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NEEDED: A METHODOLOGY FOR STUDYING THE INTERFACE AND INTEGRATION OF COMMUNICATION PROCESSING SYSTEMS?

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Abstract

A proposition is put forth for a systems methodology that examines the interface and integration of five basic communication processing systems, widely known in general terms to those working in human organizations.

Introduction

The prevalence and study of human beings in highly technology based contexts requires a construct which represents the collective flows of various forms of energy, matter, information, and ideas from one point in space-time to another. I prefer to express this construct explicitly with the phrase *communication processing system*. Though the locations of the points of these systems may seem disparate in space-time, distances are seemingly removed through the activity of the system. The points appear infinite; they can be natural, artificial, and virtual.

The forms of interface between and among communication processing systems are coming to dominant concerns of clear, accurate, and reliable communication in all human endeavors. It would be helpful to those working in technology based organizations to have an understandable and practical means to study, describe, and evaluate the interface and integration of various communication processing systems, which avoids technical and idiosyncratic languages developed by specialists within each system. It is the goal of the approach proposed here to fill this void by capitalizing on general terms and concepts which most persons can understand and find familiar in the human organization.

All communication processing systems share a common base, that of transmission of something from one location to another. In those systems included here, that something may be expressed in terms of persons, knowledge, information, data, and computers. The term *processing* is stressed to remind us that communication is a dynamic connection between two points minimally, and nowadays, typically multiple nodes in a communication network. Processing also brings out the logistical and technical aspects of communication. Processing constitutes much of the activity meant by the phrase human activity system. Nodes are points of intersection, that is, interface. They represent opportunities for as well as actualities of integration between two or more communication processing systems. The term *system* is stressed to remind us that communication nowadays involves several nodes and linkages among them, that is, a configuration that brings to visibility and vitality the communication processing system. Finally, the *centrality of the human being* is stressed to remind us that the various systems types are interdependent with and contingent on human beings for their conceptualization, creation, development, maintenance, meaning, and perpetuation.

Communication processing systems

Human beings have found it useful to conceptualize their activities in human organizations in reference to five basic communication processing systems. They are Human Activity Systems (HAS), Knowledge Processing Systems (KPS), Information Pro-

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cessing Systems (IPS), Data Processing Systems (DPS), and Computer Processing Systems (CPS). Even though we commonly associate HAS and KPS with human beings, IPS and DPS with software, and DPS and CPS with hardware, one might argue that in most human technology based contexts of everyday life each point of triangulation really involves a blend of humanware, software, and hardware. This reality provides some legitimation to the foundation (platform and architecture) for a *communication processing systems methodology* (PSM).

Table 1 lists the five areas that constitute a typology of communication processing systems, whose interface and integration bring to visibility the HAS and provide the various foci of the methodology, termed PSM. Although the nodes may seem to be emphasized in Table 1, this is not the intention but only a limitation in communication. Each row of the table represents a dynamic communication processing system, in which the linkages among the nodes bring the system to visibility. It is these active connections that provide the evidence of the existence and viability of the system.

Table 1. Illustrative bases of systemic configuration for five basic communication processing systems

CPS	chips, wires, electrons
DPS	characters, inscriptions
IPS	symbolic chunks, text
KPS	ideas, constructs, conceptual nets
HAS	human beings, human groupings

HAS may be taken to represent the overarching system. Although a HAS may be described in terms of the collective of these five communication processing systems, the chief interest here is interface and integration – that work which assists those persons constituting the HAS with synthesizing the five systems, rather than analyzing the HAS into subsystems.

