Dynamic Social Impact Theory and the Study of Human Communication

Article *in* Journal of Communication · February 1996

DOI: 10.1111/j.1460-2466.1996.tb01500.x

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Dynamic Social Impact Theory and the Study of Human Communication

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> *No science today can consider the structures with which it has to deal as being more than a haphazard arrangement. That arrangement alone is structured which meets two conditions: that it be a system, ruled by an internal cohesiveness; that this cohesiveness, inaccessible to observation in an isolated system, be revealed in the study of transformations, through which similar properties in apparently different systems are brought to light.* (Claude Levi-Strauss, in S. O. Paul & R. A. Paul, translators, *The Scope of Anthropology,* 1967, p. 27)

> *A man, viewed as a behaving system, is quite simple. The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself.* (Herbert A. Simon, *The Sciences of the Artificial*, 1969, p. 52)

This issue of the *Journal* contains six articles that comprise a symposium on dynamic social impact theory, reflecting the work of Bibb Latané and his colleagues.[1] The articles are an interrelated system, which is more than appropriate given their metatheoretical strategy.[2] In this issue of the *Journal*, dynamic social

[1] Professor Latané and I served as joint Symposium editors. We would like to thank the following individuals who served as Symposium reviewers: Isabelle Bauman, Speech Communication, University of Washington; Steven R. Corman, Communication, Arizona State University; Chris Crandell, Psychology, University of Kansas; James Danowski, Communication, University of Illinois at Chicago; Sonja Faulkner, Psychology, University of Toledo; Allan Fiske, Psychology, University of Pennsylvania; Chris Fyfe-Schaw, Psychology, University of Surrey; Reginald Golledge, Geography, University of California at Santa Barbara; Martin Kaplan, Psychology, Northern Illinois University; Robert McPhee, Communication, University of Wisonsin at Milwaukee; Daniel R. Montello, Geography, University of California at Santa Barbara; Harry Triandis, Psychology, University of Illinois at Champaign-Urbana; Kipling Williams, Psychology, University of Toledo; Joseph Woelfel, Communication, State University of New York at Buffalo.

[2] A cumulative list of works cited in each article is found on pp. 72–77.

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impact theory (DSIT) is merely introduced. Its literature is quite extensive, and the references at the end the symposium provide a reasonable starting point for those wishing to learn more about the mathematical details, studies, and simulations that are part and parcel of the theory. Since DSIT models processes that cut across the levels of analysis that communication scholars study, the theory should be of widespread interest. The theory discusses the creation, maintenance, structuring, and alteration of attitudes, beliefs, and belief systems; the dynamics of social influence; and the role of human ecology in the formation of beliefs and belief systems. This list of topics, although not meant to be exhaustive, is sufficient to show the range of processes captured by the theory. Furthermore, because DSIT is built by metaphor to other systems, there are many communication-related nuggets to be mined; students of communication should find that these symposium articles foster broad theorizing and creative insight.

The inventiveness found in the array of methods employed by DSIT is also notable. The symposium contains a considered mix of empirical research, computer simulation, reasoning by analogy, and sheer speculation. This serious work reflects some quite serious play. Alfred North Whitehead said, "Seek simplicity and distrust it." With this warning, dear reader, welcome to the symposium.

Theoretical Premises

DSIT relates cognitive, cultural, and social processes, and the six articles focus on different aspects of the theory. The first, by Latané, introduces the basic propositions of DSIT. The second (Latané & Liu) elaborates the idea of social space. The third article (Latané & Bourgeois) tests some basic ideas derived from DSIT by means of groups created via e-mail. The fourth article (Lavine & Latané) moves to the more macrolevel of public opinion formation and change. Next, Huguet and Latané relate DSIT to Moscovici's social representation theory. Finally, Schaller and Latané consider the evolution of social representations with specific reference to stereotypes. The sweep of DSIT is quite broad, encompassing cognitive, interactional, social, and cultural processes. Its premises are very simple:

1. In the mind, there are elements that interact—call them ideas (attitudes, beliefs, norms). In society, there are elements that interact—call them individuals. In the culture, there are elements that interact—call them social representations (stereotypes, theories, ideologies, religions, cultural themes).

2. At all these levels, the elements are linked to and affected by their neighbors according to simple rules: The number of neighbors, distance of the neighbors, and strength of linkage of neighbors at any one time determine the value of the elements at the succeeding times, in a process that is recursive (and therefore Markovian—at any time the elements are affected by the immediate previous time, without any residual effects due to times prior to that), simple (a multiplicative function determines the impact of neighbors), and nonlinear (a "tipping" rule determines change in any element).

