Aug 10th, 12:00 AM

Organizational Information in the Cloud of Interaction

E Burton Swanson
UCLA Anderson School, burt.swanson@anderson.ucla.edu

Organizational Information in the Cloud of Interaction

Completed Research

E. Burton Swanson
UCLA Anderson School
burt.swanson@anderson.ucla.edu

Abstract

Responding to renewed interest in the concept of information among IS scholars, I reconsider a concept of organizational information, a particular form of information more broadly, articulated decades ago, and elaborate on it in the light of newer developments. I argue that the basic concept, centered in human communication, remains viable, but should be extended such that machines, not just humans, are included as participants in what may be portrayed on the whole as an open interaction network in which organizational information is generated, maintained, and propagated to guide actions. I apply the extended concept to the illustrative example of university admissions.

Keywords

Organizational information, information systems, interaction, open interaction network, university admissions.

Introduction

> *Language maps a boundless world of objects and sensations and combinations onto a finite space. … More and more the lexicon is in the network now—preserved even as it changes: accessible and searchable. Likewise, human knowledge soaks into the network, into the cloud.*
>
> --James Gleick (2011)

Gaining clarity on basic concepts in a field of study such as information systems can be a challenging endeavor that sometimes resembles a cat chasing its tail. For instance, an organization's information system may be defined broadly as a computer-based system that provides information to help guide the organization's actions (Swanson, 2010). While straightforward, this conception clearly begs the question of how "information" should be understood in organizational context, and in what way the computer-based system may be said to provide it. In this paper, we venture to address the question, not so much to close on an answer, as to illuminate the ongoing chase for it.

There has recently been renewed interest in the concept of information among IS scholars. Important contributions to the discussion include those by McKinney and Yoos (2010, 2019), Mingers and Standing (2017), and Boell (2017). Yet the concept remains elusive and marginal in the field's literature, notwithstanding a long prior history of inquiry in multiple fields of study (see especially Gleick, 2011, for a delightful review and assessment of the information concept in the sciences). Petter et al (2018) issue a call for a renewed focus:

> To ensure that the discipline has a distinguishable core, researchers often emphasize technology (or, more recently, data) aspects of information systems. Yet, while the word "information" is necessary to create terms that are critical to our field, such as "information systems" and "information technology," IS researchers often overlook the role of information as a component of these terms (McKinney and Yoos, 2010). Information is fading from our view of IS phenomena even though, in the era of analytics, algorithmic decision making, and "fake news," information is as appropriate to study as it has ever been or as applicable to any IS topics under investigation. (p. 10)

Indeed, this call is a timely one. Here I respond to it, reconsidering a concept of organizational information, a particular form of information more broadly, articulated decades ago (Swanson, 1978), and elaborating on it in the light of newer developments. In agreement with others, such as Boell (2017) and Emamjome et al (2018), I believe that a general unified view of information is unlikely to be achievable, as underlying philosophies resist reconciliation. However, researchers can position their own concepts within the broader scheme of views (see, for recent example, Demetis and Lee, 2019). The view presented here is essentially pragmatic in the framework of Emamjome et al (2018), while complementary to other views. (See especially Goldkuhl, 2004, 2012, on referential pragmatism in information systems research.)

Essentially, I argue that the Swanson (1978) concept, centered in human communication, remains viable, but should be extended to better incorporate the role of machines in the *actions* of organizations (our central practical concern). The re-conception is guided by several desiderata: (i) it should be reconcilable with everyday understandings; (ii) it should comport with concepts in related fields of study; (iii) it should incorporate organizational context; (iv) it should allow for information processing and exchange by both humans and machines. The first two desiderata aim to keep one from straying too far afield in the conceptualization; the second two are suggested as necessary to contemporary computer-based systems in organizations and the future of machines, in particular.

