

Technoethical Inquiry: From Technological Systems to Society

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Abstract:

This paper explores technoethical inquiry as a social systems theory and methodology used within the field of Technoethics. The purpose is to leverage readers understanding of theoretical concepts and considerations underlying technoethical inquiry. To this end, the paper is divided into three sections. First, it sketches out social systems theory, its general principles, and its unique approach to the study of society. This helps to situate social systems theory within a larger context of social study and distinguish it from other approaches. Next, the paper discusses technology as a central organizing construct of contemporary society viewed as a technological system. This helps to clarify the nature of contemporary society, explain the intermediating role of technology in society, and address the new social/ethical considerations arising from the intermediation of technology in society. Finally, technoethical inquiry is posited as a social system theory and method for guiding social and ethical inquiry. Examples derived from the study of mass media are used to illustrate basic principles of technoethical inquiry.

Keywords: Technoethics; Technoethical Inquiry; Technological Society; Mass Media; Communication; Social Systems Theory

Résumé:

Cet article explore la recherche techno-éthique comme une théorie des systèmes sociaux ainsi qu'une méthodologie qui est utilisée dans le domaine des techno-éthiques. Le but est de renforcer la connaissance du lecteur des concepts et considérations théoriques sous-jacents aux enquêtes techno-éthiques. À cette fin, l'article est divisé en trois sections. Premièrement, il illustre la théorie des systèmes sociaux, ses principes principaux et son approche unique à l'étude de la société. Cela aide à situer la théorie des systèmes sociaux au sein du contexte plus large des sciences sociales et de la distinguer des autres approches. Deuxièmement, l'article aborde la technologie comme étant une construction centrale de l'organisation de la société contemporaine, perçue comme un système technologique. Cela aide à clarifier la nature de la société contemporaine, d'expliquer le rôle inter-médiateur de la technologie dans la société et à adresser les nouvelles considérations sociales/éthiques qui émergent de l'inter-médiation de la technologie dans la société. Finalement, la recherche techno-éthique est postulée comme une théorie des systèmes sociaux ainsi qu'une méthode qui sert de guide aux enquêtes sociales et éthiques. Des exemples dérivés de l'étude des médias de masse sont utilisés pour illustrer des principes de base dans la recherche techno-éthique.

Mots-clés: Techno-éthiques; Enquête Techno-éthique; Société Technologique; Médias de Masse; Communication; Théorie des Systèmes Sociaux

Introduction

The time of the technological society is now! Contemporary society places an enormous emphasis on how scientific and technological innovation leads to change within the world we live at an extraordinary pace that is difficult to keep up with and even more difficult to explain. This is in conflict with traditional humanistic notions that place human beings at the center of life and society. Within a technological society, the world can no longer be likened to a piece of clay which humans manipulate at will with a high degree of certainty and control. With the advent of modern science and technology, human reality is too complex to be subsumed under traditional humanistic notions of individual life and society. This is because different dimensions of life and society (i.e., physical being, conscious experience, human values, societal norms, cultural meaning, law, and social interaction) are increasingly intertwined within an intermediated system of technology firmly rooted at the base of contemporary life and society.

The rise of the technological society is accompanied by a social and ethical crisis that society is now struggling to deal with. Because of the tremendous power and impact of such technological intertwinements, social and ethical considerations are now at the forefront of public concern and academic interest. However, due to the complexity and multiplicity of human-technological intertwinements that arise, it is an ongoing challenge for social scientists to keep up with changes that occur in so many areas. What further complicates the situation is that

many of these changes are not directly observable and require sophisticated strategies to discern. One only has to consider the plethora of social and ethical considerations connected to Internet use (i.e., privacy issues, censorship, cybercrime, etc.) to appreciate how difficult it is to identify all key aspects of knowledge needed to inform decision-making concerning Internet use in various contexts. In response to this situation, technoethical inquiry derived from the field of Technoethics offers a theoretical base and set of tools for moving forward in the study of social and ethical aspects embedded within our technologically oriented society.

Technoethics was officially coined by Mario Bunge in the 1970s (Bunge, 1977) when arguing for increased moral and social responsibility among technologists and engineers concerning their creations. Bunge stated, “The technologist must be held not only technically but also morally responsible for whatever he designs or executes: not only should his artefacts be optimally efficient but, far from being harmful, they should be beneficial, and not only in the short run but also in the long term” (1977: 99). Bunge recognized the need for creating a new type of ethical inquiry to address the special problems posed by science and technology (Bunge, 1977). Increased attention to Technoethics led to the creation of a new field of social study on technology and ethical considerations. According to the *Handbook of Research on Technoethics*:

Technoethics is defined as an interdisciplinary field concerned with all ethical aspects of technology within a society shaped by technology. It deals with human processes and practices connected to technology which are becoming embedded within social, political, and moral spheres of life. It also examines social policies and interventions occurring in response to issues generated by technology development and use. This includes critical debates on the responsible use of technology for advancing human interests in society. To this end, it attempts to provide conceptual grounding to clarify the role of technology in relation to those affected by it and to help guide ethical problem-solving and decision making in areas of activity that rely on technology.