3. Distance, one determinant of social influence, is affected by physical space as well as by social transformations of the topography caused, in part, by human-constructed environments, communication channels, and transportation.

4. Nonlinearity exists at the level of elementary change, in the form of catastrophes.

5. The nonlinear change rule generates deterministic but unforeseen patterns in the aggregate (the culture and social structure). The trajectory of these patterns can exhibit chaotic dynamics.

6. The interaction of elements at one level results in emergent properties at the next higher levels. Thus, ideas held in common help form communities of individuals, as well as forming higher level combinations of ideas, as found, for example, in ideologies.

7. Communication is central to these processes at the individual and societal level. Communication and its media determine the extensivity of communication neighborhoods, the sources and immediacy of messages, and the number of others whose behavior can be observed and thus be influential via social comparison processes.

8. The methodology of simulation is a means of examining the implications of the theory when direct empirical test or analytical solution of the mathematical models is not possible.

9. Cellular automata (for individuals) and neural networks (for attitudes and cultural aggregates of attitudes) can be used as models of change reflecting communication among elements.

Theoretical Richness

These principles create dynamic social impact theory, which has remarkable scope, simplicity, and unpredictability, hallmarks of creative theory construction. The scope is seen in the fact that the theory encompasses change at four levels: the individual attitude, the individual person, the culture, and the society. The simplicity is seen in the change rules, which are relatively basic mathematical functions. What are the surprises of the theory? The theory shows how a cognitive structure exhibiting inconsistency overall can be composed of bundles of beliefs that are jointly and locally consistent; how islands of believers who share minority views can persist in a sea of majority opinion; how the creation of social structure is promoted, not inhibited, by unaccounted-for individual differences; how ideologies can be constructed out of sets of beliefs that become related not through the similarity of their elements, but through an inexorable, unforeseeable, and capricious dynamic. This last point means, to extend Latané's example in the introductory symposium article, that eating bagels and saying "y'all" can become, by happenstance, associated within a community, and, furthermore, that the community members can then construct a rationale that "explains" this connection.

The Theoretical Landscape: A View from the Communication Discipline

Whereas DSIT is notable for encapsulating a great deal of social science within its domain, we have seen many of the "modules" of DSIT elsewhere; indeed, some of these ideas are pervasive in science and, more specifically, in communication. A short, incomplete review follows.

Linkages. Theoretical and empirical examination of linkages of concepts and

their nonlinear effect on attitude change and attitudinal structure is based in the extensive literature on consistency processes in attitude change (see, e.g., Eagley & Chaiken, 1993, esp. pp. 89–154; Markus & Zajonc, 1985, esp. pp. 197–208). DSIT considers attitudes as forming local regions of cognitive consistency, a useful approach to modeling cognitive processes (cf. Tesser, 1978). In DSIT, attitudes do not exist as isolated units; rather, they are linked to other, related attitudes. Among communication scholars, the notion of a linkage (a spring-like one) between concepts has been explored by Fink and Kaplowitz (1993; Kaplowitz & Fink, 1982, 1988, 1992, 1996; Kaplowitz, Fink, & Bauer, 1983), based on a proposal in Woelfel and Fink (1980).

Arbitrary bundling of beliefs. The idea that attitudes and social representations (such as ideologies and other forms of structured public opinion) can comprise "bundles" of spuriously linked belief molecules (e.g., bagel eaters respond favorably to "y'all," while nonbagel eaters oppose this expression) has similarity to views of constructivist theorists. For example, Berger and Luckmann (1966) relate how the social explanation of prevailing cultural beliefs is a social construction that may be quite unrelated to the origin of these beliefs. A similar idea is found in Lyman and Scott (1970). DSIT's contribution to this issue is in showing how correlations among beliefs can arise without any intended coordination among believers, except that believers may become aware of this purely arbitrary correlation, and therefore rationalize its presence.

Neural networks. DSIT employs a neural network model in discussing attitude structure and change (cf. Eagley & Chaiken, 1993, pp. 101–103, 142–143). In a neural network, nodes (e.g., concepts, in a cognitive model; individuals, in a social model; ideologies, in a cultural model) have values, and are connected to other nodes. The number of nodes and their interconnections, as well as the strength of their connections, are specified, as are rules for the aggregation of influence to each node (a transfer function) and to activate ("fire," or change) the node (an activation function). An introduction to neural network models is found in Woelfel (1993), and such a model is used to model intercultural communication processes in Armstrong and Bauman (1993).

