

Converging Technologies Information Systems and Communication: A Story of Separation and Reunion

Ehsan Sabaghian, Syracuse University
Jennifer Stromer-Galley, Syracuse University
Steve Sawyer, Syracuse University

Abstract

We contrast assumptions of communications theorizing with those underlying information systems to emphasize that the convergence inherent in contemporary ecosystems of digital technologies, online services and the proliferation of information and communication technologies (ICT) are bringing scholars from these two intellectual communities together while challenging their understanding of one-another's scholarship. To do this we advance a simple framework to organize the contrast. We started by looking back at how one theory could be considered as an origin for both studies and how they have been further separated over decades because of different conceptualization and understanding differently over long time. It is no wonder that the theory has been claimed and called both "Theory of Information" and at the same time by some, "Theory of Communication" by others. We look at that difference from man perspective and draw the boundary between two communities. We believe the new emerging technologies have brought back both theories a back together; which we label and discuss as a reunion. We bring few examples to support our story. In short, this paper is the story of birth of two fields of studies from one theory, their separation over many decades and recent reunion of them with rise of new digital technologies.

Keywords: Converging Technologies, Communication, Information Systems, Theory

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Contact: esabaghi@syr.edu

1 Introduction

In 1948 Claude Shannon wrote a technical report detailing his unified model of information, which was then reproduced by him and elaborated on by his colleague Warren Weaver in the book, *The Mathematical Theory of Communication* (1949), in which Weaver more accessibly described the model. The Shannon and Weaver model of communication detailed core concepts of *information source*, *channel*, *information receiver*, and *feedback*, which came to be used as the basis for work in both information systems and communications.

While both fields share this common conceptual model, the research trajectories, theory development and uses, and epistemological commitments of the two intellectual communities have tracked very different paths since the 1950s. Increasingly across the past decade there is evidence of a "reconnecting" occurring between these disparate fields of scholarship. The objective of this paper is to detail not so much the historical shift but the operating principles and perspectives that defined the two distinct fields until recently. We argue that scholars in these two fields have much to learn from each other and can benefit future scholarship by bringing the two fields' perspectives together.

2 A Brief Overview of the Theory of Communication / Information

Shannon and Weaver (1949), engineers working at Bell Labs, proposed a model that explains the transformation of information (in the language of information systems) or of communication (in the language of media and human communication studies) (See Figure 1). For information systems scholars, the model helped conceptualize the troubles communications¹ engineers had been struggling with as they

¹ We will use communications to cover the research and writings that focus on systems engineering. We will use communication to cover the research and writing that focus on human communication.

worked to find the optimal, minimal level of noise that would still enable information to flow through a system, such as over radio or microwave frequencies, or as analog or digital signals over telephone lines (see Reza, 1961). For communication scholars, the model provided a conceptual framework and terminology that has pervaded scholarship on human and mass media communication. Fiske (1986) noted that the model was "one of the main seeds out of which Communication Studies has grown" (p. 6) Hockett, a linguist, in his review of Shannon and Weaver's book in 1953 notes that the limit of the model for communication scholars is that the model fails to convey whether meaning is ascribed to the information or obtained by the receiver, nor does it factor in the volume of information being conveyed.

