www.business-systems-review.org

Business Systems Review

ISSN: 2280-3866
Volume 2 – Issue 2, 2013
Special Issue - Selected papers of the
1st B.S.Lab International Symposium

Complexity and Action: Reflections on Decision Making and Cybernetics

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Published online on April 7, 2013.
DOI: 10.7350/BSR.V04.2013 – URL: http://dx.medra.org/10.7350/BSR.V04.2013

ABSTRACT

This paper highlights some theoretical and epistemological reflections about the relevance of action for managerial studies. These reflections show how the cybernetic paradigm of complexity management can be used for better decision making that unites knowledge and action in a comprising, dynamic, and evolving approach. Cybernetics can help to overcome the fear of decision making in the face of uncertainty in complex scenarios, and can be an effective tool for improving the viability and competitiveness of firms in the twenty-first century.

***Keywords**:* Cybernetics, Systems thinking, Knowledge, Action, Action research, Systemic practice, Decision making, Prototype, Kybernetes.

«*In the beginning was the Deed!*»
(Johann Wolfgang von Goethe in Faust)

1. INTRODUCTION

"*In the beginning was the Deed!*"— this is how Goethe rewrites the beginning of the Gospel of Saint John (1:1), valuing the "deed" over inactivity. Not the Word, not the thought, not the energy, but human action creates the world. This statement suggests philosophical implications that are relevant to managerial and entrepreneurial studies, and which can be summarized as

The aim is not the objective but the path.

Along the path to success, errors are not failures but rather opportunities to learn. This is seen in the etymology of the word "error," deriving from the Latin word "*errar*e," which has the double meaning of both making a mistake and wandering along a path. It is by acting, wandering, and making mistakes that it is possible to learn and to improve.
Emergence, deriving from the complexity of the social and economic environment, makes it impossible to forecast the future. It is not possible to be sure of achieving a goal, and there is no single best way to approach such a goal.
Today the "*planning mentality*" (Stacey, 1993) is still the dominant paradigm in managerial practice; it denies unpredictability and always considers failures to be negative occurrences, rather than chances to learn (Yolles, 1999: 17).

This unpredictability does not, of course, imply unintelligibility or inaccessibility to understanding, but it does predicate a different type of understanding (Turner, 1997; Phelps & Hase, 2002). In such a complex context, individuals and organizations must seek to discover and refine their own preferences over time, through a process of experimentation and error correction.

A problem faced by certain approaches to complexity is that of abstraction from the competitive character of action. Man is often not rational, because of his cognitive limits, his heuristics of thought, and his passions—of which the most dangerous is fear. The awareness that the world is complex and that there is no way to forecast the future is something that can scare to the point of inhibiting decision and necessary action.

Today there is a lot of talk about how the world—and hence the markets, the social, and business environment — is complex, but there are few real proposals about what to do. The temptation coming from reductionist models (and the reason they are still so strong in managerial (mis)practice) is that they are "reassuring." Reductionist models are able to exorcise the fear of mistakes. The challenge is to find a "reassuring" alternative to reductionism. As Yolles (1999: 13) points out:

> «*The theoretical shift has occurred with the realisation that there is a distinction between simple and complex situations. The shift in management practice to management systems is in general far from being realised. Managers still do not realise the need for systems modelling, even when they are simply seen as metaphors for a problem situation that can be used to help them formulate intervention strategies*.»

Managers and entrepreneurs still need to understand the systemic perspective and to develop new capacities to learn from the future, as it emerges (Scharmer, 2009).

Cybernetics suggests two powerful tools for overcoming the fear of the unpredictability and the inhibition of action: "feedback" and "feedforward." Feedback can be used as way of learning by doing, or a way of learning better through mistakes. But before making mistakes to learn from, we need to think in order to simplify complexity in mental schemes (as in Berthoz's simplexity) and produce a "feedforward" of possible scenarios. To do so, we need to develop prototypes for exploring the future; we do this by undertaking something small and fast that quickly generates feedback from all the key stakeholders. Therefore, the *kybernetes*[1] of an organization needs to be able to grasp the environment and to create new paths towards goals. To choose and create new paths, the *kybernetes* must be able to continuously learn to create and redesign the paths.

2. THE "ART" OF THE KYBERNETES

Cybernetics can be defined as

the art and science of the good kybernetes.

As the art of governing, it is by definition the discipline of leading, deciding, and managing all social organizations of all level, including nations, firms, and families.

I personally conceive of cybernetics as both an art and a science, while asserting that it is not a mere technique.

[1] κυβερνήτης is the ancient Greek word for "*sea captain*," "*steersman*" or "*governor*."

