COMMUNICATIONS AND INFORMATION

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Contents

1. The Fundamentals
2. Real Communicators and Virtual Worlds
3. Media and Social Change
4. Theoretical and Methodological Challenges
5. Anticipating What the Future Holds
Glossary
Bibliography
Biographical Sketch

Summary

The chapter seeks out to discern patterns that communicators (humans *per se*) develop any time they create, process, and make use of information. Needs for communication, and needs generated by communications are seen as leading to systems specialized in information management. In the triad matter-energy-information, information develops an all encompassing dynamics of its own, hence the focus on defining its most fundamental and irreducible terms, in Section 1. In Section 2, the focus is on the formation, interests-, and values-based audiences, the role of ICTs in the networked society, and on strategies emerging to the extent to which information is also a commodity.

Section 3 enlarges into these strategies in as far as media, channels, computation, and the growing complexity of networks are concerned. Concepts such as channel-of-channels, agent, network-of-networks, or mediated accessibility are discussed within the framework of the socially efficient practices endorsed by computation and intentional selection.

These matters are further detailed in Section 4 with a view on critical challenges facing producers and consumers of information, namely bridges between current practices and the formalism of programming languages. Examples of theory, and methodology building are given.

As a key word, anticipation is finally undertaken in the pragmatic terms of social and technological changes likely to occur in the near future, since the more distant one seems largely unpredictable.

Throughout this *Encyclopedia* ample references are made to the ways information is processed in various systems – from physical and chemical, to cybernetic or artificial

intelligence systems. The latter two are particularly insightful readings complementary to this chapter.

1. The Fundamentals

As the universe itself is an endless matter-energy-information formation, *in*formation belongs to the very fabric of all there is, whether physical or imaginary. For a long time, the ultimate, irreducible structure of the world was considered to be the triangle: [→matter→energy→information-]. Lately, fundamental mathematics, philosophy, theoretical physics and philosophy of language have taken the view that matter is reducible to energy in some instances, or, more precisely, that there are matter-free entities, which are identifiable only in as far as they are energy-information (examples of which are massless subatomic particles or unexpressed thoughts).

Information's very essence is given by the difference between a complete uniformity before and after an event occurs. Thus, information is neither the background uniformity, nor the event taken in isolation, but the entity they both form. That which is transferred in another background or makes sense for an observer (whether physical, biological, or intelligent) generates communication.

Actual communications occur when three conditions become contingent: some accumulation in information, some code/language communality between at least two information processors, and a medium shared by these processors. The word 'contingent' is meant to stress that communication is optional rather than the kind referred to as a cause-effect law applying to the mezzo-physical world (like gravitation). Yet, information and information transmission are fundamental necessities. This holds for existence and evolution means at biological level (see [→DNA→RNA→protein]), or for surviving means of any intelligent life as the need for in-coming information cannot be accumulated for too long without endangering life itself or one's social condition. About the same sense of necessity is preserved throughout all forms of socially organized activities.

As information transfers become increasingly mediated, and senders and receivers become highly complex, the emphasis moves from the physical quantity of information, to semantic information. This may be *measurable* in message units, though it would be more appropriate to speak of semantic information being rendered *numerable*. This is why, the phrase 'information flow' is rather a loose suggestion to communication, the one-way kind, and more appropriate a name for the dynamics of information, or better still, for processes occurring before and beyond transfers. In the theory of communicative acts of J. Habermas, the very essence of humans consists of being communicators and not simply caught in one or another flow of information. Being a communicator means not-being-alone, means sharing meanings, and construing *rationality* at the crossroads of *interests* being pursued. In a tradition that goes back to Plato (see Menon) and Taoism, grand theorists such as Habermas, Gadamer, Merleau-Ponty, Husserl and a few others aim at drawing the finest differentiator between information consumers (recipients) and communicators. Only the latter are driven by, and generators of *intentionality*, and by so being, communicators change languages, noema, media, interpretations, and themselves.

From an opposite direction, N. Luhmann and a score of social, language and ICTs scientists argue that the generality of meta-concepts such as rationality or intentionality becomes almost empty when trying to understand and manage the 'average real communicator' and the huge variety of actual communications. A good account of the difference *communication - communications* is the long entertained polemics between Habermas and Luhmann; the latter thought of society as consisting of communications rather than people. For both of them, that which makes all the difference between successful and unsuccessful communications is *interpretation*, in the first place, and only secondary to that come means, media, and the like. Interpretation cannot be understood nor anticipated unless communicators take into consideration the social-cultural, economic, and accessibility factors that come to form contexts in which patterns of interpretation rather than, somewhat static, communicative competence emerge.

The study of communicated information is spread over a large number of fields and perspectives, theories and research objectives. Semiotics, semantics and CMCs, for example, are brought together to study communication(s) between people/communities and the meta-code embodied in the local architecture. System sciences and second-order cybernetics convey to information systems, whereas models of information processes in open and non-linear systems draw heavily from information theory. Semantics, set theory, and Boolean algebra converge in bridging and even unifying natural and formal languages. Communications form the 'space' of creation and *homo ludens*, part of which is meant to distort, limit, or misuse information. This indicates firstly, that information is no longer manageable without powerful mathematical models, cryptography, or ICTs. Secondly, a strong tendency towards interdisciplinarisation emerges beyond differences in approach.