(Luppicini, 2008b: 4)

Technoethics is to technoethical inquiry as a roadway system is to automobiles. Technoethics is open to a variety of approaches from different disciplines and fields. It is a broad roadway system with many connections, many places to come from and many places to go. Technoethical inquiry is a powerful and versatile automobile that operates regularly on this massive roadway system. Technoethical inquiry, as it is developed in this paper, is a social systems theory and methodology used within the field of Technoethics for studying society as a technological system with an emphasis on its social values and ethical aspects. It is not the goal in this paper to provide a comprehensive review of the general field of Technoethics and its applications, since this is covered elsewhere (see Luppicini & Adell, 2008). Neither is it to compare technoethical inquiry to other social systems theories. Rather, it is to provide a basic overview of key theoretical concepts and considerations underlying technoethical inquiry. The paper begins with a sketch of social systems theory, its general principles, and its unique approach to the social study of society. This helps to situate social systems theory within a larger context of social study and distinguish it from other approaches.

What is Social Systems Theory?

Social systems theory is a branch of systems theory that has a specific way of looking at society. It developed largely in reaction to a longstanding anthropocentric humanist tradition that tended to define society as an assembly of individuals. In contrast with humanist (human centered) approaches within modern European and North American social thought (i.e., Hobbes, Rousseau, Habermas, Rawls), systems theory describes society in terms of events and occurrences arising from observing system operations. The communication operations of mass media in society refers to what is observed (e.g., a commercial) in some medium (e.g., television, satellite radio). The communication operations of electronic communication in society are observations of communication exchanges (e.g., email messages) in some medium (e.g., Internet). Within this technological context, it is possible to discern how the central role of an individual human being is transformed since many operations can arise from multiple individuals (e.g., media network), one individual (e.g., mobile phone user), or artificial agents (e.g., machine communication). What is important to emphasize is that the multiplicity of human and non-human operations in society cannot be reduced to the actions of individuals even though individuals participate in system operations in a variety of ways. In other words, there is a recognition that conceptualizations of agency (human and artificial) should reflect the actual complexity of the system (society). Examples of this can be found in Pask's M-individual/P-individual notion, Minsky's Society of Mind perspective, and Latour's Actor Network Theory (Latour, 2005, Pask, 1975, Minsky, 1975).

Systems theory rejects traditional dichotomies used to separate mind/brain from body and mind/brain from world. Instead, it considers reality to be a constructivist complexity replacing assumptions of external agency with assumptions of social system self-construction (originating in biological systems theory). The idea is basically that a social system produces (and reproduces) itself and its boundaries/separation from its environment. A social system produces its own systemic reality, which is essentially the result of the constructed difference between the system and its environment. Social systems theory relies on the notion of autopoiesis (derived from combining the Greek words "autos" (self) and "poiesis" (production)) drawn from biological/living systems theory. As stated by Varela:

A living system is an organization that preserves itself as a result of its organization. How does it do this? It produces components that produce components that produce components. This is no mystery: enzymes produce enzymes. The boundary of the cell is its membrane. The membrane again is a process that limits the diffusion and thus preserves the internal network of production that produces a membrane. Everywhere you see systems that exist due to a kind of Munchhausen-effect: they manage to grab themselves by the hair and pull themselves out of the swamp. . . This is the case in many areas (Biological) autopoiesis is only one example. Other examples are language, and possibly, families, firms, etc.

(1997: 148)

The autopoietic production of a system (biological or social) is able to maintain itself and its systemic reality because it not only produces itself but it also produces its own boundary or separation from its environment referred to as operational closure. Just as the boundary between

a cell and its membrane is maintained, so too is the boundary between society and its environment. In other words, by virtue of a social system's operational closure, it produces and reproduces itself by maintaining its own sub-systems (i.e., cognitive, communicational, economic, physical, political, legal, cultural, religious, aesthetic) and their operations without being absorbed into the environment. The operational closure of autopoietic systems does not mean that they are completely closed off from their environments. Just as a cell is able to react to and interact with its environment (through osmosis), interactions between society and its environment occur without compromising the systematic integrity of the social system.

