TELETECHNOLOGY SIGNALS: A Theoretical Construct

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ABSTRACT

This analytical study describes, in a general way, via a select literature overview, the historical development of distant communications technology and information (computer) technology; and presents a theoretical construct for TELETECHNOLOGY signals and their manipulation. The visual, sound and binary signalling elements constitute and modulate the interactions of the radiant energy activity within the abstract influx model and relate these to the actual ethnotechnological world. A purview of representative technological terms is broached; implications for the use and management of communications and information technologies are presented; a measurement instrument framework is depicted; and a possible new world view is proposed.

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DEDICATION TO RAË

This work, and the book in progress which is based on this thesis, is dedicated to my daughter,

Raë.

I have created this work with the anticipation that our youth, and particularly our young women and girls may prepare themselves in the fields of science, technology, and communications--these are the disciplines of our future--in order that they may gain access to progressive, central decision-making positions in our rapidly escalating ethnotechnological society, and in order that they may gain competence, with human warmth, in managing and guiding families for successful, fulfilling lives, in addition to each person's full development as a complete person--while living in an increasingly automated technological world culture, one step on the moon, and heart in the skies.

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D.J.C. Martell

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CHAPTER ONE

HISTORICAL PERSPECTIVES OF MEDIATIVE ELEMENTS

Initiation into the genesis of our Electronic Age is by the comprehension that *once* does not exist. In past eras, from the Westernized point of view of time and space, events could possibly take place for one time on a personal, isolated basis and remain socially uncommunicated. Today, this is almost impossible: 1) the world experience of human's *first step*--when a human being <u>once</u> walked on the moon--has been replayed by every media on this planet Earth; 2) the <u>Pioneer 10</u> spacecraft departure--once--on March 3, 1972, carrying messages from Earth, has similarly been replayed and discussed; 3) so, also, was the first transAtlantic <u>Africa Aid</u> television epic held--once--on July 13, 1985, yet <u>Africa Aid</u> societal impact manifested by discussions in all media, along with the internalized memory realities of over two billion viewers, has created the *now* of this event in the daily lives of everyone.

These open-media, shared, global experiences depict the instantaneousness and comprehensiveness of today's mediated communications.

> All information in all places at all times, the impossible ideal. But the marriage of communications links will take us far closer to that goal than we have ever been. (Godfrey, 1980a, page 1)

Once can no longer exist in an open world environment that has incorporated multi-interrelated distant communications capabilities. *Now* the population of Earth is gradually beginning to relate, as a planet "in the sky of Earth" (Sagan, 1973, p.222) within the solar system, and also to the suprasystem--our universe (Sagan, 1980, pp.287-290).

Now we take our place in what is, at present, called the Space Age which, by inference, denotes the capability of Earth's society to master the Electronic Age. Our technical advance during the past two hundred years is startling (p.222). We are on the brink of that mastery with the electromagnetic force (Gottlieb, 1970, p.127) acting both as a bridge and as our guidance system (Barr, 1986, p.B3).

Today's vision and sound systems are global (and, indeed, more than global). These signal systems exist at all levels of communications and they are integral to daily societal exchanges. These signal systems are central to Earth's developing space technology as exemplified in Canada's space program (Canada, 1985; Canadian Institute for Advanced Research, 1986) as well as in the ongoing space programs of the USSR, USA, Europe (and others, long on the horizon, such as in China and, now in process, Japan).

We have exchanged *once* for *now* in all places at all times (McLuhan, 1964, pp.300-307). The work offered herein is intended in some way to assist in bringing about a preliminary understanding of the influx interrelationships of the signals of sight, sound and binary computerized data that are being used in present communications and information technologies in all areas of Earth's expanding planetary culture.

Scope of the Study

Chapter One introduces the three concepts of history, theory building (of signal elements), and implications; defines the scope and sets out the limitations and the methodology of the study. This chapter is mainly the description of media development.

Chapter Two presents an overview of the development of contemporary communications (which includes the computer).

Chapter Three sets out the theoretical construct; explains the operational variables and various signal progressions; and presents three examples for validity testing of the theoretical construct.

Chapter Four a) deals with the implications of *validity testing* and applications of the theoretical construct, and b) proposes an operational-oriented management set as well as a possible general oriented new world view.

The reference materials presented are those that are general-historical, theoretical-construct references; and include some specialist dictionaries and encyclopedias.

Statement of the Problem

Communications and information technologies pervade almost every aspect of our lives. They systematically extend our natural sensory involvement in our environment. We have available an ever-increasing variety of technological devices to use on increasingly sophisticated "electronic highway networks" (Parkhill, 1980, pp.70-95). The continually falling manufacturing costs (Madden, 1980, pp.39-67) ensure the proliferation of affordable consumer electronic devices.

The past one hundred years have brought more and faster changes in technologies for communications than any other period in history. The last twenty-five years have catapulted society into an increasingly accelerated world (Serafini, 1981, p.21), in which a plethora of technological devices, their names, and their operational terms cause confusion among both experts and lay persons (Cordell, 1985, p.23). Only twenty years ago, computer specialists had not yet gained insight into the possibilities of what today the general public expects in highly sophisticated tele-transmission of various information signals (Parkhill, op. cit., pp.69-95)--*in an instant*. Now people expect

> a multiple-access information-retrieval network [with] access to all available information...to manipulate and process that information in almost any way and for almost any purpose they may have in mind (Gottlieb, p.28).

The rapid convergence of various combinations of diverse technologies creates the need for a continuous <u>redefinition</u> of names and terms (Godfrey, 1980b p.98). Many words pertaining to electronics, broadcasting, media, computer science, and to the communications field at large are used in more than one way in various segments of society; this situation applies both in relation to specific contexts and often in a changing (sophisticated engineering) technical sense.

The energizing capability of electronic signals underlies most broadcasting and data tranmission throughout the Western world. The two prime examples are broadcast television and computers. Of these technologies, various words are used to refer to or describe the technology (and the human experience) of television productions; in the field of computers, the complexity of both the computer architecture and the computer programs has given rise to a steadily increasing mass of concepts, terms and activities. The present situation could be improved by some method to examine and to organize the rapidly accumulating literature and to create a basic, yet comprehensive, categorization model for these tele-world elements that constitute our communications and information technologies.

The two prime examples of TELETECHNOLOGY (definition further) are television/ *video* and computers. The world of television or *video* is confusing and in flux. Video is being used increasingly for an expanding number of projects and is merging with other technologies and art forms.

The term *video* has many current meanings which often rely on either the context or on the orientation of the speaker/user. For example, *video* may mean the recording material, format size or the editing style, the type of presentation or the kind of audience served. At times, *video* may mean television production when used to distinguish television or video from, say, a more complex television production. *Video* may be used, also, to describe visuals as distinct from other screen images such as computergraphics. These latter merge in animated videographics automated by a computer. On the other hand, *television* usually refers to a network broadcast program (telecast) that may or may not be produced originally as a video, a (cinematic) film or an original television program. In addition, *video* is used frequently, and in a general way, to describe <u>any</u> electrographic, i.e. television or facsimile (document image reproduction), as distinct from either radio programs or audio casettes. The term *video* is flexible: the meaning resides with the communicators and the receivers.

The word *computer* is used for a wide variety of operations which are improving as the technological capabilities are increased to control more advanced programs, devices and systems. Thus, computer ("information") technologies also need new definitions (1980a, p.8) and explanations in order that society in general may be understood better by all people. At present, obfuscation of technical terminology for communications and information exists both in the public domain as well as in the academic and specialist worlds of literature. This mystique of the technological domain obscures the basic operations of how the new technologies are able to work together (interrelate) and to maintain reliability, flexibility and interchangeability.

This study is undertaken, therefore, to create a frame of reference--a way of categorizing this ever-changing, non-organized domain of TELETECHNOLOGY signals. Thus set out, the matrix I present should reveal the basics, the ordering and the interrelationships of the elements within a theoretical TELETECHNOLOGICAL system. These consist of the fundamental forms, the *basics* of signalling energies, the *dynamics*, and the property function standard laws of the signalling energies, the *techsines*. The model accommodates the radiant energy signalling for sight, for sound and for data communications throughout the TELETECHNOLOGICAL system. In time, perhaps, terms may be redefined for a more precise vocabulary for the constantly changing innovations and their operations in the real-world complex field of communications. This model is a contribution toward more precise description in order to further the understanding of communications technologies.

Delimitations

This work is not an introduction to, nor a description of, how the new technologies work, nor is it an explanation of the production methods and techniques in the field of communications. The material presented herein is an abstracted concept depicting signalling energy movement in a theoretical system with direct applications for present communications systems and technologies.

The model was not created for any specific discipline but it is a general and flexible matrix unified by its relationships in a general, self-ordering way.

The present situation of continually appearing technological innovations for communications does not allow for useful comparative judgement or for a useful comprehensive state-of-the-art evaluation. This model is designed in a manner to allow for additions or deletions of new technologies at any level in the construct. However, the basic model elements do not change, and are identifiable as categories wherein any device or any system may be ordered by relationship to other elements and, by such placement, thus gain an identity.

Messages and subject content are not dealt with in this work.

Research Method

The functional category of this study is *descriptive analysis* (Gay, 1976, p.123). The prime intent is to depict a foundational theory distinct from the outmoded Bretz (1971) concept of using media for communications. Instead, this work is meant to contribute to an understanding of the new technologies from the perspective of how signals act and are capable of change (fluxion) during a transmission.

Sources of Data

Materials for this study are from the following sources:

(i) select books and documents

(ii) government literature

(iii) general historical works

(iv) technical literature

(v) reference materials, dictionaries.

Investigative Plan

The study is organized around the need for a common model or base in order to facilitate discussion about the new technologies used at-a-distance--tele-technologies--and the way these are energized (i.e. electronics). The commonality of how a signal acts or is acted upon from a state of inertia to a changed state and is maintained in this manner is the main organizing principle: (how to think about the way signals act).

Media Development for Communication

Human beings have an innate need to communicate with one another in a societal setting. Verbal and tactile (as well as visual signs) interchange develop into exchanges with extendable *tools* used for daily needs. As human beings evolved so also did society: civilizations strengthened, were manifested by the calibre of their intellectual expressions, and then later declined, leaving behind their material cultural artifacts--the tangible facts of their expressed and communicated lives.

Technological development of *homo sapiens* paralleled the evolution of civilization. In 1836, various epochs were given names (Boorstin, 1985, p.606). These began with Prehistory. An additional Protohistory classification is mentioned in some of the literature to designate activities predating Prehistory (described by Fox, 1976).

From the earliest times until the beginning of Earth citizens' venture into raw space, the historical periods have been trail-blazed, and evidenced, by technological artifacts--the materials and hardware used in humankind's development (p.605).

At this time, in the latter part of the 1980s, our history is being rewritten because new facts are continually being uncovered by new informations. This study does not present an updated historical analysis of the most recent archaeological finds. [This author is aware that at any time a new find demonstrates further that what is documented as our traditional history of mankind may be, in fact, inaccurate. For this reason, traditional and new references, as presented, include no attempt at evaluation or verification. The reader is referred to appropriate resources in the field of archaeology.]

General Setting in Evolutionary Time

From earliest times to our present Electronic Age, *homo sapiens* developed because of technology. McNeill, (1971, p.7) states that "the use of wood and stone tools...started long before fully human populations came into existence". Childe (1964, p.15) describes the developing human beings' "use of pebbles, sticks, hides, pieces of flint and bone as extensions of the body in order to survive in the environment". As a type of basic language evolved (Childe, 1951, p.30), one human was able to communicate with another, while improvements in tools and then inventions enhanced daily life (p.34). Face-to-face communication was gradually replaced by symbols and usually carried from sender to receiver. These were marks on sticks, hide, rocks and clay. Over the course of history, the transportation system and the message carrier sytem became increasingly important and interrelated for trade and commerce (op. cit.).

Boorstin (p.605) describes the advent of historical dating and sets out the following generally accepted historical periods: *Protohistory*--the formerly unknown; *Prehistory; Stone Ages (Old and New); Metal Ages (Bronze, Iron)* as per Childe (1951, 1964); *Industrial Age* (mechanization) as per Gideon (1948); and now the *Electronics Age* (the use of various information and electronics interchangeably). At present, the term *Space Age* is used, also.

Earth citizens have developed various products and services throughout civilization, from the use of natural-found substances, then by adapting the available resources to their needs and incorporating the latest scientific discoveries. Fire was used in earliest times to produce pottery, and for mining operations, later. Tools, then were produced by the science of metallurgy and smelting followed. Alchemy evolved from the application of fire to chemicals and biological materials (Ronan, 1982); hence *chemistry*. Water was used for steam-powered and wheel-driven machines (Lilley, 1965). Once electricity was discovered, magnets were used to create electromechanical devices such as the electric motor. The present era of electronics (manipulation of electrons) (p.177) began in 1800 with the voltaic cell (p.118); this opened the way for the telegraph and telephone.

In 1886, Hertz (1857-1894), a German physicist, demonstrated the existence of electromagnetic waves (p.131) and pioneered photoelectric investigations: this was the true beginning of the development of wireless <u>radio</u> broadcasting. Many other innovations were to follow rapidly.

General Origins of Media; Definitions

The common material links from prehistory to today are tools, implements and other media--as extensions of the sensory systems of human beings (McLuhan, p.21). Communication artifacts have been used to *sign*, *signal* and *communicate* (transfer thought) within various societies.

Sign is a mark or motion used to convey an idea.

Signal is a controlled act carried out within a designed set of parameters.

Communication is thought transfer or idea transfer by signalling from sender to receiver; and which is acknowledged as *union with an "other"*.

People communicated by various means: They used words, gestures, pauses, writing, drawing, signing, sculpting and carving in various types of media. All of the foregoing are noted in historical documents, art and architectural expressions up to today. The <u>ways</u> that the communications were <u>carried</u> were by coded pulses, such as smoke, light bursts on towers as in Roman times, drum relays and human couriers, among others. Earlier, petroglyphs (rock signs) were carved or marked (presumably) to convey directions or actions for people who would "read" these at a later time. These varied media <u>carry</u> the information:

> Medium is a channel, substance or conduit used for information.

> Information is idea transfer, via cognition, that has the potential to create a change or an exchange.

Information may be communicated using social language in various ways: *signs*, *signals* and *symbols*. Symbols may be comprised of visual and/or sound *images*.

> Symbol is a visual or sound analogy or metaphor; a mark, object or figure that represents a specific idea or set of conditions--something other than the mark, itself.

> Image is a visual or sound representational likeness or counterpart.

Information (content) consists of messages, concepts, signs, signals and symbols; all relate to language which is fundamental for communication (Wiener, 1967, p.102). However interwoven the *content* (information/messages) with *carriage*, this paper is restricted to the transmission/carriage operation and not with content or language.

This carriage is possible because of the ability to control the influx energy by technological computations, as per Shannon (see further). This capacity allows for the manipulation of discrete, discontinuous measurable units of this electromagnetic radiant influx energy (*digitization*). The ability to stop and start and to quantify units is the prime reason we are able to use the computer today; the computer revolves completely around computation and quantization to control energy flow. Counting, calculating and computing date from the beginning of commerce and trade; computations have existed throughout the entire known history of *homo sapiens*.

Computation: Beginnings

Counting pebbles were placed earlier in shallow sand furrows and later evolved to a counting frame: the *abacus*. These earliest-known ways are documented and illustrated by Schmandt-Besserat (1979); Ronan also describes these (p.138, 150). For record-keeping, various cultures cut notches in sticks, marked stones and sticks, made impressions in clay, which was then baked, and tied knots in rope or hemp.

The Ancients of Greece (who could have originated from the Danube region) used a circular device for computing. This device has been mentioned widely in the literature (G. Smith, 1960, p.6); it is comprised of an intersecting axis within a circle. This device was used to show the position of the celestial bodies (p.88). We do not know if there were additional uses, or if these resembled the uses we make of our computers today. Ronan describes the Ancients' navigation over vast distances; therefore, they could have developed sophisticated operations inspired by their experiences in other lands (Boorstin, p.93).

Commerce and industry, based on economics and monetary exchange, required accountancy, computation, notation and records. Early records were kept on clay tablets which were stored in buildings called libraries (*libra* means scales and refers to the balancing of accounts). Computation became central to all business and mandatory for all inventions.

> Computation is a process of manipulating symbols related to a societally understood and acceptable standard or rule.

Symbols, signs and signals are used in computing numbers and words, as well as concepts.

Mathematics developed into rules which were used in surveying, in geometry, for standardized weights and measurements, and the like (Childe, 1951, pp.120, 153, 164, et al.).