An extremely important area of scientific and socio-economic interests is rooted in the view that technology is no longer a component of society (as in the postindustrial one), but it *is* society, with very little left that might be technology-free. Technology is broadly understood in two major senses. In the first, it is about the instrumentalization of almost every aspect of life, which begun with the first tool and soil cultivation, and reached as high as knowledge and science, with no foreseeable end. This is particularly true of the setting of a course of action through processing information, whether with rudimentary or advanced means. It is in this sense that science has the power of transforming the society as never before, whereby information qualified as knowledge acquired an equally powerful epistemic status.

In the second sense, it is about a self-feeding mechanism - that of allocating resources and means to sub-systems in society that is specialized in fulfilling the function of informational construction. Generating or transferring knowledge and ICTs are the two most important unconventional survival means that, unlike natural resources, develop self-organizing mechanisms and know no limit other than the humans' capacity of using them. In some narrower sense, it is a fundamental interest that is of unchallenged accessibility to information by making ICTs more accessible than they currently are.

2. Real Communicators and Virtual Worlds

If, for some, too high generality stands in the way of seeing the trees in the forest, then

this applies also to the oversimplified *structure of communication* involving the sender, the message/channel, the receiver, and the receiver-sender feedback. This scheme works by discerning categories in socially relevant terms, and uses content analysis to identify kinds of messages. This structure of communication encounters little variation in models, mostly linear, proposed by Newcomb in 1953 (triangular), or Dance in 1967 (helical or spiral), or Barnlund's transactional model, in 1970. The crucial contribution of that time was McLuhan's thesis that 'the medium is the message', and the Shannon-Weaver statistical measure of information as $H = -K \log_2 f$, where *H* is entropy, *f* is the frequency of a code in a message unit, and *K* is a measurement constant starting from 1 representing one bit of information. The scheme of the "five **W**'s" may still have some application to interpersonal communication or small-audience media. **W**'s prompt the researcher to answer the questions of: *who* (communicates), *what*, to *whom*, with *what means* (or through *which channel*), and with *what effect*.

Since then, important refinements have been brought to this way of thinking. These refinements are mainly concerned with the fundamental dimensions and relatedness discussed earlier, as well as with the dramatic changes induced by CMCs. Today, it becomes impossible to find some linearity in the information flows or systems, to find two channels that model the same message in the same way, to find communicators unable to initiate communication on-demand and change the framework reference, to find channels that are not networked, or context-free messages.

2.1. Emerging Patterns and Needs

Aware or not of the epistemic status of information, people use it as a commodity, which throws out of gear a mechanism whose nature is as material-energetic as informational. For, even if the material-energetic side is omnipresent, and effects of information may be material-energetic, these are accounted for as far as 'information about them' is available. Thus, part of the production and consumption of information may well become an aim in itself, and so does the need to become a qualified communicator.

Therefore, for communicators, relevant is to produce and retrieve information in as far as it carries *meaning*, while the statistical measure of information is relevant for physical storage-transmission. Meanings may be inseparable from their physical support, as in the case of the meaningful channel, or separable when one meaning is the carrier of another, as in the case of semantic information. If for telephone companies the only thing that matters is the number of bits travelling through its wares (surveillance not included); for telephone users what matters is the message getting through. Yet, the target for both of them is the same. They are both informational actors using information to instantiate action, and creating information by the very fact that action takes place.

Similarly, computation increases the amount of circulated information (see the logarithm of the programs' length), but contributes greatly to organizing information, so that communications' patterns become more apparent, observable and worked on. Statistical model aims also at finding patterns of behavior. The difference between the latter and computation is with interpretation that interferes decisively with what is

communicated. As the code may be multi-sided, at least one side is attached to values and norms of individuals, while the other belongs to the socially recognizable decoding. When it comes to identify how communication patterns emerge, then the connection message→audience, or message/channel→audience is focussed on. In discerning patterns, it is all about *degrees* applying to continua such as: from passive exposure to active selection, from target to general audience, from potential to actual addressability, from skillful to unskillful actors.

It is sensitive, therefore, to try and identify overlapping segments of audience according to degrees of sharing about the same values, interests and languages (in the broader sense), or, as the saying goes, belong to the same world. The access to commonly shared world(s) is less stable than the way messages are conceived. Hence, the idea that communication on-demand involves the access to information that is 'in waiting' whereby the sender appears somewhat external, anonymous and institutional. Depending on each message's content and channel's suitability thereto, the sender's intentions may be more important than the message itself, which may re-segment audience differently. (Compare a pigeon carrying a ciphered message with the BBC World News).

Focusing on message/channel→audience activates potential worlds and creates others, which are referred to as *virtual communities*. In fact, such communities have existed always, to compensate for the lack of face-to-face communication. They may take various forms, like that of Bach's audience, whether coming together in a concert hall or residing in far distant places, at different times. Virtual communities come about when *communicating with* embodied values, and, *through* these values, with somebody else, beyond certain time and place. The same holds for opening one of the Internet's home pages and sites. In conclusion, people are part of several worlds, more or less virtual, which leads to audience-based unstable and potential networks.

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Biographical sketch

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