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2 Information Systems Division: Intrapersonal, Meaning, Attitude, and Social Systems

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The Information Systems Division of the International Communication Association is concerned with the systems that make communication work, ranging from the intrapersonal (e.g., emotional and cognitive systems) to interpersonal, organizational, and societal system.. Over the past two decades. the interests of the division have focused increasingly on systems of mental processes in communication. but underlying mechanisms explored in information systems research range from reflexive processing of an advertisement's formal features to concepts of self-organizing systems used to model the behavior of large organizations. This review looks at four major areas of recent interest to scholars in the Information Systems Division. The first two sections examine systems of mental processing of media from reflexive attentional and emotional responses to the conscious interpretations made by viewers. The third section examines the workings of belief systems, particularly as they apply to attitude change. The final section moves away from the individual to the use of systems theory to understand complex social phenomena, including social organizations.

WHAT is the Information Systems Division? We get asked that a lot. Some confusion is understandable. Recent papers presented in the division appear to be about almost anything connected to communication: political communication, Internet advertising, television fiction, jury decision making, fund-raising letters, verbal aggressiveness, and more. Methods could be characterized as basically empirical, but otherwise they run the gamut from social observation to pushing reaction-time buttons and measuring heart rate. Experiments are popular, but so are surveys and other methods.

AUTHORS NOTE: In addition to one of the sections, the first author wrote most of the introductory pages of this chapter and coordinated the overall effort. Otherwise, all authors contributed equally, and authorship is in order of the sections of the chapter. Michael A. Shapiro is currently chair of the Information Systems Division of the International Communication Association, Annie Lang is a past chair of the division. Mark A. Hamilton is currently vice chair of the division, and Noshir S. Contractor is a member of the division. Our thanks to Rebecca Polakow for her assistance with the manuscript.

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Traditional categories don't help. Information systems research seems to include mass communication, interpersonal communication, organizational communication, new communication technologies, persuasion, and more. In fact, most of our division members are also members of other divisions, most commonly the Interpersonal Communication, Communication and Technology, and Mass Communication Divisions. We think this is true because information systems are central to making communication work, ranging from the intrapersonal (e.g., emotional and cognitive systems) to interpersonal, organizational, and societal systems. We study the processing of information within systems—all kinds of information processed by all kinds of systems related to communication. To an information systems scholar, information could be a pattern of light and shadow, the onset of sound, grief, joy, embarrassment, narrative structure, scary movies, background television, marital interactions, sitcoms, advertisements, Web sites, faces, posture, and more. Information is the stuff that's being communicated and processed in a system.

One way of looking at a system is as a system of nodes between which information passes. A node could be a mental process, a person, a department, a company, a country, or a group. It is a place where information is received, sent, altered, changed, or processed.

Over the past two decades, the interests of the Information Systems Division have focused increasingly on systems of mental processes in communication, but underlying mechanisms explored in information systems research range from reflexive processing of an advertisement's formal features to concepts of self-organizing systems used to model the behavior of large organizations. Information systems scholars are less interested in the effects of television than in how and why those effects occur. We are less interested in whether an interpersonal argument is persuasive than in the mental processes involved in constructing a persuasive message.

Trying to capture the range of theories and methods used in information systems research is like trying to capture all the theories and methods used in social science. A library, not a book chapter, is required. In this chapter we focus on four major areas within the many areas of scholarship in information systems. We first examine systems of mental processing of media, from reflexive anentional and emotional responses (in a section written by Annie Lang) to the conscious interpretations of messages made by viewers (in a section written by Michael A. Shapiro). In many ways those interpretations depend on how people mentally use belief systems. In a section written by Mark A. Hamilton, we examine the workings of those belief systems, particularly as they apply to attitude change. Finally, in a section written by Noshir S. Contractor, we move away from the individual to the use of systems theory to understand complex social phenomena, including social organizations.

INFORMATION PROCESSING AT THE INTRAPERSONAL LEVEL: PASSING THE STUFF OF COMMUNICATION AROUND INSIDE OUR OWN HEADS

What happens when you hear or see a message? Whether the message is from television or from a friend, it has to be processed by your brain. Information systems scholars have been in the vanguard of those looking at what the brain does with messages, particularly televised and other mediated messages. This work has redefined the way we think about media. Information systems researchers have conceptualized media not in terms of content but in terms of their impact on cognitive processing, using dependent variables such as attention, arousal, emotional response, allocation of processing resources, and memory. These dependent variables are then conceptualized and operationalized as parts of an information-processing system whose mechanisms can be studied and understood. This research has often led to the conclusion that the brain treats media messages pretty much the same way it treats other environmental stimuli.

Generally, information systems researchers who take this approach have conceptualized media (often television) in psychological terms (Singer, 1980). This means that mediated messages are defined not in terms of content (e.g., violence, commercials, news) but in terms of psychologically important variables, such as arousal (Bolls, Yoon, Dent, Potter, & Lang, 1997; Detenber, 1996; Kawahara, Bolls, Hansell, & Lang, 1996; Mendelson & Ognianova, 1998; Zillmann, 1982), structural features (Anderson & Levin, 1976; Ditton, Lombard, Kaynak, Linder, & Pemrick, 1998; Geiger & Reeves, 1993; Reeves, Lang, Kim, & Tatar, 1997), movement (Detenber, Simons, & Bennett, 1997), rate of production (Anderson, Levin, & Lorch, 1977; Bolls et al., 1997; Hitchon, Thorson, & Duckler, 1994; Kawahara et al., 1996; Thorson, Reeves, & Schleuder, 1985, 1987), and cognitive load (Armstrong, 1997; Kawahara et al. 1996; King & Behnke, 1998; Lang & Basil, 1996, 1998; Vaughn, 1996). One of the first things researchers have looked at in this new psychological conceptualization of media—particularly television—is the impact of structural features on the mental processing of messages.

The Role of Structural Features

Many information systems researchers have defined television in terms of Structural features. For example, Lombard et al. (1996) conducted an ambitious content analysis of television content to describe and categorize all the structural features involved in the television medium. Other researchers have studied the effects of specific structural features on various processing and emotional response variables. Detenber et al. (1997) examined the effects of movement on attention and arousal responses to emotional pictures. Ditton et al. (1998) investigated the effects of structural features on the concept of presence. Reeves et al.