How does a social system interact with its environment? Social systems are systems of difference, and are constituted by their system-environment distinctions. Thus, a system is defined in terms of the complexity and multiplicity of its system-environment differences. A social system interacts with its environment by building up and maintaining social sub-system operations (i.e., cognitive, communicational, economic, physical, political, legal, cultural, religious, aesthetic) that are used to observe and react to the environment. All autopoietic systems (including social systems) are what Heinz von Foerster referred to as observing systems because they observe and can be observed. This means that social systems and their subsystems are able to observe themselves within the environment, reflect on their own sub-system operations, and make adjustments. Because social systems are observing systems, a society constructs itself and its parts as well as its understanding of the environment and other systems as differentiated from itself. By means of its internal operational mechanisms, society is able to produce understanding about the environment and other observed systems within itself.

How social systems are differentiated from their environment is system and sub-system specific. This entails that each social system is differentiated not only from its environment but also from other social systems that existed in previous periods. For instance, the reality of ancient Greek society is derived from specific society-environmental constructions that were not the same as other societies at this time or societies that followed. Under systems theory, reality exists as a multitude of system and sub-system constructions that are unique to each system. Similarly, how social sub-systems within social systems are differentiated from their environment is sub-system specific. This marks a radical break from ontological and epistemological traditions which assume a common reality that can be represented (at least potentially) to all participating systems in the same way. This also avoids the age old problem of attempting to discern which representation of reality is correct (or the most correct). An autopoietic system's openness to an environment is attributed to the internal activity of its sub-systems. Because the brain is operationally closed, it can produce physiological operations of experienced events in the external world observable in the brain. Because the mind is operationally closed, it can produce cognition of physiological events in the brain observable in the mind/consciousness. And because communication is operationally closed, it can have communications of events in the mind or external world observable in communications.

Social subsystems interrelate by forming an intra-social environment for other subsystems which evolve within the system. Like the systems themselves, sub-systems are operationally closed and open to what is external to them. That is, each sub-system is an autopoietic reproduction of itself which creates its own systemic reality. Each subsystem has its own set of perspectives by which it observes the other subsystems (intra-social environment) and the environment. For instance, politics can observe the other sub-systems from a political standpoint and interpret society in political terms. Economics can observe the other sub-systems from an economic standpoint and interpret society in economic terms.

Under a social systems view, every society is a unique system unto itself. Because each society is unique, the interrelations among sub-systems are also unique with inequalities arising when operations within one sub-system flourish at the expense of other sub-system operations. This entails that earlier societies were differentiated in different ways than our society is today. It also entails that, over time, the complexity and operational importance of some societal sub-systems in any society increases while others dwindle. For instance, the operational role in our society once held by religion is not the same today as it was 400 years ago before the industrial revolution, before the advent of mass media, and before the transforming power of globalization. This highlights the important role of technology in defining the society we live in.

As is developed in this paper and work elsewhere (see Luppicini, In press), it is argued that our contemporary social system is a highly specialized technological system marked by rapid technological changes and corresponding ethical/social dilemmas. To this end, technoethical inquiry is posited as a social systems theory and methodology for studying contemporary society. The following discussion provides a brief overview of technoethical inquiry as grounded in fundamental transformations in society and the human condition interwoven within an increasing technologically intermediated world. It describes how technoethical inquiry attempts to overcome this paradox by promoting an interdisciplinary study of technology as a social system with both technical and non-technical (ethical, social) aspects that must be examined.

Technology and the Rise of Technoethical Inquiry

From Technology to Technological Systems

In the beginning there was technology! We have gone from a society that manipulates technology as an object to a society that constructs itself within a technological system. Although technology has been defined in many ways, its derivation from the early Greek term “techné” comes closest to reflecting the richness of technology within contemporary society. Technology (as techné) was valued highly within the Roman Empire and was equated with the human power to construct homes and roads. Cicero believed this was no less than the creation of a second nature (*Alteram Naturam*) as reflected in the following statement. “We sow corn and plant trees. We fertilize the soil by irrigation. We dam the rivers, to guide them where we will. One may say that we seek with our human hands to create a second nature in the natural world” (Cicero, 1972). This emphasis of techné as ‘second nature’ is significant because it connects social development and technological activity in the world with the internal workings of human life and society. In other words, it placed technology at the center of human meaning and social progress.

The richness of this conceptualization of technology has regained its importance in society due the transforming effect of technology as it transitions from being on the periphery of society to being firmly entrenched as a core construction within our social system. There is now a growing recognition of the transition in society from a nature oriented to a technology oriented society where technology plays an increasingly important intermediating role in human activity once occupied by nature. Mitcham (1999) explains, “Nature is less and less immediately present to human experience, and more and more mediated by a complex manifold of geometrical enclosures, artificial materials, large-scale structures, processing systems, consumer products, and electronic communications media” (128).