Systems methodologies of interface

There are many systems methodologies to examine the five communication processing systems. But it appears they involve the study of one, two, and at most three of them. Though only a few representative approaches can be noted here, most are heavily analytic. On one side, my impression is that informatics based approaches tend to map out CPS, DPS, and IPS. KPS and HAS appear implicit, secondary, and/or theoretical adjuncts, with undue attention to total systems integration. However, interests toward interface and integration are more recent and increasingly evident, for example, Bazewicz (1994), Bazewicz and Collen (1995), Grzech (1995), and Hanson *et al.* (1995). On the other side, approaches which are human-centered, such as Ackoff (1991), Banathy (1991), and Checkland (1981) for example, tend not to examine an interface among communication processing systems, but they delimit the methodology to a collective group oriented process involving systems analysis, synthesis, and design activities of the HAS primarily. Further, survey texts, like Flood and Jackson (1991) and Jackson (1991), provide little by way of methodological approaches on interface and integration, but clearly many systems methodologies focus on human communication through the conceptual framework of the methodology. Cybernetics based approaches developed from Beer (1985) and Forrester (1969) appear relevant, but remain largely analytical and circumscribed in their application relative to the emphases proposed here. As much may be said for the methodology originating from Miller (1978). In the middle, approaches of Sociotechnical Systems and even more so Operations Research, stemming from the contributions of Emery and Trist (1965) and Churchman, Ackoff, and Arnoff (1957), respectively, involve two traditions in methodology in the United States in this century directed toward some of the same interests as those espoused here; however, PSM does not appear redundant with their contemporary successors, as does such transdisciplinary developments as Nissen *et al.* (1991).

In short, rarely does a systems methodology place greatest emphasis on interface and integration of five communication processing systems. Further, it seems that a particular systems methodology remains largely the exclusive terrain of those practitioners who invest the time and training in acquiring facility with the technology and language of the methodology.

As the globalization of humanity accelerates, our interdependence demands careful interface and integration of communication processing systems within the global context of finite resources. Although there appears to be methods and methodologies that can study and describe the five communication processing systems, I think it important especially in the current contexts of the human organization to have one methodology that emphasizes the interface and integration of any one system with the others and whenever possible all five as a whole system. Pragmatically, we will expect various communication processing systems to be integrated, work flawlessly, and maintain their invisibility in the service of our needs and interests. Today we expect a telephone, for example, to work reliability every time we pick up the receiver; we prefer to have a minimum of concern with the intricacies of hardware and software that make it possible for us to schedule an appointment, discuss a business transaction, and socialize with a friend. Such a statement may be made for virtually every form of communication technology we have come

to depend upon in our transactions of daily life. The efficient, effective, efficacious, and ethical utilization of communication processing systems will likely become a necessity of life in the next century.

From micro- to macrointerface and integration

The five communication processing systems increasingly pervade human affairs and therefore are duly relevant to understanding the complexity of human organizations. For purposes of the methodology, one may take as the starting point any of the five systems, then move to any vantage point within it, subsequently to other systems, and reaching toward more macro-integration ultimately seek a comprehension of the complexity of the whole system. PSM is intended to provide its users with a means to explicate the interface and integration of the five basic communication processing systems from a human-centered orientation.

Collen and Bazewicz (1995) present the initial formulation of a systematic and systemic approach to construct and implement PSM. It has several advantages that can only be alluded to here. It is important to note the flexibility of the methodology to allow both micro-integration within any system, while encouraging movement toward macro- integration. One form of this movement from zero to fourth order integration is illustrated in the table below, taken from Collen and Bazewicz (1995):

Table 2. Foci of micro-integration and orders of macro-integration

Macro-integration of the zero order and foci of micro-integration [i = 5].

HAS KPS IPS DPS CPS

Macro-integration of the first order and base points of micro-integration [i = 10].

HAS-KPS KPS-IPS IPS-DPS DPS-CPS
HAS-IPS KPS-DPS IPS-CPS
HAS-DPS KPS-CPS
HAS-CPS

Macro-integration of the second order [i = 6].

HAS-KPS-IPS KPS-IPS-DPS IPS-DPS-CPS
HAS-KPS-CPS KPS-IPS-CPS
HAS-IPS-CPS

Macro-integration of the third order [i = 3].

HAS-KPS-IPS-DPS HAS-KPS-IPS-CPS KPS-IPS-DPS-CPS

Macro-integration of the fourth order and whole systems integration [i = 1].