(1997, 1999) looked at the effect of screen size on emotional response and memory. Bolls et al. (1997) and Kawahara et al. (1996) examined the effects of rate of structural features on arousal, attention, allocation of processing resources, and memory.

Virtually all of these studies show that the structural features of a medium have important effects on the information processing of mediated messages. At a basic level, most of these structural features have been shown to elicit an orienting response in attentive television viewers. The orienting response is an automatic physiological attention response that causes a momentary increase in resources allocated to a task (Lang, 1990; Lang & Basil, 1996; Reeves et al., 1985, 1997). This research has substantiated theoretical conceptualizations of the orienting response as a mechanism for the automatic allocation of processing resources to the processing of mediated messages (Lang, 1997; Reeves et al., 1985; Reeves & Nass, 1996).

Limited-Capacity Models

Related to this, a major conceptualization of attention used by information systems scholars is that of the limited-resource or limited-capacity model (Armstrong, 1997; Basil, 1994a, 1994b; Bolls et al., 1997; Kawahara et al., 1996; King & Behnke, 1998; Lang, 1995, 1997; Lang & Basil, 1998; Vaughn, 1996). In such a model, media users are conceptualized as having limited processing resources available to allocate to the processing of mediated messages. Resources are allocated through a combination of automatic and controlled processes. Messages vary in the levels of resources required to process them. As a result, different messages are perceived as having various cognitive loads. The cognitive load imposed by a message is a major factor in determining how well that message will be processed (Armstrong, 1997; Hibbs, Bolls, & Lang, 1995; Thorson & Lang, 1992).

A great deal of information systems research has focused on how various features or characteristics of messages increase or decrease the messages' cognitive loads. Several researchers have shown that the processing of emotion requires additional resources (King & Behnke, 1998; Lang & Basil, 1996; Lang, Newhagen, & Reeves, 1996; Newhagen & Reeves, 1992). Complexity and fast pacing have also been shown to increase the resources required to process a message (Bolls et al., 1997; Kawahara et al., 1996; Lang, Bolls, Potter, & Kawahara, in press). Semantic redundancy between the audio and video channels is another structural feature that plays an important role in determining a message's cognitive load. Messages with high redundancy require fewer resources, whereas those with low redundancy may require greater resources (David & King, 1996; Fox, 1996; Grimes, 1991; Lang, 1995). Variations in the designs of human-computer interfaces have been shown to alter the cognitive load of computer programs (Vaughn, 1996). Finally, imagery (Viser & Gordon, 1996), movement (Detenber, 1996), screen size (Reeves et al., 1997), and the presence of background media

(Armstrong, 1997) have all been shown to increase the resources required to process a message.

In addition, controlled processing resources—that is, the resources intentionally allocated by the viewer-also play an important role in how thoroughly a message is processed. Less work has been done to investigate variables that increase and decrease controlled processing allocation. Among those investigated so far are emotion (Lang, Dhillon, & Dong, 1995), previous knowledge (Thorson & Lang, 1992), education (Grabe, Lang, Zhou, & Bolls, 1999), and age of viewer (Lang, Schwartz, & Snyder, 1999). Obviously, many individual-difference variables, such as interest, previous knowledge, goals, and motivations, play a role here.

Emotional Messages

Another focus of the research being conducted by members of the Information Systems Division is on the effects of emotion-eliciting messages on information processing (Bryant, 1997; Nabi, 1998; Viser & Gordon, 1996; Weaver, 1997). As mentioned above, emotion has been shown to increase both the automatic and controlled allocation of resources to a message. In addition, research shows that emotion affects processing in many other ways. Researchers have taken several different theoretical approaches to the study of emotion. One common approach has been to look at negative and positive messages and determine how the valence of a message alters processing. Research suggests that negative messages compel attention and that both positive and negative messages receive greater attention than neutral messages (Lang & Bolls, 1995; Lang et al., 1995; Newhagen & Reeves, 1992). Further, the research clearly shows that emotional messages are better remembered than neutral messages.

The second important component of emotion that has received significant research attention is arousal. Research has shown that arousing messages and calm messages are processed differently. The presence of arousing content in a message increases viewers' self-reported and physiological arousal (Bolls et al., 1997; Kawahara et al., 1996; Lang et al., in press). In turn, the elicitation of arousal in viewers leads to increased cognitive load and better memory for messages (Bolls et al., 1997; King & Behnke, 1998; Lang & Bolls, 1995).

Other studies have focused on how the use of emotion in messages alters other cognitive processes. For example, Nabi (1999) has developed a persuasion model that details how negative emotion alters the processing of persuasive messages.

Processing Pictures

Another major focus of research among members of the Information Systems Division concerns how people process video images as well as combined audio and video stimuli (e.g., audio-video redundancy). Many researchers have approached this problem using Pavio's dual coding theory (David & King, 1996;

David & Peay, 1998; Preston, 1996, 1997). This research suggests that video encoding is virtually an automatic process (Lang, Potter, & Bolls, 1999); that when pictures and words are redundant, memory improves (Grimes, 1991; Lang, 1995); and that concrete words that elicit visual imagery are remembered better than words that do not elicit imagery (David & King, 1996; David & Peay, 1998).

Presence

Recently, some information systems researchers have begun to focus on questions concerning the processing of new media and new media forms such as virtual reality, home theater systems, and computer-related media (agents, the Web, 3-D gaming, and so on). Questions about how information presented in these media is processed are receiving some attention (Nass & Steuer, 1993; Reeves et al., 1999; Reeves & Nass, 1996).

In addition, several information systems researchers have begun to examine the concept of presence or telepresence (Kim & Biocca, 1997; Lombard & Ditton, 1997). This concept is related to the notion that new media may blur the boundaries between reality and fantasy even more than other media do. To date, research has focused on attempts to conceptualize presence (Lombard & Ditton, 1997) and attempts to determine how structural characteristics of media and messages may alter users' sense of presence (Kim & Biocca, 1997). Studies suggest that structural features such as larger screens, point-of-view camera movement, and affective computer agents alter viewers' sense of being there (Deitz & Lang, 1999; Orton, Reeves, Leshner, & Nass, 1994). Recent research also suggests that presence may mediate viewers' physiological and emotional responses to some media (Lang, Schneider, & Deitz, 1999).