That organizational information should be conceived as allowing for information processing by both humans and machines departs from traditional views that reserve the term "information" for human processing and employ the term "data" for computer processing, and where the task is to somehow convert data into information for human consumption (see Boell, 2017, pp. 2-3). Here I acknowledge that information processing by humans and machines is very different, but assert that where organizations are concerned it makes sense to consider the communicative actions taken by humans and machines in equivalent terms where they are undertaken jointly in interaction. As practice-oriented research has made clear in recent years, both humans and machines, here understood as computers and other devices with processing and storage capability that inform their operations, serve as important actants in coordinating both the organization's work and its broader commercial and social interactions (Latour, 2005; Nicolini, 2009). While human agency may still be primary in establishing goals and pursuits, what the organization now routinely accomplishes follows from the purposed engagement and actions of its machines (Brynjolfsson and McAfee, 2014, provides a compelling view of the future). I argue here that older concepts of organizational information need reconsideration in these terms.

With all this in mind, I next revisit the Swanson (1978) conceptualization and discussion, staying close to its text. The reconsideration follows.

Organizational Information

As background, note first that the early days of the emergent information systems field were marked by significant research addressing basic concepts, such as that of information, often published in related fields, such as management, computer science, and accounting (important contributions include those by Langefors, 1980, and Stamper, 1973). Swanson's (1978) article on the "two faces of organizational information" appeared in a relatively new accounting journal that took a broad organizational and social view (now well established, *Accounting, Organizations, and Society* continues to be published today). Ranging widely in its discussion, the article offered a concept of organizational information that provided a new perspective.

Specifically, Swanson (1978) conceptualizes organizational information as purported facts given and taken, and inferences drawn and established by human participants in an organizational situation. Such information contributes to participants' knowledge of this situation. Individual items are equivalent to natural language statements, assertions that may be taken as "true" or "false" (or "more or less true" or "more or less false") with respect to the situation. Such statements of course mean different things to different people. There is thus a certain "distribution" associated with an information item, not only in terms of its dispersion among participants, but also in terms of its import to the collective knowledge held.

This particular view follows closely a classical distinction made by MacKay (1969): "General information theory is concerned with the problem of measuring changes in knowledge. Its key is the fact that we can represent what we know by means of pictures, logical statements, symbolic models, or what you will. When we receive information, it causes a change in the symbolic picture, or representation, that we could use to

depict what we know." (p. 42) MacKay's emphasis on representation here is crucial. What is often exchanged in organizational communication among participants, either orally or in written form, consists of representations of purported facts or inferences. How these are accepted or not and interpreted and acted on by recipients, that is to say, how recipients are actually themselves informed, is another matter. Human recipients will draw their own inferences in any communication exchange (e.g., "now I know he's lying").

Swanson's (1978) view also comports with the established definition of organizational communication as "the exchange of information between a sender and a receiver and the inference of meaning between organizational participants" (O'Reilly and Pondy, 1979, p. 121). As noted by Weick and Browning (1986), the roles of sender and receiver are further interchangeable, and, moreover, "communication is usually reciprocal rather than unilateral, that each participant both sends and receives within a single episode." (p. 244). The notion of exchange is thus suggestive of interaction as fundamental to providing information in organizational context, a point to which I will return below.

Swanson's (1978) conception can also be understood as elaborating on Galbraith's (1973) seminal treatise on organization design and the need for information, where "the greater the task uncertainty, the greater the amount of information that must be processed among decision makers during task execution in order to achieve a given level of performance." (p. 4). Here the role of computer-based systems in organizational information processing is recognized and theorized as a coordinative alternative in management, although the information concept itself is not explicated. Much subsequent research has built on this notion that information processing by both humans and computer-based systems is central to coordinating the firm as a hierarchy, also without elaborating on the concept of information itself, or how its processing by humans or machines differs if at all (see, e.g., Malone and Crowston, 1994).

Swanson (1978) continues by noting that in the complex organization, it is the written record which is both source and repository for much of the information generated and represented. However, information is also transmitted and maintained in an organization by word of mouth. It is not necessary for information to assume written form before it enters into the organizational memory, as Krippendorf (1975, pp. 21 -22) notes: "Social organizations possess temporal memory by virtue of the fact that their members communicate with each other, affect each other's behavior, or participate in long chains of consequences. Information is maintained as long as it is being passed around. Naturally, processes of transmission are particularly susceptible to disturbances such as noise, additions, deletions, or super-impositions of information."