The Ancients of Greece developed logical reasoning as the basis for geometry, astronomy, algebra (and integral calculus, p.174). Logic is symbolic reasoning. Today, computers operate on the basics of systematized computational symbols: symbolic logic.

Visuals and Sounds: Progressions

The electromagnetic and light radiance, which today carry the visuals and sounds via electronic and other high technology systems, operate through channels far different from how people communicated messages before 1800, but the light and sound sources are unchanged. We have learned how to access and to use this energy for societal benefit. However, the visual and sound *mediated* images of human beings have changed by a substantive amount.

Visual representations of all kinds include those from simple static ideographs--*x*, *3*, *&*, *+*--to still pictures manipulated by persistence-of-vision, two-dimensional mobiles and three-dimensional holographic virtual moving images, from visual sound and data sources. The prehistorical pictographs, carvings and artifacts, various reified communications throughout history such as maps, paintings, sculpture and musical scores were created from the available contemporary materials. With our scientific and technological sophistication we are constantly improving our electronic and light mediated images.

Our ability to see, sense, hear and write/mark over vast distances has progressed phenomenally. Remote sensing is one highly refined advanced technology we take almost for granted today. Current computerized remote sensing systems can analyze vegetation and upper layer ocean life-forms and relay this information to any capable computer vision screen located on Earth or nearby orbitting mechanical structures. The computerized printout of the organic forms or compiled text on screen are the most advanced examples of technological *far writing* to date.

Signals to Write Far, Sound Far, See Far

Signals are a way of transmitting (carriage) information (content) from one location to another, and a way information can be detected (observed) by some means. Signals are active; signals imply verbs or action in order to exist: signals act.

There are different methods for using visual and sound signals. The essence of signalling is that of action over a distance of any degree, from a sender to a sensing receiver. Signals, therefore, exist in order that receivers may sense; an action that occurs in a vacuum or in a location where there are no sensing receivers is not a *sensed signal*, by definition. (The actuality may take place without significance because no verification exists between a sender and a receiver.) To put it simply, stacked books do not signal to one another.

The Greek for *far off* or *at a distance* is tele. There are numerous examples of distant *writing* (i.e. telegraphing, from the Greek *graphein*) and of distant *sounding/hearing* (sund means "sea", Old English), *distant seeing* (note sequester, Latin for "follower") throughout history. These signals are transmitted and/or are imbedded in various materials. Some examples are smoke signals, signalling using different kinds of heliographs (sun reflectors) and the various telegraph (distance writer) systems, such as devices used by Morse (1791-1872). Others are the light blinking signalling systems (semaphores) used in transport-communications today, such as on trains and naval ships--these are *semaphore* (signal) transmissions: they use signalling energy--smoke, sunlight, electricity and focussed light--for signalling. Clay, stone, paper-bound messages and other surface representational or symbolic marks and messages are transmitted to the receiver by light and sound waves.

Instruments such as the telescope are not carriers of information. Such devices are channels that delimit the sensed-lit image. The air is the medium through which passes light signals carrying the selected image via the telescope lens. The light signals act on the eye and the brain. Light may be reflected (echoed), refracted (split), relayed (boosted), focussed (polarized and directed) and amplified (enhanced). In general, sound waves move in patterns similar to light waves.

Sound waves move directly, unobstructed, in air, by relay with instruments such as drums, by reflection (echoing) and by refraction (direction changes). Sound waves move relatively through media of differing densities. Direct sound movement, in natural situations, and refraction for the control of a situation were the two main ways sound was used for communication among people until the Age of Electronics. In 1906, the first human speech was transmitted by radio; this heralded the open broadcast transmissions and almost instant communication throughout the Western world.

Sound signalling may be natural, as listening for vibrations by placing an ear to the ground or, by artificial devices, such as in *sonar* (sound navigation and ranging) which is echolocation, and *radar* (radio detection and ranging). Radio waves are not to be confused with sound/acoustical waves; both may transmit that which may be heard, sensed or detected by instrumentation. Sound signals, as well as light signals, may be transposed to writing/marking (or other sensed results) as in sonographs and seismographs, as well as oscilloscope readings and printouts.

Sensing or seeing far (remote or at a distance) is verified by either marking (writing) that which has been seen remotely, or by other demonstration of such remote sensing operation, such as text description on a screen. To see far is bound to the signals of "to write far"; they are both visual. The verification of the sensing/far seeing is demonstrated by recording the event.

Vision systems enable the viewer to reflect light for magnification by: a) the power of catching and holding the image, or by b) the ability to focus an image from a distance so that the naked eye may see this virtual closer image. The beginning of sophisticated vision systems started with *optics* (the scientific study of light and vision); this was Lippershey's 1608 discovery of the action of eyeglass lenses (Boorstin, p.314). Soon, telescopes and the microscope were added to optics (op. cit., Ronan). The writings of the Ancients revealed knowledge of light refraction and reflection (ibid.). In the Western world, Newton's (1642-1727) Opticks (published in 1672 and 1730) stimulated the scientific community. The Arab world was significantly more advanced: the Arab physician Al-Kindi (813-873) quantified light rays travelling from an illuminated object to the human eye, thus formalizing science (Ronan, pp.133-147). Boorstin (p.353) notes that the Chinese theory of optics dates to the fourth century, BC. Many vision systems and devices have evolved from these beginnings.

At this writing, scientists and communications specialists are able to send and to receive information via electronic and related light systems across all parts of the globe. Since the onset of the Electronic Age, in 1800, we have increasingly compressed the time required to complete a transmission. The energy to do so has decreased while the distance relative to the time to encompass that distance has been compressed to zero: transmission is virtually instantaneous between sender and receiver. The substantial continual drop in costs of all kinds--production, operation, replication, service--has created an economically ready market. The cost of small personal devices, consumer and commercial electronics, and transmission services continue to decline.

CHAPTER II

COMMUNICATIONS TECHNOLOGIES: SIGNALLING DEVELOPMENT

Electromagnetics

> Electromagnetics is the science and application of electrons in electric and magnetic fields.

The current state of relatively inexpensive resource power for communications is a result of the following progressions in utilizing energies: the control of fire, the process of smelting metals and the discovery and control of electricity and related radiant energy.

The Ancients of Greece knew of magnetite, amber and lodestone (Canby, 1963, p.7). The two former materials held powers of attraction; the latter exhibited polarity. The Chinese created the earliest magnetic compass (Ronan, pp.172-173,177). In the Western world, the next break-through came with the English natural philosopher Gilbert's (1544-1603) De Magnete (1600), which differentiated magnetism from electricity (Canby, p.14).

Electrics was the name Gilbert gave to substances that behaved like amber. (The New Latin "electricus" means "like amber", because amber produces sparks when rubbed; ergo, *electrics* means "sparks").

An incandescent particle is a spark--a short pulse or flow of energy. *Incandescence* (light emission related to temperature) was not, at that time, separated from what we understand today as electromagnetism.

Nor did Gilbert's categorization of magnetism/electricity include the identification of repulsion and conduction as foundational to the concept of electricity. Electricity would only be understoood 200 years later with the concepts of charge, capacity and potential. This came with the Italian Volta's (1745-1827) demonstration of direct current electricity in 1800. The English chemist/physicist Faraday (1791-1867) had defined *induction* in 1831; this is the propagation of electrical effects in time. Faraday's discovery was basic to the entire concept of electromotive force, which replaced steam- and water-powered machines of his day with electromechanics (in 1821) and the dynamo (in 1831) (Gideon; Lilley; Ronan, p.448). In 1864, the Scottish physicist Maxwell (1831-1879) used Faraday's work to produce Maxwell's equations, which were published as his theory of electromagnetism (Ronan, p.467).

The following definitions are presented in preparation for the discussion on electromagnetics:

> *Electron* is a negatively charged subatomic particle; the charge is static or dynamic, and operates as a ready variable.

Electricity is the phenomenon arising from charged particles which thereby create an energy form.

To *charge* means to impart energy; a charge is an energized potential, or a state of excitation or intensity.

Magnetism is the phenomenon of a force field which has polarity of attraction and repulsion.

Electromagnetism is the phenomenon of simultaneous electric charge and magnetic polarity: Electromagnetics.

The two basic principles of electromagnetism are:

1. an electrical motion/electricity produces a magnetic force field, and

2. a magnetic force field in motion across an electric field produces an electromotive force. This means that a spark (photoelectricity) activates electromagnetic waves, as in radio, and that a magnet inserted into an electrical field generates an electromagnetic force, as in generators and television receivers.

Electronics is 1) the science and technology of electron phenomena, and 2) the commercial industry of devices and systems energized by electromagnetism.

Maxwell's equations became the base for the world of communications (1864). His electromagnetic theory inspired all subsequent communications that used electromagnetics (Canby, p.67). Many electronic inventions proliferated after Volta's work. Radio was developed during the 1914-1918 war and improved rapidly from a few broadcasts in 1920 to fairly regular programming within a short time. In 1924, a radio telegraph station was put into operation (Lilley, pp.175-6). Television broadcasts were transmitted before World War II. The British Broadcasting Corporation opened their system in 1936. Other countries brought in television: approximately 1945 in the United States of America and about 1952 in Canada (ibid.). By the end of the great war, world communications had become mainly electronic. The next great change would result from a new device called a thermionic valve (vacuum tube) (Ronan, p.510), the forerunner of the *transistor*, which was the basic component used for the other new device which would be called the *computer*.

The Transistor

The transistor was produced after World War II, after many scientists had experimented for almost a decade with the problem of detection and amplification of electrical current. Vacuum tubes, also known as thermionic (heat) valves (ibid.), were used for the flow or emission of heated electrons. Electrons enter the system at the *cathode* (negative plate). Emission of electrons may be varied (Pitt, 1984, pp.378-379) in the space charge region. Electrons flow from the cathode only when the incoming signals are positive. This *diode* (a device with two electrodes--anode and cathode) produces an electrical current which varies similar to the way that electrical signals vary. The current may be amplified and turned into sound. DeForest (1873-1961), of Western

Electric, Chicago, invented the first known vacuum tube in 1907; all complicated electronics, e.g. the radio, the telephone and electronic computers, are derived from this electric-current modulating device. Thermionic tubes amplify (strengthen), rectify (correct) and act as oscillators (fluctuators) for generating electromagnetic radiant (radio) waves.

[The following is not a set of strict engineering descriptions. The explanations offered are extremely simplified and presented for easy understanding of the general concepts and how to think about how electromagnetic radiant energy moves in designated ways:]

Within the thermionic valve (vacuum tube) the current (flow) and voltage (force) are interchanged; the electricity flows across (<u>trans</u>) the resistance (res<u>istor</u>), hence the name *transistor* for the new solid state device of 1947 which replaced the thermionic valves. The secret of the transistor lies in the realm of quantum theory (Pitt, p.304). This <u>dual</u> conduction-resistance inherent in the quantum capability makes integrated circuits possible. In other words, the two variable flows, positive and negative, can reverse one another, or flow intechangeably. This *influx potential* of the transistor is its immense power, thus complicated electrical signalling has been made less expensive and very reliable with transistors operating at the "speed of thought".

Integrated circuitry on a substrate (platform) was created to replace the transistor and the entire unit was miniaturized and then microminiaturized by the process of lithography (light etching). This unit was called a *chip* because of its miniature size, and because each unit was *chipped* from a mass-produced larger group of *wafers*. These units were labelled in terms of the integrated circuitry capacities such as the following: small scale integrated (SCI), large scale integrated (LSI) and very large scale integrated (VLSI) (O'Brien, 1982, p.24).

The many solid state devices and integrated circuitry chips which became the core units of computers were designed around the transistor. Evans' (1981, p.109) simple definition of the transistor is "...a crystal, in which small flows of electrons can be controlled to provide signals". Pitt's more technically complete definition follows:

> *Transistor:* A multi-electrode semiconductor device in which the current flowing between two specified electrodes is modulated by the voltage or current applied to one or more electrodes.

In short, a transistor has reversible conductivity whereby an incoming electrical current is either admitted or rejected. This means a transistor is a "no-yes" modulator for incoming activating electromagnetic radiant energy signals by which multiple-choice "tree" sequencing commands are controlled by the computer operator/input device (terminal).

With the invention of the transistor and its subsequent changes into the machine we recognize today as the computer, there emerged the first mechanical *system* harbouring significant <u>usable</u> potential energy which was easily manageable (controllable) by human beings.

> *System* is a set of interrelated and/or interdependent elements which form an aggregate via harmonious and orderly interactions.

The computer system basically consists of *input, control* (modulation reversibility) and *output* operations. All other related processes, functions and operations are elaborations, or are ancillary to these three; varied additions can be made and thus create an expanded network of any dimension, and for a wide variety of purposes. The centre that provides the control is the core of today's linked communications and information technologies. One such emerging example of an *integrated learning system* is the world class TELIDON *videotext* system, accepted as the international standard for *videotext*, (Graham, pp.177-179). There are a variety of videotext systems in different countries, widely cited.

The Computer

A Basic Description

The computer is both an operative and a device that has developed throughout history from the first mathematical reckoning (using pebbles as counters) to devices such as the abacus, various inventions for recording, measuring and crafting and now as a processor of vast quantities of information. The operational speed of the first electromagnetic computer was increased to a phenomenal rate by the advent of electricity. Today, more information is manipulated by the computer faster, better, and is done so via directions (programs) of greater complexity and sophistication than ever before. The technical capabilities, built into the computers (at this writing), power computers to access data (information), hold it "on-line", reroute it extensively, manipulate it in many and diverse ways, store this data, retrieve it with complete fidelity on demand, and manage and control other operations with the stored programs (memory), in addition to other specialty (custom designed) operations. The way the computer operates is in response to operator commanded *coding systems* (which are incorrectly labelled "languages"), such as BASIC, PASCAL, and LOGO coding systems. The following are examples of the tasks performed by computers:

a) design of an architectural project incorporating operators who are known for or have different styles of design or unique attributes,

b) decision outcome for a new administrative strategy in a situation with ongoing daily change in many categories or departments,

c) operational management for a complex physical plant with restrictive areas for humans (such as with corrosive chemicals, radiation, intense heat),

d) data gathering in remote locations at vast distances, and relaying on-line data output via differing machines, simultaneously, in satellite-based, relayed, remote sensing of ocean or land areas for a wide variety of purposes,

e) choice of an archaeological site on the other side of the globe where there exists continuous correlation of relevant data from other in-progress sites,

f) world-wide stock exchange activities, on-line.

Computers have been given the task of correlating information and carrying through decisions at ultrafast speeds: Computers have taken over the repetitious voluminous calculations previously carried out by people. Wisely programmed, and used as an adjunct to beneficial plans for people, computers have the potential to be major assets in our daily lives.

Pioneering the Computer

The essence of computing consists of numbers and their diverse manipulations, as described by Evans is his extended definition in The Making of the Micro (1981). As noted earlier, counting pebbles, the abacus, knots in string (the quipu), clay tablets, stone engravings, and marks on hide and paper were used for computing since earliest times.

The earliest records of what we, today, label a modern computer were Babbage's (1792-1871) "difference machine" and "analytical machine" (O'Brien, p.14) proposed plans, but these were never built. Although deemed unreliable, a citation credits Pascal with having invented the first significant calculating machine, between 1642 and 1644 (p.13); this machine used wheels and gears, was capable of addition, multiplication and subtraction. Babbage's plans had been for the first general-purpose computer (Evans, p.41). For this, Babbage had employed the 1805 Jacquard loom technique of punched holes in cards to create a logical pattern. The basic design of Babbage's computer (which was a full century before its time) was used by Turing in 1935 to create a fully operational computing machine (p.13). The computers that followed were built and managed by International Business Machines (IBM), Massachusetts Institute of Technology (MIT) and Dartmouth College (p.63).

[O'Brien sets out the history of the modern computer very competently. The next two subchapters are condensed from O'Brien and Moreau, and are presented as the contemporary computer situation relevant to this paper. The guiding comments thoughout are intended to assist the unenlightened reader in obtaining an easy overview understanding of the computer.]

Five Generations

Traditionally, the development of computers is described in "generations" of the energized capability, speed and size of the increasing sophisticated technology used for computers. O'Brien includes ample examples and photographic illustrations (pp. 12-31).