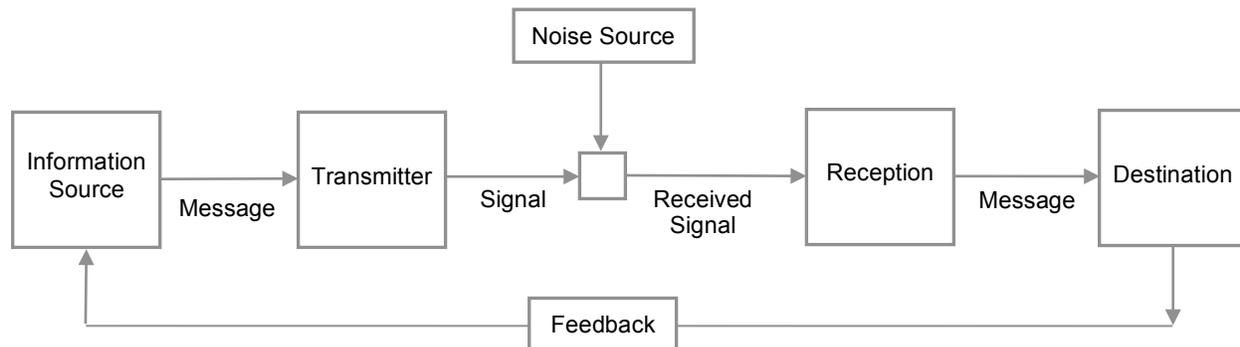


Figure 1. Shannon & Weaver's (1949) Theory of Communication

3 Two Perspectives on the Model

As detailed in Table 1 and discussed below, scholars in the emerging fields of communication and information system interpreted the core concepts in Shannon and Weaver's model differently and focused their research and scholarship distinctly.

3.1 Communication Perspective

The communication field, which includes sub-fields that focus on the mass media, interpersonal and intercultural communication, organizational communication, and political communication, focus their research on the cognitions, motives, attitudes, and behaviors of the information source, with some emphasis especially in mass and political communication to conceptualize the transmitters as those who filter, translate, and interpret information for mass audiences, such as the news. (Fiske 1982, Colbey 1996, Lazarsfeld, & Merton 2004, Dunwoody et al. 2005, Baran, S J. & Davis, D. K. 2012, Brookey & La France 2012)

Noise is generally not discussed, except sometimes in the context of interpersonal or intercultural communication. Reception is the interpretive work and effects that a given message of a message source generates, while the receiver are those who are the recipients, intended and unintended, of the message. The message is the focus of scholarship across the sub-areas, examining message structures, intended or unintended meanings, and characterizing the nature or topics of the content of the message. Feedback - which is studied in social interaction studies, interpersonal and intercultural communication, as well as in computer-mediated communication - examines the structures and processes of response in an interaction.

3.2 Information Systems Perspective

The information system field rooted in data processing in organization, which includes sub-fields that focus on automating work, strategic uses of information technology, computer-support for decision-making, inter-organizational information sharing are related by their twin interests in the uses digital technologies within formal organizations that are designed and developed to improve and increase organization productivity and decision making process for managers (Ackoff 1963, Mason & Mitroff, 1970, Keen 1980, Avgerou 2000, Alter 2002, Sidorova et al. 2008, Swanson 2009, Benbasat & Zmud 2003)

Information system field have been focused on various topics such as: defining an information system; information system development models and approaches; strategic systems planning; interaction with people and the application of information systems within organizations (Bacon & Fitzgerald, 2001).

From this perspective, information is both internal and external to the organization, inclusive of all of its actors and related to business value. The transmitters are the algorithms and workflows that process inputs and provide richer information.

The reception ends for information systems are workers and managers in all levels in organization to improve their operational awareness and decision-making. The reception end of an information system -- users (such workers, managers and customers) -- interact with the system for different purposes. The message here is the data, information or knowledge, considering different levels of an organization. The feedback from information perspective are user experience, the system functionally, the quality of information and the organizational impact. The feedback examines how the system has been aligned with organization strategy and or how it has been assisted the decision making process in the organization. The feedback of information system is the study of impact of the system on the different organizational level and also customers.

	Communication	Information System
Information Source	Message Sender	Data, Information, Knowledge
Transmitter	Gate Keepers, Agenda Setters	Processing Algorithms
Reception	Individual, Group, Audience Cognition, Attitudes	Organization
Receiver	Individual, Group, Audience	User and Customer
Message	Structure, Content, Meaning	Processed Data, Information and Knowledge
Destination	Individuals, Publics	Managers and Users
Feedback	Response, Uptake, Interaction	Organizational Performance

Table 1: Shannon & Weaver's (1949) Concepts as Manifested in the Two Fields

Elaborating on the Shannon theory as a foundation, we provide a list of perspectives that highlight how tow fields have become separated and how they have been recognized differently and have established their own intellectual communities.