That organizational information may be maintained by word-of-mouth only to the extent that it is repeated among participants is an interesting insight, especially since it is well known that a sequence of such repetitions may, in fact, transform the message beyond the recognition of its originator (Huber, 1982). The recording of a stated fact, on the other hand, may serve to keep the original message intact. Still, there is no reason to believe that its informational nature is thereby preserved; on the contrary, it may disappear from the memories of organizational participants entirely, even to the extent of having little effect whatsoever when reintroduced through a subsequent reading. It may be then that organizational information is inherently unstable. Considerable effort and expense may be required to maintain a particular aspect of its distribution.

Swanson's (1978) conceptualization also incorporates the phenomenon of uncertainty absorption (March and Simon, 1958), where inferences are drawn from a body of evidence and the inferences, instead of the evidence itself, are then communicated. Uncertainty is absorbed at such points in the sense that whether the inferences follow "reasonably" from the evidence is not examinable by the recipient of the communication, who, as a consequence, is severely limited in judging its correctness. Interpretation must be based primarily on confidence in the source and knowledge of the biases to which the source is subject, rather than on a direct examination of the evidence. (March and Simon, 1958, p. 165).

Swanson's (1978) stance on information is thus multi-subject-centered and, being organizational, also sociocultural (Boell, 2017), where shared understandings may be sought, if not necessarily achieved. A virtue of the stance and conceptualization is that it is not centered in computer-based systems, but rather is human-oriented and consonant with everyday understandings of information as something more or less exchangeable (although not as "stuff") in ordinary communication (see Beynon-Davies and Wang, 2019, on the problem of information sharing). It is also anchored in the research literature of the time on human

and organizational communication (see, e.g., Guetzkow, 1965). However, from today's perspective, where computer-based systems and other digital technologies proliferate and robotics is also ascendant in the field, the concept as centered in human communication falls short in capturing organizational information processing and arguably needs to be refined and extended to incorporate machines, not only people, as organizational participants. This is illustrated most vividly in electronic commerce, where consumers make purchases online, interacting entirely with machine systems serving as the firm's transactional actants.

Having established the concept of organizational information, Swanson (1978) goes on to examine it primarily in terms of its import to the relationship between an organization and its environment, where information can be classified as: (a) either inner- or other-directed; (b) either internally- or externally-based; and (c) either self or other-referencing. It is suggested that much, if not most, organizational information is probably best regarded as "two-faced", i.e. as the product of inner- and other-directed needs taken together, with consequences for organizational self-learning and self-delusion, and for the maintenance of organizational credibility and organizational secrets. The particular role of computer-based systems in all of this is touched upon, in particular, it is noted that a computer's data base typically represents purported organizational facts, i.e., it is ostensibly "truth bearing" (Mingers and Standing, 2017), but the notion of information itself remains specific to human communication. In the reconsideration to follow, this is remedied.

Reconsideration

In retrospect, perhaps the most important aspect of the Swanson (1978) view is its incorporation of interaction among organizational participants as the source of organizational information generated and maintained. In the present reconsideration, I build on this fundamentally social notion (see also Goguen, 1997). In extending the concept to include machines as participants, I suggest that interaction between humans and their machines (beyond interaction among humans) has become central to organizational information, and, more broadly, fundamental to generating and maintaining information in the contemporary built-up world.

That human-machine interaction is important in information systems has long been understood, in particular by HCI (human computer interaction) scholars. However, the original conception in management information systems (MIS) emphasized how managers or other decision makers came to be informed by the computer-based system. Information for a system user was characterized as "data in context," for instance (see Davis and Olson, 1985, who define information as "data that has been processed into a form that is meaningful to the recipient and is of real or perceived value in current or prospective actions or decisions", p. 200). To the extent interaction was important, it was always in service to providing better information for the human user, whose satisfaction with the experience was central to assessing success.

The flaw in this early conception was not so much a misunderstanding of how humans could be informed by their computer-based systems, as it was the failure to grasp how computer-based systems were themselves "informed" in the interaction with users, and how, indeed, the gaining of information by the machine system, as with enterprise systems, was often at the heart of the endeavor as a whole. It thus needs to be emphasized that in any interaction between organizational participants, both parties to the interaction will be informed by it. Failure to grasp this yields a misperception of how the organization as a whole informs itself.

