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The Cybernetic Metaphor in Organisation Theory: Epistemological Implications

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Abstract

Cybernetics is the metaphorical term that describes and characterises the field of study which is concerned with the control and communication in animal and machine. Broadly speaking, developments have occurred in two directions, one of which builds upon early cybernetic insights which sought to build machines upon the principles which characterise organisms, and another which follows the epistemological implications deriving from the cybernetic perspective. The former line of development has given rise to a number of theories and techniques, which facilitate the achievement of regulation and control in social affairs. The latter has given rise to a cybernetic world view which has very fundamental implications for our understanding of the manner in which ecological systems evolve. This paper seeks to argue that whereas cybernetics as a technique for enhancing regulation and control within organisations has already had an important impact upon theorising, its epistemological implications have not been so clearly appreciated. Systematically developed, these implications have fundamental consequences for the way organisations and their mode of operation are viewed.

Key words: epistemological implications, metaphors, consequences, control, techniques

Introduction

Scientific theorising is basically a metaphoric process. The construction of any given theory rests upon the detailed elaboration of a metaphor which provides its own special brand of insights with regard to the nature of the phenomenon being studied (Morgan, 1979, Okojie 2001). Cybernetics is a metaphorical term deriving from the Greek word meaning "Steersman", and following Wiener (1961), was initially coined to characterise the field of scientific enquiry which focused upon control and communication in the animal and machine. The power of the insights generated by the metaphoric process upon which cybernetics is based has proved enormous, and over the last forty years or so, increasing attention has been paid to the possibility of extending its use as a framework for analysing the realm of social affairs. Broadly speaking, developments have occurred in two directions, one of which builds upon early cybernetic insights which sought to build machines upon the principles which characterise organisms, and another which follows the epistemological implications deriving from the Cybernetic perspective. The former line of development has given rise to a number of theories and techniques, which facilitate the achievement of regulation and control in social affairs. The latter has given rise to a cybernetic world view which has very fundamental implications for our understanding of the manner in which ecological systems evolve. The purpose of the present paper is to argue that whereas cybernetics as a technique for enhancing regulation and control within organisations has already had an important impact upon theorising, its epistemological implications have not been so clearly appreciated, (Okojie, 2001:41-53).

Cybernetics as a metaphoric conception

Cybernetics, as a scientific discipline, has largely developed as a result of an attempt to create machines that behave as if they are organisms. (The Cybernetic brain 2010) whilst its emergence and development must be seen as a consequence of the wider change in scientific world view emerging around the early twentieth century in the wake of the ideas of Einstein on

relativity, and Gibbs and Boltzman on the probabilistic nature of the universe, the specific roots of cybernetics rest in the effort to construct machines designed upon the basis of principles which characterise the nervous system of animals. Thus, whilst Einstein and other theorists sought to de-materialise the mechanical conception of the universe implicit in the prevailing orthodoxy of Newtonian physics, early cyberneticians sought to de-materialise our conceptions of the principles through which machines can be made to operate. They did so by focusing upon the principles which underlie the transmission and exchange of information rather than upon the principles of mechanical motion linking predetermined networks of inanimate parts. Cybernetics developed as the study of control and communication in the animal and machine; as a new metaphor emphasising the importance of information in systems analysis. It abstracted from the material nature of machines and organisms, to establish the principles, which they have in common. In so doing it set the basis for a new science, and a new technology which finds its most visible expression in the new generation of electronic machines which characterise the computer age.

The role of metaphor in the genesis of cybernetics is clear. The concept of a machine based upon the principles of an organism is itself metaphorical. The choice of the specific metaphor of "steersman" to characterise the new science is also important, having exerted a powerful influence with regard to early conceptions of the nature and domain of cybernetic enquiry. As will become clear, many of the early applications of cybernetics have been geared to the analysis of steersmanship in terms of narrowly defined systems of control. Only in recent years has the discipline begun to extend beyond the bounds of this particular metaphoric conception, as the focus of cybernetics upon information has been linked to the metaphor of ecology as a basic epistemological frame of reference. The importance of metaphor is also clear in the detailed experiments in which early cybernetic theorists engaged Wiener (1961) for example, reports on the direct links between the study of the nervous system of cats, the design of anti-aircraft guns, and learning machines based upon cybernetic principles. Early computers were directly modeled upon the analogy of the nervous system, and these computers were

in turn used to inform understanding of the way in which the nervous system worked. Thus, the use of metaphoric conception in the genesis of cybernetics is very clear (see, for example, Wiener, 1961:14, McOliver, 1998; Okojie, 2000). Similar metaphoric links are also evident in the writings of other cyberneticians, such as those of Ashby (1952, 1956), and Beer (1972) who specifically developed the implications of the design of a brain for machine and organisational technology. The early cyberneticians quite literally wanted to convert metaphor into reality through the development of machines which possessed the ability to behave as if they were organisms, based on artifical intelligence (John, 2008).