By 1960, about fifteen years after the invention of the transistor, computers had proved their value based on Turing's (Evans, p.13) theory: "any computable function can be evaluated by means of a single digital machine". Computers, in 1960, were extremely fast calculators with memory banks of considerable capacity. The developmental stages of the computer (as per O'Brien) are as follows:

1. First generation computers used vacuum tubes, were very large main frame structures, required large amounts of space and electrical energy;

2. Second generation computers used transistors, stored information on magnetic media and some punched cards; they required less energy;

3. Third generation computers used integrated circuits (chips); programmed directions called *software* had negligible energy requirements and were characterized chiefly by miniaturized chips and the diminishing overall component size demonstrated as a microcomputer;

4. Fourth generation changes were large-scale integrations (LSI) of the circuitry which emphasized microminiaturizing of components; the memory capability increased in immense proportion. The complete computer, e.g. that of IBM, exists in the unbelievably small size of .5mm X .5 mm;

5. Fifth generation changes brought the use of automatic servomechanisms using *artificial intelligence* (*AI*) which carried out decision making. AI may also be applied to robotics depending upon use and performance. In both the fourth and the fifth generation, electromagnetic energy requirements are minimal. The high technology design is costly, especially for custom/specialized operations, but this

latter is related to how the technology is used. In general, cost continues to decline with larger markets. The physical size of the fifth generation technologies continues to decrease, software capabilities increase, and transmission speeds are in development for superordinate calculations of parts of a billionth of a second (O'Brien, p.9).

Memory and Storage

Memory is the capacity for storage of data. *Storage* is a device for data retention. Broadly speaking, this is the distinction between memory and storage. Realistically speaking, the differences are not so clear: the terms are almost interchangeable.

In a computer, there are three basic steps for data: *entry*, *storage* (and manipulation), retrieval and *redirection;* there are variations on these three throughout various systems. The following are some definitions from Moreau's (1984) point of view:

> *Memory:* "access to memory is made in groups of bits, either words or characters, and the capacity is measured in terms of these characters" (p.51).
>
> *Storage:* "Memory is a device in which an item of [information] data can be stored and from which it can be subsequently recovered" (p.49).
>
> "The capacity of [such] a memory is the maximum volume of information that it can store" (p.50).

The preceding points out the general notion of memory and storage as the same device. Clarification is emphasized again, herein, that the way these words are used is that *memory* is capacity or the program unit power; *storage* is the available physical space position in a device and is measured in bits of information. Therefore, *memory* is a memory-programmed-unit capacity; *storage* is a measurable bit-space-position device.

Primary storage of computers is the measurable space within the circuits of the microprocessor (chip). Each space position includes groups of these circuits which have been etched by microminiaturized photolithography on the chips in the quantity of thousands--and to come--millions of groups. The *access times* (speed) to these circuits are presently in the *nanosecond* range (one billionth of a second) and are soon to be in the *picosecond* range (one thousandth of a nanosecond) (O'Brien, p.9).

The internal space positions are designed to use the following computer data elements (p.80):

1. a *bit* is a binary digit and has a value of either zero or one;

2. a *byte* is an eight-bit grouping and is the basic unit of data quantity;

3. the storage capacity is expressed in bytes, kilobytes, or megabytes (MB or M), i.e. a thousand bytes or a million bytes, respectively.

The unit *K* is a rounded quantity for about 1,000 storage space positions. The computer is usually labelled and identified in the marketplace or engineering laboratories by this storage unit--K. In general, computer primary storage capacities may range from 4K bytes to 40M bytes for a very large computer system;

4. the *word* is a grouping of bytes that are transferred as a group between the primary storage and the logic control unit;

5. the *page*, which usually consists of 2K or 4K bytes, is a computer data element which is continually transferred between primary and secondary storage in computers that have *virtual memory*, i.e. an extension of the primary storage space which gives the appearance that the main area is unlimited--which it is not.

Additional primary storage media are:

1. magnetic core devices that have reversible magnetic direction for nanosecond direct access storage;

2. magnetic bubble chips, with capacities of 32K bytes to 1 megabit (1 million bits) are now in use in high shock-resistant situations (p.86);

3. charge-coupled devices (CCD) are sensors that use the structure of the silicon crystal itself (containing about 120,000 electronic elements) to store data: half the elements form the imaging array and half are for storage and read-out. (They, like the magnetic bubble, are highly volatile as a storage medium.);

4. cryogenic-electronic storage devices are in development that will be smaller and faster than today's semiconductor storage; extremely low temperatures will allow this faster speed (superconductive tunnel junction circuits: Josephson Junctions);

5. laser storage and holographic memory devices are in development that use crystalline material to change the polarization of light. This means that the focussed, amplified beam resonates to the opposite focus, in essence, maintaining stasis. (Crystals are vibrators and affect the energy or mass around them.) In this case, the changes in the polarity of light, immobilized by the crystals, would become a storage device for binary data bits operating at the speed of light.

Secondary storage of computers today may be categorized in four main types, which may change with rapid convergence and increasing innovations. In general, the types are: magnetic, optical, voice and hardcopy; none of these is in a distinctive category. The following are some of the most used storage devices:

- magnetic tape (cartridge, casette)

- magnetic disk (various sizes, thicknesses)

- magnetic drum

- solid state disks (also called charge-coupled devices [CCD] which store the data on the crystal). Sizes may be in the extreme microminiaturized range.

- magnetic bubble (which "holds" data by electromagnetic pulse on the crystals)

- optical disks (video disk; laser imprint)

- voice (various, synthesized, natural)

- hardcopy (print, graphics, facsimile)

- micrographics (microfische, microfilm)

- experimental, and in development, which includes the realm of biotechnology and organic sciences, (including transplants).

Some ancillary processes of the computer are created with various hardware such as the following:

1. voice hardware for both natural speech and for synthesized talking chips;

voice recognition--various devices (including the newest "smart cards" to use in bank depositories, telephone machines and other service repositories); "talking prosthetics";

2. *character recognition hardware*, such as optical character recognition (OCR), magnetic ink character recognition (MICR) and personal character recogntion (PCR), for example a handprint or a fingerprint;

3. *remote location devices*, such as a microchip embedded in a child's tooth, or under the skin, such as for family pets and for coding and tracking wildlife for conservation purposes;

4. *smart cards* used for identification purposes, such as remote banking and payment for services (e.g. telephone calls). Smart components are microminiaturized chips embedded in the card; some automatically have "use up and delete" quantities in progress;

5. many heat-seeking devices of various kinds operate on sensors that activate an automatic program (e.g. a computerized emergency-water-release system in a high-rise complex for fire protection).

Communications Technologies Summary

The technological development of a civilization is reflected by its capability to articulate, transmit, receive and act upon informations of various kinds and for various communicative purposes. In earliest times, expressions and transmissions between peoples were mostly face-to-face. As their social organizations developed and trade, commerce, industry and the religious and professional establishments evolved so, also, did their communications' media, modes and the quality of their informations. The concept of storing information developed into formalized systematized files, stores, libraries and data banks which contained, among other things, mediated information in the following formats: clay tablets in sealed cylinders, scrolls, counting pebbles in clay containers, parchments in sealed jars, wampum, vellum writings, string records, books, journals, microfilm (in a variety of sizes and formats), cinematic film (celluloid), magnetic tape formats such as videotape and videocasettes, audiotape and audiocasettes, various computer formats in magnetic and other materials, video and audio fibreglass disks.

The methods and media for communication among people, and for collecting and recording all of the above, are described in this paper as occurring via signals that *write far*, *see far* (and *sense far*) and *sound far*. The significant energy resources which carry the signals, changed over historical time from human and animal labour, fire, water (and steam) to electromagnetics.

Since the discovery and applications of electricity, there has been a constant reduction in the needs of time, energy and costs for the operations, manufacturing and service in the various dimensions of communications and, especially, costs and time have collapsed with respect to geographic distance. In addition, the psychological distance between peoples, related to information access and communities of knowledge, has contracted considerably with information more readily available to the public. Electronic Age communications have virtually opened up the world socially, intellectually and for economics and industrial trade opportunities.

The transistor was the breakthrough device that allowed for combining the power of communications technologies with the immense and diverse capabilities of the computer as described earlier.

Throughout the history of media, people have depended on their communicative abilities--their sensory (reception) abilities--those for seeing, hearing, touching, and on their cognitive interpretations, as in reading and innate "seeing", in an auditory and nonauditory, visual or nonvisual way, as well as on their language skills. These latter skills encompass the ability to comprehend and transmit messages via signals (carriage) in preselected codes, within which reside meaning for those who possess the same (group) knowledge. The select or group knowledge is based on information gathered and stored, which is encoded and decoded for the *message*. As stated earlier, this paper does not deal explicitly with meaning; this description includes material relevant to the signal energy carriage of message content.

The signalling energies were discussed as light and sound waves which were reflected, relayed, focussed and enhanced/amplified in order to propagate the signals over greater distances. Mirrors, lenses and relay systems have been used in many ways historically. Today, we use technologies such as reflectors, refractors, receivers, transmitters, boosters and repeaters. Cost effectiveness is the state of the market for consumer and commercial electronics and for personal, business, industrial and corporate oriented computers.

The computer is changing our world and will continue to do so as we increasingly integrate this machine into the management and operations of an increasing number of systems on this planet.

CHAPTER III

TELETECHNOLOGY SIGNALS: A THEORETICAL CONSTRUCT

> The closer [people] live to reality, the more daringly inventive and scientific they become and the quicker they are to adopt new ways.
>
> (R. Buckminster Fuller, 1969, p.273.)

The current state of a tele-world distant, engineered infrastructure uses both wired and non-wired transmission systems. Joined to the computer, telecommunications has created the information economy (Serafini, p.100) which affects the lives of everyone on the globe today. The convergence and effective management of communications and computer technologies (*informatics*) is the operant-possible means of attaining an humanistic and cognitively high level of civilization on planet Earth--if used wisely. The perceptive and responsible manner in which we use these available combined technologies and the intent for which we propose those uses constitutes the basis on which our civilization has the ability to develop further.

Communications systems of all kinds have been developed throughout history mainly for the benefit of the nation, for trade and commerce, and for military expansion. In some nations communications are tightly controlled such as those of the USSR and of South Africa which in 1986 and 1987 censored journalism. Increasingly, the rapidly falling costs of consumer electronics, and those of the personal computer, have allowed many people to have ready access to communicate with large numbers of others. The very powerful computer operations of large systems and networks handle work done formerly by human beings; they monitor immense numbers of diversely located operators. The nature of work and of human management systems has been changed irrevocably: some examples are in administration, in management, in service delivery and with products. Continual acceleration is expected with continual innovation.

Many people are concerned about this computer control situation as it continues to disrupt their everyday lives with some very major upheavals. People who are not knowledgeable about the mystique of computers and the evolving tele-world require insight into the basics of the effective use and management of technology. The stability, health and potential automomy of humans in an evolving technologically oriented society require that they have a sense of control/management and the ability to make reliable decisions about their lives and environment.

In order to assist the reader in the full meaning of what I term TELETECHNOLOGY--systematization at a distance--i.e. an abstract general term representing systematic interdependence of operations or, more usually, a device or system for distant operations, I present below several definitions that lead to and thus, comprehensively and in a general way, circumscribe TELETECHNOLOGY for the field of communications. Taken together, this grouping will serve as a concerted body for a cognitive inductive grasp of the theoretical representative domain of TELETECHNOLOGY for communications within which the term TELETECHNOLOGY is described. Throughout this study, the concept of a *system*, an interrelated ordered grouping of parts/elements, and the concept of distance/*tele*--which implies, in addition to "far off", the concept of a *goal*, *place/locus* or developmental *phase/relation*--are considered the generalized aggregate grounding with which to comprehend this theoretical construct. The following distinctions are presented:

The transdisciplinary academic field of communications studies encompasses common interactions and transactions among human beings, animals and machines. Communication may be described as an interdependent transaction that is concerned with message (content) and all relevant technologies (devices, systems and methods) to complete the activity. (Analysis of definitive cybernetics, i.e. machine control, description for purely machine communication, and communications engineering are beyond the scope of this work although mention is made throughout.)

<u>Communication</u> (see under General Origins of Media: Definitions).

A <u>communication system</u> is a configuration route for sending and receiving messages such as by transmission, networks, relay stations and terminal equipment.

<u>Communications</u> encompasses 1) all of the art and technology of communicating which signify a change or exchange of ideas or thought transfer, [this includes skills and techniques of the arts and sciences (applications) and also those of information (the computer)], and 2) the specialized branch of electrical engineering that deals with information transfer between people and equipment.

<u>Communications technology</u> encompasses all devices, systems and techniques for thought transfer. Information technology is a subset and may be an ancillary.

<u>Communication media</u> are those channels (carriage) by which the information (content) is transported such as phone lines, broadcast, microwave, optical communications systems; and satellite communications.

<u>Information</u> (see under General Origins of Media: Definitions).

<u>Information Technology</u> (restrictively) is concerned with computers and data; it is a subset of communications technology: Informatics.

<u>Technology</u>, broadly, is the available knowledge base for systematic application within a civilization: methods, materials, resources, science and art skills.

In review, the term *communications*, in the broad sense, encompasses everything related to communication technology and the subset *information technology*. The term *technology* refers to a civilization's level of development, in the broad sense. With reference to an advancing technological society, such as in North America, and relative to a definitive use of the term *technology*, I present the following:

> Technology, *per se*, is the entire systematic body of methods and materials in a civilization which is designed to achieve measurable--quantitative and qualitative--objectives in various social areas or systems.

Technology is used in today's scientific, industrial and social world, as well as for personal use in homes and places of entertainment, in the form of sophisticated designs, devices and operations. Today's advanced technology has the capacity to enhance and to improve daily work and leisure pursuits in all areas of society; it could extend the positive capabilities of human beings if they chose the means of technology wisely.

Such wisdom may be made possible through the general understanding of how technology is energized and manipulated in theory and, therefore, how people may use the available actual technologies in order to obtain the best possible results. Insight may be gained by those who examine the present technologies via the analytical model presented in this paper. Insight may also be gained by those who examine human communication signals in action. Theoretical juxtaposing

TELETECHNOLOGY with other model domains may reveal also, to the investigator, new horizons related to global communications, national innovations, personal opportunities or other possibilities for restructuring contemporary communication exigencies. The model, therefore, may be used as a catalyst for varied thinking styles or new ways to view the world.

The TELETECHNOLOGY Domain

Teleological (Morris, 1980, p.1323), as used within this paper, is intended to mean the utility within a comprehensive design or, in the sense that *logical* means systematic and in the sense that *telos* is Greek for completion, then teleological means goal achievement as the systematic priority. Further, by using *tele* (far) in order to consider TELETECHNOLOGY as far-goaled or as utlility-achieved design oriented, *inductively*, I establish the abstract domain in which this work is presented as that which is removed from organic or natural and spontaneous production and usability, and as that which exists as a distanced (end) design set.

1. The abstract domain of *TELETECHNOLOGY* exists, therefore, in relation to the *potential* utilization of a design(ed) set or construct,

ergo,

2. The *TELETECHNOLOGY* domain is an aggregate of possibilities for the use and management of devices, systems and mediated informations within the actual (real) field of communications.

The abstract domain of TELETECHNOLOGY consists of things, as distinct from ideas or other phenomenological entities: one thinks about TELETECHNOLOGY; one does not think mechanically but, as a human being, one may think in a systematic, logical or technological manner. Succinctly, one thinks about computers and about technology; the computer "works" or operates in a TELETECHNOLOGICAL manner--the computer does not think.

The prime aspect of the TELETECHNOLOGY domain is that of *relativity*--because in an aggregate of any type, the whole consists of parts relative to one another, i.e. space and time are interdependent (Augros, 1984, p.57) with the energy that modifies or changes their interrelationships, all of which act under laws. [This is the core principle of the theoretical construct.]

Operations in utility of the above in the virtual field of communications technologies afford the generalized concept of a theoretical domain to accommodate both common and possible uses in 'real' (actual) life situations.

The TELETECHNOLOGY domain encompasses all communications and information technologies that are not of immediate face-to-face, person-to-person or person-to-animal mode of communication. Any content or carrier, message or transmission, or any device, system, method or medium used, which is distant in physical location or from natural, instantaneous, human origin, may be construed as *tele-techno-logical*. The reality of this communications oriented concept is that it is the opposite of unknown origin or parameters, or of spontaneous existence in close proximity between sender-receiver of the message (i.e. not face-to-face) in any virtual sense. This emphasis is required to establish the domain of TELETECHNOLOGY as an entity with continuity and which exists in space as well as in time and spacetime. (The cognitive meaning aspects of communication are not included as central, in this paper.)

Thus, the tele-world is described as the invisible (to the naked eye) yet expressly powerful domain in which devices and systems are used in close physical proximity or at a distance in space, in time or in the spacetime continuum. *Spacetime* is defined as the fourth dimension:

> *Spacetime* is the fourth-dimension continuum as defined by Einstein's relativity theory: an event is described in terms of a fourth-dimensional continuum. (Pitt, p.157 [paraphrased].)

The various orientations of *reality* include *time* (consisting of interval and duration), *space* (location) and *spacetime/event* (occurrence). These are implicit in any descriptive analysis of the TELETECHNOLOGY domain.