How Do We Do It?

In addition to studying interesting theoretical problems, information systems researchers are constantly searching for new methods to illuminate thorny research problems. The intraindividual focus of this area of research has led to a number of interesting methodological developments that have spread outward from the Information Systems Division into general usage in the field of communication. The focus on cognitive processes and mechanisms, many of which are automatic or unconscious, has led information systems researchers to search for covert measures of cognitive activity. Among the measures often used are (a) the recording of real-time physiological responses, including heart rate (as a measure of attention), skin conductance (as a measure of arousal), and facial EMG (as a measure of valence) (Bolls, Lang, Potter, & Snyder, 1999; Lang, 1994); (b) secondary task reaction times as a measure of resources allocated to media use (Lang & Basil, 1996, 1998); (c) latency to recognition as a measure of memory or judgment accessibility (David & Peay, 1998; Shrum, 1999); (d) signal detection analysis (Fox, 1996; Shapiro, 1994; Shapiro & Fox, 1995, 1996); and (e) a plethora of the more common self-report measures and paper-and-pencil memory tests.

What Does It All Mean?

Research conducted by members of the Information Systems Division suggests that the human information-processing system is a limited-capacity system (Geiger & Newhagen, 1993; Lang & Basil, 1996; Reeves & Nass, 1996). Many characteristics of mediated messages can trigger an increase in the automatic allocation of processing resources (i.e., attention; see Basil, 1994; Geiger & Reeves, 1993; Lang, 1990, 1997). Depending on the cognitive load of the situation, this increase in resources can lead to an increase or decrease in memory for messages (Thorson & Lang, 1992). Thus when cognitive load is high, additional calls for resources overload the processing system and memory for the messages decreases (Grimes, 1991). On the other hand, when cognitive load is low, additional calls for resources increase message processing and result in an increase in memory

Emotion is an important variable in this system. Emotion alters the way in which information is processed (Newhagen & Reeves, 1992). Emotion-eliciting messages increase arousal. This means that viewers rate themselves as being more aroused, and the physiological measures of sympathetic nervous system activation increase. When viewers are more aroused, resources allocated to the message are increased, attention to messages is increased, liking for messages is increased, and memory for messages is increased (Lang et al., 1995).

The processing of pictures is an important focus of information systems research. Division researchers have clearly shown that pictures are frequently remembered better than words. In addition, research has shown that the encoding of visuals requires fewer processing resources than the encoding of text and audio stimuli. Further, when the visual track of an audiovisual presentation is produced in such a way as to compel attention (either through the addition of emotional images or through the use of visual production techniques to draw automatic attention), memory for the accompanying audio track decreases. This is particularly true when the redundancy between audio and visual stimuli is not high.

MESSAGES AND MEANING

Obviously, the brain also processes the meaning of a message. Although meaning is an element of the discussion in the preceding section, it is not the main focus. Information systems investigators have looked in detail at the mental systems involved in creating interpretations of a message. These systems can be relatively automatic or more thoughtful and less subject to the limited capacity of reflexive processing.

Until recently, the goal of most television-related communication research has been to discover when particular television effects occurred. Information systems

investigators focus not just on when particular interpretations occur, but on what mental contents and procedures people use in making interpretations. Here, too, there has been a shift away from thinking of these meanings as a function of media content toward a more balanced view of meaning as a complex interaction among message content, prior experience, and the viewer's ongoing mental processes. By focusing on the systems of mental processes that create meaning, information systems investigators attempt to capture the complex ways people create meanings across a broad spectrum of media sources and media content, including entertainment, news, and advertising.

Meaning and Content

The challenge is to create a theory of meaning creation that accommodates viewers' real abilities. We know that viewers can share social meanings while simultaneously creating unique meanings. A systems approach accounts for subjective reactions to objective messages while at the same time permitting intersubjectivity (Hewes & Planalp, 1987).

Messages place at least some loose limits on possible interpretations if even approximate social meanings are to be transmitted. For example, if the writer of a television drama does not correctly anticipate at least some of the interpretations likely to be attached to a message, the message may become unintelligible. In such a television drama a police officer's questioning of a suspect may make sense only if the writer has correctly anticipated the viewer's understanding of earlier plot elements and the viewer has understood those plot elements in at least somewhat the same way as the writer. Of course, the viewer brings something to the interaction as well—his or her own prior experience. That experience can dramatically influence the viewer's interpretation of the police officer's questioning (as fair or unfair, for example). Such multiple interpretations can take place without threatening the writer's and viewer's shared sense of the basic elements of the story. Thus the meaning of a television message is a combination of the writer's skill in producing specific responses and the viewer's experiences and social and cultural interpretations (Livingstone, 1992).

Another factor is that a person's experiences, beliefs, attitudes, and goals are in part consequences of his or her social and cultural milieu. To the extent that those in a culture share mental contents, they are likely to produce similar interpretations. A corollary is that people from different value systems may interpret the same stimulus very differently (Liebes & Katz, 1986). However, information systems scholars are likely to focus on the fact that it is the similarity of mental contents, not mere membership in a social category, that leads to similar interpretations (Berkowitz & Donnerstein, 1982).

Some scholars have claimed that the mass production of television messages creates dominant cultural messages that tend to reduce some belief differences among viewers—particularly if they are heavy viewers (Gerbner, Gross, Morgan, & Signorielli, 1986). Although the debate over this claim is beyond the scope of this chapter, it is clear that two people can and often do interpret the same media message in very different ways (e.g., Cooper & Jahoda, 1947; Hoijer, 1992; Liebes & Katz, 1986; Vidmar & Rokeach, 1974). Considerable evidence shows that increasing television viewing does not change beliefs and attitudes in any one direction (Hirsch, 1980; Potter, 1991). The meaning of a message is the interpretation a person gives that message (Dervin, 1981, 1989).

A variety of content and audience factors can affect both the amount and the direction of influence. These include type of program (Potter & Chang, 1990), outcome of plot elements (Bryant, Carveth, & Brown, 1981; Tamborini, Zillmann, & Bryant, 1984; Weaver & Wakshlag, 1986), identification with characters (Reep & Dambrot, 1989; Turner & Berkowitz, 1972), audience perceptions of television (Adoni, Cohen, & Mane, 1984; Adoni & Mane, 1984; Cohen, Adoni, & Drori, 1983; Potter, 1986, 1988), prior experience (Austin, Roberts, & Nass, 1990; Ball-Rokeach & DeFleur, 1976; Fazio, 1986; Perry, 1987), attention (Anderson & Lorch, 1983; Chaffee & Schleuder, 1986), and audience goals (Meadowcroft & Zillmann, 1987; West, 1993; Zillmann, 1991).

