first-order) beliefs onto engineers working on artificial systems or scientists studying natural systems has the effect of discouraging their participation in the cybernetics movement. It is probably unhealthy for the movement to nourish an identity politics of who is second-order or whether a given person's perspective is sufficiently second-order (i.e., "politically correct"). As a neuroscientist and theoretician, I constantly wonder about myself and exactly where I stand vis-à-vis the tenets of second-order cybernetics.

« 14 » We need an inclusive big tent rather than a divisive faction fight. I think the cybernetics movement will be enriched if it brings in participants from *all* fields that deal in some significant way with purposive systems (Table 1, bottom row), i.e., those systems that have internal goals that they pursue (Ackoff & Emery 1972). These include fields of endeavor that deal with the broad range of purposive artificial, natural, and social systems: engineering, natural sciences, neural & psychological sciences, social sciences, therapy, management & policy sciences, the arts, and movements for social change.

« 15 » There will be those who deal with how such systems are organized so as to effectively pursue their goals (first-order), and others who deal with how such self-directed systems interact with other such systems (second-order) to cooperate, compete, and converse. Somehow we will all get along and learn from each other.

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Second-Order Cybernetics Needs a Unifying Methodology

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> Upshot • Theory without a strong methodology is stranded in philosophy. Principles devolved from theory can be applied to situations in the arena of practice in many ways; however, a continually improving science must refine its theories with feedback from data drawn from the use of continually improving sets of codified methodologies. Second-order cybernetics is contingent upon sense-making within sapient systems. A perspective on cognitive science points toward the requirements for an enabling sense-making methodology for second-order cybernetic science.

Introduction

« 1 » In his target article, Stuart Umpleby's current review of the evolution of the epistemology of second-order cybernetics draws our attention first to a neurophysiological (neuropsychological; cognitive neuroscience) consideration of the sensory system. Sensory-input, the first step in sense-making, is both organically selective and autonomously filtered. Meaning, which is the substrate of cognition, is individually derived from direct and vicarious experiences via the senses. Our shared understandings are meanings that have become socialized through communication. And communication again involves selective and filtered sensory channels. Sensing and sense-making is, Umpleby asserts, the foundation of second order science … and for all other sciences too. The specific relevance of sense-making to the practice of second-order cybernetics is asserted to be based upon a (r)evolution in the construction of social meaning and a concurrent enhancement of action taken within living systems.

« 2 » The revolution is stated as an altered perspective. The cybernetic scientist is immersed within the system with the inference that being positioned within a system will alter the experience of the experimental observations that the scientist gathers. Implicit in this expectation is the belief that the scientist's way of seeing and interpreting observations into meaning changes as a function of the altered observational perspective. This theme warrants considerable exploration given that sense-making (and higher meaning-making) have autonomous features forged by formative experiences beyond voluntary control as well as reflective features that are more obviously and directly under voluntary control. The point that I am exploring here relates to autonomous features of a researcher's sense-making capacity that may be resistant to un-learning and re-learning without specific methodological support.

Expanding the research arena

« 3 » A fundamental feature of an observer's immersion within a sapient living system relates to the exchange of emerging understandings with and among actors in that system. When sense-making is a collective, subjective process (rather than solitary, objective work), the product of the sense-making is co-constructed. The second-order cybernetic researcher cannot be viewed simply as a cultural anthropologist artfully hidden behind a one-way mirror positioned in the center of an interactive sapient system; the cybernetic researcher is interacting directly and is being directly influenced by interactions. The researcher also cannot afford simply to be an arbitrator for collisions among differing theories of how things work in the system under study. Interdisciplinary perspective is not a matter of theoretical reconciliations, but rather it is a co-construction of new theory through the reconfiguration of meaning drawn from joint consideration of primary observations. This recombination can be considered as homologous to the synthesis of new chemical entities through reactions that facilitate recombination of elements into new coherent wholes. This letting go and rebuilding cycle can be particularly painful for researchers who cling strongly to favored theories.

« 4 » Input that is intentionally drawn from interactive recombination of ideas from a community of actors changes expectations of what constitutes a scientific finding. The finding is a complex function of:

a the observational and communication dynamics within the system under study,
b the conjoint sense-making methodology selected for use by the researcher and fellow actors,
c the focus and boundary conditions of the inquiry specified by the researcher,
d the adequacy of the reporting narrative (see next section).