1. This TELETECHNOLOGY domain consists of <u>real</u> space and <u>real</u> time and <u>real</u> spacetime. For example, as an aircraft ascends helically in levels or altitude planes, at each parallel point on each level the time lapsed will be equivalent to the same space covered, if all other things are constant. Therefore, at each level, at the equivalent locus,

the aircraft is noted to have progressed through one increment of space equivalent to one increment of time: each level attained is one increment of spacetime, if all other things remain constant. This may be an actual true life "here and now" experience; this may also be a virtual participation (vicarious) as a movie of the above. The communications used during the flight ascent by the pilot, airtraffic controller and possible others using mobile telephones, and/or radar operators using mobile equipment, all participate in real time if communications are in progress throughout.

2a. This domain also consists of extended time and extended space as well as extended spacetime. The situation of planned future time and the tangible methods to accomplish this are required for design of a system that exists in any area or phase of time and includes the extended dimensions of anticipated space--both for the future as well as for the past or for any additional concurrent phases of the preceding (which includes spacetime extension).

In trajectory calculations, future speed (time), target (space), and spacetime positions (event-intervals) are identical for modelling (simulation) or for real war killings, similar to those that appear in video game programs.

In an example of extension of time for human life cryogenic (deep cold) suspension, the TELETECHNOLOGICAL system could be programmed for various time, space and spacetime capabilities. Canadian astronauts in raw space could remain dormant (in suspended hibernation compartments, now in development by the National Research Council) until they are required to function fully at a (programmed) distant, future time, and at a distant future place aboard an outer space traversing vehicle. The cybernated environment requires communications technologies of exacting precision between the humans' (body) vital signs--the on-board electronic support, and/or terrestrial mission control.

2b. Contraction is the reverse of extension. In some cases, time, space and spacetime may be contracted. Sound may be compressed. Editing is used widely for this purpose, wherein data may be collapsed.

3. Additionally, in the TELETECHNOLOGICAL system there exists the imaginative (conjured in the minds of humans) or hypothetical time, space and spacetime; this proposes cognitive and operational possibilities and juxtapositions of previously untried anticipations.

In the case of the popular classic, Walt Disney's film, The Sorcerer's Apprentice, the producer demonstrates an imaginative analogy--that of a run-away technological function poorly managed. The unstoppable operation creates chaos. The time relates to (a) the period in which the film was imagined, planned, developed and produced, (b) the developmental period of mankind (i.e. pre-computer era, post World War II), (c) the numbers of possible times this film has been/will be screened, (d) usage, in possible combinations with other events in space or time, including (e) in possible computerized operations, as yet unknown. In addition, the concept of time of the film itself, time considered as (a) the length of "running time" of the entire film, (b) the sense of duration in which the action of the play takes place, which can be depicted in real or virtual time related or unrelated to the unfolding lives of human beings, in seconds, minutes, hours, days, etc., and from this springs the concept of the continuity of film time, (c) the sense of psychological time in which the hero experiences mental/emotional expanded or perceived contracted time of anxiety, delight, anger and so on, (d) the beat of the musical or other sounds within each scene, and (e) the rhythm of the entire movie as a whole, (f) the perceived viewer's time related to segments enjoyed, ignored or rejected, all of which by attending becomes an integral part of the individual viewer's involvement and experience of any aspect of time related to the film. Perceived time, on the part of every viewer is highly individual: via the preceding methods of interrelating with various elements of the film, the perceiver recreates the experience of any aspect of the film and may comprehend some of the objectives as preset by the film producer. Thus, the film has the functional capability of a *medium* by which a participant may experience *simulated* time--being there <u>now</u>. Extrapolations are also possible for space and spacetime.

A second imaginative example--of space, time and spacetime--is that of the popular university professor G. O'Neill's well publicized concept of space colonization (<u>Man</u>, 1985, pp.212-213). O'Neill's concepts and scientifically designed architectural miniature models have usually been construed from the scientific (technological) point of view--they are classified as hypothetical. Scientists investigate things most frequently by creating possible idealized models (constructs) (Augros, p.133) and by analyzing the tests/experiments that they set up to assess those models. After a reasonable number of experiments or trials to challenge their models (as hypotheses) they are able to find out on a rating scale how close their postulates (guesses) are to what their true findings reveal. Professor O'Neill has been doing the same thing using possible extraterrestrial habitation, such as his biospheres in Arizona, USA, and vehicular transportation models as part of some NASA trials. In this case, his work is considered by the scientific community to be theoretical, so far: an artist would call the conceptual stage *imaginative* and the model stage *creative*.

O'Neill's concepts, plans and scale models have been in existence and critiqued for a great many years. They have been depicted in numerous books, journals, photographic slides, newspapers and films but have not, as yet, become an extraterrestrial physical reality. This near space colonization concept has an existence of its own in the minds of many people; as yet it has not been reified as an outer space habitational complex to, and from which, humans communicate by vehicular and communications systems and devices. Many hold it as a goal and therefore, by definition, O'Neill's concepts reside in the TELETECHNOLOGICAL domain.

4. Simulated *real* space, time and spacetime exist as *simulation* models on various display screens, in various environments, and as computergraphics.

Simulation for training in like situations (for various performance skill operations) are now available in virtual three-dimensional animated software programs which are computer automated design/computer automated education (CAD/CAE). I call these *techno-real hybrids (TR/H).* Simulations may also include and juxtapose appropriate technologies which create a *surreal* effect (Morris, p.1295).

Surreal means from the unconscious mind or "beyond the real", residing in the unconscious. Some examples are the numerous visual and sound ever-progressively changing, ever-startling computergraphics. These depict *unreal* combinations of objects, sounds and actions. Many of these are used for advertising and entertainment. Similar to art surrealism, some say that they are unconscious expressions of our real world; others depict these either as accidental or purposive innovations that are created by manipulating and combining preselected signals, with or without human design.

These surreal depictions reside in the TELETECHNOLOGICAL domain. I term these as *techno-surreal hybrid* (TS/H) images.

6. *Superreal* is another reality orientation of the TELETECHNOLOGICAL domain. Typical examples are (a) the extraordinarily large, in <u>size</u>, like the massive TRON television screen used for huge outdoor crowds, b) the greatly magnified image, such as a closeup of a human eyebrow on a face projected on a cinematic, twenty-foot-high silver screen, (c) the inordinately magnified sound, such as breaking the sound barrier by a jet aircraft or quadraphonic amplified music,

(d) the almost incomprehensive ultrafast speeds of computers cited in the *picosecond* (trillionth-of-a-second) range, now in the experimental stage. *Techno-superreal hybrid (TSR/H)* images and devices may identify this group as belonging to the TELETECHNOLOGICAL domain.

7. Combinations, as well as experiments in several dimensions of formerly two-dimensional media, are in the investigative stage. As the capabilities of the technologies are increased so, too, are the possibilities for new uses. Predictions are not possible about emerging combinations.

The accomplishment of TR/H is moving rapidly and is demonstrated as computer-aided simulation combined with specialized video screens for airtraffic control, and for real life, "on-line", real time situations; there exist new learning situations related to science:

One noteworthy computer simulation example is that of SUNSTAR (English and Reilly, 1986, p.11) and other software by the Stanford University/NASA affiliation team. The computerized simulations consist of the fundamentals of the science program called "telescience", and of the activities carried out by in-space (in earth orbit) workers--scientists, astronauts and others. This includes the *real time* simulation of a USA space shuttle mission flight (p.13)--a "now" experience.

The simulations on screens, with sound, may be experienced by participants within a real life-sized model (replica) of the space shuttle. The crew of the space shuttle trains with this simulation model. Boeing, a major airline company, and others, have used this training method for over twenty years.

All of the foregoing descriptive TELETECHNOLOGICAL domain *mediations* concerning human reality perceptions of time, of space and of spacetime, are exemplified by experiences depicted in relation to the standard concepts of what humans generally understand as physical reality, and as demonstrated by a variety of visual, sound and data manifestations. These are categorized as: real life, actual, virtual; extended and contracted (which includes compacted, compressed, collapsed or "edited out"); imaginative or hypothetical; simulated; surreal (beyond the real); super real; and combinations (which include life-sized model/replicas).

The foregoing electronic-mediated visual and sound images, as *media products*, in or on various technological devices and systems--videotext, television, video, radio, print, computers et al.--may be located for use in the following societal areas:

- communications and transportation sites
- museums, galleries, exhibit centers, theatres
- information and knowledge industries
- fields of education; entertainment
- the artistic and literary domains
- commercial and industrial enterprises
- scientific and technological investigations
- diverse professions

- government bureaucracies
- military megacomplexes
- emerging and experimental situations

Many disciplines and fields of endeavour are able to benefit from new perspectives, lateral thinking and expanded ways of considering space, time and spacetime interrelationships and experiences within the domain of TELETECHNOLOGY.

The preceding extrapolation is essential for understanding the numerous possible operations of the computer--to command the wide variety of *mediated reality manifestations*--when the computer is linked to communications technologies (at a distance, including earth orbit). This inimitable manipulation device has the powerful capability to *interrelate* systems and devices (via channels, links and circuitry), all of which are activated by electromagnetism and light-radiant energy. The core mechanism of the computer is designed to respond at high energy-activating speeds; this speed gives the computer its immense power. Enormous speed accommodates enormous productivity: the computer has extraordinary speed in counting (digital signals) and for continuous measurement (analogue signals).

The content (message or information) of a communication intended for transmisssion is interdependent with the carriage (channels, methods, systems and devices, including ancillary equipment). [Content is not dealt with in this paper.] The following statement is included because of its demonstrable significance: Messages (content) are structured for, and are wholly dependent on, the carriage systems. Signalling energy is the core of communications.

Signals for and of the signalling energy, which activate any transmission or reception, also contribute to the formation of the carried message/content itself. In the flow of energy, messages or parts of a message may be distorted or lost depending on variables of the signal strength, continuity and reliability of the system which uses influx signalling radiant energy.

In addition, the modulation-reversibility of the computer has almost instantaneous command over this influx radiant signalling energy. Linked together, these two compatible dynamic energy forces present a formidable resource potential. Extremely complex and highly sophisticated technology is required to access this energy, to maintain the influx reliability, and to respond immediately to any combinations of commands. The complexity of the actual world of communications is beyond description. The domain of TELETECHNOLOGY has operatives for communication. This domain is a definitive abstract concept depicting the interrelations of the humanly experienced technologies at this time and place. Society continues to develop and to integrate increasingly advanced technologies based on the many virtual realities of the TELETECHNOLOGICAL domain.

TELETECHNOLOGY, as actuality, may be concerned with varied <u>patterns</u> and <u>dimensions of uses</u> (now, not now, later) in different times and places or phases. The evaluation of the common-place telephone is a popular phenomenon. No one expected the telephone to have a significant impact when it was first marketed to the public. Conversely, the general opinion about the video telephone at the 1964 World Fair was that it would be an immense success, which it was not. People would not buy it or use it. Today, the unifying switch mechanism of the ordinary telephone extends space and time and spacetime, if one is using a mobile unit in transit anywhere--sub marine, across land, in airflight or in orbit. The telephone exchange system holds together entire corporations, entire national satellite relay systems and vital communications among nations.

The earth orbit (teleport) space station communications system, based on a prototype design, unites space orbiters with their families and others on Earth. The multiple reruns of videotapes of astronaut-Earth communications appear as *now*. Other *now* videotaped experiences are virtually anywhere--from playback sessions by ordinary citizens in their homes, to reviews by head dignitaries of nations who refer to these *now* experiences in many situations, including those related to the state-of-the-nation addresses and world-summit colloquies. *Now* can be in time (i.e. any time of day or night), in space (located or carried by any means or transmitted anywhere on Earth or outer space) or in spacetime (i.e. moving through space measured in speed/time or in duration as event-interval in an actual or a virtual sense). The telephone, electrography (television/videography), radio, et al., are unstoppable. *Now* is in all places and at all times. The eternal inimitable *now* has become the popular idiom of what is today called the computer era or, alternately, the Space Age (which is completely dependent upon computers).

The technology is actualized currently in the following design sets of communications or information devices or systems or methods:

- telecommunications, facsimile, text, data, semaphore and character symbol forms;

- broadcasting, radio, cable television; closed circuitry, maser (microwave) and laser (lightwave) propagated systems; satellite orbiting relay systems;

- information technologies/computer systems and links;

- ranging, navigation, detection and other; remote sensing (including aerial); telemetry (including aerial); various others mesh with communications, such as medical diagnostic, and other detection and problem-solving instrumentations and operations;

- various electronic systems and devices that encompass *imaging* of optic, sonic, photonic, tomographic, magnetic resonant and spectographic scans including those for crystallography, chemical analysis and nuclear particle investigation;

- various visual, sound, synthesized sound, tactile, pressure/friction, spray and heat operational devices that allow interchangeable, message-signal formatted communications by specialty operators or by persons who are disabled in one or more sensory organ (receptors); or allow machine-to-machine interfacing in addition to, in some cases, animal-human interfacing--*transactional media*.

Currently, the digitization of telecommunications allows for transformations from one visual, sound or text format to another.

The operative TELETECHNOLOGY, which has evolved from simpler forms to complex networks, emerges as a subsumed quasi-identity. A sense of restrained power of inexorable magnitude and possible escalating dimension resides in our increasingly sophisticated technologies. The fulcrum of this power resides in the wisdom of human beings. The way devices and systems are managed and used for global, as well as local and national, communication is the key to survival in a rapidly advancing technological-nuclear civilization which includes many global system problems. Communications media wisely used to strengthen human relationships may help to sustain our planet.

TELETECHNOLOGY Defined

The preceding definement of the abstract domain of TELETECHNOLOGY emerged from an inductive analysis of the meanings of *tele*, far-goaled, and *logical*, systematic, which taken together were understood to mean a design set which is far-goaled or distanced (end-goaled). The TELETECHNOLOGY domain was further investigated from the relative orientations of space, time and spacetime mediations. The following points are set forth for considerations prior to a conclusive precise definition of TELETECHNOLOGY:

1. The concept of TELETECHNOLOGY emerges as an optimized construct with the real (actual) potential to *affect* human communication via reality-mediations (i.e. movies, computer simulations and the like) in a tangible measurable, as well as in a symbolic, way via computerized or noncomputerized goal-oriented, technological (systematic) operations using electromagnetic radiant signalling energy, in space, in time and in spacetime.

2. The capability of TELETECHNOLOGY can change and exchange things into something else (i.e. become information abstracted): TELETECHNOLOGY is transformative.

3. The potential of TELETECHNOLOGY may relate to inner lives of human beings. As stated earlier, understanding how radiant energy moves (as it carries the content/message) in a system may be used to empower the operator/user to control (to manage effectively) the complex contemporary technologies.

4. Extensions of the above may be used in the fields of interpersonal or organizational relations or in management of human resources.

TELETECHNOLOGY may be considered from several points of view: as a systematized method or as a logic set; as a transformation modulator; as a set of variable operatives. TELETECHNOLOGY is created originally by human beings (although machines are now able to design, program and manufacture technologies).

> TELETECHNOLOGY is spacetime transformation (of the operations of systems, of methods, and of human beings, via media)
>
> ergo,
>
> TELETECHNOLOGY is a design set of interrelated quantifiable operatives.

As such, this definition may serve as a kind of template (standard) for a wide variety of systematically designed entities, including those of measurement instruments for a wide variety of operations, processes and functions. TELETECHNOLOGY has emerged as the source construct for the basic format for measurement and evaluation instruments for quantitative and (appropriately applied) qualitative research purposes.

Earlier Relevant Models

In the transdisciplinary field of communication, the literature of the past thirty years provides varied and general communication models, which demonstrate several changes of focus. Mainly, the emphasis is on *effects*: mass media, social (ideological) and psychological (behavioural) effects and, more recently, the source effects and attitude change effects of audience targets which are oriented to media analysts and journalists. Severin and Tankard (1979) present a representative well-organized description of models and theories for communication and, in a limited way, for information theory research. Although stated to be so, most of the models in this and in other works do not fit neatly into categories of *interpersonal*, *mass*, or into those loosely called *mathematical*. The Bretz taxonomy (1979) which relates wholly to educational technology, is the best, although now an obsolete, example of structural choices set out, supposedly, to assist learning via various media.

Several authors questionably describe group (i.e. more than one person--a dyad, a trio, several persons or a large number) communication. *Communication* is an individual, highly selective and personal experience that exists within the understanding of one person or someone or something else (or, possibly, in self dialogue). Communication is union with an other (Bain, personal communication Spring, 1985). Communication is mainly dialogue and relies on purposeful *signalling*, not solely on signing, for successful communication. Each person in any assembly of human beings communicates, individually and separately with each other. There may be a large number of persons, but each communication experience is each-to-a-one or a simulated one-to-the-other (as for a speaker in a large, filled lecture hall). Mass communication is a phenomenon in which the collective takes on a *oneness* and responds as one body, as in the majority of a population electing a leader, or as in fans cheering in support of a favourite performer. Mathematical models are mainly those that imply a controlled *cybernated* effect with a *feedback* element; they are systematic and are monitored for change.