The Process of Interpretation

Interpretive processes occur both while an individual is processing a message and later, when he or she may retrieve memories, beliefs, and attitudes. Mental elaborations that take place during viewing are sometimes called on-line processing (Hastie & Park, 1986). Few media studies have investigated this directly, but considerable research bas shown that people often generate evaluative thoughts while processing persuasive messages (Greenwald, 1968; Petty & Cacioppo, 1981). These evaluative thoughts are used to change attitude during the processing of the message and are better predictors of later attitude change than memory for the message arguments or even memory of the evaluative thoughts (Greenwald, 1968).

Evaluative thoughts are only one element in the on-line interpretation of messages. For example, considerable on-line processing of a television situation comedy is needed to understand the social situation, the motives of the characters, and the consequences of various actions. (For a thorough treatment of how people create meaning while viewing television, see Biocca, 1991.) People may also be making on-line judgments about the reality of what they are seeing (Adoni & Mane, 1984; Shapiro & Chock, 1998; Shapiro & Lang, 1991). As Hoijer (1992) notes, audience interpretation of media is a "dynamic interaction" among "content, structure and presentation, and the realms of social experience of the viewers" (p. 599).

On the other hand, many decisions influenced by media content are made sometime after viewing. These depend on memory for bits and pieces of experience, including mediated presentations, to reconstruct a view of what the real world is like. Such reconstruction can be as uncomplicated as retrieving a memory or using

a simple heuristic (Chaiken, Liberman, & Eagly, 1989), but more thoughtful reconstructions can be quite complex. For example, social reality estimates may involve a complex assembly of direct and indirect experience, possibly influenced by attitudes, preferences, and social pressures (Shapiro, 1995).

Finally, construction and reconstruction influence each other. Reconstruction depends in part on information stored in memory from previous on-line interpretations of television. On-line interpretations may be influenced by previous reconstructions stored in memory.

The Special Role of Direct Experience

Direct experience seems to have somewhat special potency in informing a wide range of interpretations of media. Experience with a topic may confer some immunity to media influence (Adoni et al., 1984; Cohen et al., 1983; Perry, 1987). Even children are more likely to think for themselves when they have some direct experience with a topic (Austin et al., 1990).

Direct experience influences interpretation of media for a number of topics, including crime (Doob & MacDonald, 1979; Elliott & Slater, 1980; Gerbner, Gross, Morgan, & Signorielli, 1980; O'Keefe, 1984; Schlesinger, Dobash, Dobash, & Weaver, 1992; Weaver & Wakshlag, 1986) and judgments about health risk (Flora & Maibach, 1990; Shapiro & Han, 1994; Snyder & Rouse, 1992; Tyler, 1980).

Although there is considerable evidence that direct experience is especially potent, we know little about its relationship to television experience. It seems possible that some television experiences can approach the status of direct experience (Shapiro & McDonald, 1992), hut we have only begun to scratch the surface of when, how, and why. This seems like a fruitful area for future research.

Conscious and Unconscious Processes

People are not always thoughtful when they assign meaning to media messages. Meaning processing can range from intentional and controlled (the individual is highly aware of what is passing through his or her thoughts) to automatic (an environmental stimulus automatically causes a mental procedure to occur without the individual's being consciously aware of the event; see, e.g., Fazio, 1990; Hansen, 1989; Hansen & Hansen, 1988). Automatic processing does not require an explicit goal to occur (Sanders, Gonzalez, Murphy, Liddle, & Vitina, 1987; Schneider, Dumais, & Shiffrin, 1984; Shiffrin & Schneider, 1977). Most mental processing of television is a combination of automatic and controlled processing.

A large number of studies have shown that unconscious activation can influence interpretation of an ambiguous social stimulus (Higgins, 1989; Higgins & King, 1981). One suggestion is that relatively short-term priming effects may explain a number of television effects, including effects on estimates of social reality and on

aggressive behavior (Berkowitz, 1984; Berkowitz & Rogers, 1986). For example, in political communication there is some evidence that exposure to a topic on television news may increase perceptions of that topic's importance and may make it more likely to influence later political decisions (Iyengar, 1990).

Construct activation may also prime social reality estimates by heavy television viewers (Shrum & O'Guinn, 1993). The subtle nature of these psychological effects may make some of them difficult to detect using a complex stimulus like television. Overall priming is a largely unexplored but potentially important explanation for television effects (Shrum, Wyer, & O'Guinn, 1998).

Another way in which relatively unconscious processes may influence reconstruction is through automatic processes that draw on episodic memories of specific television events and the contextual information stored with those memories to determine which memories are relevant to a social reality decision. The contextual information stored with memories may include the perceived source of the memory as well as psychophysiological responses to television. This contextual information acts as a sort of filter in various automatic processes that weighs and balances which memories are relevant (Mares, 1996; Shapiro & Lang, 1991; Shrum, 1997).

The distinction between automatic and controlled processing is an important one for media studies. Methods that are appropriate for the study of automatic processing are different from those that are appropriate for the study of controlled processing. Methods used to study automatic processing must assume that the processes involved are covert and not available to be reported directly by subjects. On the other hand, techniques such as thought listing can he appropriate for investigating more thoughtful processing (Shapiro, 1994). Interpretations based on automatic processing are not necessarily inferior to those based on more thoughtful processing. In fact, automatic mental procedures are that way because we are very good at them. Nonetheless, they may influence our interpretations in ways that might not stand up if given more thought. For example, sex-stereotyped music videos seem to have some unconscious influence on viewers' later judgments about women (Hansen, 1989; Hansen & Hansen, 1988).