The cybernetic metaphor in organisation theory

Cybernetic imagery has informed much recent theorising in relation to the study of organisations. In contemporary organisational theory and parlance, we see things like cybernetic models of organisations, organisations as thermostats, and organisms as being servo mechanistic i.e. the ability of organisations to adapt themselves when faced with turbulent environments (Okojie, 2001). It is important to state that for the most part, developments have concentrated upon exploring the implications of cybernetics as a technique for improving the design and management of organisations. From this point of view, cybernetics has provided a means of integrating many of the insights deriving from the more conventional mechanical and organismic metaphors, as well as transcending some of their limitations. The focus upon information as a key factor for understanding the processes of self-regulation and control, has opened up interesting new avenues for exploration, and led to new means of conceptualising and designing organisations. (Hight 2007). Other cybernetic theorising, which in line with Bateson (1972) emphasises that cybernetics carries fundamentally new epistemological implications for the manner in which we conceive of organisations and their contexts has so far had much less influence, though is captured to a degree in the work of theories who have sought to study organisations from a contextualist point of view. Whilst drawing upon cybernetics as a root source of inspiration, this work has utilised different kinds of cybernetic metaphor in order to provide a framework for detailed theorising. Thus we find the metaphors of the ‘black

box', 'thermostat', decision maker', 'learning system' shaping contemporary cybernetic insights as far as our understanding of organisation is concerned.

Cybernetics as epistemology

Much of the cybernetic theorising referred to above has been guided by an implicit concern to forge cybernetics as a design technique for the development of adaptive systems capable of self regulation, modification and control. Developments within cybernetic thinking have been addressed to the wider epistemological issues which arise as a consequence of viewing the world as a pattern of information. Cybernetics expresses relationships found in material nature or the realm of social affairs, in a manner which frees them from their immediate context. In effect, it de-materializes their nature, and expresses the relationships found in the system under consideration in terms of the patterns of difference which they reflect. Information conveys patterns of difference. Its content, the signs, symbols, and language which comprise any given message, are selected to express particular kinds of difference observed in the universe; and such messages are essentially probabilistic since the differences reported, and the signs, symbols and language used, are selected from a much wider range of possibilities. This view has fundamental epistemological implications, since it emphasises that knowledge is an abstraction from a particular pattern of difference from a wider context.

Cybernetic epistemology thus serves to emphasize that in attempting to understand a phenomenon we tend to abstract from context. These insights have important implications for the manner in which we attempt to understand our world, favouring a more contextualist approach which emphasizes the importance of understanding relationships in a way which emphasizes their place within the whole (Pepper 1943, Wilden 1972).

The metaphor of an 'ecology' has been utilised as a means of marshalling the epistemological insights deriving from the cybernetic perspective (Bateson 1972, Emery and Trist 1973, Ziemke 2005). Whereas the concept of ecology has also been utilised from a perspective which employs the root metaphor of an organism as a means of studying social affairs (e.g. Hawley 1984, Steward 1955), its cybernetic use is of a fundamentally different orientation. Whereas the organismic "approach to ecology emphasizes the processes through

which organisms adapt against a wider ecological ground in a neo-Darwinist fashion, the cybernetic approach emphasizes how it is the context or ecology as a whole which evolves as a coherent pattern of relationships. The difference in orientation which the two approaches produce in relation to the way in which we view organisations can be clearly seen for example, by contrasting the organismic perspective adopted by Hannan and Freeman (1977), with the cybernetic approach adopted by Trist (1976). The significance of the concept of ecology for our purposes now, is that from a cybernetic perspective, it emphasizes that adequate understanding of phenomena cannot be soundly achieved through abstractions which detach figure from ground, and that a concerted effort must be made to appreciate contexts as Gestalten, or wholes, (Unpleby, 2007).

Important implications of cybernetic epistemology have been developed by Bateson (1972), who has investigated the nature of the learning process which characterises adaptive systems. Ashby (1952) has shown that the learning process typically proceeds upon the basis of trial and error, or as Wiener (1961) has put it, 'trial and success', and that by the avoidance of certain undesirable end states, a system can engage in adaptive behaviour which has the appearance of being purposive. Bateson's work develops this perspective, emphasizing that such systems of trial and error are hierarchically ordered, since if a system is to learn and engage in adaptive change it must learn how to minimize the likelihood of error. In other words, adaptive change rests upon the capacity of a system to learn, to engage in what Bateson (1972:159 166) describes as 'deutro – learning'.

From the mechanical standpoint, the universe embodies grand principles of mechanical design. From the organismic standpoint, the universe and its constituent elements are seen as evolving in a purposive fashion oriented towards 'survival', adapting one to and other, as elements within a complex web or network of causal relationships (The Mangle in Practice, 2008). The epistemology of cybernetics questions the validity of these views. Specifically, it questions whether the nature and evolution of contexts can ever be understood in terms which place emphasis upon 'conscious purpose' as a means of explaining the existence of mutually adapted forms. As such, it

provides the basis for a world-view which challenges those based upon the mechanical and organismic metaphors on many counts. The challenge of cybernetics to organisation theory, like many other disciplines, thus rests not merely upon what it has to offer at the level of technique, but also upon the contribution which it can offer epistemologically, through the manner in which we attempt to appreciate the nature of contexts. Cybernetics, which developed initially from an interest in understanding the nature of specific mechanical and organismic phenomena, and as a result of the potential which it offered for the development of a new generation of machine technology, has now emerged as a world view with epistemological implications of a distinctive, fundamental, and wide-ranging kind.

Conclusion

Cybernetic epistemology, in stressing the importance of patterns and relationships of contextual wholes, rather than systems comprised of discrete, atomistic parts has had a powerful impact upon the development of organisation theory.

Thus, when viewed epistemologically as opposed to simple technique, cybernetics questions the very ground on which organisation theory is based. And it is because of its ability to question this ground that it must be regarded as presenting a major challenge to contemporary organisation theory on a magnitude and scale which has yet to be realised, and unprecedented

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