Catastrophic attitude change. A catastrophe model assumes the occurrence of a discontinuity on some state variable based on changes in one or more control variables. DSIT considers important attitudes to exhibit catastrophes—for such attitudes, incremental changes in positivity of information result in catastrophic changes in attitude favorability. Furthermore, changing the favorability of information in one direction (say, from positive to negative) is expected to result in a "tipping" of attitude favorability at a different point than if we moved in the opposite direction (say, from negative to positive; see Figure 3 in the Symposium). Few studies have employed catastrophe modeling for human behavior; an introductory article is found in Stewart and Peregoy (1983). The technique is applied to perception in Ta'eed, Ta'eed, and Wright (1988), and to person perception in an organizational context in Hanges, Braverman, and Rentsch (1991). Theoretical examination of catastrophic cognitive change based on communication is presented in the study of humor by Maase, Fink, and Kaplowitz (1984).

Chaos and self-organization. Chaos, complexity, and nonlinear dynamics are

terms that sometimes refer to a new science, sometimes to new analytical methods, and sometimes to the (misapplied) idea that the human world is too difficult to study. The basic premise of chaotic dynamics is that, for some values of system parameters, a system may exhibit sensitive dependence on initial conditions; this means that small changes in inputs can result in radically different system trajectories. This idea is related to catastrophe theory (both require nonlinear equations governing the system; both have aspects of apparent unpredictability), so they are often discussed together. Abraham and Gilgen (1995), Brown (1995), Guastello (1995), and Vallacher and Nowak (1994) discuss both chaos and catastrophe theory. In addition to sensitive dependence:

> *Chaos's most important finding relates to one thing—structuring. . . . Chaos's most important realization is that interdependence produces such things as patterns, coherence, coordination, networks, and synchronization. Understanding nonlinear interdependence is key to understanding how and why systems structure themselves.* (Goerner, 1995, p. 4)

DSIT suggests that such self-organization processes occur, and such processes are the mechanism that creates structured attitudes, culture, and social systems. In the communication literature, the mathematics and modeling capability of chaotic dynamics is explored by Richards (1993) and West and Biocca (1996); the self-organizing potential of nonlinear dynamics is explored in Contractor and Grant (1996).

Cultural evolution. Culture, in DSIT, evolves and has a dynamic of its own. The idea of evolution here is meant to be Darwinian, not in the sense that the cultural elements that survive are best, but that, given the whole culture and the society in which it is embedded, they are fittest. The survival of cultural elements via mathematical models has been studied in, for example, McPhee (1963). A recent discussion describing how elements of culture are preserved across generations may be found in Taylor (1996).

Cellular automata. Cellular automata are models in which "organisms" in "cells" (such as the grid of a chess board), following simple rules, generate patterns that turn out to be surprisingly complex. In DSIT, the influence of neighbors on individuals is simulated by a cellular automata model. Simulation based on cellular automata provides a model of social influence on "sorting and mixing" (segregation and integration) in Schelling (1978), and, with somewhat different assumptions, Schelling's conclusions appear quite similar to those found in DSIT: Both cellular automata simulations discover the formation of patterned majority-minority "communities" that are more segregated than the original "society" was initially. The application of cellular automata models to communication is found in Corman (1996). A neural network model, the tool used in DSIT for attitude structure and process, is a more complex model than is one based on cellular automata.

Social networks. Network models incorporating the notion of thermodynamics produce models in which convergence of beliefs is typically expected. In such models, elements of belief or behavior are typically treated as continuous

rather than discrete (the rate or desirability of bagel eating; the rate or belief in the cleverness of emitting "y'all"); as is mentioned in the first Symposium article (Latané), communication in DSIT is expected to produce greater extremity in important attitudes, rather than producing overall homogeneity. Woelfel and Fink (1980) discuss how "group structures ought to be expected to form and grow" (p. 194), and the idea of the generation of local structure has been applied both to examine cultural convergence (i.e., homogenization; e.g., Kincaid, 1987; Kincaid, Yum, Woelfel, & Barnett, 1983), as well as cultural segmentation (Fink & Chen, 1995; see also Bailey, 1990).