That machines, not just humans, may be informed in such interaction is portrayed below in a classic cartoon by Gary Glasbergen. The cartoon's humor lies in the suggestion that both parties might come to the same thought. As shown, the cloud bubble that holds this thought also captures the notion that any information gained is of the moment and rooted in the interaction itself. One is tempted to say that more broadly organizational information might be colorfully understood as gained and maintained in the cloud of interaction. Succumbing to this temptation, I chose to title this essay accordingly, paying homage to the cartoon.

Of course, human and machine participants are not informed in the same ways through their interactions, as is well known. In particular, human participants will gain knowledge from their awareness of the context of the communicative exchange, beyond the content of the messages they receive. Machine systems gain whatever knowledge they can from the messages themselves, interpreted through data and processing code,

although some are now built to emulate humans in gaining contextual information, as with systems that monitor facial expressions of the users that interact with them (see den Uyl, M.J. and van Kuilenburg, H., 2008).

A second important aspect of the Swanson (1978) conceptualization is the temporality of organizational information, the notion that it is generated and maintained in interaction, and that in the absence of interaction it dissipates. This notion is reflective of the view that information is not something confined to a stored representation, rather it is something that happens to someone. It contrasts with views of information as something contained intact in a written record or document, or data base, or even in a video. Instead it regards these communicative devices as holding representations of informative potential, realizable when invoked in interaction among organizational participants, both human and machine.

The notion that the machine, not just the human, might have a temporal thought in the cloud of interaction is part of the humor in the Glasbergen cartoon and deserves comment. While I would not suggest that such a thought might fleetingly occur beyond the code and data that drives the machine's actions, I would claim that what the machine learns, beyond what it communicates, is directly comparable. For instance, it may infer that it is interacting with a novice and offer up help accordingly. It may hold this "thought" only as long as the interactive session lasts. And so for practical purposes, temporality may be built in for the machine.

Figure 1. Machines and humans informed in interaction. Reproduced with permission.

A third important aspect of the Swanson (1978) conceptualization is the attention it draws to the propagation of information in organizational context, through the "purported facts given and taken" and the "inferences drawn and established" among participants. Such propagation is regarded as important to organizational decision making and action. In the early days of centralized computing, the machine played little role in such propagation, beyond spitting out stacks of printed reports for distribution and making a data base accessible to multiple users. Today, however, the machine has become a central player, extending its reach beyond internal use to guide interactions with a firm's suppliers and customers, for instance. It has achieved further importance as social media have come to dominate the larger scene, becoming a vehicle for organizing itself, in the interest of politics, for instance, beyond simply serving a communicative function among those already organized. The notion of organizational information has in effect been vastly extended.

In summary, the reconsideration of Swanson's (1978) conception leads to the suggestion that machines, not just humans, be included as participants in what may be portrayed on the whole as an *open interaction network* in which organizational information is generated, maintained, and propagated to guide actions. While human-machine interactions constitute a principle portion of this network and are of central interest to information system design, interactions between machines are also an important feature, as are interactions between humans that extend information bounds beyond the domain of the machine. The network is open in the sense that it always subject to extension beyond any attempts to bound it, and, moreover, achieving scope and scale in sharing and propagating certain facts and inferences may be a collective goal.

Discussion

What emerges from the above reconsideration is a rather new view of organizational information and the systems built to provide for it. In a nutshell, this view suggests first that the purpose of an organizational information system is to support the organization in its actions, by informing and coordinating an open interaction network of people and machines. Second, it suggests that both people and machines are governed in this network through their respective agencies and knowledge, which are natural to people but artefactual to machines. Third, it suggests that organizational information generated and propagated by means of an open interaction network serves to advance organizational knowledge in the aggregate.

The new view combines representation with adaptation in the information taxonomy of McKinney and Yoos (2010). As already discussed, representation through language in which purported facts and inferences are expressed forms a foundation for interaction among human and machine participants. The meaning extracted from such interaction constitutes the in-forming process that shapes participant understandings (Boland, 1987). But as suggested here, it is not just in the meanings that information has its force; it is also in the cloud of interaction itself, driven by organizational pragmatics, where maintenance and adaptation of the open interaction network itself is necessary. Thus, for instance, the informational import of say a firm's ERP system is to be found in the work that gets done in the multitude of interactions, more than in the semantics of the software code and database, or in the interpretations of human participants.