« 5 » Umpleby reports that second-order cybernetics research was used in the 1950s to engage tactical response from within a community (i.e., the Institute of Cultural Affairs, ICA; §34). The wisdom behind this use was based in the belief that those closest to problems would have the best insights into how problems could be addressed.

« 6 » Indeed, input from the public could be gathered to contribute to the co-construction of a model of how things could work. A fine distinction should be drawn about the role of the researchers who are practicing second-order cybernetics in the community: are they contributing to the blended emergence of new scientific meanings related to how to understand and then solve tactical problems (in the sense of second-order cybernetics), or are they more modestly manipulating and observing the natural evolution of thinking that occurs in a sapient system once that system has engaged in collective action (in the sense of expert analysis). Without reference to specific methodological interventions, it is difficult to extract the extent to which researcher exchanges have been critically catalytic for new ways of thinking or to which researcher exchanges have been sampling ongoing innovative action. Methods as modest as hosting discussions represent an intervention within which exchanges among citizens (to the exclusion of exchanges with researchers) might catalyse inclusive citizen sense-making and design of new response tactics without impacting the science. Had citizens been involved in co-designing an intervention program that included when, where, and how to host specific types of exchanges, researchers and citizens might more convincingly demonstrate their inclusion in second-order cybernetic work. This level of inclusion would represent co-design of "collective choice rules" (after Ostrom 1990). If the citizens were to be involved in specifying how the inquiry into the system had been designed (e.g., the questions that were being asked and the venues that were to be used in citizen-researcher co-engagement), they would have been participating at the "constitutional level" (again after Ostrom 1990).

« 7 » It can be argued that only when citizens do participate at the constitutional level will they provide input into the "theories" upon which the second-order cybernetic interventions would operate. This level of participation is not an easy starting point – which will be obvious to any practitioners with experience in the arena. Work at this level is critical because activity at this level is the most direct way that experiences from the arena feed back into the corpus of theory (see the domain of science model, below). It is my belief that citizens will only contribute to the corpus of the theory of practice when they are supported with methodologies that provide compelling demonstrations of the coherence of their collective sense-making activity.

Developing a sense-making methodology for second-order cybernetics

« 8 » Research method matters. To amass a coherent body of findings for comparisons among and across sapient systems, the scientific community supporting the research (as well as supporting the evolution of the science behind the research) will need to minimize the ambiguity of the findings. The dynamics within the systems themselves will be uncontrolled variables, while the word-use and the reporting style of the resulting narratives must be matched to the needs of specific audiences. Improvement then depends upon refinements to the precision and boundary conditions of the inquiry and to the sense-making methodology. A focus on codification of the topic and boundary of inquiry along with a concurrent focus on a codified sense-making methodology are needed to reduce ambiguity that will impede the evolution of the field.

« 9 » Much as Umpleby in his article focused on fundamental limitations of neurophysiological processes to identify the foundation of second-order cybernetics, establishing the foundation for a dialogic sense-making methodology benefits from first considering fundamental limitations of the sense-making process.

« 10 » Collective sense-making is a cognitive communicative task with expected and unexpected costs and expected and unexpected benefits. As such, the sense-making process can be modeled as an unspecified economic system (Charter & Loewenstein 2016). In Nicholas Charter and George Loewenstein's model, natural language is the fundamental means of negotiated exchanges. Natural language as a medium of exchange is problematic due to its idiosyncratic evolution in all individuals (as discussed above). The embodied cognition theory posits that each lexicon of natural language results from an accumulation of combinations of early experiences captured into locally used words (Lakoff 2012). In this view, words are compounded metaphors for experienced meaning, and each coding of a complex, multidimensional cognition into a linear flow of words constitutes an idiosyncratic abstraction that unavoidably leaves some meaning behind. Languaging addresses the matching of meaning with word use. Iterative explanation allows initially succinct verbal expressions to be augmented with some of the meaning that was stranded during a prior expression. Iterative explanation is only possible, however, when the sense-making methodology preserves both the authenticity of an original author's statement and the real-time linkage of that specific author to that specific statement. This linkage assures that the augmented meaning will remain coherent with the original cognitive thought. Second-order cybernetic methods will need to evolve to support and to improve the efficiency (reduce the cost) of group-level sense-making.