Conclusions

The mental processing of media such as television is a complex psychological task, even when individuals are viewing ritualistically, to be relaxed or distracted. Viewers must keep track of plots, characters, and motivations to understand even the most mindless programs. Using television memories to make later decisions is equally complex. In both cases, the result is active interpretation of the television stimulus, not passive reception of content. This interpretation depends on both the content of television and an individual's prior experience and goals. The effect of television depends on the interpretation. Any consistency in interpretation across individuals exists because people who share cultural and social experiences also

share prior experiences and goals. In addition, one goal of any communication is to share social meanings.

Related to this is the work of some information systems scholars who look in detail at the processing and interpretation of messages of one specific type: persuasive messages.

INFORMATION SYSTEMS AND PERSUASION

The two preceding sections have dealt with systems of mental processing of both the structure and meaning of messages. One common goal of messages is persuasion. Information systems scholars have made a significant contribution to our understanding of how persuasive messages work (and don't work).

Considerable research by Information Systems Division members has focused on the processes that mediate the impact of message exposure on belief change. Most of these researchers have investigated source (e.g., Basil, 1995), message (e.g., Crano & Cben, 1997), channel (e.g., Boster & Levine, 1997), or receiver (e.g., Tyson & Hamilton, 1996) variables that facilitate persuasion. Some researchers have also been developing models to explain resistance to persuasion (Nabi, 1995; Pfau et al., 1996).

This section explores two main themes of information systems research related to persuasion. The first involves the influence that knowledge structures exert on the communication process (Ritchie, 1995, 1997; Ritchie & Good, 1996). Knowledge structures link beliefs together and determine beliefs' centrality. Belief systems theory (Hamilton & Mineo, 1996, 1999; Rokeach, 1960, 1969) defines the centrality of a belief as the number of functional connections it has with other beliefs in a given knowledge structure.

A second theme has been how receivers process messages and the impact that message-processing variables have on receiver beliefs and behaviors (Basil, 1996; Meyer, 1996; Mongeau, 1996; Reynolds, 1996; Roskos-Ewoldsen, 1996; Tremain Koch & Crano, 1996). The discussion in this section will concentrate on the impact that certain message features have on receiver evaluations of source, message, and topic—an area often referred to as ***message effects research.***

Information Systems Division members typically use multivariate statistics that reflect the complexity of message-processing phenomena. This research is characterized by a striving for methodological rigor, with an emphasis on accurate estimation of effect size, effort to control potential confounding variables, and the reporting of effect size estimates in conjunction with significance tests and estimates of the reliability of measurement devices.

Belief Structures as Information Systems

Although information systems research on belief structure often draws on a variety of theories, belief systems theory (Rokeach, 1960, 1969) holds promise as a means of synthesizing these diverse findings. Beliefs are more or less connected within knowledge structures, where the flow of information organizes the belief system along a central-peripheral dimension (Rokeach, 1960). Consequently, the belief system can be divided into the three major sections shown in Figure 2.1. The central region contains three types of primitive beliefs: the primary primitives related to cognitive competence, the secondary primitives related to the self-concept, and the tertiary primitives related to the generalized other (Hamilton & Mineo, 1999). The peripheral region contains beliefs derived from the central region. Peripheral beliefs can concern individuals, groups, or cultures. The intermediate region contains the processes that justify the derivation of peripheral beliefs from central beliefs. The three main justification processes are authoritarianism, rationalism, and emotionalism.

The intermediate region shown in Figure 2.1 contains ethnologics that represent three different ways of justifying beliefs. Ethnologics are the informal, personal logics that people use to justify their beliefs. *Authoritarianism* involves reliance on the opinions of experts. Receivers who derive their beliefs through authoritarianism will focus on the credibility of the source as a justification for belief change.

One recurrent topic for persuasion research under the information systems banner has been the conditions under which people doubt their own ability to render accurate judgments and turn instead to authoritative sources. Rational justification, also known as ***criticalness,*** involves reliance on reason and informal logic. Receivers who derive their beliefs through rationalism will elaborate on the issue as a justification for belief change. Information systems research has explored systematic reasoning processes (Mineo, 1995, 1996) and heuristic thought processes (Shapiro & Han, 1996; Stiff, 1995), with special attention to the types of arguments that people find more or less convincing (Allen & Preiss, 1996; Berkowitz, 1984; Slater & Rouner, 1995; Sopory & Dillard, 1996; Whaley & Weber, 1996). Receivers who derive their beliefs through emotionalism will be influenced by the charisma of the source, and their perceptions of how dynamic the source is will subsequently influence their liking of the source (Bentar, 1997; Dillard, 1995; Hamilton, 1997; Lemieuz, Hale, & Mongeau, 1996; Nabi, 1997a, 1997b).

Most persuasion studies attempt to change peripheral beliefs by making one, or occasionally two, of the three justification processes salient to receivers—examples include Petty and Cacioppo's (1981, 1986) elaboration likelihood model (ELM) and Chaiken's (1980) heuristic-systematic model (HSM). Outside of the laboratory, receivers may use two or even three justification processes for their peripheral beliefs. The extent to which receivers employ given justification processes is supposed to depend on the organization of their central beliefs. If belief systems theory is correct, then the impact that source credibility variables, argument quality variables, and affective response variables have on peripheral belief Change will be moderated by variables found in the central region. Due to their interconnectedness within the belief system, central beliefs are particularly resistant to change.

