

**CYBERNETICS AS A THEORY OF MANAGEMENT:
ABSTRACTS PREPARED IN 2014-2015**

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PREFACE

The Research Program in Social and Organizational Learning at The George Washington University hosts visiting professors for periods of several months or an academic year. In the 2014-2015 academic year, the Research Program hosted two visiting scholars. Both were Fulbright Scholars. Some of these abstracts were prepared by professors and visiting scholars associated with the Research Program. Others were prepared for panel sessions at conferences on cybernetics or systems science.

Abstracts 1-5 are from a Panel on Management Cybernetics held by IEEE in Boston, MA, June 24-26, 2014.

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A JOURNEY WITH CYBERNETICS IN A CONSULTING COMPANY

MGPL Narayana
Tata Consultancy Services

Tata Consultancy Services (TCS) is a leading IT services, consulting and business solutions organization. Its association with Cybernetics and Prof. Norbert Wiener can be traced back to the 2012 IEEE Founder's Medal recipient, Dr. F. C. Kohli, former TCS chairman and also referred to as the 'Father of the Indian Software Industry'. He was a student of Prof. Norbert Wiener at Massachusetts Institute of Technology (MIT) in 1950. This relationship seeded in Dr. Kohli a vision to start the Systems Engineering & Cybernetics Centre (SECC) in TCS. In 1981, he invited Prof. P.N. Murthy, a Ph.D. in Aeronautics and Astronautics from the University of Illinois, then teaching in IIT Kanpur, to lead the Centre. Prof. P.N. Murthy along with a team of researchers developed new models and applied them for resolving complex business and socio economic problems by undertaking consulting assignments from the public sector, governments and industry. Prof P.N. Murthy during his career spanning more than 25 years in TCS alone published articles and papers through which he introduced the science of complexity which have detailed systems models and concepts as theory and their application to real life management problems. This was to make today's managers and consultants feel intellectually elevated and provide stimulation for complex thinking. The work at this research centre has resulted in several models using cybernetics principles. One of the key models is a Cybernetics Influence Diagram (CID) which helps in understanding the cybernetic nature of a system. SECC later re-christened as Business Systems and Cybernetics Centre (BSCC) in 2004 was headed by Prof. Kesav Nori, popularly addressed as "creator of computer cures", due to his love for programming languages, meta tools and derivation of tools for software processes. He contributed to this field by applying the concepts to software quality problems where he articulated newer models. Headed by Mr. M.G.P.L.Narayana for the last five years, the current focus of this research center is in the area of consulting, competence, quality, value, risk and design under an umbrella research program called "Trusted Business Adviser". The center has been instrumental in creating a footprint for work done in the cybernetics area in International Forums and enabling its application to the Management Consultancy context in client engagements.

HOW CYBERNETICS PROVIDES A GENERAL THEORY OF MANAGEMENT

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The various fields of management – finance, accounting, marketing, operations research, organizational behavior, etc. – have each developed descriptions of some aspects of management. In each case the variables chosen are different. Students are asked to integrate the different perspectives in a capstone course at the end of their degree program. Alternatively, cybernetics provides a way of integrating the different perspectives in management by offering a more general theory. The more general theory focuses on the regulation of variety in the interests of viability. Rather than searching for linear causal relationships among variables in a particular subfield of management, cybernetics emphasizes the circular causal activities involved in management. As an example, Stafford Beer's Viable System Model describes a successful organization as an adaptive system that is able both to deliver the current product or service and to develop the next product or service. As a second example, focusing on the need to match the variety in a regulator with the variety in the system being regulated leads to several strategies for amplifying management capability. Cybernetics offers a way of integrating the subfields of management with a common language and a shared frame of reference.

CYBERNETICS AS A FOUNDATION FOR ALTERNATIVES TO HIERARCHICAL THINKING: IMPLICATIONS FOR MANAGEMENT

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The idea of recursion (or circularity), a central feature of cybernetic thought from its beginning, suggests the possibility of non-hierarchical organizations. Realizing this possibility in everyday life has been problematic for many reasons, including the difficulty of imagining any economic organization that is not reward-, achievement-, or goal-oriented, a way of managing that seems to require a hierarchical structure. Hierarchy is simply the way we think about dealing with complexity—we divide things into groups or categories and then subdivide them, and so on. People get assigned to manage each group and a CEO at the top manages the whole. Our language and its logic do not readily support alternative ways of thinking, and the hierarchical, reward-oriented way of thinking is reinforced by the political economic systems that imbed our organizations and most other aspects of our everyday lives.