Cybernetics uses techniques and models, but it is not just what it uses. The reason it is not a technique is obvious: a technique implies a mechanical view of the world, implies a world that can be decomposed and reduced into parts whose sum again constitutes the same whole. This mechanical view, typical of the hard sciences of the first half of the last century, has been abandoned in most of the "hard" scientific fields except, paradoxically, in the softer sciences, such as management and economics, where it remains today a dominant paradigm. I believe that the social and economic crisis we are facing today has been generated by the negative effects of the implementation of the technical-reductionist-mechanical paradigm to political, economic, and managerial sciences.

Science is more than a technique; science uses methods and techniques to achieve further knowledge. For this reason, cybernetics cannot be reduced to the "technique of feedback" (as it is in much criticism of first-order cybernetics). Feedback and feedforward are the tools, not the purpose, of cybernetics.

Asserting that cybernetics is an art does not mean it is in opposition to science. Both art and science are activities of the human intellect which aim to describe and understand reality. As Dewey argued in his *Art as Experience* (1934), art is a particular quality of human experience that is present in any interaction an individual has with the world, implying that a certain quality of care and sensation are involved in the experience of reality.

According to the traditional distinction between art and science, the difference between the two relies on the subjective nature of art and the objective nature of science. According to this distinction, cybernetics is an art, since it is "subjective" (in the meaning given by second-order cybernetics; von Foerster, 1974, 1979, 2003). As von Foerster (1979: 6-7) pointed out:

> «*[...]the flawless, but sterile path that explores the properties seen to reside within objects, and turn around to explore their very properties seen now to reside within the observer of these objects. [...] From this it appears to be clear that social cybernetics must be a second order cybernetics—a cybernetics of cybernetics—in order that the observer who enters the system shall be allowed to stipulate his own purpose [...]*»

However, science is also subjective, since it is made by humans who carry their own autopoietic schemes, their mindsets, and their own perceptions of the reality.

Conceiving of cybernetics as the art and science of governing implies that there is no objective property of things out there in the context that could be used to determine the single best way to achieve the goals of an organization. In a complex environment, an actor cannot rely on a single strategy and a single method (Nicolis & Prigogine, 1989; Dominici, 2011, 2012). The best guide of an organization will have a combination of creativity and discipline, and to that extent, art and science are complementary. Elliot and Powell (2002: 134) assert that:

> «*Scientific research can be thought of as a practice, as something done over time. It could be argued that the conduct of any practice can be thought of, at least potentially, as an art*.»

The subjective nature of cybernetics makes the *kybernetes* a "scientist-artist" in charge of shaping reality and guiding the organization over time through a path that will lead towards its goals, being aware that there is not only a single path to the goal, that there is not a single *"best practice*" for everybody and for everything.

The kybernetes creates through the very act of creation.

3. KNOWLEDGE OR ACTION?

«*[...] life is not a problem to be solved, but a reality to be experienced.*» (Søren Kierkegaard, quoted in Steele, 2002: 159)

Problems are often the path through which we can learn by action. As we continue to improve, we come to value the lessons learned through our problems. What must be avoided is "problem thinking" becoming a problem in itself. There is much academic discussion about how the world is complex, about how the problem of the twenty-first century is the increasing complexity of the social and economic scenarios, and so on. But these reflections are often limited to mere philosophical speculation, and rarely suggest how to deal and "act" in complex contexts.
Some approaches to complexity rely too much on abstraction from the competitive character of action. As pointed out by Martin Shubik (1982, quoted in Scholz, 1893: 3):

«*One of the most important problems of our world is the trembling hand*.»

As Edgar Morin would say (1990), [the kybernetes] needs some archipelagos of certainty to navigate on the sea of complexity. The temptation of reductionist models, and the reason why they are still so strong in managerial (mis)practice, is that they are "comfortable" and capable of exorcising the fear of mistakes coming from uncertainty. This is actually what happens today with most business consulting (Dominici, 2011) where consulting agencies, being marketing-oriented, produce business models to satisfy the firms' demand for "magic formulas" that promise to bring them out of the crisis. Unfortunately the excessive abstraction and fuzziness of most approaches to complexity leaves space for this kind of "promising" reductionist business model that, of course, cannot keep their promises and thus often create more problems than they claim to solve. As Mihata (1997: 34) points out:

«*The problem with complexity is that it is - well - complex. It is difficult to conceptualize, much less operationalize, emergent phenomena. Thus, as intuitive and even obvious as the idea of emergence may be, it has not advanced much beyond rhetoric, metaphor or disclaimer. If anything, the effect has been to trivialize emergence as either too obvious or trite to be theoretically useful, or too complicated to be practically useful*.»

As suggested by Duncker (1945), what is lost is the power of feedback as way of learning by doing-learning by mistakes through correcting variation. In other words (Groner et al, 1983: 103):

«*[...] in a complex world, the alternatives of action are not given but must be sought out*.»