4 Further Separation of the Two Fields

Although Shannon and Weaver's core concepts are used as terminology in the two fields, their connotations and the assumptions that surround them are approached from distinctly divergent perspectives. Table 2 probes further several of the distinct perspectives that communication as compared with information systems scholarship takes.

Perspective	Communication	Information Systems
Phenomena / Conceptualization	Channel	System
Settings & Boundaries	Society, Families, Groups, Culture	Organizations
Function	Disseminating Message	Decision-Making Process
Common Unit of Analysis	Message	Data, Information, Knowledge
Actors	Sender, Decoder and Receiver	Designer, Developer and User
Human Interaction	Diverse External Audiences	Organizational Members
Dynamics	One-way to Audience	Two-way Interactive with Users
Types of Technologies being Studied	Communication Technologies, i.e. TV, Radio, Electronic Media	Combination of Digital Technologies i.e. TPS, OIS, DSS, ERP, KMS
Purpose	Persuasion, Information, Entertainment	Business Value (Efficiency, Effectiveness, and Productivity)
Value Proposition	Information Flow & Knowledge	Organization Efficiency and Effective Decision Making
Framed Social Impacts / Effects	Social Effects through Society	Social Consequences Inside Organization

Table 2: Underlying Concepts and Perspectives between the Two Fields

4.1 Phenomenon and Context

Phenomenon / Conceptualization; Heavily influenced by system theory, information systems studies have been conceptualized the phenomena using system theory concepts like input, data, process, output and feedback. The focal point of analysis for information systems is general system theory and the evolution of system theory has been influential with the evolution of information systems studies. Cybernetics, open systems, soft systems and complex systems have been adopted widely by information systems scholars. Communication studies the individuals, institutions, and cultural factors that shape the nature of information, opinions, and cultures. The focus is on understanding as succinctly characterizes as "Who communicates what to whom by what medium, under what conditions, and with what effects?" (Waples, 1942).

Settings and Boundaries; Context within communication studies is generally focused on the role of culture in shaping messages and their reception as well as the channels particular individuals or groups choose to use. Culture can be understood broadly, as a societal level phenomenon, as well as locally, such as within a family or a work place.

Looking at how the same phenomena has been conceptualized and studied differently, how the role which they played was also different and the context they have existed in was also different, it reveals why the communication and information systems were taken different paths in their history so far.

4.2 Functions, Actors and Unit of Analysis

Functions; Communication scholars have placed much interest on the function of interpersonal communication or the consumption of mass media over the last few decades. Uses and gratifications research, for example, has examined the motives and needs that audiences have for using given channels for communication or particular shows or content.

Actors; Actors related to media are those of senders, decoders and receivers of message while for information systems, these actors are designers, developers and users of information.

Unit of Analysis; Unit of analysis of communication and information systems fields are also different. For communication studies, the common units of analysis are the story, the message, the channel, the individuals, or the society. In information systems, the common units of analysis for actors are data, information, knowledge, software, hardware, system, process and user.

4.3 Dynamics, Technology and Human Interaction

Dynamics; The dynamics between audience and media at beginning was one-way direction from sender to receiver. Considering old media (TV, Radio and Papers) the message has been disseminated from sender to receiver. That means sender was always sender and the receiver was only receiver. There were feedbacks but not interaction. While with new media, the audience could interact with the media sometime in real-time like YouTube news channels.

Technologies; From an information systems perspective, technology is an artifact, for communication studies, technology typically refers to the channels through which communication occurs, such as TV, radio, or e-mail. In the information science domain technological artifact refers to combination and digital technologies, i.e. TPS (Transaction Processing Systems), OAS (Office Automation Systems), DSS (Decision Support Systems) and ERP (Enterprise Resource Planning) in organizational context.

