitative although will use quantitative data where appropriate; it aims for explanation not prediction; it focusses on mechanisms rather than general laws; it recognises the hermeneutic nature of observation; and it accepts that we can rarely know that we have a true theory, although truth is an ideal (Mingers and Standing, 2020).

We take some unexplained phenomenon that has been observed (albeit not objectively) and propose hypothetical mechanisms or structures which, *if they existed*, would generate or cause, through their properties, that which is to be explained. The mechanisms may be physical, social, cognitive or ideational. So, we move from experiences in the Empirical domain to events in the Actual domain through to possible structures or mechanisms in the Real domain. Such hypotheses do not of themselves prove that the mechanism exists, and we may have competing explanations in terms of other mechanisms, so the next step is to work towards eliminating some explanations and supporting others. Finally, this leads to a correction of previous results or theories. Bhaskar (1994) summarises this as Description, Retroduction, Elimination, Identification and Correction (DREIC) (p. 24).

This approach can be applied equally within social science but we must recognise that the social world is intrinsically different to the material world and this places limits on the methodology (Mingers, 2004b) in the following ways:

- **Ontological**
  1. Social structures do not exist independently of the activities they govern; they exist only in their effects or occurrences. Social structures enable social activities but may thereby be themselves transformed.
  2. Social structures do not exist independently of the agents' conceptions of what they are doing. In contrast, natural phenomena are independent of our conceptions of them.
  3. Social structures are localised in both space and time.
- **Epistemological**
  1. Social systems are inherently interactive and open and generally cannot be artificially closed in the laboratory. People are self-reflexive and can choose how to define a situation.
  2. The possibilities of measurement are very limited since intrinsically the phenomena are meaningful, and meanings cannot properly be measured and compared, only understood and described.
- **Relational**
  1. Social science is itself a social practice and is, therefore, inherently self-referential. Social knowledge can change the nature of the social world.

Conclusion: towards the future

S&K are right to point out the problems of the traditional model of natural science and that therefore it should not be seen as a guiding light within IS. But, in fact, within the philosophy of natural science itself, there has been a move away from the traditional deductive-nomological (D-N) model of Hempel (1965), which suffers from many of the faults described above, towards an approach based on the idea of causal mechanisms (Mingers, 2014, Ch. 4). This has been especially so in an area like biology (Bechtel and Abrahamsen, 2005; Craver, 2009; Glennan, 1996, 2002; Illari, 2013; Illari and Williamson, 2011; Machamer, 2004; Machamer et al., 2000; Salmon, 1998).

The causal mechanisms approach has also been utilised within the social sciences (Astbury and Leeuw, 2010; Hedström and Swedberg, 1996; Mayntz, 2004; Reiss, 2007) and even within IS (Avgerou, 2013; Bygstad, 2010; Henfridsson and Bygstad, 2013; Mingers and Standing, 2017). I believe that it has the potential to go beyond the current impasse between positivism and interpretivism.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

ORCID iD

John Mingers https://orcid.org/0000-0002-4102-4696

Notes

1. 'Naturalism' is the view that there should be a common scientific method across both natural and social science.
2. Called 'abduction' by Peirce (1907).

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Author biography

John Mingers is a professor of Operational Research and Systems with research interests in philosophy, information systems, systems theory and bibliometrics. He is a past Dean of the Business School and Editor of MIS Quarterly