Many of the communications models and theories have been influenced by the Wiener feedback theory, and by the mathematical (measurement) orientation of Shannon and Weaver (1949, pp.30-32). These basic concepts are accommodated in Shannon's basic model which includes the commonality of continuous feedback monitoring of information signalling and modifications to maintain the transmission. (The orientation of most social science communication researchers is based on signing.) The difference between Shannon's basically measurement-oriented theory and the construct presented in this study is that Shannon describes signalling information as mathematical functions or symbols (p.33); whereas this study describes signalling energy of general dimensional forms and varied interdependencies. Shannon mainly deals with measurement, with time, with space and other functions in an exacting mathematical engineering model. This study deals with the general way that radiant energy moves and/or is acted upon (by the control-based signals) as basic signalling forms, through a system; and in a general way describes the potential interrelated changes available--dynamics--within preset standard functions of that system.

The Wiener feedback loop is controlled and continuous; the Shannon model is linear, does not provide for different kinds of interdependent, specific differing actions to take place--the emphasis was on maintaining desired, measured energy levels. Neither Shannon's nor Wiener's models provided for augmentation or enhancement by specific relationships with multiple alternatives for change, i.e. to change goals (products or services). (Weaver is included with Shannon because of his contribution; he provided an interpretation into layman's terms of Shannon's technical reasoning.)

The model I propose operates within a standardized design set of operatives with two-way, dynamic change alternatives for the energy forms that move through the system. This model fills the gaps as outlined above, and as follows:

a) by accommodation of specific dynamic interactions not simply on one operational level, i.e. of reacting (feedback), but also of a concerted five-part set of activities to <u>guide</u>, <u>manage</u> and <u>optimize</u> the <u>use</u> <u>of</u> <u>energy</u> as it moves through the system;

b) by standardization of a definitive ordered <u>framework</u> which includes each operation, separate and interrelated in a hierarchical arrangement that allows for complementarity or augmentation by other compatible similar systems, thus <u>extending</u> its capabilities;

c) by the <u>unification</u> of <u>converging</u> technologies by cybernated operations with multiple alternative functions, thus enhancing possible aggregate-<u>expanded</u> or networked (ongoing) operations.

<u>The Theoretical Construct</u>

A theoretical construct is a representation of (fundamental) elements, their order and their interrelationships (Bain, 1977). An exploration of such a model often may lead the examiner to understand more readily the forms and purposes of those devices and systems that already exist. Furthermore, a well-integrated model may have the power to suggest to fertile minds, devices, systems and (operational) forms that do not exist, yet.

This proposed model for TELETECHNOLOGY activated by radiant energy signals is not a design for a particular piece of hardware, nor an abstract concept of how some device works. This is an abstracted model of the interactions in the system: electromagnetic radiant energy signals move interdependently through the system, while energy is acted upon (or manipulated) by a centralized control mechanism. As this resource signalling (carriage) energy moves through the system, it is monitored continuously; concurrently, this accessed energy is directing (and/or tracking), measuring, regulating, converting and resolving the carried content (information) signals. All of the energy in the system acts or is acted upon by the standards preset by techsines. The techsines consist of ensine, (central-)control, exsine, transmit, store-and-retrieve, and command. (Definitions to follow.)

The need is pressing today for people to understand the underlying principles of communications. Some kind of conceptual framework is required for a new perspective from which to consider the numerous available devices which overwhelm our daily lives. In order to maintain an individual sense of command (autonomy) and a connection with reality (Augros, p.133) and in order to make sound decisons related to technology use and management, some kind of a common knowledge base is required. A "grounded" set is needed towards understanding for the general public as well as for administrators, for those in the professions, and numerous others, to assist them in effectively managing these technologies.

The focus of this study, and its main organizing principle is to provide a model (Severin and Tankard, p.29) through which the abstract domain of TELETECHNOLOGY may be perceived as a continuously changing phenomenon, pulsed by electromagnetic and light-radiant energy.

This paper is intended to advance and extend thinking about (a) how signals act and are acted upon during transmission, in a general way, (b) the in flux information and communications systems and devices in this transformative societal period and, (c) (possibly) about the way people themselves communicate in various transactions and interactions (Augros and Stanciu [pp.94-98] propose that any model relevant to human beings is concerned with subjectivism--the realm of the human mind and spirit.)

The Interrelated Elements

The model I propose consists of three categories, one of which deals with *signal forms*; one with *processes* of altering such forms; and the third with the *functions* used to control and manipulate the foregoing. The possible combination of signalling energy movements and the *transposition* of any one signalling action related to any other element, interdependently, or in any one signal action output formatted into another, categorizes this TELETECHNOLOGICAL construct *transformative*. Because of the interchangeability potential, differing technologies are able to be combined at control points, which are called *links*. The various communications technologies have the potential to be linked by digitized computer capabilities.

The theoretical construct, figure 1, is comprised of three types of interrelated elements:

First are the signalling energy forms I call *BASICS*. They are both carriers and/or signal <u>forms</u> for mediated images, both visual and sound, and of data (pressure and other) which are <u>mediated products</u>. The processes of the construct, I call *DYNAMICS*. The standard based control functions I call *TECHSINES*.

A. *BASICS*: (signal forms)

The electromagnetic energy forms are described as the following forms: *point*, *line*, *plane*, *volume* and *pattern*.

A.a. *Point* is a position of an energy signal or a single impulse between intervals of time and/or space, or spacetime.

A.b. *Line* is a series of contiguous points of energy signals on the border of the spacetime plane.

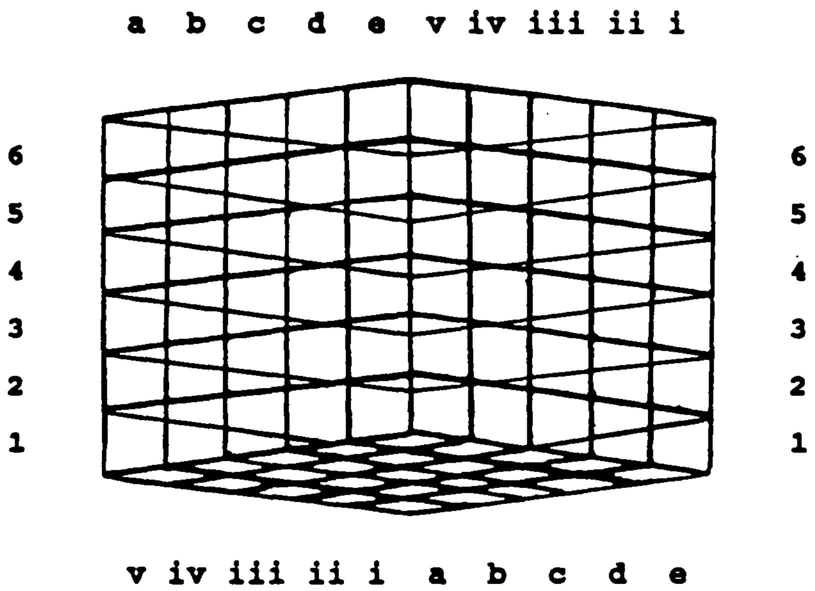
A.c. *Plane* is a bounded (or defined) two-dimensional area of contiguous lines (of signalling energy) between intervals of time or of space or of spacetime.

Figure 1

TELETECHNOLOGY RADIANT ENERGY SIGNALS

A theoretical construct for influx radiant energy signal movement through a TELETECHNOLOGICAL system

(D.J.C. Martell, 1987)



A. BASICS	B. DYNAMICS	C. TECHSINES
e. pattern	v. resolve (ing)	6. command
d. volume	lv. convert (ing)	5. store-and-retrieve
c. plane	iii. regulate (ing)	4. transmit
b. line	ii. measure (ing)	3. exsine
a. point	i. direct (ing)	2. control
		1. ensine

A. BASICS B. DYNAMICS C. TECHSINES

A.d. *Volume* is a solid (actual or virtual) bounded position of contiguous planes (of signalling energy).

A.e. *Pattern* is an interpretable design composite of events (points, lines, planes or volumes of signalling energy) located in spacetime; intervals may be contrapuntal to events.

Each of these theoretical qualitative five forms is described as an accessed energizing signal pulse form; each form acts in a discrete-valued step-by-step digitized way. Each form may be accessed as continuous variable, nondiscrete analogue pulses as directed by a specific central control program.

Each form is identifiable by position in space (in closed-channel space, free space or any other known transmission space); in time (which may be governed [engineered] by differential equations [i.e. analogue] as set out in Shannon's model, or in discrete integral values as when required in pulse code modulation (PCM) of digitized pulses); and in the general spacetime continuum: event, locus formation. As such, each form requires radiant energy in comparable strength and speed (amplitude and frequency) to transmit successfully and to receive the predesigned communication (thought transfer of cognition; intelligence of engineering, as per Shannon).

A. *BASICS*:

A.a. *Point* occurs as an energy pulse which is numerically either a "0" or a "1" (i.e. an interval or an event). When the point of energy is a "1", that position is energized and capable of moving or carrying a unit or a *bit* of signal energy. Some examples are: an instantaneous light--a flash of a heliograph, or an electronic warning indicator; a *bit* or a *dot* of sound as in a code, such as Morse code, one bit in data transfer signalling (see Graham, 1983, pp.22,127); a *pixel*, which is a miniature visual dot called a picture element, such as that used in a television image; a *pip* (planned position indicator) which is a radar screen's bright point representing a detectable object located in space: a *phonon* is a sample/bit of sound such as calculated in synthesized speech devices; a *photon* is one particle of light energy.

A.b. *Line* occurs in time, where it may show direction from one interval to the next; as a beamed energy signal such as the daily noon-hour national standard radio broadcast signal which exists for the duration of one minute; the *dah*--the prolonged sound in the Morse code. (The Morse classical description consists of spaces and marks: "0s" and "1s".) A line of energy exists in space as a searchlight's beam, which is of considerable length. In spacetime, a line of energy is demonstrated when the observer may watch the emerging line as it undergoes the process of being formed, especially if synchronized to a time-beat or music which occurs in many moving pictures (film, video, computergraphics). A one-line (i.e. linear) sequence of energy pulses is known as a unit *burst* in data transfer, and in computer quantized/digitized operations: these are measured as standardized units. *Words* or *characters* are each one linear unit. In open broadcast, *line of sight* transmission is analogue, continuous wave energy. (There are many types of, and ways to describe, energy wave forms; only those which are digital or analogue are included in this study and, of these, *digital* is highlighted.)

A.c. *Plane* may be different types. Planes occur as *bands* in the Earth's electromagnetic (radio) frequency spectrum. The spectrum is an invisible series of energy/force field planes moving at varying rates (time) over vast physical areas (space); this radiating energy is continuously expanding outward from the surface of the Earth. These are the planes or bands of the world of electromagnetism: frequencies are traditionally expressed as occurring between two planes--this area is called the *bandwidth* (Pitt, p.35).

Plane is described in *optics* (light and vision studies) and is measurable. *Light level* control is fundamental for quality productions. In general, images are <u>projected</u> from the focal plane. Images on planes are <u>displayed</u> by optics on the focal plane of a still camera. In electronics, images are displayed on a cathode ray tube (CRT) of a television set or computer display terminal (VDT). The same principles, in general, apply to holograms which are two-dimensional; these are duplex and more complex operationally (p.181).

Sound planes or *levels* are controlled carefully in any sound or music productions which include film, video or television. The sound levels, synchronized or "mixed" to a visual production, are expressed as one or more levels of any kind that exist from moment to moment within each *sound-on-picture* frame. In such case, editing or modifying any part of any sound level, as with any change in light level, will change the product as a whole. Sound compression, which is used often when an old movie is edited to fit a television airtime, will change the total effect of the overall timing of the film.

Cognitive planes, or levels of understanding or experiencing a cinematic or television production, may be sustained or may vary throughout the experience of each viewer/perceiver.

The multiplicity of energy actions on the several planes in a transmission system contributes to the formation of *volume* of electromagnetic radiant energy required for complex operations.

A.d. *Volume*, as used to describe electromagnetic signalling energy, may be expressed as capacity for modulation of visuals, sounds or data and as capacity for combining these. The volume refers to the amount (strength) of the available energy and to the power (speed) of the particular frequency required for a transmission.

Volume, as an imaging event, energizes the visuals and sounds in an imaging energy signal and is produced as an actual two-dimensional visual-with-sound format, but is illusory three-dimensional representation. These virtual three-dimensional mediated products exist as simulated real life in moving pictures and, with exceptionally realistic surface representation, as moving holograms. In all light-projected images, the focal point on the plane, or the apparent origination plane from which the image appears to diverge, will determine the volume dimensionality as actual or virtual or both. All surface representational electronic images which appear to have three-dimensional volume are actually two-dimensional. Holograms are actual two-dimensional, virtual three-dimensional images produced on a planar format. Holograms projected into free space appear as voluminous and are optically three-dimensional. (The holographic image is created by an interference pattern of projected, focussed light and exists as an image accessible from multiple angles.)

Remote electronic sensing and imaging displays may accommodate virtual three-dimensional, full-volume images with motion on VDTs. The American airborne image spectrometer (AIS) uses this method for subterrestrial mineral prospecting. The AIS images are computer screened, simultaneously printed out on hard copy and may be changed to other formats. Some of these are videotape, videodisk, or are sent over telephone lines as facsimile (fax) transmissions, or other media.

A.e. *Pattern* is created by the pulsed signalling of electromagnetic energy:

- within a closed system or systems, as along data/telegraph/facsimile wires, on telephone poles or underground, within coaxial cables, optical fibres and wave guides);

- as beams across open, direct wave systems in the atmosphere (as in radio, microwave systems, satellite relay) or;
- as beams within nondirected wave systems in the atmosphere in line-of-sight transmission (as in satellite relay broadcasting, including mobile cellular radio).

Within the above, closed and open, directional and nondirectional communications systems, are the *patterns* of transmission referred to in A.d., as signal modulation and combination. Energy signalling consists of where the signals travel (i.e. open or closed pattern) and how they are propogated (i.e. order, segmentation and combination of patterns related to amplitude, frequency, phase and spacetime considerations).

In review, this means: where--loci as closed or open energy planes within the Earth's atmosphere and in near space; how--loci of the signals ordered/combined as they travel relative to the total volume transmitted. The loci/pattern of energy planes encompass the signal volume ordering patterns (modulation and multiplexing).

Pattern is an elemental form of radiant energy which occurs as *event* and operates by intervals and various modifications of the durations of interval-event interdependencies. A pattern can exist within space, within time, or within spacetime, within a line, a plane, or a volume. Pattern may also exist as a point, separated only by intensity--stronger/weaker; by density--greater/lesser; and by colour--red/yellow/blue, for example, as in sparks, fireworks or microscopic charged currents. In addition, television has a triad of electronic beams for surface image colours: red, green and blue.

Pattern exists as a repetition or an alternative of the first appearance of that point, line, plane or volume. Texture may result from juxtaposing of objects or events which, when combined, create a new entity. Texture may also be called pattern by overlays or superimpositions of nonidentical elements such as a pulsed signal with a continuous signal, either of light or sound, or a combination of any of these. The various patterns of energy signalling in data transmission and in broadcast transmission are complex. In general, integrated information systems at all levels of complexity provide enhanced services to users.

B. *DYNAMICS*

Dynamics, as processes for potential change consist of the following actions:

B.i. *Directing*: this is the continuing process to <u>select</u>, <u>order</u>, <u>guide</u> or <u>track</u> signals along a route or transmission channel at various levels of signal power and radio spectrum routing; to <u>reroute</u>, sustain, change or merge at a destination. Channelling, receiving, supporting ongoing energy towards designed activities and destinations requiring differing measures for sustainable operations.

B.ii. *Measuring*: this is the continuing process to determine the amount of, or to *quantify magnitude* of, signal power and transmission stability during various ongoing activities; to quantify signal duration (time) rate of signals at various levels of signal power and radio spectrum routing; to quantify scale and direction of luminous intensity for activities concerned with spectral colour. (Note that achromatic wavelength related to broadcast colour signals exists solely within the luminosity scale and is measured as wavelength within that luminosity scale.) Detecting, sensing, recognizing patterns, all of which include interpretation for using and regulating.