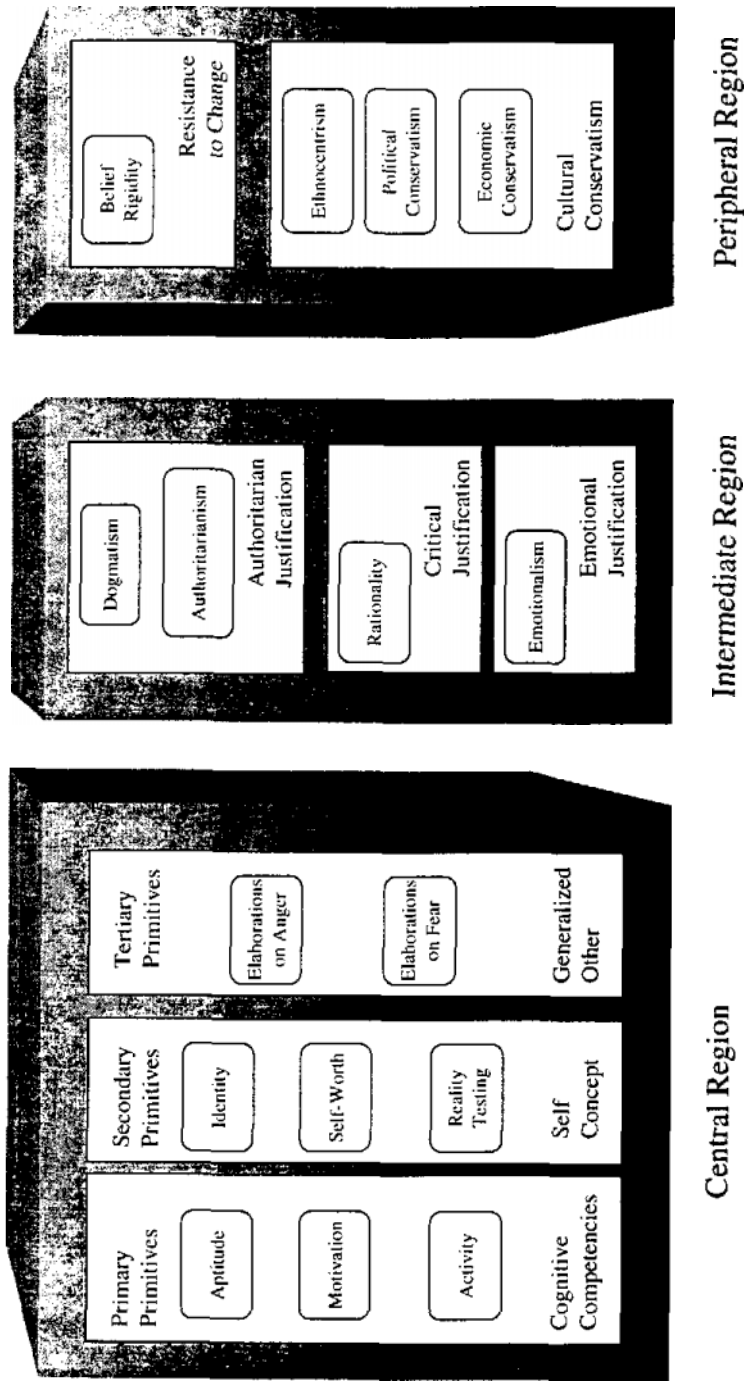

Figure 2.1. Organization of the Belief System

Message Effects Research

Researchers in the Information Systems Division have frequently employed meta-analyses to determine which results replicate across studies (Hunter & Hamilton, 1998). Meta-analyses have helped to resolve many long-standing conflicts within the message effects area.

Conclusions for Altitude Change

Meta-analyses, many done by information systems scholars, have provided a much clearer picture of the persuasion process than the one available to early persuasion theorists. Consider the propositions regarding "message discrepancy" found in the persuasion literature. Message discrepancy is the difference between the position advocated by the source and the premessage position of the receiver. Attitude change has been shown to be an increasing monotonic function of discrepancy with negative acceleration (Hamilton, 1997; McGuire, 1969). That is, the more belief change sources advocate, the more change they generally obtain—but with diminishing returns as the difference between source position and receiver position becomes large. This negative acceleration (the diminishing returns) is due to counterarguing. As message discrepancy increases, so does counterarguing. These propositions are as close to lawlike generalizations as can be found in the field of communication. These effects are as powerful as they are reliable.

People's use of information they possess in memory to counterargue persuasive messages is a subject often studied hy information systems researchers. For many years, researchers disagreed as to whether distraction enhanced attitude change by decreasing counterarguing or inhibited attitude change by decreasing comprehension (see Buller, 1986; Buller & Hall, 1998). In fact, meta-analysis has shown that *both* counterarguing and comprehension mediate the effect of distraction on attitude change (Hamilton & Hunter, 1998b). On average, the indirect effect of distraction on attitude change mediated by counterarguing is positive but small, whereas the indirect effect of distraction mediated by comprehension is negative but even smaller. Thus the combined overall effect of distraction on attitude change is slightly positive.

Meta-analyses conducted by members of the Information Systems Division have also resolved key disputes in the message effects literature. Meta-analyses of the fear-appeal literature have shown support for the drive model (Boster & Mongeau, 1984; Mongeau, 1998). The meta-analytic results indicate that greater fear in a message has a moderately large effect on perceived fear in receivers, with perceived fear having a large positive effect on attitude change and attitude change having a very large positive effect on behavior change.

In another message effects meta-analysis, Allen (1998) found two-sided messages with refutation to be more persuasive than one-sided messages and one-sided messages to be more persuasive than two-sided messages without refu-

tation. Hamilton and Hunter (1998a) found that language intensity influenced attitude change only if the message was discrepant and the source had high credibility. For the credible source delivering a discrepant message, intensity had a moderately small positive effect on attitude change for receivers who were uninvolved with the topic, but a moderately small negative effect on attitude change for receivers involved with the topic. If the source had low credibility or the message was congruent with receivers' position on the issue, then intensity had no effect on receiver attitudes.

Conclusions for Source Evaluation

Across studies, there is a mounting body of evidence that stronger messages improve ratings of source dynamism but lead receivers to evaluate the messages as more extreme. Dynamism and source position produce antagonistic effects on ratings of source competence. On the *positive side*, dynamism increases message clarity, with clarity improving ratings of competence, in part by improving evaluations of argument quality. On the negative side, a more extreme counterattitudinal message reduces competence ratings. Competence, in turn, increases trustworthiness, and trustworthiness increases liking of the source and attitude change. This model helps to explain the results of Cruz's (1998) meta-analysis on conclusion drawing. Cruz found that explicitly drawing conclusions had a very large positive effect on message comprehension, with comprehension having an extremely large positive effect on perceived extremity of source position. Source position, however, had only a slight positive effect on attitude change. The results of Burrell and Koper's (1998) meta-analysis are also consistent with the proposed model. They indicate that powerful language had a moderately positive effect on perceived source credibility, and perceived source credibility had a massive positive effect on attitude change. Additionally, in his meta-analysis of equivocal language effects, Hamilton (1998) found that opinionated language that evaluates receivers for the positions they hold has a large negative effect on competence, as does extremity of source position.