We note that bringing people and technology together in interaction networks is a focus of much current research that complements the view presented here, although it does not usually speak to the information concept. See, for example, Contractor, Monge, and Leonardi (2011).

It remains to address the implications of the reconsidered view for information systems research. In doing this, I follow the insights above that organizational information is centered in interaction among humans and their machines, that it is substantially temporal, and that it is generated, maintained, and propagated to guide organizational actions.

A first implication is that interaction becomes a basic focus of IS research at multiple levels beyond traditional HCI studies (Swanson, 2012), and that in this research it also becomes a basic unit of analysis. The smallest (micro level) unit would be the dyadic interaction between two participants, while the largest (macro level) would be a "full" interaction network. Whether micro, macro, or mezzo (in-between), the time frame of analysis of the interaction might be brief or extended, depending on the research question and study design.

A related implication is that in studying any interaction, how all parties to the interaction are informed by it is a central concern. Traditional "one-way" studies, for instance, certain usability studies that examine how a user is informed by a machine, but not the converse, are seen as having less potential for insight than those studies where learning by both parties is conjectured to be central to useful interaction. Similarly, studies of ongoing information system use that focus only on learning by the human user are less likely to yield insights than those that also address how the machine system learns (or not) from the interaction.

The second principal implication is that the temporality of organizational information becomes a potentially major focus of IS study. Following the discussion above, it is understood that information among participants can dissipate unless maintained in interaction. An important fact or inference may need reinforcement to retain salience for action. At the same time, much that is unimportant can be allowed to drop away and be forgotten. What is largely unexplored here is the role of the machine in all of this. How does the machine in interaction support the enterprise in maintaining its information, given its temporality? Inspiration here can be found in examining the design and maintenance of Wikipedia as an organized effort, where entry contributors and editors employ Talk pages to discuss and argue ideas, resolve

disagreements, and shape the narrative. Importantly, Wikipedia maintains a complete developmental history of each entry and changes to it, as well as the Talk pages pertaining to it.

The third principal implication of the reconsidered view is that information propagation also becomes a potential major focus of IS study. With the advent of social media, such propagation has of course assumed high organizational importance, as reflected in a firm's use of these media not only to place ads and attract new customers, but to engage existing customers interactively, e.g. in product design, so as to build loyalty to its brands. Here the need to build and expand an open interaction network through information propagation is a lesson already learned in practice, and research studies are well focused on how best to accomplish this. What is less well understood is how information propagation can best be contested, as illustrated by the problematic spread of "fake news" in the public arena, but also by false or unsubstantiated claims made by customers or others about a firm's products or services, which come to wide attention.

A related issue pertains to the internal propagation of misinformation within an organization, where a particular inference about the enterprise and its situation is wrong and does not square with the facts, but is perpetuated because some or even many want to believe it. This is illustrated, for instance, where management promotes beliefs that the firm's products are safe when they are not, or that its industrial pollutants are unproblematic when they are not, or that its hiring practices are non-discriminatory when they are not. How information systems might be designed to help contest the spread of misinformation internally, not only externally among customers and others, would seem to be a worthy avenue for future research.

Application

Given these broad implications, where might we look to further explore and apply our perspective? In what organizational contexts might the concept of organizational information in an open interaction network have particular relevance for researchers and practitioners? On the face of it, I suggest that it is where *organizational reasoning* (in terms of purported facts given and taken, and inferences drawn and established) is both problematic and central to organizational action as exemplified in certain organizational routines (Feldman and Pentland, 2003). As is well known, where organizational reasoning is relatively straightforward, even if complex, routines may be substantially automated, as with transaction processing in electronic commerce (Swanson, 2020). But elsewhere in a practice, reasoning may be more problematic, even if relatively routine, as in recruiting and hiring new junior employees (Goldman Sachs reportedly receives a quarter million applications annually (Bartelby, 2018).) It is here, in such problematic settings, that AI is currently making controversial inroads and where we might focus our research attention.

Consider, for illustrative example, the practice of college admissions at both the undergraduate and graduate levels. In the U.S., at the undergraduate level, a "holistic approach" is increasingly undertaken by leading schools to evaluate large numbers of applications through routines featuring the deliberations of teams and committees, where efficiency is necessarily at a premium, as described by Hoover (2017, 2018). The University of Rochester, for instance, receives some 20,000 applications, and gives each a two-person team reading, followed by a committee meeting to resolve disagreements. By its nature, the holistic approach excludes admissions decisions made simply by algorithmic processing of a pre-defined data set. Decisions are inherently problematic in their reasoning and likely to feature information processing in an open interaction network.