Reflecting on the complex character of our contemporary world defined by technology is perhaps the most challenging problem of the 21st century. What makes this challenging is not due to technology (in itself), but rather, the elusive character of technology within society. As some new technologies become accepted and integrated in society (i.e., cell phones, Internet), they tend to become invisible to individuals and disappear into the background of everyday life (Volti, 2009). Other technologies, developed in recent years (i.e., nanotechnologies, sonar, radar) are elusive because they are not directly observable in time and space. The main consequence of this is that the powerful intermediating role of technology is poorly understood because it is not noticed. This blocks any efforts to provide responsible decision making about which technologies to nurture, which to suppress, and in what contexts.

Defining technology as a social system draws on the core principles in systems theory in unique ways as will be seen. As a social system, technology is a self-producing (autopoietic) and operationally-closed system situated within and differentiated from the environment (nature). This system is constituted by numerous interdependent sub-systems which co-evolve to create a complex multiplicity of social system-environmental relations. Although each sub-system has separate and mutually exclusive operations, sub-systems are open to the environment and each other (social environment) by observation. *Table 1* illustrates basic social sub-systems:

Table 1: Social Sub-Systems

<i>Sub-system</i>	<i>Core Operations</i>	<i>Values</i>
Law	Production of social norms and regulation of conflict	Justice
Politics	Production of collective and binding decision-making	Fairness
Religion	Production of spiritual guidance	Faith
Economy	Production of wealth	Need satisfaction
Science	Scientific knowledge production	Truth
Communication	Production of information/knowledge exchange	Understanding
Culture	Production of social meaning and practices	Community
Education	Production of social values, education, and professional training	Learning

How each sub-system operates is complex and exceeds the scope of this paper on technoethical inquiry. What is of concern is to explain why the widespread integration of technology in contemporary society has led to a uniquely differentiated society that did not exist in previous periods and how humans fit into this system.

Technological Systems and Human Agency

One of the biggest challenges in systems theory is to accept a more humble conception of human agency than that espoused by traditional humanistic approaches. The anthropocentric role attributed to the human condition throughout the Enlightenment placed the human individual in control of and at the center of society and social inquiry. This society has since been replaced by a technological society defined by complexity and multiplicity. As an integral part of society (as a system), human agency, too has evolved into a more complex multiplicity. We are the “more generation”—more connected to more people more of the time in more speedy and flexible ways.

Virilio (1995) described the development of contemporary life within our technological society as marked by three revolutions that nicely differentiate this society from others in terms of technological advancement and speed. First, the revolution in transportation enabled society to control space by creating machines that allowed people to travel through it. Second, the revolution of communication transmission provided society with control over time and the opportunity to send and receive information faster than previously possible. Third, the revolution of transplantation enabled people to increase their capacity to process information by incorporating information technology into the organism. This revolution in society is also a revolution of agency connecting to well entrenched conceptualizations of cybernetic organisms (cyborgs) found in Cybernetic systems theory and related research literatures. As stated by Wiener:

It has long been clear to me that the modern ultra-rapid computing machine was in principle an ideal central nervous system to an apparatus for automatic control; and that its input and output need not be in the form of numbers or diagrams. It might very well be, respectively, the readings of artificial sense organs, such as photoelectric cells or thermometers, and the performance of motors or solenoids ... we are already in a position to construct artificial machines of almost any degree of elaborateness of performance.

(1948: 27)

Norbert Wiener (1948) provided the theoretic background for the idea of cybernetic organisms and a reconfiguration of human identity and agency in terms of the organization of elements rather than the elements themselves (essences). Cybernetics assumed living elements and technological parts could be exchanged if organized in the right way with respect to their the environment. Cybernetics thinking has influenced contemporary research and development in artificial intelligence and efforts to create autonomous agents (human enhanced, artificial agents) that can self-organize, produce, and reproduce themselves. Complementary uses of the notion of cyborg have been equated with augmentation of the human mind and body through technological enhancements resulting in an entity that is part human and part machine (Haraway, 1991).