Implications for Future Persuasion Research

As researchers have gained a better understanding of how belief systems are organized and how people process persuasive messages, they have become better able to track the effects of messages on the message reception and yielding processes. These trends suggest that the most progressive research will possess two features. First, it will examine the belief targeted by a persuasive message not in isolation but within the belief hierarchy in which that belief is embedded. Suppose, for example, that a source's objective is to change people's attitudes toward bovine growth hormone. It would be useful for the source to know how people view fond additives in general and to know what their attitudes are toward milk, as well as toward other dairy products. Second, progressive research will explore the

complex relationships among the key dependent variables in the study. For instance, how does distraction disrupt attention, and what impact does this disruption have on comprehension of message content and the counterarguing of that content? Studies can thus be used to track the effects of message variables on receivers' exposure to the message; their attention, comprehension, and evaluation of its content (leading to bolstering thoughts or counterarguments); and the potential integration of the new information contained in the message into receiver belief systems.

SYSTEMS APPROACHES TO THE STUDY OF COMMUNICATION

History of Systems Approaches

The interests of the Information Systems Division described in the preceding three sections reflect an abiding commitment to the identification of underlying theoretical ***mechanisms*** in ***systems*** that explain how, and with what results, individuals process information.' The first section bas described, at the intrapersonal level, the human as an information-processing system, reacting to structural and other characteristics of the message. The second section has described the mechanisms of co-constructing meaning and interpretation in a system that includes the media and the individual. The third section has examined the mechanisms of persuasion and attitude change by considering both the system of beliefs, articulated as knowledge structures, and the dynamics of interaction between sender and receiver articulated in terms of such concepts as refutation, distraction, and counterarguments.

This shared commitment to a focus on underlying mechanisms in systems at different levels undergirds a fourth area of interest for members of the Information Systems Division: a metatheoretical, sometimes philosophical, and increasingly empirical interest in the study of systems at and, more intriguingly, between different levels of analyses. Starting in the late 1970s, the tenets of systems theory have influenced scholarship in the field of communication (Monge, 1977; for a historical review, see Barnett, 1997). In his overview of the Information Systems Division in the first volume of the ***Communication Yearbook,*** Krippendorf (1977) outlined three critical aspects of general systems theory: structure, process, and function. *Structural functionalists* sought to identify the structures and processes that keep a system functioning in a stable state. A move away from equilibrium was seen as a symptom of a dysfunctional system. ***Open-systems*** theory recognized that the system's undesirable departure from an equilibrium state was often predicated by activities in the environment. ***Cybernetic*** systems underscored the importance of communication as a feedback mechanism to restore the system to its stable state. With their emphasis on stability and feedback, traditional systems theories were not well suited to model the dynamic emergence, mutual causality, his-

toricity, time irreversibility, and discontinuity that imbued the intellectual discourse surrounding late-20th-century social systems (Barnett, 1997; Contractor, 1994; Pnole, 1997).

Contemporary Systems Approaches

The diversity of responses to the shortcomings of traditional systems perspectives is well reflected in the research interests of members of the Information Systems Division. The division has witnessed at least three interrelated strands of theorizing and research from contemporary systems perspectives. First, starting in the late 1970s, communication researchers have studied the emergent and evolving structures of systems from a networks perspective. Second, starting in the late 1980s, the interest in underlying nonlinear generative mechanisms has been fueled by a renewed interest in the concepts introduced in contemporary systems theories, such as chaos theory, self-organizing systems theory, and autopoietic systems. Third, starting in the mid-1990s, the proliferation of computational tools has spawned a renewed interest in extending the study of systems from a metaphoric approach to a computational modeling approach.

Network Approach to Systems

Grounded in the mathematical subdiscipline called graph theory, sociometry (Moreno, 1934, 1953, 1978) was introduced as a mathematical representation of the structure of social systems. Today, the field commonly known as network analysis (Stohl, 1995; Wasserman & Faust, 1994) offers communication researchers a framework to describe the emergence of social systems based on the individual attributes of actors (e.g., individuals, families, and organizations) as well as communication relationships (at the dyadic, triadic, and global levels) among these actors. For instance, the stability of a system of interpersonal relationships is shown to be a function of the attributes (e.g., personality characteristics, age, gender) not only of the individuals, but also of the triads, groups, and larger networks in which the individuals are embedded. As such, it provides scholars an opportunity to articulate and test theories that often cross different levels of analyses. For instance, Valente (1995) has used network characteristics to model the diffusion of innovations by specifically incorporating individual and collective characteristics of the system. New network-analytic techniques, such as p* (Wasserman & Pattison, 1996), offer great promise for moving network analysis from a primarily descriptive endeavor to one that provides an omnibus test for cross-level inferences.

In recent years there has been substantial interest within the Information Systems Division in applying network analysis to the study of meaning and interpretation systems. Traditional network analysis had been criticized for its focus on the structure of systems without due recognition of the content of the relationships.

Catalyzed by Monge and Eisenberg's (1987) coinage of the concept of "semantic networks," communication researchers have examined social systems as networks of shared interpretations among key concepts and symbols (Danowski, 1988; Jang & Barnett, 1994; Rice, 1994; Stohl, 1993). Richards and Seary (1997) have used network analysis to articulate convergence theory—the ways in which individuals' configurations of concepts converge—from a systems perspective. These researchers have examined the correspondence (or lack thereof) between the communication and semantic structures within social systems. In a related line of research, building on an influential essay by Richards (1985), Corman and his colleagues (Corman & Scott, 1994; McPhee & Corman, 1995) have argued for the importance of conceptually distinguishing, and theoretically privileging, an actor's perceptions (or interpretations) of the communication network from what may be the "actual" self-reported communication network.

As we enter the 21st century, network theories and methods are poised to study the creation, maintenance, and dissolution of flexible, interconnected social systems (Contractor, Zink, & Chan, 1998; Monge & Contractor, 2001) precipitated by the inexorable forces of globalization (Kincaid, 1987; Monge, 1998; Stohl, 2000).

Nonlinear Complex Systems

Some scholars within the Information Systems Division have responded to their disillusionment with traditional systems approaches by introducing to the field of communication systems some of the more recent developments in the study of complex systems. ***Complex systems*** is an umbrella term used to describe a large family of contemporary systems theories and models that have as their goal the explanation of nonlinear phenomena. Members of this family of interest to members of the Information Systems Division have included autopoietic systems, second-order cybernetics, the second cybernetics, morphogenetic systems, chaos theory, self-organizing systems theory, dissipative structures, neural networks, and fractals.