Still, admissions decisions are also made in the context of organizational routines and systems that support them. They are substantially structured and guided by machine. Most schools manage their admissions using an enterprise system such as Slate, provided by Technolutions, which constitutes a "comprehensive CRM" for the review and management of admissions interactions, communications, applications, test scores, relationships, and associated materials. As promoted on its web site, Slate offers some 172 functional features for incorporation into a full range of admissions routines (see technolutions.com). Our own school is a user of Slate for its MBA admissions and for illustrative purposes we briefly examined this usage from the viewpoint of the open interaction network. For the Fall of 2019, our school enrolled 360 new full-time MBAs admitted from 2817 applications received over the previous year. We focused our attention on the organizational routines for recruiting these applicants and deciding upon and making offers of admissions.

The admissions process as a whole engages two principal populations in information-seeking interactions, applicants (both prospective and actual) and school representatives (admissions officers and staff supported by selected faculty, current students, and alums). From the school's perspective, the information sought pertains to the preparation, qualities, and potential of the prospect as conveyed primarily in a formal application and supportive documents, and in an invited interview, supplemented by other communications, such as email. Slate is used first to acquire information on prospects, recruit them, and guide applications from initiation to completion. The formal application takes place entirely online. Slate then guides staff readings and evaluations of the applications, interviews where invited, and admissions recommendations, decisions and acceptance actions. Throughout, each application is placed in a workflow bin that identifies its status and next steps to be undertaken. As decisions are made, Slate is further used in managing the yield on acceptance offers to achieve the target class size. Admissions concludes only with actual Fall enrollment of the class. On the whole, Slate not only provides structure for the admissions routines, it serves as the central coordinative actant, gathering information, both facts and inferences from these facts, and making these accessible according to access privilege in the open interaction network. Organizational reasoning is highly structured by design, and network communications reflect this. For instance, invited interviews are conducted mostly by current MBA student volunteers who have access only to the candidate's CV, so as not to bias the interview with the full application. Because Slate generates a vast amount of data from the interactions (including the applicant's web page visits), it mitigates against problems of information temporality as discussed above. With respect to information propagation, it seeks to restrict it according to participants' various needs to know. The importance of respecting confidentialities is underscored through training and management of the process as a whole.

While Slate offers AI prediction functionality that might be applied to applicant data to inform admissions decisions, our school does not use it. Nor is an algorithm employed. While each application is scored by readers on several categories and an overall score is assigned, no score is computed. Extensive notes are included, including reasons for recommended decisions. While several in-house studies have probed whether decisions might be better informed by applicant data analytics, none has explored machine learning. Looking ahead, the most likely AI application might be in initial screening, as some (e.g. Camerer, 2019) have suggested in similar contexts. However, even here, I suggest that AI may problematic for precisely the reason that admissions reasoning is itself problematic, even if imitable. In our school, with its holistic approach, a rich amount of information, not all of it recorded, is propagated in the open interaction network and machine prediction of any decision recommendation or assigned score (with the possible exception of the academic score based on grades and GMAT) would likely be unreliable. Human judgement is considered necessary and highly valued throughout the process. Too, one objective of our admissions, reflecting a foundational value, is to achieve a diverse entering class. We thus have a portfolio problem that complicates the reasoning across cases. As this also suggests, the criteria against which we should judge the success of our admissions are several and the weight given to each is likely contentious within the school. Still, as Agrawal, Gans, and Goldfarb (2019) suggest in a hypothetical example, the future for machine learning in admissions has some promise for improving upon the human attention given to different parts of the business process and we suspect some schools are experimenting with it.

