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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,

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- 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.

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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).

References

Aaltonen A and Tempini N (2014) Everything counts in large amounts: A critical realist case study on data-based production. *Journal of Information Technology* 29: 97–110.

Astbury B and Leeuw FL (2010) Unpacking black boxes: Mechanisms and theory building in evaluation. *American Journal of Evaluation* 31(3): 363–381.

Avgerou C (2013) Social mechanisms for causal explanation in social theory based IS research. *Journal of the Association for Information Systems* 14(8): 399–419.

Bechtel W and Abrahamsen A (2005) Explanation: A mechanist alternative. *Studies in History and Philosophy of Biological and Biomedical Sciences* 36(2): 421–441.

Bhaskar R (1978) *A Realist Theory of Science*. Hemel Hempstead: Harvester Press.

Bhaskar R (1979) *The Possibility of Naturalism*. Hemel Hemstead: Harvester Press.

Bhaskar R (1994) *Plato Etc*. London: Verso.

Bygstad B (2010) Generative mechanisms for innovation in Information infrastructures. *Information and Organization* 20(3–4): 156–168.

Bygstad B, Munkvold BE and Volkoff O (2016) Identifying generative mechanisms through affordances: A framework for critical realist data analysis. *Journal of Information Technology* 31(1): 83–96.

Carlsson SA (2010) Design science research in information systems: A critical realist approach. In: Hevner A and Chatterjee S (eds) *Design Research in Information Systems*, vol. 22. New York: Springer, pp. 209–233.

Craver CF (2009) Mechanisms and natural kinds. *Philosophical Psychology* 22(5): 575–594.

Glennan S (1996) Mechanisms and the nature of causation. *Erkenntnis* 44: 49–71.

Glennan S (2002) Rethinking mechanistic explanation. *Philosophy of Science* 69(S3): S342–S353.

Hedström P and Swedberg R (1996) Social mechanisms. *Acta Sociologica* 39(3): 281–308.

Hempel C (1965) *Aspects of Scientific Explanation*. New York: Free Press.
Henfridsson O and Bygstad B (2013) The generative mechanisms of digital infrastructure evolution. *MIS Quarterly* 37(3): 907–931.
Illari P (2013) Mechanistic explanation: Integrating the ontic and epistemic. *Erkenntnis* 78(2): 237–255.
Illari P and Williamson J (2011) Mechanisms are real and local. In: Illari P and Williamson J (eds) *Causality in the Sciences*. Oxford: Oxford University Press, pp. 818–844.
Machamer P (2004) Activities and causation: The metaphysics and epistemology of mechanisms. *International Studies in the Philosophy of Science* 18(1): 27–39.
Machamer P, Darden L and Craver CF (2000) Thinking about mechanisms. *Philosophy of Science* 67(1): 1–25.
Mayntz R (2004) Mechanisms in the analysis of social macro-phenomena. *Philosophy of the Social Sciences* 34(2): 237–259.
Mingers J (2004a) Re-establishing the real: Critical realism and information systems research. In: Mingers J and Willcocks L (eds) *Social Theory and Philosophy for Information Systems*. London: John Wiley, pp. 372–406.
Mingers J (2004b) Real-izing information systems: Critical realism as an underpinning philosophy for information systems. *Information and Organization* 14(2): 87–103.
Mingers J (2014) *Systems Thinking, Critical Realism and Philosophy: A Confluence of Ideas*. London: Routledge.
Mingers J and Standing C (2017) Why things happen – Developing the critical realist view of causal mechanism. *Information and Organization* 27(3): 171–189.
Mingers J and Standing C (2020) A framework for validating IS research based on a pluralist account of truth and correctness. *Journal of the Association for Information Systems* 21(1): 6.
Mingers J, Mutch A and Willcocks L (2013) Critical realism in information systems research. *MIS Quarterly* 37(3): 795–802.
Peirce CS (1907) *The Charles S. Peirce Papers*. Cambridge, MA: The Houghton Library, Harvard University.
Reiss J (2007) Do we need mechanisms in the social sciences? *Philosophy of the Social Sciences* 37(2): 163–184.
Salmon W (1998) *Causality and Explanation*. Oxford: Oxford University Press.
Smith M (2006) Overcoming theory-practice inconsistencies: Critical realism and information systems research. *Information and Organization* 16(3): 191–211.
Volkoff O and Strong D (2013) Critical realism and affordances: Theorizing IT-associated organizational change processes. *MIS Quarterly* 37(3): 819–834.
Williams CK and Karahanna E (2013) Causal explanation in the coordinating process: A critical realist case study of federated IT governance structures. *MIS Quarterly* 37(3): 933–964.
Williams CK and Wynn DE Jr (2018) A critical realist script for creative theorising in information systems. *European Journal of Information Systems* 27(3): 315–325.
Wynn DE and Williams CK (2012) Principles for conducting critical realist case study research in information systems. *MIS Quarterly* 36(3): 787–810.
Wynn DE Jr and Williams CK (2020) Recent advances and opportunities for improving critical realism-based case study research in IS. *Journal of the Association for Information Systems* 21(1): 8.
Zachariadis M, Scott S and Barrett M (2013) Methodological implications of critical realism for mixed-methods research. *MIS Quarterly* 37(3): 855–879.

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