Other scholarship related to autonomous agency is found within the cognitive sciences and other work in systems theory. Franklin and Graesser (1996) describe an autonomous agent as “situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to effect what it senses in the future” (1996: 2). Minsky’s (1985) *The Society of Mind* posited an agent based account of distributed consciousness controlled by agents within multi-level hierarchical structures. Perhaps the most

impressive theory of autonomous agency comes from Gordon Pask's (1975) cybernetic oriented conversation theory of learning systems. Pask conceptualized observing systems with interacting structures of communication that were reproduced based on how information is passed on as an organism. In this conceptualization, Pask distinguished individuals as objects (M-individual) from individuals as self-producing conversations (P-individuals). Each person is perceived to be an M-individual constituted by multiple P-individuals that communicate within and between M-individuals (Luppicini, 2008a). Recent work within the field of Technoethics builds further on the re-conceptualization of human identity as autonomous agency (human and artificial) by addressing moral aspects of artificial autonomous agency (Danielson, 1992; Floridi & Sanders, 2004; Sullins, 2008).

What this trend in interdisciplinary scholarship demonstrates is that more researchers are overcoming a longstanding anthropocentric habit and sense of entitlement in placing the individual at the center of everything. There is now a growing awareness (particularly within systems theory and cognitive science) of the complexity and multiplicity of the human condition as it manifests itself within contemporary society also marked by complexity and multiplicity. This does not reduce the importance of the human condition but takes a step back to look at the many ways that human agency, as a complex multiplicity, produces and reproduces itself within an evolving society.

What does human agency mean to a system? Under a systems perspective, society does not consist of human beings. Rather, society is a differentiated social system consisting of sub-systems and intermediated by technology and human agency. Human agency evolves within a social system through its intermediating system and sub-system operations. That is, human agency participates in social system operations within a complex web of interdependent sub-system relations. Observing human agency is achieved indirectly by observing its participation in social sub-systems. This means that a social system can be described without reference to individual humans. The system intermediation between human agency and sub-systems leads to a co-evolution of human agency and social system operations. Through social system intermediation, human agency develops as a complex internal structure that reacts to social sub-systems, other intermediating system elements (technology), and the environment. Human agency, then does not change society directly. Instead, society changes itself by reacting to changes in its sub-system operations involving human agents.

It should also be mentioned that the interdependence of human agency and social sub-systems is a requirement for the social system operation. Social system operation is contingent upon sub-system production and the intermediation of human agency (and technology). It is possible for someone to be included with the system of education but not the political system. For instance, there may be universal access to education in North America that is open to all but that the political system restricts participation (i.e., voting, running in an election) to citizens (defined according to some criteria of who is and is who is not a citizen). Part of the challenge in technoethical inquiry is to identify sub-system imbalances and explain why this is so?

Can human moral values be reconciled with human agency? Yes. Because human agency is part of the social system, the social system includes social and ethical values that are part of human agency that participates in social system production. In other words, under the conditions of system differentiation, social equalities and inequalities are produced by sub-system operations and must be analyzed at that level. The ethical aspects of technological system operations are discussed in more detail in the next section.

Technological System Operations: Differentiation and Intermediation

As discussed above, technological systems, as social systems, are systems of difference defined in terms of their complexity and multiplicity of system-environment differences. Following social systems logic, an increase in system-environment differences increases the complexity of the social system and its sub-system operations. Technology (along with human agency) is the main intermediating relation within a social systems perspective of contemporary society. More specifically, technology evolves within a social system by constructing a second-nature (technology) that intermediates system and sub-system operations. This increases complexity within a social system by increasing the complexity and multiplicity of differences between social sub-systems and its environments. Consequently, through its intermediation, the integration of new technology leads to an increase in social system differentiation unique to contemporary society. The intermediation of technology is part of the general internal structure of our social system and influences it by providing a form of reality that is unique to contemporary society. The intermediation of technology has also been discussed by pragmatists in terms of transactional mediation of artifacts and humans. As explained by McDermott, “Artifacts, then, are human versions of the world acting as transactional mediations, representing human endeavor in relational accordance with the resistance and possibility endemic to both nature and culture” (1976: 220).

Contemporary society viewed as a technological system is unique in that it not only creates itself and its boundaries (system-environment, subsystem-subsystem), it also creates the boundary conditions (intermediations) which influence how the system operates within the environment. More specifically, society is a technological system that constructs itself through system differentiation and intermediation. Consider the advent of ICT’s and how it changes the nature of communication and how it is employed. Within a tribal society, oral communication between individuals was simple and straight forward. Information was exchanged between individuals face-to-face. This is not the case now to the same extent. ICT’s provide opportunities for a variety asynchronous (e.g. email) and synchronous (e.g., online chat) information exchange operations that in multiple forms (visual, text, sound). No longer is communication fixed in time and space for individuals engaged in communication. Now communications can be sent and received almost simultaneously by millions across the globe. In social systems terms, the technological system-environment differences have increased because the complexity of internal operations of the system have increased within the sub-system of communication. The intermediating role of technology within contemporary society is also reflected in communication-other sub-system differences. For instance, the production of collectively binding decision-making concerning the election of a political leader within the political sub-system of society is complicated by technology as new options (and debates) for online campaigning and electronic voting become available. Candidates now have opportunities for greater public participation and communication exchange than ever before. The differences between the sub-systems of communications and politics are more complex when intermediated through ICT use. The exemplary use of social networking tools by President Obama for campaigning in the 2009 U.S. elections and gathering public feedback on new policies is illustrative of the intermediating role of technology between communication and political sub-systems.