In summary, our illustrative case suggests new ways to study organizational information in open interaction networks. The primary suggestion is to explore organizational reasoning and its problematics more deeply where it involves machine actants. Systems such as Slate are everywhere now and provide a wealth of data to support such research using both quantitative and qualitative methods. Might the tracing, surfacing and documenting of reasoning in certain organizational settings, such as college admissions, help to explain or even guide it as it takes place among participants? Might analysis yield insights that aid in improving upon the routines, as well as the reasoning, in future performances? Might it also enable the organization to examine and reflect upon the values and premises inherent to its practices and manifested in its routines? What forms should these analyses take in practice? More broadly, what symbiosis should organizations seek to achieve when they incorporate machine systems such as Slate in open interaction networks?

Conclusion

In conclusion, here I have sought to respond to the recent call for IS researchers to pay renewed attention to the basic concept of information. I have done so in a focused way, re-examining an older concept and suggesting that it retains viability when extended to incorporate machines, not only humans, as information

processing participants in an open interaction network. The reformulated concept is at heart organizational, rather than psychological or computational. Fundamentally, it addresses organizational reasoning and in this way also responds to a recent call for research that brings a symbolic action perspective to organizational action (Aakus et al, 2014). What I have not done here is bring new insights into human information processing, or probed into how machine information processing is fundamentally different. These basic and important issues I have left to others. Rather, I have argued that where information is understood as purported facts given and taken, and inferences drawn and established among organizational participants, humans and machines can be brought together to explicate what takes place in their interactions. More broadly, the stance on information taken is both pragmatic and sociocultural in the consequentialist framework of Boell (2017), where information is seen to exist only within a particular sociocultural background and cannot be separated from it. What is considered as "significant, technologically possible, or the things for which one has labels, categories and words, and thus can connote information" (Boell, 2017, p. 9), will change from setting to setting. Here the knowledge that "soaks into the network, into the cloud" in Gleick's words above, soaks into the open network of interaction.

References

Aakhus, M., Ågerfalk, P.J., Lyytinen, K. and Te'eni, D. 2014. "Symbolic Action Research in Information Systems: Introduction to the Special Issue," *MIS Quarterly* (*38:*4), pp.1187-1200.

Agrawal, A., Gans, J. and Goldfarb, A. 2019. *Prediction Machines: The Simple Economics of Artificial Intelligence*. Boston, MA: Harvard Business Review Press.

Bartleby, "How an Algorithm May Decide Your Career," *The Economist*, June 21, 2018.

Beynon-Davies, P. and Wang, Y. 2019. "Deconstructing Information Sharing," *Journal of the Association for Information Systems* (*20:*4), p.1.

Boell, S. K. 2017. "Information: Fundamental Positions and their Implications for Information Systems Research, Education and Practice," *Information and Organization* (*27*:1), pp. 1-16.

Boland, R. 1987. "The In-formation of Information Systems," in *Critical Issues in Information Systems Research*, R. J. Boland, and R. A. Hirschheim (eds.), New York, NY, USA: Wiley, pp. 363–379.

Brynjolfsson, E., and McAfee, A. 2014. *The Second Machine Age*. New York, NY: W. W. Norton.

Camerer, C. "Artificial Intelligence and Behavioral Economics," in *The Economics of Artificial Intelligence: An Agenda*, A. Agrawal, J. Gans and A. Goldfarb (eds.), Chicago, IL: University of Chicago Press, 2019, pp. 587-610.

Contractor, N., Monge, P. and Leonardi, P.M. 2011. "Multidimensional Networks and the Dynamics of Sociomateriality: Bringing Technology Inside the Network," *International Journal of Communication 5*, pp. 682-720.

Davis, G. B., and Olson, M. H. 1985. *Management Information Systems*. Second edition. New York, NY: McGraw-Hill.

Demetis, D. and Lee, A. 2019. "An Observer-relative Systems Approach to Information," in *Proceedings of the 52nd Hawaii International Conference on System Sciences,* pp. 6300-6309.

Emamjome, F., Gable, A., Bandara, W. and Gable, G., 2018. "Re-thinking the Ontology of Information," International Conference on Information Systems, San Francisco, December 13-16.

Feldman, M.S. and Pentland, B.T. 2003. "Reconceptualizing Organizational Routines as a Source of Flexibility and Change," *Administrative Science Quarterly* (*48*:1), pp. 94-118.

Galbraith, J. 1973. *Designing Complex Organizations*. Reading, MA: Addison-Wesley.

Gleick, J. 2011. *The Information*. New York, NY: Pantheon.