Of course, this does not mean that the kybernetes must act without thinking; both thinking and acting are necessary to deal with complexity. Just as thinking without acting is a mistake, acting without thinking is of course also an error. As Yolles (1999: 13) points out:

«*Management can be argued as being concerned with inquiry and action, and involving cybernetic processes*.»

Thinking implies checking the feedforward against the feedback as way of learning—that is learning by doing and learning by mistakes in a continuous loop. This loop in characterized by the cybernetic type of circular causality given by the loop. Socrates assertion that "*I know that I know nothing*" implies that we never stop learning, and that learning is a continuous and circular process that does not proceed straight from "not knowing" to "knowing," but requires that, sometime, we unlearn something to learn something different; this is the circular loop of life and learning symbolized by the snake "*ouroboros*." In this cyclical learning process, action contributes to knowledge and knowledge adjusts action, involving the agents in the context into this learning loop.

Action is evident in the real world through an organizing process that is, in effect, a transformation of reality. In other words, action is the way by which the kybernetes, through a thinking-action logic, can identify those archipelagos of certainty that make possible to guide the organization through the sea of complexity towards improvements of the context in which it operates. As McNulty and Canty (1995: 57) point out:

> «*Action learning develops the ability to create change and not be afraid to do so. It enables members to see and understand the concomitant change that is happening inside themselves so that they can do it again with ever greater facility*.»

Cybernetics can suggest a path of action that goes beyond passive "*thinking about complexity*," which includes thinking, experiencing, and acting.

> *«Cybernetics is a way of thinking that bridges perception, cognition and living-in-the-stream-of-experience (the involvement of the observer) [...].»* (Glanville, 2007: 1175)

To be successful, the kybernetes must be able to combine knowledge with the required action. Knowledge alone is just "*power in reserve*" (Scharmer, 2009)—a reserve of possible actions that are useless if not applied in the world. Knowledge supports the generation of visions of the future (feedforward), but these visions require action if they are to be helpful in reach individual and/or organizational goals.

Some useful indications about the implementation of this perspective into business science are suggested by the field of "*action research*." Action research is research in which the researcher enters a problem situation, "takes part" in the effort to improve things, and makes that experience the focus of his or her research (Lewin, 1946). As highlighted by Brooks and Watkins (1994: 8):

> «*Complexity rejects the idea that one generalisable solution can fit multiple situations and establish a dynamic and ongoing inquiry into the particular*.»

Therefore, every theory or model must be experimented with in specific situations in the real world. In particular, economics and business science cannot make "experiments" in a lab or base the results of research on computer simulations and mathematical formulas alone. The testing laboratory of business research is represented by firms, and each approach must be tested on firms that are part of a social and economic context. If we fail to do this, we will remain in the field of mere philosophical speculation, which is of little utility for finding effective ways out of the crisis. In other words, the art and science of management (which governs the organization) is concerned with both knowledge and action linked together in a cybernetic causal loop.

The systemic-cybernetic approach gives no "magic formula" that can solve all problems with an algorithm, but it can give a practical approach to overcoming several possible states of crisis.

4. THE BATHOMETER AS A CYBERNETIC PROTOTYPE

As outlined by Datta (1994: 67) in the following metaphor, we need to go deep into reality through action if we are to grasp the way of dealing with complex reality, by diving into the deep water of complexity:

« *[...] neither the quantitative hook set for the big fish not the qualitative net scaled for the little fish adequately captures life in most seas. We need a paradigm to help us become scuba divers*.»

Applying the approach of cybernetics with action is consistent with the notion of adapting to the environment that is fundamental to complexity. Cybernetics can be a way of bridging thinking, knowledge, and action, thus becoming a learning tool for trying out solutions to local and specific problems by thinking in order to implement a prototype of action as a feedforward tool for reading the feedback coming from it.
Cybernetics gives us two powerful tools for overcoming the fear and inhibition deriving from complexity: "feedback" and "feedforward."
Feedback can be used as way of learning by doing or of learning better through mistakes. But before making mistakes to learn, we need to think in order to simplify complexity in mental schemes, and to have a "feedforward" of possible scenarios. As Lee (1997: 23) summarizes:

«*Interactive component relationships create hierarchical levels of complexity. Protracted over time, component interactions 'feed forward' to produce the macroscopic configuration of components that is discernible at any given point; 'feedbacks' describe the continual accretion of effects from previous interactions, which may in turn alter lower-level interactions and higher-level configurations at the next point in time*.»