B.iii. *Regulating* is the continuing process to maintain energy (signal) strength constantly as measured against a signal standard; to qualify additional signals; to harmonize or to modulate signals as within transistor circuitry as well as to modulate radio frequency signals onto a carrier wave, or to modulate light signals within a waveguide (microwave or fibre optics); to amplify or enhance in order to alleviate the inherent channel signal attenuation (a waveform cutoff) or loss (signal weakening).

B.iv. *Converting* is the continuing process to change a regulated signal either from an analogue waveform to a digital waveform, or the reverse (A/D, D/A), and to maintain the signal conversion for as long as required to return to resolution fidelity.

B.v. *Resolving* is the continuing process to return the signal, from conversion, to its original or improved detail fidelity--quantified in pixels (picture elements) and rated in lines per second--for representational visual (television, text data or graphic, or holographic), or for sound image fidelity. In the case of data transmission where the signal may originate with pressure, friction or from an optical recorder, the same fidelity as above applies except that the readout may be either from an oscilloscope, a pen-marking seismograph or a digital liquid crystal display, among others. Resolution is equated with power and with the speed required to maintain a quality mediated product.

The process of resolution also includes the separation of chromatic wavelength differences by appropriate ratios for transparency and photographic colour saturation, gradations, luminous intensity (and image brightness approximates) and includes all of the above on a spectral band, numerically. (Wavelength is calibrated by the waveform and by the *light temperature*, which is thermal and light radiant.) (Radio chemistry and spectroscopy are specialties and will not be dealt with further herein.) Resolution quality of picture and sound depends on the bandwidth of the transmission signal and on the capability of the equipment and system used.

Taken together, these dynamics describe the potential for TELETECHNOLOGY energy signals. The means of enacting these processes are in the third category of the model: the *Techsines*.

C. *TECHSINES*

TECHSINES are the functions for immediacy control (either/or, on/off) of the potential energy *sines* (variation capabilities).

Techsines consist of the following property techniques: ensine, (central) control, exsine, transmit, store-and-retrieve, and command.

C.1. *Ensine* is the technique directive to enter. Ensine is a composite term meaning to start operations/access now by the energy signals; some of these operations are grouped together (concentrated) within the system (for flexibility and interchangeability, for expediency, and for immediate emergency alternatives). The group of ensine functions operated by the energy signals are to input the "on" signal, mark or activity to start systemic functions; to encode (change into machine language) signals for various functions; to assign values for characters and symbols in order to recognize (sense) and manipulate these property patterns; to link, change or bus (line up in series), interface (connect) or operate in the first stage of a limited-use tripartite serial operation (such as a complex network), which is comprised of concentrate, distribute and expand functions. (See also transmit and command concerning this triad serial operation.)

C.2. *Control* is the technique directive to manipulate and switch (connect) memory logic units which are of various complexities and speeds for constantly changing activities; to flow data continuously as in different routing patterns through a central processing unit (CPU) used for the total system and also to the command (terminal) systems; to sustain (all one-way, two-way, on-line, or any other) operator traffic modes in operation for: communications and computer processing (CACP); the system's everchanging central control programs (SCCP); and management communications/control programs (MC/CP); other programmed systems (Px/S) in development.

C.3. *Exsine* is the technique directive to execute; to decode (change back from machine language, as in C.1.); to override all interconnections, interruptions, and to rectify operational failures of intercommunications and critical connections during the major types of system central-control programs (SCCP): main operating systems program (MOS); database management program (DMP), various other communications control programs (XX/CP), some of which, for example, are placed on "hold" (thereby creating an overlap of function temporarily as in *store-and-retrieve* [see C.5.], or are in a "temporary file") for expediency.

C.4. *Transmit* is the technique directive to transfer or carry the message/information (cognitive) from origination to destination, and includes routing various informations from a transmitter to a receiver with relays, modulation, compression, amplification and time interleaving (insertions) of digitized signals and packet-switched routing (of data); or to mix and/or to distribute discrete informations on wires, and closed and open (broadcast) systems--beamed or non-beamed; also, to operate in the second stage of a limited-use tripartite serial operation (such as a complex network) which is comprised of concentrate, distribute and expand. (See also *ensine* and *command*, concerning this triad serial operation.)

C.5. *Store-and-retrieve* is the technique directive to store and to retrieve on demand. It includes the standard rule to execute management communications/control programs (MC/CP); to file or to place information into appropriate storage files; to activate the retrieve-program sequence in order to reproduce the original information (or, as later, in *command*, to transform it); to evaluate, continuously, the ever-changing file holdings, and to automatically update and print out reports on those files.

C.6. *Command* is the technique directive for the third stage of a limited-use tripartite serial operation, such as a complex network, comprised of concentrate, distribute and expand. (See also *ensine* and *command* technique directives.) Other command techniques directives are as follows:

a) to transform the retrieved information into expanded systems, different formats and different media, as linked to (central-) control, semi-automatically:

(1) to operate the total system as an (automatic) servomechanism (i.e. a closed-loop feedback control system such as a thermostat);

(2) to switch to other systems in one of many network configurations;

b) as a remote operating unit, to self direct, automatically as a servomechanism:

(1) to operate the total system as a servomechanism;

(2) to <u>design</u> and to <u>produce/manufacture</u> (CD/CM);

(3) to <u>switch</u> to other systems or to networks, or to functions at a distance (either automatically or remotely activated by control C.2, from outside the unit itself as (a)(2), in the preceding) as follows:

- remote operations, such as broadcasting, computer software, processing and printing;

- remote sensing and related activities which include remote surveillance and automatic climatology reporting;

- remote operation and guidance of a vehicle or human powered or nonhuman powered craft on land or subterranean; on or under water; in the atmosphere (air), in orbit, or in raw space; in varied geographic locations (cells); and other possible locations;

- for civil, federal, (military), space science, experimental and industrial-commercial public and private operational ventures.

c) as a remote operating unit which is <u>self-generating</u> , and is powered by solar cells, electronics or other possible energy sources in order to carry out activities similar to any of those above, and possibly others. (Note: servomechanism used in the preceding is meant as automatic control of a mechanism within any type of system.)

TELETECHNOLOGY: Practical Examples

The preceding section has set out and defined the three TELETECHNOLOGY signal categories of forms, processes and functions of the electromagnetic signal/system model. Under Basics, the forms are described as qualitative (essentials); under Dynamics, the processes are interdependent and are described as quantitative variables; and under Techsines, the standard functions are described as the immediate (on/off) control properties.

In order to demonstrate the validity (soundness) of the model, I have chosen two examples, each of which is used widely by some members of the public. The first is the common telephone, a device available to ninety-eight per cent of the population of the Western World. The second is the exchange system, which is a computer-based linked extension of the telephone. The exchange system, in varied configurations and levels of complexity, with ancillary technologies such as *facsimile*, or "fax" (original document reproduction), et al., is used in a wide number of agencies, corporations and industrial megacomplexes. Integrated automatic exchange systems are increasingly widespread throughout the globe.

The basic principles of a computerized exchange system are those of all protocol linked communications systems (Froese, personal communication, Spring, 1984). Such a schema is based on specific needs of users and on management contingencies. This paper focuses on interactions of system energy signals to the exclusion of a design for a particular integrated communications or information system.

The two examples of the telephone and of the exchange system (which both use computerized switch control centres [nodes]) are used herein to point out the various elements as set out by the model. Note that the ordering sequence of these two examples is unimportant, in many cases. The signal speeds in the computerized control mechanism of the telephone and the exchange system create the illusion, when assessed against the natural reception and delivery (i.e. speech and gestures) sensory speeds of people, that the entire electronic operations are almost concurrent. Human beings, therefore, perceive many electronic activities and telephone-related activities as almost instantaneous. Space telephones reveal the true time lapse by reverberations. (An actual engineering description would reveal phenomenal speed in electrical transmissions; we are concerned with generalities.)

In these two examples, instead of writing out each category and level I will simply use its designation: thus, *dynamics*--directing--is B1.

Example #1: The Telephone

The telephone voice signals travel along [B1] wires [Ab] in closed space [Ae] in a line [Ab]. They are amplified [Biii] in the handset [C1] which is a miniature transmitter-receiver [C4]. The line is "opened" [C1] by removing [Bi] the handset from the contact with the engaged [C2] lever. The telephone channel speed is 3,000 cycles per second (3k Hz); it is classed two-way[Ae] (duplex) wired, simultaneous [Bi,Bii]. Signal switching [C2] at the telephone exchange centre (node) may be automated [C6], thus increasing the speed [Bii] at which connections are made. In an emergency, the telephone operator (or an automated mechanism) may connect [C3] a third party in the place [Biii] of the second party on the line. (An automated switch emergency number may be used by the third party in the second case.) In planned sessions, for multiple users on one line, such as that of telephone conferences [Ad,e], a special device called a *bridge* is used at a preset location and all operations are manipulated from the bridge [C1,2;Bi].

Example #2: An Exchange System

The automatic command and integrated private automatic branch exchange (PABX) telephone system increasingly is being used throughout many countries. This is a closed [Ae] (private) line [Ab] telephone system for one network [C6] within a very large corporation, for a group of decentralized offices or for units (such as a group of multinational corporations who have offices throughout the globe and a large unifying telephone system), for example, those provided by Teleglobe or Telecom. The system may be for one enterprise or for an agency of any size.

Other examples of exchange systems are those on Earth orbitting satellites [Ae] with relays [Ac] perhaps, between satellites [C6] or via a spacetelephone [C2,4;Ab;Bi,iii,iv,v] via automatic change [C6] to or from anywhere on Earth and outward (into various regions of raw space).

There are many possible linkages [C6] with PABX; a read-out device [Ae;C1,2;Biv] of any kind in order to document [C3], file [C4,5] or transfer messages [Ae] in any format may be serviced on demand. A message may be varied [Bii,iii] at the input terminal [C1] by the human operator, is converted [Biv] to digitized signals [Bv], transmitted [Ac;C4;Bii,iii,v], then received [C1], and stored [C5], in the receiving unit, transformed [Biv] and projected [C3] onto a visual display unit [Bv;Ae] in graphics [C6] with finer text [Bi,ii,iii] format in the lower half of the screen [C3] as a combined [Bii,iii] graphics- [Bv] with-text [Biii] example of electronic mail [C4] messaging [Ae]. (Software packages determine layout capability.)

Instead of text messaging, the content may be sent out [Biv] as hard copy format [Aa,b;C3] or videotext (such as TELIDON); a specialized graphics system is incorporated using operations similar to the following unordered list: [Bi,ii,iii;C1,2,3,4,5,6; Aa,b,c,e]. The international communications satellites [Ac,e] (CTS) are able to accommodate these operations (but, as yet, the costs remain high and the public interest very low).

A PABX system may be used for many purposes. Potentially, any telephone or any computer or any TELETECHNOLOGICAL device/system which is stochastically (statistically) formalized may be used: the possibilities are limited only by the imagination and designs of engineers and by financial resources.

A Measurement Instrument: For media service

A measurement instrument for experimental research is designed to provide for manipulation of the independent variable, thus differentiating experiments from other methods of research (Gay, p.12). In order to consider the model in this study as a resource for designing an appropriate measurement instrument Basics, Dynamics, and Techsines may be taken as variables related to an appropriate investigation. The Dynamics may be taken as the conditional variables, i.e. they are attributes of the Basics and act as relative occurrences. Techsines may be considered unconditional variables.

In terms of the possibility for creating a measurement instrument to assess media (a) energy efficiency (input energy to output attained) or, (b) economic efficiency (costs of devices/systems based on delivery speeds related to unit cost as dictated by the provider), Basics may be considered as the qualitative variables and Dynamics may be considered as the quantitative variables. Techsines may be considered (opportunity) costs for the time or speed required of each function for each service (or product). For example, a slow-scan (captured frame) electrographic (television picture) is relatively inexpensive.

Computer/data transmissions are low or medium priced. An appropriate measurement instrument for a comparative cost-product/service analysis would consist of an hierarchically designed grid for outcomes expected related to unit costs cited in *bit rates* for the various media and routes (O'Brien, pp.332-335).

Motion Pictures and Newscasts

In addition to the preceding two practical examples, the telephone and the exchange system, the following discussion is included concerning the most popular audio-visual medium on earth--motion pictures. This medium was chosen because globally, we are an exceedingly mediated visual culture and the vast majority of people have had experience with, or access to, moving pictures/movies/television despite widely varying socioeconomic situations. The impact of "movies" is unequivocal. And, daily newscasts--televised, are a part of the lives of most people in the Western world.

"Movies" are "moving pictures". Movies are all of those surface representational mediated formats using pictures and sound which, when assembled in any physical, electronic (or other like-energized) manner, via *persistence-of-vision*, appear to fulfil the requirements of motion. Motion pictures include: all rapidly moved 35mm slides, still two-dimensional picture cards, celluloid or other frames, and these may be transmitted globally wihout regard to distance in general. Medium image quality is universally available. The accessing equipment (camera) does not require strong image-resolving power (quantitative). The film stock determines the speed/resolution to a significant degree. The speed or rate of transmission may be in planes or bandwidths of relatively low frequency, including those of telephone lines, for electronic images. In this case the time is great, the speed (frequency rate) is slow, the quality product required is low to moderate, i.e. the quantity of (pixels) resolving power units (bandwidth) is low. In general, the foregoing description is for an acceptable quality slow-scan video/electrography image. Sound is not included in slow-scan transmissions. These transmissions are possible globally and to space platforms and outward.

The reverse of the preceding is for satellite transmitted live laser relayed full television productions with state-of-the-art digitized visual and sound images. High quality examples are available currently in experimental laboratories; the general market cost is prohibitive.

Thus, motion pictures (movies) include, in addition to possible others, all these perceived as "in motion":

a) all visual images as in cinema, television, including newscasts, holography, and all "fireworks-type incandescent images", and laser-light images. (Imaging, as in remote Computerized Tomography Scanning [CTS] or ultrasound imaging is not classed as motion pictures in the general sense; in these cases, we say "imaging" or "scanning" and the products are *scans*);

b) all acoustic images used with or created by the foregoing; this includes all kinds of production formats such as feature films and documentaries in particular, as well as broadcast/television newscasts, experimental films and other productions including (see above) laser light shows.

In the case of motion pictures, the signalling energy may be considered either as:

a) the virtual use of all aspects of sound and pictures, of light and dark gradations, of energy-nonenergy (i.e.pauses) of these two as well as all aspects of the beat--or timing--both throughout parts of, and also the total, unified rhythm of the movie, i.e. the signalling energies within and encasing the production; or as

b) the producer-director's designed and intended cognitive signalling energy which, in a metaphysical (super natural, immaterial) sense, affects the viewer as an individual and, for some, as a collective (group). In the latter (i.e. b), the force of the (intended, and carefully structured) message or metamessage is designed for vicarious participation by the viewer or viewers on conscious, subconscious or supraconscious levels. (Movies are intended to affect real-life simulations in these various planes.) The interrelating dynamics depicted in any of numerous possible ways, using codified production techniques, cybernetic aesthetics i.e. control planning, purposeful direction, editing and serendipity (fortunate accidents) is the prime technically concerted process by which the viewer is affected (Martell, 1981). The foundational set or settings which may or may not affect the experience of viewing motion pictures, including newscasts, and reacting to them are the *access* (cost, equipment for distribution, time, travel, ideology, group acceptance, etc.), the *control* component (which has many conditions, mainly that of producer or television station management bias) and *promulgation* (availability of complete unedited films).

The foregoing description of motion pictures as an individual experiential/participatory idiom may, or may not, result in the perceiver comprehending the carefully set-out design of the producer. The internalized experience of a "movie perceiver" is highly selective and unique: each person "sees", "hears" and internally experiences an unique movie or newscast--each time the movie or newscast is attended. Herein lies the difficult task for precision tracking of the individual elements of the TELETECHNOLOGY model for the reviewer. This model may be used successfully for movie and newscast participatory assessments in these ways:

a) from the individual viewer's perception (for self evaluation), or

b) from the producer's perspective with the objective--that of self assessment of production choices. Either of these points of view--the receiver's or the sender's--may lead one to construct an appropriate and valuable instrument for evaluation, from this discussion as related to the elements of the TELETECHNOLOGY model.

Evaluation Criteria for Measurement

A self-evaluation instrument for use by a viewer of a movie or newscast may be set out similar to the previous description for media service. One may choose basic aspects for analysis, such as the producer-director's conscious design affect of location (emotive) or revealed facts (cognitive) in order to influence (affect) the viewer. These could be rated as plain to exotic, or standard information to various degrees of revelation--all are quality comparatives. The interrelationships, observed by the interactions or movements within scenes as, for example, changing lighting requirements, could be rated on a scale as quantitative. These movements/changes or interactions are determined as relative to the success of the product. The group of questions that the evaluator selects in order to create the instrument is the control component.