Next consider the globalizing role of ICT’s and new manufacturing technologies within societal sub-systems like the economy. Within the global economy, the regional and national

systems have expanded in scope becoming a global economic system with greater complexity than ever before. Cheaper labor for working in manufacturing plants in developing countries combined with cheaper prices in developed countries have led to outsourcing and the growth of multi-national organizations at the expense of local economies. Again, the technological system-environment differences have increased because the internal operations of the system have increased in complexity. The intermediating role of technology within contemporary society is also reflected in economic-other sub-system differences such as culture. The production of cultural meaning and practice is difficult to localize within a global economy because cultures are difficult to localize when its members must immigrate to other countries to participate in the global economy. The complexity of cultural-environment differences increased in contemporary society due to the global scope of cultural meaning production intermediated by ICT's used to connect cultural members around the globe. From these examples, it becomes clear that contemporary society is a technological system with a complex multitude of system-environment differences that are unique.

What is particularly interesting is that the notion of intermediation overcomes limitations of existing theories that offer oversimplified views of one way interactions (i.e., technological determinism). Intermediation does not assume that technology directly impacts or is impacted by a social system or its sub-systems (i.e., law, education, politics, culture, education, communication). Instead it explains the mutual influences within social systems through the intermediation of sub-systems which produces effects that can be observed. These mutual influences (interdependencies) affect system construction and complexity without affecting the structural integrity of the social system involved. Building on the previous example, the recent U.S. campaign for President Obama employed social networking software to reach a greater public creating new opportunities for public feedback on governmental policies. At the same time, the integrity of the communication system operations (to produce information) and political system operations (to produce collective and binding decision-making) remained intact.

Technological Systems and Technoethical Inquiry

The Ethical Aspects of Technological Systems and the Paradox of Technology

Technological systems are ethical systems in multiple ways. First, technological systems are historically at the heart of contemporary transformations in life and society interwoven within an increasing technologically intermediated world. The advent of the Internet, broadband networks, new ICT's, biosensors, genetically modified food manufacturing, new reproductive technologies, nanotechnologies, and neurotechnologies have helped society change itself in ways that were not possible before the advent of these technologies. At the same time, this transformation has created a multiplicity of new social/ethical dilemmas and debates in the public sphere that did not previously exist. This has given rise to what can be referred to as *the paradox of technology*. On one side, individuals and institutions within contemporary society depend extensively on technological innovation for progress and opportunities to improve human life and society within a global economy; on the other side, technology can have anti-human consequences against which individuals ought to defend and protect themselves. The heightened level of public attention and debate concerning technological developments is unique to the recent history of contemporary society. The recognition of this paradox in the contemporary history of technological development has been nurtured in the interdisciplinary field of Technoethics.

Consequently, one of the overarching guiding principles of Technoethics, referred to as the Law of Technoethics, asserts that ethical rights and responsibilities assigned to technology and its creators increases as technological innovations increase their social impact (Luppicini, 2008b). It was posited to address the need for social and ethical responsibilities among those working with and affected by the paradoxical consequences of technological development.

Second, from a social systems perspective, technological systems are ethical systems because social and ethical values emerge from the operations of human agency which participates in social system production. Because of system differentiation, social equalities and inequalities are produced by the intermediation of human agency in sub-system operations which can be observed. Because social and ethical values are attached to human agency, they can be applied to any social sub-system. For instance, the educational system in Cuba over the last 40 years is a model of successful production of inclusive social values and education available to the Cuban population, resulting in a high literacy rate and level of education. At the same time, the political system has inequalities in human agency and struggles with the production of collective and binding decision-making.

A systems approach to social and ethical considerations rejects all ethical theories attempting to provide universal principles that apply to all societies all of the time. There is no one way for a society to be good or bad under a systems perspective because each society is unique and too complex to be reduced in such a way. The social system of today differentiates itself from the environment and previous social systems that existed in the past. Therefore, system approaches delimits ethical inquiry to observable (or potentially observable) operations located in a specific society under the conditions of system differentiation. It also allows a delimitation of systems inquiry to focus on specific sub-systems. As is discussed below and elsewhere (see Luppicini, In press), technoethical inquiry, as a social system theory, relies on pragmatist methods rather than rationalist methods, and relies on empirical data gathering and inductive inferences rather than deductive reasoning. This creates many research opportunities for interdisciplinary work on technology and ethics in society.