So, attempts to create more democratically governed, non-hierarchical organizations result in matrix, circular and other forms that still have an underlying (or default) hierarchical structure; even Stafford Beer's viable systems model is presented in a hierarchical form. However, Beer spent the last years of his life developing a group interactional process called syntegeation that is embedded in a nonhierarchical structure. The structure is based on a polygon with 30 edges, 12 vertices and 20 faces called an icosahedron. Each edge is a person, each vertex is a project or task, and each face represents how projects are interrelated through the people doing them. The structure is dynamic and holds together as the default structure, even as temporary hierarchies are formed to get things done. This development represents a different way of thinking that requires support from both the early cybernetic ideas of feedback, control, information and communication, and the more recent cybernetic ideas of reflexivity, autonomy, avoidance and conversation. Beer was, of course, strongly influenced by Norbert Wiener, including his book *The Human use of Human Beings*. We are now at a point where Wiener's vision of a world where commercialism and militarism do not provide the primary criteria for global decision making can be imagined. Desires as goals are replaced with desires as constraints, and managing to achieve goals (and rewards) is replaced with managing to avoid the undesirable—means and ends become indistinguishable.

THE LEGACY OF STAFFORD BEER AND MANAGEMENT CYBERNETICS

Allenna Leonard

The Complementary Set and the Cwarel Isaf Institute Toronto, Ontario, Canada Sixty years ago, a young man named Stafford Beer wrote to Norbert Wiener to say 'I think I am a cybernetician'. Correspondence and meetings ensued, and Stafford was inspired by both the technical possibilities in Wiener's work and the sense of social conscience that was evident in his *The Human Use of Human Beings*. Stafford was very proud when Norbert Wiener declared that if he could be considered the father of cybernetics, then Stafford could be considered the father of management cybernetics.

Stafford was among many in the field whose beginnings were in what is now considered to be operational research during World War II. From there, Stafford went into the British steel industry where he began building neurological and set theoretic models of processes. This work led to the Viable System Model that nominates the necessary management functions that correspond to functions in the human nervous system. He went on to apply the VSM in a number of settings – the most famous of which was the work done under Salvador Allende's presidency in Chile. Stafford next developed the Team Syntegrity process that uses cybernetic ideas of variety and heterarchy to bring multiple perspectives together to determine a common future.

The juncture of methodologies and attention to the notions of ethics and justice that informed both men is a legacy that is valuable and useful to carry our work forward into a future with challenges that were identified and foreseen by both men.

INFORMATION SECURITY GOVERNANCE OF MODERN CYBERNETIC SYSTEMS

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The design of cyber-physical systems rests on the foundation of the theory of cybernetics developed by Norbert Wiener at MIT in the 1950s. Cyber-physical systems are the product of a trans-disciplinary engineering design process—mechatronics—that integrates electronic, software, computer, and motor control. Cyber-physical systems and trans-disciplinary design are, therefore, important to the security of these increasingly integrated and pervasive systems. Stafford Beer introduced the Viable System Model as a blueprint for designing the communication and control aspects of viable systems. It is a model for organizational structure that is based on the structure of the human nervous system. A system is considered to be viable if it is able to survive in a particular environment. The viable system maintains itself in a homeostatic manner and exhibits survival, self-production, and identity through ‘coherence’ among its component sub-systems. This is essentially a systems approach to address organizational complexity. The Viable System Approach has at its heart the recognition of ‘Management Control’ structures and processes best suited to cope with the environmental changes.

Information Systems support and help develop business management at all levels by providing support for policy and decision making as well as control and coordination of the operations. The disruption or destruction of these information systems can cause serious disruption to, or loss of, businesses. As systems increasingly come under threat from both internal and external agents, there is a need to establish vigorous and dynamic responses to protect information assets. If an organisation is viewed, metaphorically, as an entity that seeks to continue to live and grow in a world full of potential threats, it must have a mechanism that is capable of dealing with and recognising threat and communicating particularly dangerous threats to a point that is capable of taking immediate remedial action. Information Security governance could thus immensely benefit by incorporating the underpinnings of a viable system.