Technology, in communication research, is not operationalized necessarily as a variable in a conceptual model, but is rather accounted for more from the point-of-view of uses and gratifications, rather than an earnest contemplation of the affordances of a given technology. As digital media have diffused in the west and across the globe, increased attention is being paid to affordances of communication channels and scholars are paying more attention to the ways that channels affect the nature, structures, and effects of messages.

The agency of systems and the importance of technology artifact was not the primary focus of media studies, although recently there is a shift toward that. In contrast, in information systems studies, there is a focus on the importance of technology as an independent variable in research and also the agency of technology toward the human and other components of system.

Human Interaction; One of the noteworthy distinctions in the approach that the two fields take to humans can be seen in the terminology of those who are using a channel, receiving a message, or interacting with a system. In media studies, the emphasis is on audiences, while in information system, the focus is on users which include organization member and customers.

4.4 Goal, Value and Social Effects

Goal; The goal of media is persuasion, information and entertainment for its audience while as for information system the goal of system is business value that could be efficiency, effectiveness and

productivity and in some cases strategic advantage. The ultimate goal of any media would be persuasion (like advertisements), informative message (like NEWS) or entertainment (like series and movies) or combination of these in a form a story-telling. The ultimate goal of an information system is efficiency, effectiveness and productivity of processes, work and organizational tasks to improve service or product.

Value; The value of media could be described as the flow of information and knowledge to its audience using different channels. The success of a media could be measure by the audience reach and number of viewers and also the transformation of message.

Framed Social Effect; One major branch of communication studies is media effects which studies the effects of media on audiences. The same goes to information systems studies which studies information systems consequences for users and organizations. In communication studies, media effect could be examined and studied in many levels like cognitive, behavioral, attitude, psychological and affective and also in different contexts like gender, race, market, ethics, politics, social and economics for both individuals and public. For information system, the social consequences of information system studied and examined within organizational boundaries also in different levels like individual, groups and organization as a whole. In information studies, the social consequence of new system has been studied regarding many variables such as power, organization structure, gender, leadership, change, culture and other social elements within the organization.

5 Re-Union

We argue that new digital technologies have both identities of media and information systems and show both functionalities: they are both information systems and communication systems. They are in between. They are systems and channels at the same time. The boundary between these two has been blurred and the roles of media and information systems have been overlapped in many cases and contexts.

3 - Examples:

This is an example of a media becomes an information system;

Enterprise Social Networks

Social media sites could be used by organizations as both information systems and also communication media for internal and external users. There is a growing trend toward establishing social media manager role in organizations, which who is responsible for overseeing social media space that sometimes overlaps with information systems space.

This is an example of information system that becomes a media;

“Share” Button

Many organizational information systems are now have sharing capability that allows members to share the processed data (content) or various personal organizational data across many social platforms. The argument here is when an information systems enables you to share content via social media, it transforms from a system to a media at that moment.

This is an example of blend version of information systems and a communication media;

Twitter

For many organizations, Twitter functions as both a media channel and an information system.

It is also important to note the new emerging technologies called smart connected devices or Internet of Things (IoT) which is a physical artifact plus a controller/sensor/actuators and a connection (wired or wireless). These new technologies are entering into the boundaries of not only these two fields and other information and technology fields.

6 Conclusion

New emerging technologies such as enterprise social networks like twitter, which we called *Converging Technologies* has blurred the boundaries between intellectual communities because of their identity and the way they framed. These technologies have been conceptualized from different perspectives by different intellectual communities. In this theoretical paper, we look at how communication scholar from one side and information system scholar from another, has conceptualized a common phenomenon from different perspectives. Although we argue that both community have establish their own point-of view but new technologies with adopting new identities, new functions in various contexts, has blurred the thick boundary between these communities. Examples we presented here are social enterprise networks, info sharing capability of information system via social media like Twitter and LinkedIn and smart digital devices like visibly shows this fuzzy space between communication and information systems domain. We propose some insights on how two communities have to re-visit and how these new technologies could be a common point for intellectual exchange and collaboration between scholars on both sides.

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