Goguen, J. 1997. "Towards a Social, Ethical Theory of Information. *Social Science, Technical Systems and Cooperative Work: Beyond the Great Divide*, pp. 27-56.

Goldkuhl, G. 2004. "Meanings of Pragmatism: Ways to Conduct Information Systems Research," in *Proc. 2nd Int. Conference on Action in Language, Organisations and Information Systems* ALOIS-2004, Linköping, pp. 13-26.

Goldkuhl, G. 2012. "Pragmatism vs Interpretivism in Qualitative Information Systems Research," *European Journal of Information Systems 21*(2), pp.135-146.

Guetzkow, H. 1965. "Communication in Organizations," in *Handbook of Organizations*, J. G. March (ed.), Chicago: Rand McNally, pp. 534-573.

Hoover, E. 2017. "Working Smarter, Not Harder, in Admissions," *Chronicle of Higher Education*, March 12, 2017.

Hoover, E. 2018. "Reading an Application in Under 10 Minutes? Way Too Fast, One Admission Dean Says," *Chronicle of Higher Education*, February 1, 2018.

Huber, G. 1982. "Organizational Information Systems: Determinants of their Performance and Behavior," *Management Science* (*28:*2), pp. 138-155.

Krippendorff, K. 1975. "Some Principles of Information Storage and Retrieval in Society," *General Systems: Yearbook of the Society for General Systems Research,* Vol. XX.

Langefors, B. 1980. "Infological Models and Information User Views," *Information Systems* (*5:*1), pp. 17-32.

Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-network Theory*. Oxford, UK: Oxford University Press.

MacKay, D. M. 1969. *Information, Mechanism, and Meaning*. Cambridge, MA: MIT Press.

Malone, T. W., and Crowston, K. 1994. "The Interdisciplinary Study of Coordination," *ACM Computing Surveys (CSUR)* (*26:*1), pp. 87-119.

March, J. G. and Simon, H. A. 1958. *Organizations*. New York: Wiley.

McKinney Jr, E. H., and Yoos, C. J. 2010. "Information about Information: A Taxonomy of Views," *MIS Quarterly* (34:2), pp. 329-344.

McKinney Jr, E.H. and Yoos, C.J. 2019. 'Information as a Difference: Toward a Subjective Theory of Information," *European Journal of Information Systems* (28:4), pp.1-15.

Mingers, J., and Standing, C. 2017. What is Information? Toward a Theory of Information as Objective and Veridical," *Journal of Information Technology* (33:2), pp. 1-20.

Nicolini, D. 2009. "Zooming In and Out: Studying Practices by Switching Theoretical Lenses and Trailing Connections," *Organization Studies* (*30*:12), pp. 1391-1418.

O'Reilly, C., and Pondy, L. 1979. "Organizational Communication," in *Organizational Behavior*, S. Kerr (ed.), Columbus, OH: Grid, pp. 119-150.

Petter, S., Carter, M., Randolph, A., and Lee, A. 2018. "Desperately Seeking the Information in Information Systems Research," *ACM SIGMIS Database: the DATABASE for Advances in Information Systems* (*49*:3), pp. 10-18.

Stamper, R. 1973. *Information in Business and Administrative Systems*. New York: Halstead Press (Wiley).

Swanson, E. B. 1978. "The Two Faces of Organizational Information," *Accounting, Organizations and Society* (*3:*3-4), pp. 237-246.

Swanson, E. B. 2010. "Information Systems," *Encyclopedia of Library and Information Sciences*, Third edition. Taylor and Francis.

Swanson, E. B. 2012. "Who Learns What from the New Human-computer Interaction: Enlarging the Perspective," *ACM SIGMIS Database*: *The DATABASE for Advances in Information Systems* (*44:*1), pp. 9-17.

Swanson, E. B. 2020. "How Information Systems Came to Rule the World: Reflections on the Information Systems Field," *The Information Society*, forthcoming.

den Uyl, M.J. and van Kuilenburg, H. 2008. "The FaceReader: Online Facial Expression Recognition," *Proceedings of Measuring Behavior* 2005, pp. 589–590.

Weick, K. E., and Browning, L. D. 1986. "Argument and Narration in Organizational Communication," *Journal of Management* (*12:*2), pp. 243-259.