The question is how do ethical tensions within social systems get addressed? Technology, as a social system is deeply connected to life and human interest. As such it is an observing system. That is to say, humans can study and learn from technology as a social system because they are part of it as human agents participating in its multiple sub-system operations (i.e., education, law, communication, politics, economy, culture). Acquiring knowledge about technological system operations allows individuals to acquire knowledge and understanding about technology and its ethical aspects. This, in turn, can shed new light on positive and negative elements of technology to help guide ethical decision making. A successful technoethical inquiry is intended to provide opportunities for humans to better understand ethical responsibilities created by technological innovation within our contemporary society defined by technological progress. This, in turn, can be used to help steer the system in ways that reduce ethical tensions within it.

General Aims of Technoethical Inquiry

Technoethical inquiry is a systems approach to Technoethics which studies technology as a social system with a focus on both technical and non-technical (ethical, social) aspects. The overall goal in technoethical inquiry is to leverage knowledge to help guide ethical decision-

making regarding some technological phenomena studied. The following guiding rules of thumb are reworked from Luppicini (In press):

- (1) Technoethical inquiry views society as a self-producing technological system that reproduces itself on the basis of its own self-production and sub-system self-production.
- (2) The derivation of meaning about technological system operations is observable in the intermediation of technology and human agency within various social sub-systems.
- (3) The outcome of a successful technoethical inquiry is defined as the point at which a shared understanding/knowledge is demonstrated concerning relevant ethical aspects of system operations with no new knowledge emerging. This does not require consensus, but rather the identification of all relevant sub-system and sub-system operations applicable to the technological relations to which a technoethical inquiry is applied. What this means is that technoethical inquiry is intended as a research methodology which focuses primarily on knowledge acquisition and the understanding of a social system under investigation.

A detailed discussion of methodological tools is not possible in this limited space but it is noteworthy that technoethical inquiry is not limited to any one set of data collection and analysis strategies. Rather, variety of qualitative, quantitative, and mixed-methods research approaches are applicable. This may include but is not limited to the following: needs analysis, systems research, archival research, content analysis, semiotic analysis, case study, historical research, interviews and focus groups, life history, narrative research, observation studies, ethnographic research, participant observation, survey research, evaluation studies (formative and summative), usability testing, and longitudinal studies. The reason behind such a breadth of methods and tools addresses the interdisciplinary nature of technoethical inquiry and the group of scholars working within it. Regardless of the approach taken, the assumption behind technoethical inquiry is that a systems approach offers a powerful set of tools to leverage understanding about how to live harmoniously in a complex society increasingly defined by a synergy of technology, human activity, and societal relations.

Mapping Technoethical Inquiry onto Mass Media Communications

This paper draws attention to a technological reality and a humbling of the role of humans in society that may be difficult for academics and the general public to accept. Because of the complex and elusive nature of technology within society we do not always understand how it operates and what we do understand we often lose sight of. The transforming powers of technological relations redefine and restructure work, life, and society in a plethora of ways that need special attention to be properly understood. Mass media communications is a particularly interesting area of contemporary society where technoethical inquiry is applicable. To put this in systems theory terms, the study of mass media communications is the study of how communications react to the intermediation of mass media.

Mass media refers to the institutional use of copying technologies to disseminate communication to the masses (mass audiences). In systems terms, the main difference between

face-to-face communication and mass media communications is that mass media intermediates communication operations and circumnavigates direct communication (and many contextual cues that help leverage communicative understanding) between the sender and receiver with indirect communication intermediated by technology. This increases communication complexity within society in multiple ways. This is because the copying capacity of mass media allows for more information to be disseminated to more people in less time. This influences society and society reacts to this pressure of time by shortening the production time of communication as new communications replace older ones. Because of the constant selectivity of information for broadcasting, communication loses its value in society quickly. News today is gone tomorrow, along with the values expressed within it. The built in forgetfulness that accompanies mass media communication creates added pressure on the communication system for self-observation. On the one hand, an overemphasis on the constructed form of reality created within a communication sub-system may lead to inequalities with respect to other important areas of society (i.e., education, health, law) which may suffer. On the other hand, an under-emphasis on the constructed form of reality created within a communication sub-system may lead to an increase in miscommunication within society that compromises system integrity. For instance, the integrity of the mass media was greatly questioned during the post-9/11 news coverage. Arsenault and Castells (2006) conducted an excellent case study demonstrating how the mass media perpetuated false claims leading up to the Iraq War. The authors documented how the majority of media networks continued to propagate false information which biased the views of the public long after the introduction of compelling evidence that such claims were false. In other words, a lack of communication sub-system monitoring and control allowed miscommunication processes (the creation of false information) to propagate itself for an extended period of time before the societal system was able to self correct through other sub-system operations (i.e., political upheaval, public education about the key issues, legal considerations). Within a technoethical inquiry, mass media communication is viewed as intermediated by human agency and the social and ethical values of participating agents. This suggests that mass media communications should be supplemented by a communication analysis when social system imbalances are suspected. One useful tool for technoethical inquiry draws from Toulmin's practical argumentation model which evaluates arguments in terms of whether they can withstand criticism (Toulmin, 1958). Reworking Toulmin's framework provides the following dimensions and guiding questions that can be applied to the sub-system relations of mass communication system operations:

- Claim—Has the merit of the conclusion been established?
- Evidence—Do the facts appealed to support the claim made?
- Warrant—Do statements made justify a link between the evidence and claim.
- Backing—Are credentials provided to back statements of warrant.
- Rebuttal—Do statements acknowledge any restrictions to which a claim may be legitimately applied?
- Qualifier—To what extent do statements express certainty or conviction about the claim.

This strategy is intended to compensate for the intermediation of mass media communications by infusing the communication sub-system with another type of communication (rational argumentation) that connects to other communication sub-system operations and other sub-

systems (i.e., political, legal). In the case of the post-9/11 news coverage, it is obvious how public dialogue/debate, research, actions of lobbying groups, and legalistic considerations on key areas of this mass media communication eventually helped rebalance the power of mass media communications. In systems terms, it helped diversify the information selection process of the overall societal system and retain selected information within the communication sub-system memory for longer, thus, rebalancing the influence of mass media technology on the speed of communication. In other words, other social sub-systems with slower sub-system operations (i.e., legal procedures legal knowledge are often retained in society for decades) reacted to communication sub-system operations (production of mass media content) with their own sub-system operations (i.e., legalistic procedures and production of legalistic knowledge) concerning the Iraq war), which increased the overall diversity of relevant operations (societal reaction to Iraq war) within the overall system.

It must be noted that this paper is limited its coverage of social system applications since it focuses primarily on elucidating theoretical principles and concepts pertaining to technoethical inquiry. However, this example does offer a rough sketch of one area where social sub-system and sub-system operations could help rebalance overall social system operations. Although a full examination is not possible in this limited space, a future research project could leverage understanding on this contentious area of public debate by fully mapping out all relevant specific system operations.

Technoethical inquiry is offered as a suitable approach for leveraging knowledge and understanding required for responsible decision-making and actions within a world both nurtured and threatened by technology. Now that a general overview of contemporary society as a technological system is sketched out, future work in technoethical inquiry could focus on creating a detailed systems view of each social sub-system and core operations involved. Particularly, in the area of communication and media studies, this opens the door to a great deal of promising collaborative research work for communication scholars and systems theorists.

Conclusion

This paper has described technoethical inquiry as a call for a systems study of the interweaving of technology with human agency within contemporary life and society. First, the paper provided an overview of social systems theory and its unique approach to the study of society to help situate social systems theory within a larger context of social study and distinguish it from other approaches. Under a systems perspective, society is described as a differentiated social system consisting of sub-systems and intermediated by technology and human agency. Human agency is viewed as an evolving process within a social system observable through its intermediating system and sub-system operations. Next, the paper positioned technology as a central organizing construct of contemporary society viewed as a technological system. This was accomplished by highlighting the important intermediating role of technology in society and by addressing the new social/ethical considerations arising from the intermediation of technology in society.

Despite the fact that technoethical inquiry offers a unique focus on the interconnection of technical and non-technical (ethical, social) aspects of society, there are limitations to consider. First, this paper did not have the space to provide a detailed application of technoethical inquiry, which would have been helpful for augmenting understanding. As is the case with most, if not all, systems theory work, there are a large number of relationships between systems and subsystems that have to be taken into consideration before applying technoethical inquiry. That

is why this paper focused mainly on basic principles and concepts pertaining to technoethical inquiry, while leaving detailed examinations of social system applications for future research. A second limitation lies in the challenge of applying complex social systems methodologies like technoethical inquiry. This can be time consuming and labor intensive. However, this scholar believes that this limitation is outweighed by the potential for added breadth and depth in analysis. It is recommended that technoethical inquiry (and other systems approaches) be strategically used in the study of complex and dynamic social phenomena within organizations and society.

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