A production-evaluation instrument may also be used for self evaluation by the producer in order that s/he maintain control over all aspects during complex production activities. The traditional phrase to describe production calibre is "production values", and this concept underlies most of the decision making throughout any production.

One may also consider Basics as space, Dynamics as spacetime and Techsines as time for a mediated reality assessment base. In the above descriptions, no definite content or outline has been presented for design of a measurement/evaluation instrument. This is in order to allow individuals to use the model as a basic framework in creating their own instruments peculiar to their changing needs and times.

SUMMARY

This segment on TELETECHNOLOGY included the practical examples of the telephone, the exchange system; of motion pictures/newscasts; and a general framework for a measurement instrument--all of which are related to the elements of the TELETECHNOLOGY theoretical construct. Included was a brief description of the way the generality of the model may be used as a template or base for measurement instruments of all kinds, for example: for media efficiency choices, for self evaluation by movie or newscast participants of all types, and for many possible others. The model elements articulated in this study emerge as foundational to systems analysis: thus, this model has generalizability of first magnitude.

CONCLUSION

TELETECHNOLOGY has been defined as an operational set of interrelated, interdependent system/aggregate variables. The TELETECHNOLOGY model presented in this chapter is a TELETECHNOLOGY theoretical construct. The three categories of the model describe the interactions of the energy signalling within the theoretical TELETECHNOLOGY system. No one element is vital to maintain the system: all three parts interact with all other parts, therefore any operation is modifiable/transformable in order to sustain the system and/or the system's activities.

This model emerges as the <u>template model</u> for measurement instruments for electronic technological systems and devices that are used for communications.

The TELETECHNOLOGY model demonstrates "*generalizability* of first magnitude" for the real world of technology (science applications). Some implications of this powerful, panoptic model for technology are introduced and described in Chapter IV.

CHAPTER IV

SUMMARY AND IMPLICATIONS

The theoretical construct information was researched from available literature covering the period of ancient history to the present, with extensions of some developmental trends (such as the possible ultrafast technology speeds) for the future. This study was undertaken to create a frame of reference for the categorization of the varied and increasingly complex systems and devices in the tele-world of communications and information technologies.

The complexity and power of man-made machines with almost limitless capabilities leaves many people overwhelmed, uneasy and deeply concerned about our technological future. Many require an insight into the fundamentals of the effective use and management of technology. The wise use of technology for communication at all levels of society could strengthen human relationships and help preserve our society and our planet.

A demonstrated need exists today for people to understand the underlying principles of communications. In order to take control over the increasing number of electronic devices, particularly the ubiquitous computer, a conceptual framework that reveals the integration of electronics' operations is needed. A common knowledge base for users and managers could assist with reliable decision-making and policy implementation at all levels of society. A "grounded set" such as described in this paper could assist in the task of comprehending technology--for the general public, administrators and professional people of all types.

A common knowledge base assists people in maintaining an individual sense of command (autonomy) and connection with reality, and an ability to make sound decisions related to technology use and management. *If used wisely*, our advanced technology has the capacity to enhance and to improve daily work and leisure pursuits in all areas of society; it could extend and augment the positive capabilities of human beings, assisting them to attain a higher potential of self-actualization and a more highly developed civilization.

The model in this study reveals how electronic technology is energized and how the various elements are manipulated in theory. Extrapolated to daily life, people may apply this theoretical common knowledge to the actual technologies in order to obtain its best possible results. The model sets out the common interdependent categories of any electronic system, device or system--those of the energizing signalling forms called Basics, the processes termed Dynamics, and the variable functions called Techsines.

The construct/model was presented as a comprehensive design set of interrelated hierarchically ordered categories within the abstract domain of TELETECHNOLOGY (the design set of interrelated operatives). In real-life situations the computer has the power to interrelate systems and devices at phenomenal speed. The multiple concurrent interrelationships of the various elements of the tripartite model appear to human beings to operate almost instantaneously. An examination of communications systems, devices and services as compared with the TELETECHNOLOGY model presented in this paper, as per A, B and C, the energy signal forms, processes and dynamics, would accrue to the examiner an understanding of underlying commonalities. The energizing signals activate the system; the interrelated operating signals are capable of changing the content signals from one form into another. Understanding these interactions/exchanges and how to control them may allow users and managers a sense of command (autonomy) and an optimism concerning our technological world. The model in this paper is comprised of the fundamental interactive elements on which electronic communication systems are based, world-wide.

In the foregoing chapter a brief description was included of the way the generality of the model may be used. The model was found to be *the template (basic design) for measurement instruments per se*. The examples of measurement instruments described in this paper were for media efficiency and management-user services as well as for movie and newscast producer and/or viewer evaluation. The model elements articulated in this study emerge as *foundational* to systems concepts and analyses; thus, this model was found to have generalizability of first magnitude.

The three parts and the interdependent elements may contribute, also, to media articulation both written and oral, as well as electronic. These elemental terms may be used in the future, perhaps, in describing more precisely the forms of mediations and products, the processes of the technologies, and the functions of the standards and technologies required for communication per se. These terms may, perhaps, assist users, managers, and policy makers in more careful definition of activities for informatics, communications systems, telecommunications and differing media fields. And, they may assist people in understanding how these are globally integrated.

Actualization: Some technologies, computer linked

The theoretical construct presented in this paper denotes the ways in which some of the shortcomings (gaps) of earlier communication models are eliminated. This model integrates the basic principles of Wiener's feedback and Shannon's measurement-control theories; Bretz' contribution lacks a unifying core, in my opinion. In particular, the abstract model presented in the preceding chapter is comprised of interrelated, interdependent and ordered qualitative forms of electromagnetic energy signals (*Basics*); specific, active, measurable, quantitative processes (*Dynamics*) which are continually and potentially variable; and the ordered, standard property <u>functions</u> (*Techsines*). At all of these three categorical interfaces (connections), actual engineeered devices are adjoined in order to facilitate the defined requirements of an actualized, total integrated technological system. For example, the real-world emergent and integrated networks are comprised of varied communications such as <u>combined</u> television, radio and/or data systems, often operated over vast global distances, which are computer driven (and/or linked networks).

The prime example now in place is the National Aeronautics Space Administration (NASA) mission control. There are many other integrated systems of varied complexity. O'Brien (pp.403-406) presents integrated information/computer systems for business (defined, p.403) and data communications networks (pp.322-327). Integrated learning systems for education are in an emergent stage. The supercomputer power (Somerson, 1984) now available will be able to increase productivity: the implications of the new superchip and new superpower are of superlative significance compared to their present capability. L. Johnston, chief of programmes and policy analysis for the Canadian Department of Communications--Western Region, states that data, carriers and communications are in a fast changing realignment stage (personal communication, Spring, 1985).

<u>Real Life: Some implications of the TELETECHNOLOGY model</u>

Some implications (inferences which exist but are not apparent) for the use of this theoretical construct for real life usability, management and evaluation are for those persons who produce, create and analyse various media and programs, including computer operators, software producers and evaluators, and with media users, managers and administrators of all types.

Interactions are actions between people, and in some instances, between people and animals. *Transactions* are carried out between people and machines and, in some instances, between machines and animals. Complex human signalling energy is involved in human-to-human communication and in human created software for machines (and in most cases, for human initiated animal-human and animal-machine situations). The intellectual signalling energy is the commonality in all of the above. The model may be used--*extended* from the earlier descriptions of media and technology users-producers--by substituting intellectual energies of various fundamental forms for A, Basics. These are cognitive and will not be explained in this paper, although the *expansion* of this is exemplified as artificial intelligence (AI). The B, Dynamics may be the various interactions and/or transactions which occur during the communicative activities. The third component, C, Techsines may be standard or control criteria of either parameters, milieu, present objectives or operations to be carried out. Thus, the model may be used for prescriptive, descriptive or analytical involvement among people and communications technology and computer/information technology. Careful planning and control for the use, management and evaluation of these technologies enhance the possibility for optimum outcomes. The next segment deals with the usability and management of communications technology and information technology, and for any combinations of these.

Management and Usability

The real life actualization of the TELETECHNOLOGY model sytem energized by electromagnetic radiant signals is based on intellectual energy. Intellectual energy may be in the form of face-to-face interactions, or in the form of users' computer software, or in any other form created by human intelligence. (The realm of Artificial Intelligence [AI] is not discussed in depth in this paper.)

The following is an application of the model in terms of the intellectual, management and user categories. I have changed the terms from those of the model in order to depict more precisely the actions of human managers and users. Instead of elements used for electromagnetic energy signals, I use ongoing human intellectual energy for the category termed Basics. The category Dynamics I replace with Usability; both of these denote interdependent actions. Techsines I replace with Management; both of these are centered on control variability. This extrapolation is an illustration of a management-user system energized by intellectual energy.

Basics (A) are considered real life human intelligence (i.e. intellectual energy forms of idea, thought, level, development and type). Instead of Dynamics (B) of the model (directing, measuring, regulating, converting and resolving), I shall use the following:

Usability criteria shall consist of selecting, operating/maintaining, producing/delivering, enhancing and evaluating. For *Management* criteria, instead of using *Techsines (C)*, I shall transpose from the model and use the following criteria: orienting, priorizing, integrating, regulating, implementing and communicating. Thus, I am using the model as a *transformative* entity, adapting it as a human intelligence communication model for users and managers of communications technologies.

These above named criteria are, therefore, parallel to the elements of the *A*, *B* and *C* categories of the TELETECHNOLOGICAL construct. I shall then test the interdependency and interrelated validity of this total integrated system as an "intellectual energy-management-usability" matrix by matching these criteria in the teleconference example (see further). The impact of technology depends on <u>why</u> it is used and on <u>how</u> it is used (Martell, 1983b). The following enunciates the usability of communications technologies.

<u>Usability Criteria for Communications Technology</u>

1. Selecting: The communications device/system or service (CD/S/S) is examined, identified as appropriate for the current needs of the user, tested as a pretrial run, carefully considered and selected to fulfil particular requirements as per the users' orally stated and/or written objectives. The user is required, also, to consult appropriate related literature/informations that will assist in the best selection for the objectives of that particular individual, and for the optimum

expected results for the CD/S/S under construction. (In some situations, there are consumer groups and professional or technical sources that may be consulted during preselection research.)

2. a) Operating: The CD/S/S is put into operation under appropriate conditions; quality-control monitoring and maintenance is ongoing.

b) Maintaining: The CD/S/S is maintained in accordance with engineered and/or technical manual rules; is corrected, realigned, boosted, given small repairs, (oiled), and other support treatment is provided in order to retain a comparable near-original state of the product. In the case of a CD or service, the optimum conditions and adherence to regulations are maintained in order to obtain the best possible quality experience, simulation, output or service. (Close communication is maintained with management, if this is appropriate.)

3. Producing and Delivering: The CD/S/S is used to produce and deliver (under management if appropriate) the intended program, product, service or operations as set out in the objectives, monitored for quality control and evaluated (to come: see 5). Delivery is as projected with contingency alternatives preplanned, rerouted and other changes carried out under management.

4. Enhancing: The CD/S/S are augmented, amplified, rectified, extended or changed by technological (or other) means to optimization. And/or they also may be linked with other parallel advances to other

CD/S operations in order to create extended or expanded products and services.

5. Evaluating: The CD/S/S undergo formative, cumulative and summative evaluations for continuous monitoring on-line of all operations, ancillary services and/or for quality control user satisfaction.

The well-informed autonomous user who is capable of the above performances is able to understand and/or to maintain control of communications technologies in most areas of daily living. (In some situations these managers may be users.)

Management Criteria for Communications Technology

1. Orienting: Managers are required to orient themselves and those for whom they are responsible, to the (new and emergent) CD/S/S, to how these work and the role of each member/worker in the system or agency. All pertinent updated informations that relate to management operational needs are expected to be assimilated and understood (Martell, 1983a). Managers are required to accommodate the provision for, or production of, the varied communications and/or information technology (devices and systems) used by the agency, based on an understanding of the categories of *A,B,C* of the model. In the case of any specified in-system device, activity, or any mediated product, or comparable computer software, the managers are required to be aware of all regulations and to notify those users or workers for whom they are

responsible, of the standards, policy and the regulations (such as copyright infringement) that concern any and all CD/S/S for which the agency is held responsible, both legally and morally. Competence is the minimum requirement for managing the integral operations of the CD/S/S as set out in the job description for the manager (op. cit.). Knowledge and skills' performance, in addition to appropriate management credentials, are required that concern the viability of the interdependency of the system parts, and of overall on-line, on-going guidance or control for efficiency of the total system.

2. Priorizing and Planning: Managers are required to collect appropriate, available, timely and relevant data in order to set goals and objectives for operations; to priorize operations of the device/system, as in *A,B,C*, of the model, for matters of importance to users such as individual or specialty needs, values and resources. These resources may be: appropriate emergency back-up resources; personnel; facilities (and setting); finances; ancillary equipment; policy; security; insurance (training for users, if applicable); and others. Priorizing includes on-line/"live" choices and alternatives for operations in order to fulfil goals; and adherence to required operational standards (including those for health and safety).

3. Integrating and Organizing: For the purposes of integrating and organizing people and operations, managers are required to comprehend the manner and the purposes of the *A,B,C* model categories, and their links with interdependencies within each category, each of

which has priority levels related to specific goals of the operation. Managers assist in personnel integration, continually.

4. Regulating and Monitoring: Managers are required to abide by the policies, regulations and standards that control all aspects of operations for safety, quality control and orderly performance of the device/system.

5. Implementing and Adjusting: Managers are required to carry out operations to implement the objectives for communications and information technology devices and systems as appropriate.

6. Communicating and Evaluating: Managers are required to communicate with users, workers and others based on the model system concerning the devices and systems. This refers to evaluation (1983b) that is formative, cumulative and summative; to advertising/promotion, to instruction or education, to any and all operations; and to devices, systems, ancillary products and/or services related to the operations. The successful managers use both the formal and the informal organizational networks for continual communication among managers, workers, staff and related external personnel and the public.

An Applied Method: Teleconferencing

The proliferation of communications and information (computer) technologies has moved faster than organizations, agencies, schools and other societal subsystems have been able to respond. Telephone use has not, as yet, been comprehended fully by any major group.

Teleconferencing remains costly at this writing; when costs will decline, teleconferencing will increase immediately and in inverse proportion to costs. *Teleconferencing* is any meeting of business, educational or other professional seminars, by two or more persons, that is conducted over distance via technological means, which includes: radio, television, computers, telephone and others (1983c). Additional media may be integrated into the telephone milieu as needed: such as *slowscan* (captured frame--an electronic television picture that is transmitted in nonreal time and requires appropriate bandwidth, or roughly one minute, to appear as a still video on a screen) and on-line printers that output hard copies, et al., or several participants intermix, as when astronauts and mission control are in session in space shuttle communications. One example is the Inuit Inukshuk Broadcasting System community-conducted teleconferences in the Canadian far north in 1981.

In the present use of terrestrial teleconferencing, operations are under the planning, management and evaluation of managers/co-ordinators.

Usability of Teleconference Method

1. Selecting: Users select this method (i.e. mode of interaction between an agency and an individual) after careful consideration of relevant informations and advisors. (The teleconference method may be used by almost anyone who desires an

electronic meeting at a distance.) Ancillary materials and technologies are selected to enhance the activity.

2. Operating: Users operate the telephone, radio, television, TELIDON viewdata or computer equipment, or follow directions of the manager in order to obtain optimum results from participation. For example, a button may require activating after a distanced speaker finishes a point of discussion, or the user may input text onto the on-line computer by keyboard, or the user may use an electronic pen to draw on the computer screen an image which is transmitted to other participants located, perhaps, at great geographic distances.

3. Monitoring: Users monitor their operations by the feedback method; the users also monitor the operations of other participants in order that communication is maintained during the continuous "live" on-line activity. Any verbal or nonverbal directions or signals received by the manager are complied with.

4. Producting and Delivering: Users produce the actions, behaviours or informations pertinent to their participatory role, such as acting as consultants, and they may supply pertinent information to all other teleconference participants. (Stock exchange brokers use this method continually. So do tele-medicine specialists who advise health personnel to carry out specific procedures for emergency life-saving situations. The delivery is carried out by the sharing of knowledge as procedural directives in this case.)

5. Enhancing: Users may enhance their communication with ancillary drawings, graphs, flow charts, pictures and sounds of various types, and so on, depending on the situation.

6. Evaluating: Users evaluate the experience both for the managers/co-ordinators and for their own needs or for those of their particular group, agency or organization.

Management of the Teleconference Method

1. Orienting: Managers welcome the participants, explain the basic procedures and operations, have each individual carry through a transaction, demonstrate how to rectify usual errors (such as "cutting off" oneself accidentally during transmission), or what notetaking may be helpful (op. cit.). The style of each manager usually determines the manner in which this introductory interaction takes place.