Recent work on second cybernetics, self-referential systems, and autopoiesis has challenged the received view that communication systems are more profitably conceptualized as open, rather than closed, systems (Hawes, 1998; Krippendorf, 1998; McFarland, 1997). Maturana (1991) argues that "it is the organization of a system that characterizes its unity, not its relations with an environment" (p. 377). Luhmann (1992) proposes that a communication system is a "completely closed system that creates the components nut of which it arises through communication itself" (p. 254). This view of a system as being closed may appear to signal a counterintuitive challenge to earlier attempts by systems theorists to "open" the system to informational and energy exchange from the environment. In fact, the use of the term *closed* in the contemporary context refers explicitly to logical and organizational closure of a system, where the boundary of a system is defined

more expansively to include what earlier scholars had considered the environment. According to Krippendorf (1987): "Organizational processes of communication are explainable only from within a social form and are in the true sense self-referential. Living systems, indigenous culture, self-government, or organizationally autonomous social systems exemplify the empirical domain of this paradigm" (p. 208). Further, Krippendorfstates that it is the "processes of communication that make a society see itself as distinct and that make it retain its indigenous form of organization, culture, or mind (p. 208). From this perspective—sometimes termed second-order cybernetics—the organizational and logical closure of a system precludes not only the influence of but observation by elements outside the system. As such, it offers aradical constructivist challenge to the study of systems by problematizing the role ofresearchers "observing" a system without being a part of that system (Krippendorf, 1984; Steier & Smith, 1985). Specifically, it eschews the traditional social scientific researcher's role of dispassionate, unobtrusive "outside" observer of the system.

Conceptually distinct from the development of second-order cybernetics, but equally influential among scholars in the Information Systems Division, is Maruyama's (1963) introduction ofthe "second cybernetics." Unlike the focus of traditional cybernetics on regulating a system by using negative feedback to reduce deviation, Maruyama argues that many systems exhibit positive deviation-amplifying feedback. Salem (1997) has used the arguments of the second cybernetics to articulate a four-stage model (emergence, divergence, transformation, and convergence) to study morphogenesis in social systems. Unlike traditional cybernetics, which examines how systems regulate themselves, the focus here is on examining how large deviations from a system "morph" it into a system with new structures. As such, the second cybernetics offers a powerful framework for identifying, from a systems perspective, the mechanisms that explain fundamental changes in social systems resulting from interventions, such as new technological innovations.

Perhaps the two most popular of the nonlinear complex systems theories of the past two decades have been chaos theory (Gleick, 1987) and self-organizing systems theory (Prigogine & Stengers, 1984). These two theories are premised on closely related sets of nonlinear mechanisms that underscore the system's sensitivity to initial conditions and the system's ability to exhibit discontinuous behavior. Despite their similarities, however, the two theories manifest very different patterns of emergent dynamic behavior (Briggs & Peat, 1989). Chaos theory is concerned with the processes and conditions that lead deceptively simple systems to exhibit seemingly random or chaotic dynamic behavior. Tutzauer (1997) discusses how chaos theory could be used, for instance, to model the longitudinal data collected by Rice (1993) about the dynamically changing self-reported appropriateness of seven types of media (face-to-face, telephone, meetings, videoconferencing, voice mail, text, and electronic mail) used in organizational settings. Self-organizing systems theory, on the other hand, seeks "to explain the emergence of patterned behavior in systems that are initially in a state of disorganization" (Contractor, 1994, p. 51). Thus, whereas chaos theory seeks to explain the creation of chaos from order, self-organizing systems theory seeks to explain the emergence of order from chaos.

Computational Models

Closely related to the developments in chaos theory and self-organizing systems theory is the investment of effort by scholars in the Information Systems Division in the exploration of various modeling environments (such as cellular automata, neural networks, and object-oriented programming) for nonlinear systems. These environments characterize the system in terms of the attributes and relations among a set of actors. The actors are called *cells* in cellular automata models, neurons in neural network models, and objects in object-oriented environments. The system uses simple rules (the underlying theoretical mechanisms) to explain the changes in the attributes of, and relationships among, the actors in the system on the basis of the attributes and relations among other actors in the system. Thus these models can help uncover complex, emergent, and, in many cases, unanticipated collective "global" behavior resulting from individual actors' enactment of simple rules based on their "local" conditions. Corman (1996) argues that computer simulations using cellular automata (CA) modeling techniques offer "a new method of challenging explanations of communication that assume a collective intent. . . . If CA models can account for observed structure in collective communication, it becomes questionable why more complex postulates of collective-level intent are necessary" (p. 201). Woelfel (1993) offers neural networks as a viable modeling environment for policy research. Neural network models attempt to capture the emergent collective behavior of a system resulting from, for instance, a change in policies that are applied to individuals within the system. Likewise, Hyatt, Contractor, and Jones (1997) have used social information-processing theory and structural theory of action to develop an "object-oriented" model ofthe adoption and diffusion of a new information technology in an organization.

Future Directions

Despite their differences, systems theorists working from network, complex Systems, and computational modeling perspectives share a fundamental intellectual Commitment to the examination ofthe underlying generative mechanisms that explain changes in the system (Houston, 1998). However, these perspectives offer only a metatheoretical language; future research needs to build, extend, and test specific communication-based theoretical mechanisms from a systems perspective.

Members of the Information Systems Division are also increasingly aware of the limitations of computational models and simulations that are not validated by empirical studies. They are increasingly committedto statistical validation of their

computational models through the use of empirical data. With these efforts, their contributions will further attract the attention and engagement of communication scholars in other divisions of the ICA who share a commitment to the intellectual domain of communication, hut not necessarily to a systems perspective.

SOME FINAL COMMENTS

As the field of communication moves from questions of the effects of communication to explaining the how and why of communication, the work of the Information Systems Division becomes more and more central to communication scholarship. Information systems scholars are not just a collection of nerds focused on abstract methodological issues (although we are proud to say that does describe some of us). Information Systems Division members are aggressively explaining the processes at the heart of mass, interpersonal, and organizational communication. We believe our focus on the psychological, social, and cultural systems of communication is the key to a mature understanding of communication that will emerge in the future.

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