« 11 » A collective sense-making methodology for second-order cybernetics must include provisions for languaging because people use language that is uniquely coded for expressing only certain parts of their immediate needs (see Christakis & Bausch 2006). The meanings behind statements need to be decoded and clarified within a consensual linguistic domain so that parties engaged in collective sense-making can accurately share understandings. The language used within the sense-making process evolves when it is discovered to carry additional meaning. The meaning behind linguistic labels for complex thoughts need to be captured in the language of the group

and presented as an evolving reference for real-time support of the parties engaged in collective sense-making. Languaging among groups is difficult, and is most difficult when applied within highly diversified groups, as prescribed through Ashby's law of requisite diversity. A methodology for languaging will be critical in enabling the expansion of second-order cybernetics.

« 12 » The essence of sense-making is the process of pulling disparate ideas into a coherent assembly. Ideas are connected by virtue of the paths through which they exchange materials in classic system dynamics modeling and by linkages through which they exert influence in one of the multiple forms of interpretive structural modeling (see Christakis & Bausch 2006; Warfield & Cardenas 1994). These two methodologies are complementary examples of codified means of making connections between ideas. Connections could be made using any link between any pair of nodes within a systems map. The coherence of the overall structure will depend upon the ease with which the structure is read.

« 13 » Different audiences can be expected to have different skills or preferences for interpreting system models. Participants in the community under study need to share mental models to make sense of their situation so that they can design interventions with a cybernetic perspective. Interpreting and internalizing a systems model must be balanced with benefits from reduced executive and management costs in

a mobilizing action, and
b monitoring and coordinating goal-directed activity.

A model building or problem structuring methodology for second-order cybernetics should include an agile method for building and updating models at levels of detail appropriate for community use.

« 14 » Whether we are based in a scientific community or the civic community at large, we socialize ourselves through the narratives that we share. When working with complex sapient systems, narratives will spontaneously emerge, and carefully crafted narratives are subject to the intended or unintended influences of those who retell the narrative. When a narrative is based upon a systems model, the narrative can be anchored to a learning artifact that was constructed through a conjoint sense-making process from within the community (Flanagan 2008). The artifact has legitimacy to the extent that its designers are recognized as authentic voices in the community, and it has durability to the extent that it is current (i.e., can be readily updated as new information is discovered or as prior ideas become irrelevant). The methodology for crafting narrative with explicit reference to learning artifacts from sense-making work will enhance and sustain social impact mediated through second-order cybernetic interventions.

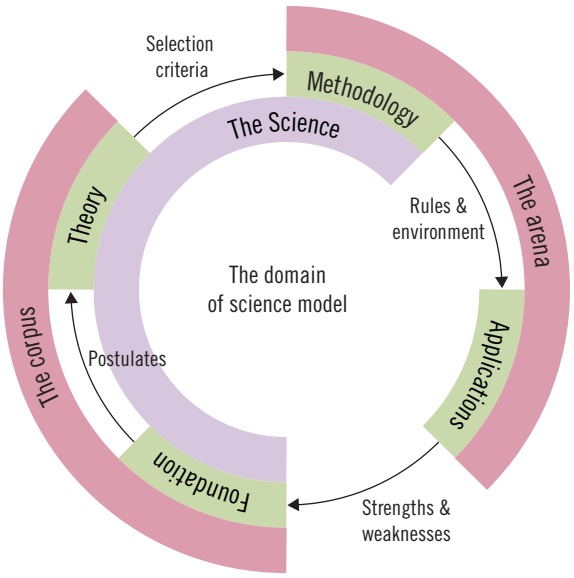

Figure 1 • The Warfield domain of science model.

Advancing the science of second-order cybernetics

« 15 » Learning within a complex arena is frequently reported as a case study narrative. This mode for contributing data into a reservoir of comparable scientific information could be improved if case study methodology was codified. Codified case studies would contain a consistent set of elements, which would facilitate inter-case comparisons. Codified cases could evolve to include self-assessments by authors on the extent to which specific elements of the case were observable, and suggestions for improving observability in future cases. Without agreement on case study design within the scientific community, each case study is a narrative (i.e., an incomplete collection of all potential observations of a system coherently expressed as a story). Compelling narratives are artfully crafted with features that appear immutable because they are embedded in networks of dependent findings. An easily read and easily compared graphic alternative to (or addition to) a thick narrative would render relations among salient findings more explicit. This will benefit both the scientific community and the sponsors of civic works. Second-order cybernetics reports should use network analysis approaches to model the systems that are analyzed. If the inclusion of a systems model were part of a codified reporting scheme, then, over time, that model-construction process could powerfully contribute to learning by facilitating meta-analysis across accumulated cases.