2. Priorizing and Planning: Managers plan and co-ordinate the objectives, the assessment of costs based on attributes of technology such as speed, format and quality of materials and interfacing technologies, and assist clients and users to choose the appropriate elements. Managers assist the chairperson (if there is one) to priorize topics and speakers to be presented. In general, each meeting is individual and the interactions between the managers and participants cover specific requirements; managers are mainly responsible to assist the users/clients in effective accomplishment of stated objectives. Managers may choose or arrange for ancillary media related to the

scheduled topics; each meeting is planned carefully before the teleconference begins. Success throughout relies on excellent communication signs and skills, on feedback from participants and on the competence of the managers (op. cit.).

3. Integrating and Organizing: Managers carry out their duties as needed in each situation; each participant has ready access to the managers throughout all phases of the teleconference.

4. Regulating and Monitoring: Managers regulate the "flow" of the human elements; for example, time for each speaker is stated and expected, sharing of materials and information, copying/duplicating, operating equipment (if this is appropriate) may be included. Feedback is relied upon heavily by the managers in order to conduct successful teleconferencing.

5. Implementing and Adjusting: Managers take control to initiate, maintain pace and instructions and transactions, <u>at site</u>, and to terminate the teleconference transaction. Close communication (via other means) between managers located at different <u>sites</u> and the central post manager is required continually until all operations are completed.

6. Communicating and Evaluating: Managers are required to be knowledgeable and skilled in the use of the TELETECHNOLOGY system tripartite model, as set out in this paper, and in the way the applied human communication signalling energy model is used in teleconferencing. Continuous attention and practice are required to maintain quality service and attainment of objectives and goals. The prime component, as

reiterated throughout, is the use of feedback for successful interactions and transactions. This cannot be emphasized enough, in my opinion. Warm, authentic, skilled use of feedback is elemental in promoting and sustaining human communication satisfaction and *perceived* spatial closeness (which includes, if possible, *appropriate* spatial closeness).

In review, for teleconferencing to occur efficiently, the four important points for managers and co-ordinators are:

- co-ordination proficiency of operations
- participant satisfaction with the experience
- authentic and continuous feedback interaction
- proximity or perceived spatial closeness.

The foregoing criteria and strategies for both usability and management for teleconferencing would apply, similarly, to other networked situations. In general, managers dealing with any communications technology are dealing with a) originating and setting objectives, b) designing or producing, c) operating or monitoring, d) supporting or directing, e) evaluating and f) communicating (continuous feedback) among all who are involved.

<u>Emergent Innovations: A comment</u>

Technical laboratories issue products into the marketplace when market researchers identify the willingness for people to purchase devices, systems and/or services or to create and manage those services related to the newest communications technology or computer-related innovation. Wise users and managers will adhere to a basic orientation of what the innovation is used for in relation to what is required at this present time, within the limits of financial and other *resources*; suitability to the *milieu* into which the innovation will be placed and the value of the expected results to fulfil the carefully considered objectives. These are general abstract principles. Applied to every situation, from the latest throwaway mini still-photograph *cameras*, which will soon be followed by throw-away credit-card sized computers, to the most highly advanced (possible) software packages for laser-oriented quantum mechanics research scientists--who are currently designing experiments at the ultrafast femtoseconds speed (i.e. thousandth of a picosecond)--these principles could become the basis for establishing sound decisions related to technology selection, use and management for everyone.

All communications technologies of any kind, including the newest and the most highly advanced, are successful to the degree that they are able to be perceived by users as eliminating psychological (and/or physical, spatial) distance between sender and receiver, and in eliminating difficulties of usability. "User friendly" is a popular term. The *ergonomics* (designed for humans) requirements are for safety, efficiency and comfort (in addition to aesthetics or cosmetics). Many devices are in use by humans over extended periods for situations that are demanding, dangerous and which require prolonged mental concentration. Many working on-line situations require split-second timing for vital operations. Therefore, many technologies need to be physically as well as psychologically designed for the simplest ways to use them under potentially adverse conditions.

Communications technologies pervade everyone's lives today. People of all kinds realize that they need to know something about technology in order to use and/or understand the new devices which have replaced many manual devices. Research into various aspects of our cybernated lives is urgently needed in order to align society to beneficial use and management of our technologies.

All strata of society will be required to have some understanding of the more complex, more current technological devices, including instruments and their systems. Business, industry, government (and military) use ninety percent of telephony, which includes ancillary technology. Computers are incorporated in most industrial, business, educational institutes or corporations, in various professional and medical/health complexes, recreational facilities, entertainment industries, navigational, governmental and military installations. The <u>core of all military, arms and lethality enterprises are their communications</u>--their transmissions, technologies, and supply services. Without effective communications today, there could be no war of any great size. This is a point well worth relaying to our youth in order that they remember well that the <u>lines of command in wars and killings depend completely on communications for that lethal system</u>.

In addition, the digital capability for computer-linked transmissions is the core of communications. This fact advances the realization that <u>all</u> of the communications technologies we have now and in the future encompass the <u>capability for non-peaceful purposes</u>--a point strongly made by Wiener, over thirty-five years ago:

> I have already said the dissemination of any scientific secret whatever is merely a matter of time, and that in the long run, there is no distinction between arming ourselves and arming our enemies. Thus, each terrifying discovery merely increases our subjection to the need of making a new discovery (Wiener 1967, (c) 1950, p.176).
>
> Thus, a new war will almost inevitably see the atomic age in full swing within less than five years...the actuality and the imminence of this new possibility (op. cit. p.218).

CONCLUSION

The focus of this study and its main organizing principle is to create a model through which the abstract domain of TELETECHNOLOGY may be perceived as a continuously changing phenomenon, pulsed by electromagnetic and visible light energy. A "grounded set" is needed to help people today in understanding the real-world of technology.

The original TELETECHNOLOGY theoretical construct, presented in this work, integrates and simplifies for easier understanding the vast complexities of the many available kinds of communications technologies and computer systems. These include: the entire range of actual *analogue* (continuous variable waveforms) radio signals of broadcasting, telecommunications, and *digitized*/quantified (discrete, mechanized) electronic signals ancillary to, or energizing, the computer as within an aggregate--an integrated system. This model also sets out the way communication may be improved by careful monitoring between senders and receivers.

The model is an <u>abstract concept</u> and not an actual integrated system, although the latter is a true possibility. Application of the model presents a wide range of possibilites related to understanding varied media, and for the creation of measurement instruments for communications--for media efficiency (of energy and economics), for human and resources management, for interactions and transactions. The elements of time, space and spacetime of reality mediations were included as relatively organized entities of the mediative world. A wide range of uses for this model may be anticipated.

The TELETECHNOLOGY theoretical construct for electromagnetic radiant energy signalling was applied to the real life significant activities of a) usability and b) management. For this latter, the matrix was considered as intelligent energy-usability-management. An application of this matrix was the method of teleconferencing; the criteria and strategies for usability and management success were demonstrated as applications for the method of teleconferencing. A comment was included concerning emergent innovations.

Research application is required in the field in order to authenticate the statements of theory set out in this work, i.e. that the broad generalizability of the model demonstrates first-order magnitude, and that TELETECHNOLOGY, defined as a design set of interrelated variables with transformative potential, is actually measurable.

The TELETECHNOLOGY system is an abstract constructed domain which may be reified in actual communications technology interacting in the lives of human beings so as to change their lives (and, possibly, the entire world) in some way. The operative TELETECHNOLOGY is a subsumed quasi-identity of considerable power. Insight into how to control the potential of actual technology may be gained by those who examine the present technologies via the analytical TELETECHNOLOGY model. Insight may also be gained by those who examine all types and levels of human communication in action, identifying the *interaction system* as based on, and as an application of the TELETECHNOLOGY model. Theoretical juxtaposing TELETECHNOLOGY with other model domains may reveal also, to the investigator new horizons related to global communications, to national innovations, to personal opportunities or to other possibilities for restructuring communications. The model contributed in this paper, therefore, may be used as a catalyst for varied thinking styles or new ways to view the world.

A Possible New World View

The TELETECHNOLOGY domain and the real life technological world have been analyzed and each considered as an *aggregate*--a design set of interdependent, in flux, operational variables. The constant which exists within each, is a (virtual or actual) invisible energized *force field* with reversibility capabilities. The *unifying* element is the limitless potential of the natural available energy. Taken further, the intellectual potential of the boundless human mind was described as applied in parallel ways, in interactions and transactions and for production and updating of computer software for communications and information technology. Thus, the *aggregate* (model/system) is the focus of this study: the fundamental criterion of the model aggregate is *influx* energy.

The universe itself may also be considered an harmonious aggregate (Fuller, 1983), a unified *whole* (Augros, p.57) operating under *force field* laws (Boorstin, pp.680-684 ; Ronan, pp.465-519) within which the individual is required in contemporary times to live a multidimensional existence: related to that of the microcosm, the mesocosm, [macrocosm] and the cosmos [universe] (Ronan, p.188, 306); and to be able, continually, to adjust to contingencies as well as to find personal meaning and individual value in each of these three dimensions of life. Communications technology has made possible the ability of people to experience the immediacy of these three spheres of life, actually and virtually experienced via vision systems at the microscopic (and submicroscopic) level, at the human (proportioned/operational) level, and at the cosmic (outer space/universe) level via diverse mediated operations.

In order that an individual live autonomously, and in order that s/he find meaning and fulfilment while existing in/participating in the actual or virtual realities of these three dimensions, simultaneously, the opportunity arises for the individual to suspend the notion of the "once", <u>the one present time</u>, and to replace this with the concept of the *Eternal Present*--an absolute. (Discussion follows.) This sense of vicarious eternal suspension, of *timelessness*, may then allow the individual an enriched perception of the microcosm, the mesocosm and the cosmos as variable facets of *eternal* spacetime. In turn, this *awareness* (consciousness) (Augros, p.94) could increase the individual's spirit of responsibility, the ability to consider the concerns, interests and welfare of "the other" persons with whom s/he interacts as being of equal value to those concerns of his/her own. And, taken further, since *primacy of mind* is the core of one's humanity (p.95), this developed individual may then be capable to *affect* the lives of others in a positive constructive way. S/he could systematically design his/her communication with "other/s" in order to consciously affect rather than the perceived resultant effect (Severin and Tankard) on others. Then, perhaps, the potential human intellectual energy (of the mind) by those who interact from the point of view of "other/s", could accrue beneficial change to our societal systems-at-large. Positive constructive thought, thus carried out, has the potential to reap beneficial societal change.

This perspective, a new world view, emphasizes the *individual* as related to all aspects of the everchanging (influx) universe. This new *focus* maintains each person's wholeness (integrity), sustains his/her inner-outer personal experience related to any reality dimension, and the extrapolation from the preceding assists each person in valuing the eternal metaphysical (supernatural) presence in human relationships.

Sagan (1973, p.177) states:

> Anthropologists believe that the development of human intelligence has been critically dependent on these three factors: Brain volume, brain convolutions, and social interactions [underlining mine].

If this is true, then, individuals develop by interactions with others. They <u>need</u> others for the attainment of their full human potential.

Human interactions and varied relationships have continued througout time. The vital interdependencies among living, organic beings and entities, and between supernatural (metaphysical) existences (Ronan, p.238) and cosmic forces (which have been demonstrated in physics laboratories) (Ronan, pp.480-527) could be combined consciously and purposefully to improve constructive activities, and not leave interactions and transactions to chance. By focusing on <u>the value of the individual</u> in an accelerating technological society, and by accentuating release from (a psychological tie to) an humanistically restrictive, competitive (Augros, p.85) way of life, people may be assisted to comprehend "the absolute foundation of human knowledge" (p.181), the unity of timelessness, and the communication of peace.

The new world view I here present is that of an <u>aggregate</u> in harmony that consists of an influx microcosm, mesocosm and cosmic totality; a self-generating, continuously interacting <u>aggregate</u> (Fuller, 1983) which exists both on the visible natural level and also on the invisible natural and metaphysical (supernatural) reality levels.

A proposal for a possible new world view/direction is presented based on the fundamental concepts of the Eternal Present (see further) as a philosophic stance for all individuals in an ethnotechnological accelerating society. This evolving, influx, self-actualizing Western (or, perhaps, World) society has a true potential for developing into an interplanetary civilization sometime in the distant future: this implies advanced human and machine partnership via intellectual and metaphysical development.

The daily experiencing of a metaphysical living Eternal Present set design of interrelated variables is what eludes many people today: the aggregate of matter, physical laws and mind. Perhaps this paper will assist in these people's perceptions and encourage them to think in terms of the commonality of all *living* things. The commonality of *life*, per se, is "the absolute foundation of human knowledge" (Augros, p.181). Perhaps by daily consideration of the unity of all life in the cosmos, which is sustained by some Eternal Present energy, we may gain an understanding of the eternal presence of *the power of our humanness*. We may also consider the influx concept of the Eternal Present as affecting and energizing all aspects and dimensions of our everyday effective use of the communications technologies for human benefit on the planet: we power the machines by our human mind power, at this time. The allocation of our control into machine software as in AI is a major confrontation to the continuity of what is termed *human*.

The increased individual sense of value of and for each human being could sustain and strengthen people during their daily transactions with computers and other nonhuman machines, with nonreal televised images, which may be surreal and/or superreal, and with nonnatural sound and visual images such as computergraphics and sterotypical-morphic animated films. Common daily transactional encounters one may have may include those with voice-synthesized telephone answering signalled humanoid "messages", with robots (Kelly) or with other devices with artifical intelligence (Steklasa, 1983). All of these have a *telepresence*, an affect as if a human were interacting with the user (CIAR, pp.10-11). As the globe expands to include industrial use of near space, with space platforms and vehicular travel and communications--an imminently possible fact (Barr, p.133)--signalling interactions with human others over vast distances, and transactions with technological devices (and systems) will become routine (Canada, 1985).

One maintains one's sense of wholeness (integrity) by sustaining an internalized (mind) point of view of the Eternal Present grand design and of one's place within the influx cosmos. The quantum theory is another way of explaining the cosmic whole or the submicroscopic whole of worlds, or of seen or unseen realities of any dimension, and reflects the universe (aggregate) in totality. Quantum theory reflects these three worlds--the microcosm, the mesocosm and the cosmos. Moreover, this quantum theory viewpoint (Augros, Ronan, pp.496-516) is the prevalent view in physics and society today despite our acknowledged limitations in understanding quantum theory itself, in total.

The way devices and systems are managed and used for global, as well as national, communication is the key to survival in a rapidly advancing technological-nuclear civilization which includes many global system problems. Communication wisely used to strengthen human relationships may help to sustain our planet.

Just as communications are energized and affected by electromagnetics, so it could be possible that metaphysical energy activates human beings. The model is a bridge to comprehending a possible supernatural existence by the use of extrapolation. An understanding of these abstract, artificially produced operations of Dynamics and Techsines, energized by Basics, may permit the reader a) to perceive a simplified view of the inexpressively complex, invisible world of natural electromagnetism and visible light radiance, b) to gain an insight into how programmers, designers and producers or operators use their intellectual (mind) energy in communication designs via various media, and c) to increase each person's autonomy in our machine-oriented world.

Technologies are in place now, for the enhancement and actualization of the daily lives of large numbers of human beings who live, literally, anywhere: near or in orbit, or on, this planet Earth. Our task is to assist developing and unstable nations in putting into place improved communications systems and opportunities for <u>all</u> individuals, societies and nations, in order to assist them to realize their potential with these technologies in our development towards the goal of a peaceful interplanetary civilization.

The overall implication of this thesis is that energizing and actions are continually and endlessly balanced against set unifying laws, principles or standards in any variable set, system or aggregate. Taken from the greater perspective of civilization, per se, peace and survival may be attainable by the equilibrium of physical-metaphysical quantum field energies (Augros, et al.). In real life terms, this means that each individual (as well as each society) by retaining the possibility of individual autonomy and fulfilment, and of ongoing interdependency as a constant within an orientation of the Eternal Present perspective, may be able to sustain and develop outward from a living planet which is at peace within the universal aggregate. This is a formidable practice to put into effect but the mere thought of it, and the simple acting out of it by each planetary citizen, could generate inimitable power, perhaps, to change the world. All power holders throughout history have always used a physical and metaphysical energized "design set of interrelated operatives"--reified TELETECHNOLOGY--to change their world.

Insight stimulates learning and, in turn, may promote growth of the individual by constructive use, management and wise control of communications and information technology, which is imperative for our contemporary transformative planetary civilization, now,

at all times, and,
in all places. Once, "once"
was enough. However, "Now" is linked
to the absolute--
to the Eternal Present.

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