Geometry of social influence. Spatial distribution plays an important role in DSIT. People are arranged spatially, forming "geometries" with different dimensionalities. As Latané and Liu discuss, people may be arranged linearly, as, for example, along an isolated road, two-dimensionally, as in huts arranged across a plain, or three-dimensionally, as in a high-rise apartment building. In all these forms, greater distance between people has two antagonistic effects on social influence: First, it reduces the likelihood of interaction, reducing immediacy, and second, it increases the number of others with whom one may be in contact. Using experimental data, Latané and Bourgeois show how these geometries are related to the consolidation of beliefs and to the clustering of individuals. The simulation evidence suggests that "spatial clustering is . . . ubiquitous . . . occurring whenever people are more influenced by their neighbors than by strangers."

DSIT considers two ways in which space affects and is affected by human activity: First, greater distance reduces interaction (the distance-interaction hypothesis), and second, the social space may be warped because of perceptual distortions and biases, brought about by, for example, electronic communication (the social space-physical space hypothesis). Such warping makes some distances smaller than would be expected based on physical distance alone. Both these notions actually have a long history. The distance-interaction hypothesis is found most notably in Zipf (1946); the social space-physical space hypothesis is seen in Coleman (1964, pp. 470–478). Barnett and his colleagues (Barnett & Choi, 1995; Kim & Barnett, 1996) have shown how "social geometry" is affected by communication flows, which are determined by political, economic, and cultural factors.

Simulation. Simulation can be used to derive implications from an otherwise intractable model. For a simulation to be fertile, we should discover the operating characteristics of a system by repeatedly (recursively) applying the same rules to the system, and observing system performance. This idea has been applied successfully, and controversially, by Axelrod (1984), in his research on cooperation. In the communication literature, the method is discussed in Richards (1980); see also the recent simulation of a model of patterned deviance by Jacobsen and Bronson (1995). Note that sometimes a simulation is evaluated against existing data, whereas in other cases the qualitative predictions of the model (e.g., whether an equilibrium is achieved, time to equilibrium ratio, character of the equilibrium values, robustness of the equilibrium against various inputs) are examined (see Doran & Gilbert, 1994). DSIT has generally used simulation of the latter type.

Unanswered Questions, Unquestioned Answers

The Role of Communication

Although communication plays a central role in DSIT, there are traditional areas of communication study that are not germane to it, and there are areas where DSIT is not sufficiently well specified at this point to offer precise predictions. Every theory, including DSIT, necessarily proposes a simplified version of the universe to create parsimony; nevertheless, let us try to be somewhat precise about the location of DSIT's imprecision. DSIT is relatively uninformed or uninformative in these areas: (a) characteristics of message sources and channels (verbal and nonverbal) that determine their content, frequency of use, and effectiveness. (Consider the words of Sir Alan Herbert: "If nobody ever said anything unless he knew what he was talking about, a ghastly hush would descend upon the earth"; (b) characteristics of receivers that are associated with greater message receptivity; (c) the means by which messages are created and disambiguated by their recipients, and are either made consistent with existing belief structures (see, e.g., Liebes & Katz, 1990), or come to modify them; (d) the mechanisms by which new communication channels (interpersonal as well as mediated) come to be created, utilized, altered in their effectiveness, or destroyed; (e) the role of social conflict and physical mobility in maintaining and destroying social communities, and in enforcing homogeneity of opinion; (f) the role of deceit, pluralistic ignorance, and other devices that make the marketplace of ideas one of partial, rather than complete, information. (Consider what Robert South, in a sermon given in 1676, had to say: "Speech was given to the ordinary sort of men whereby to communicate their mind; but to wise men, whereby to conceal it"; and (g) the possibly distinct roles that conscious thought and unconscious responses have on the processing of messages.

Metatheory. Finally, there are metatheoretical issues regarding the status of the theory and its evidence. While Huguet and Latané state that "DSIT is not a verbal theory but a well-specified computer tested model," it is clear that some aspects of the theory remain untested: For example, whereas DSIT discusses neural network models of attitude structure, it does not explicitly provide such a model of its own; whereas DSIT provides some evidence for a catastrophic view of attitude dynamics, the evidence itself is static, and parameters of a catastrophe model are not estimated; although a biological model provides a rich heuristic for the natural history of social representations, suggesting processes analogous to speciation and turnover, we have no direct evidence for this model.

DSIT and General Theory

DSIT is a sweeping account of human psychological, social, and cultural processes. It incorporates sophisticated tools and principles from modern science, and makes communication a central and fundamental feature of human activity. Its array of surprises and provocative ideas should compel us to add it to the armamentarium of theory that we teach and study. Although most of us have long extolled the essential role of process in communication models, dynamic social impact theory, introduced in this issue of the *Journal*, shows us how the notion of process may be used in a fertile and stimulating way.

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