Our brains have finite capabilities (e.g. Beer, 1974: 58), and hence simplification is necessary for every human decision and action. When the kybernetes observes the suprasystems in the environment (Golinelli, 2010), he observes them from "outside," hence considering them as black boxes. As Espejo and Reyes (2011: 9) point out, when the observer is situated "outside," he treats the observed system as a simple entity, ascribing to it some attributes and studying its interactions with its environment. This type of description is sometimes necessary to cope with the complexity of the world (Espejo & Reyes, 2011: 10).
The necessity of simplifying complexity, in order to make decisions and to move to action, has been pointed out in neurophysiology by Alain Berthoz (2011), who introduced the concept of simplexity, which describes how living organisms (and hence, how viable organizations) need to find conceptual maps that allow them to deal with information and conditions, while taking into account past experiences and anticipating future ones. Given the limits of our brains, these conceptual maps cannot include all the potentially infinite occurrences of complex reality. Using feedforward, the kybernetes can eventually change, map, and rapidly elaborate new solutions, to plan how to act and react in different situations. The capacity of a viable system to survive is hence given by the kybernetes' ability to find conceptual maps consistent with the system scopes, and useful for finding directions of action and imposing his own rules in the context. Only with a map can the viable system act in the midst of the uncertainty of a complex world. These maps call for a conceptual simplification that can be managed by our cognitive capabilities, in order to act in the best possible manner (Pitasi & Dominici, 2012).
In other words, feedforward allows the kybernetes to find maps that allow him to grasp in advance, and to be able to modify, the deviation that a certain input could cause to a possible desired final state, while the feedback both works as a regulatory mechanism inside the chosen conceptual map and, at a higher recursive level of decision, supplies inputs as a starting point to adjust the feedforward planning and change the map.

A way to practically implement this cybernetic framework is to develop prototypes to explore the future, by doing something small and fast that generates feedback from all the key stakeholders (Scharmer, 2009).

The metaphor I propose here is that of the "*bathometer*." A bathometer is an instrument used to measure the depth of the sea beneath a moving vessel. Using a bathometer, the captain or kybernetes can know if he is sailing in safe waters. The bathometer monitors the depth of the sea by plunging into the water, thus avoiding an accident that might occur if a route were followed without checking what is happening where the captain cannot see. The bathometer

- probes the depth of the sea;
- discovers what is not visible to the eye of the captain;
- takes the risk out of what is under the sea and cannot be seen from the ship;
- gives feedback about the bottom of the sea;
- and supplies inputs for feedforward to modify the route of the ship.

In other words, the bathometer is a metaphor of a prototype.

A prototype with feedback can give clues about the true merits of any kind of change in organizations or products. A prototype may be an organizational unit, a new product, a new process, etc. The prototype enables the kybernetes to receive feedback which help improve the prototype, and which can be used for feedforward thinking in the design and organization of new prototypes. Moreover, using a bathometer or prototype risks only the bathometer or prototype, avoiding more serious damage to the ship or firm. To be useful, a bathometer or prototype must also have the following characteristics:

- It must be clear and possess a single focus, while being easy to read and interpret, so that it can supply unambiguous feedback;
- It must be resistant to whatever in its environment threatens to inhibit its functioning, in order to be able to supply the necessary feedback.

5. THE GOOD KYBERNETES: CONCLUSIONS

Uncertainty, unpredictability, lack of information, and "liquid" contexts in continuous change moved by changing actors (Bauman, 2000) are the characteristics of today's complex social and economic contexts. To overcome the fear of acting that arises in such circumstances, the manager or kybernetes requires new skills to deal with different models of depicting and manipulating new "possible" scenarios towards organizational goals. This implies the necessity of conceptual tools that can help the kybernetes to give directions in the "mare magnum" of complexity, disclosing complex issues and transformation paths that cannot be grasped by the application of a single model (Dominici, 2011). Since it is not possible to forecast events and future scenarios with a single model, every decision needs to be tested through action in the real world. The cybernetics approach supplies the kybernetes with two powerful tools, "feedback" and "feedforward," through which he can act and learn by mistakes. Building prototypes is crucial if the kybernetes to choose the direction appropriately and to understand his mistakes, in order to improve decisions and the actions consequent on them. The good kybernetes must be

able to continuously learn by mistakes. The good kybernetes must conceive of errors, not as failures, but as opportunities.
Of course, even using a prototype or bathometer is not without risk. Today high levels of competition require decisions to be made quickly, and this may lead to "*slipping on a banana peel*." The organization must be viable, but the kybernetes must also be resilient. For organizational resilience is the ability of the viable system to return to the previous (or desired) state after an unexpected perturbation occurs. For the kybernetes, psychological resilience is the ability to cope with stress and adversity, resulting in the individual bouncing back to a previous state of normal functioning, or to "*posttraumatic growth*," in which the occurrence of hardship leads to better performance.
In summary, the main criteria for a good manager or kybernetes in the twenty-first century should be knowledge, an aptitude to action, the ability to learn from mistakes, and psychological resilience which allows eventual failures to be damped and absorbed, learning from these failures, and starting up again to act better than before.

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