HAS-KPS-IPS-DPS-CPS

Constructing a processing systems methodology

One means to study a processing system we may term a research method, and the combination of two or more methods a methodology (Collen, 1995). Despite the oftentimes confusing flows of information within a processing system itself, the cyclic and repetitive activities of such a system make it possible to observe them when inquiry is formalized by means of systematic rules and procedures (disciplined inquiry). The interface of human beings, software and hardware creates numerous variations and consequences in procedures, programs, resources, and positions in increasingly more human contexts. PSM is intended to enable us to study and monitor the interface and integration of the communication flows in and among five basic areas, those associated with each major processing communication system.

Furthermore, the five systems do not remain distinct in usage, and our conceptualizations of them are rather rhetorical and academic until applied to a specific human organization. But given the saliency of the human being – that such systems are created and placed in the service of human interests – it seems only natural that HAS be given the predominate and center stage role in the methodology, lest we loose perspective regarding whether software and hardware serve us, or we serve them.

To exercise PSM, the term method becomes the useful level of conceptualization as well as the pragmatic level of application in its construction and execution, respectively. The former entails specifying, designing, and planning the chief methodological components, which for the latter, the researchers can witness communications, make observations, and collect evidence.

Combining two or more methods to construct a methodology compounds the complexity of the inquiry in most respects. PSM is a methodology which assumes to confront the complexity of HAS in order to gain some sense of comprehension of its complexity. How successful PSM practitioners are at meeting this challenge I think depends more on the multiplicity of decisions made by the researchers in constructing and executing PSM than on its basic concepts and principles, although I expect this assertion to be questioned and tested.

As more communication processing systems are included in a PSM, one can expect an increase in the complexity of the inquiry. Ideally, a PSM includes all five systems. A productive strategy is to tap unobtrusively more sources of evidence produced in the ongoing flows of the communication processing systems. This approach may be akin to the idea of installing meters and gauges at various points of the whole system, which may be read periodically and funneled into a database. The database may be augmented by data processing, so that researchers can study at will the activity within and among the five communication processing systems.

Certainly, a central issue for researchers to manage any PSM project is to decide which communi-

cation processing systems warrant inclusion in the PSM project. To consider one communication processing system at a time instead of all five may appears to simply the point, but it will drastically underconceptualize PSM and truncate its chief advantages of examining interface and integration. However, it must be noted that even one processing system may become more complex as the various sources of evidence make it increasingly more visible. Consequently, the researchers must decide on a manageable number of indices to monitor each communication processing system. Perhaps more crucial to its application, those indices must be chosen that make visible the interface and integration between and among systems, rather than restricting the methodology to indices that monitor the flow characteristics of a specific system. This shift in attention from within a system to interface between systems is critical to understanding PSM and using it to greatest advantage.

Whether in the micro or macro direction, the volume of data flow to process is staggering, but the computer-assisted processing and integration of this data makes it possible for us to comprehend the complexity with sophistication unsurpassed in human history. The volume and variety of communications can quickly overwhelm those who attempt to put PSM into practice. Interestingly and paradoxically, the general task and challenge in studying the complexity of a HAS is to manage the complexity of the inquiry itself.

Summary and conclusions

In our daily work life, we frequently take for granted the software and hardware aspects of interface. We expect them to facilitate our communications and they remain largely invisible. However, it is the interface that underlies our increasing interdependence on them for human communication.

This brief article puts forth a means to study communication processing systems in human organizations. These systems involve the interface of human beings, software, and hardware. PSM is proposed as a viable approach to study, describe, and evaluate our interdependence through the interface and integration of five basic communication processing systems. Although matching the complexity of the human activity under study to the complexity of constructing and executing the methodology seems appropriate, it imposes a cautionary vain into the implementation and management of this type of systemic inquiry, which it shares certainly with other systems methodologies making claim to aid us in our comprehension of the complexity of human organizations.

But what can we learn from PSM that other systems methodologies do not already provide? What are its strengths and weaknesses? What problem contexts are best addressed via PSM? These and related questions remain as yet insufficiently answered. PSM appears to be a potentially viable systems methodology, and it invites further articulation, application, critique, and evaluation.

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