« 16 » John Warfield (1986, 1987) advanced a model wherein philosophy, principles, axioms, tenants, or laws constituted a foundation from which theories of action were devised (see Figure 1). To test the theory, specific methods were adopted or developed with attention to specific conditions of the arena within which the methods would be used. Foundational principles, causal theory, and applied methodology were framed

as components of science. In this model, the methodology is the means through which the science connects to the arena of application (Bausch & Flanagan 2013). Within the arena, methods specify agents, venue, and schedule, resulting in applications. Lessons from the impact of specific applications in the arena are envisioned to connect back to parties who maintain an active surveillance of the relevance of the principles that are the foundation of the science. Learning that occurs in the arena thus informs the science. The specific challenge is the imperfect understanding of lessons from the isolated perspective of the arena, and the imperfect link (through the scientist) from the arena back into the corpus of the science.

« 17 » Second-order cybernetics is an approach that seeks to fuse the knowledge of the science with the wisdom of the arena. The second-order cybernetic scientist plays a critical role as a sapient agent of the science in a sapient system of the arena. At this juncture, sense must be made of a situation or opportunity that couples the arena to the science so that lessons from the use of the application of prescribed methods in the arena will efficiently and authentically be communicated back into the corpus of the science.

Conclusion

« 18 » Second-order cybernetics is part of a slow cultural (r)evolution toward greater civic inclusion. The transition will require expansion of civic capacity for participating in pluralistic investigations of complex situations on one hand and governance confidence in civic participation on the other hand. Without delegating the authority to design parts of the future to local authorities, the political will that is needed to engage in such a process inclusively will not peacefully emerge (Ostrom 1990; Flanagan 2014). Second-order cybernetics makes a critical contribution to learning experiments that advance this transformation. I strongly share Umpleby's view that "second-order cybernetics as a mode of research from within still has a significant future" (§46); however, realizing this potential requires a robust sense-making methodology (see also Umpleby 2002). The methodology is not only needed to enhance impact within the arena but also to bridge the arena back to the corpus of the science (Figure 1). Structured dialogic design (Christakis & Bausch 2006) is one sense-making methodology that could be used as such a bridge.

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Viva the Fundamental Revolution! Confessions of a Case Writer

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> Upshot • The process of writing a discussion case study requires that a researcher become embedded in the domain being studied; it entails constructing a reality as it is perceived by the participants; it demands a high level of humility, since complex environments have a tendency to thwart rational reasoning processes. Unfortunately, these very characteristics lead conventional researchers to disparage case writing, even questioning whether it warrants the label of "research." The propositions of second-order cybernetics offer a glimmer of hope to those of us who continue to write cases, as they inform us that what we are doing is science, just a different flavor of science.

Introduction

« 1 » As a teacher and researcher in information systems, I have always been perplexed by a paradox. The authentic discussion case study, a meticulously prepared in-depth description of an actual decision situation faced by a protagonist (key decision-maker), has long been recognized as the premier means of incorporating constructivist learning into the business classroom. The process of writing these cases often involves lengthy visits to an organization, extensive interviews of the protagonist and other stakeholders in the decision, the gathering of archival data from diverse sources – both paper and electronic – and, finally, synthesizing these into a document that is accessible to a broad range of students, who can be expected to come at the decision from diverse perspectives and very different levels of expertise. The paradox is as follows: despite the nature of the activities involved in developing a quality case, few academic researchers in business today are willing to characterize the case writing process as "research." They would be absolutely horrified by the notion of anyone proposing case writing to be a form of "science."

« 2 » Stuart Umpleby, in his target article "Second-Order Cybernetics as a Fundamental Revolution in Science," nicely captures the notion that there need to be alternative approaches to science. For different domains, different approaches will necessarily dominate. In my commentary, my objective is to make two key points. The first is that the process of developing authentic discussion cases maps nearly perfectly to the underlying philosophy of second-order cybernetics. The second is that most of the environments that are studied in business and management environments could benefit greatly from more – not less – of this type of science. I begin, however, by providing some background on case studies.

Background

« 3 » To understand the current state of business research and the role played by case studies, particularly in the US, it is useful to go back to the 1950s. Up to that point in time, graduate schools of business were generally treated as quasi-disreputable institutions whose main purpose was to provide an academic pathway for wealthy individuals whose intellectual stature or morals were insufficient for serious intellectual endeavors. At Harvard, for example, legend long has it that bloody pitched battles between the business school faculty and their more serious colleagues at the Graduate School of Arts and Sciences were avoided only through the moderating presence of the Charles River between. While the actual situation doubtless differed from this caricature, it is nevertheless fair to assert that the typical products