THE OTHER HALF OF THE SYSTEMS DEVELOPMENT POTENTIAL: ARE WE HALF-BRAINED SYSTEMS PROFESSIONALS?*

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ABSTRACT

These observations concern the other half of our systems development potential. We have largely ignored perhaps fifty percent of the significant considerations for enhanced systems development. In this view, we are indeed half-brained systems professionals! But, fortunately there are some steps we can take to correct this im-This paper develops what is balance. meant by half-brained and what the disorder's consequences are for systems work. Then, three examples are presented to give the subject concrete meaning. Finally, some brief suggestions are given for extending the scope of systems study so that we can move away from our halfbrainedness.

KEYWORDS

Human information processing, Systems development. ACM Categories: 1.52, 2.42, 3.51.

INTRODUCTION

To focus attention on the other half of the systems development potential, we need to introduce the concept of human information processing. Recent insights into the mechanisms of the human bioconputer appear to have profound significance for our approach to both teaching and doing systems work.

Systems professionals are "creators." That is definitely used with a lower case "c," but nonetheless stated as basically as possible. Systems people are sought out to bring their creative ability to bear to solve problems and capitalize on opportunities. In reviewing the basic job definitions for information analyst and systems designer, we see that creativity threads through both of these systems positions as the essential ingredient. It is in this sense that analysts and designers are responsible for bringing

*The collective subject "we" is used throughout to place us as systems people directly in the context of the discussion. new systems into being.

Two sources identify what we are supposed to know and do to exercise our creativity. Here is a list of knowledge areas that are the subjects for the CDP examination (4):

Data processing equipment Computer programming and software Principles of management Quantitative methods Systems analysis and design

First, this indicates systems personnel should know something about data processing equipment. Now, that may be manual equipment or it may be very sophisticated computers, but there is a need to be knowledgeable about equipment for all degrees of sophistication. Next, these topics suggest knowledge about computer programming and software. This also covers procedures since we have to provide instructions for the people component of systems. Then analysis and designers should have some appreciation of the principles of management. From time to time, the opportunity arises to use quantitative techniques to support the manager user. This implies the need for quantitative skills. Finally, systems analysis and design represents an essential part of the professional'sknowledge. We need to successfully take things apart and put them back together again to achieve greater effectiveness and more efficiency for the organization.

Another view of our required knowledge and abilities is given by the ACM recommendations for graduate information systems study (1):

| People | Computers |
|---------|---------------|
| Models | Organizations |
| Systems | Society |

Without reviewing each individualiy, these categories represent the areas of study that will supposedly provide us with the knowledge to do our basic work - to create. But, the knowledge and associated abilities which are recommended do not adequately develop our potential as "creative" systems professionals. We find ourselves in a double bind. We are expected to bring new things into being, but by and large our training does not comprehensively address itself to the development of this ability. To suggest a way out of this double bind, we can consider recent insights in human information processing.

HUMAN INFORMATION PROCESSING

There are a number of different ways that people talk about how we handle tasks in our brains. Some of the more recent views are especially intriguing. For instance, Ornstein considers two different modes of consciousness for the human brain (10). His ideas are based in part on research into the hemispheric specialization of the human brain. We have left and right hemisphere capabilities which are to a significant extent unique and complementary. We are in fact multiprocessors. However, we do not seem to use our processors to anywhere near their real potential.

Another view of these two primary ways of processing, and by implication looking at the world, is presented by Pirsig (11). The author, at least at the time he wrote the book, was a fellow systems professional practicing as a technical writer for a computer manufacturer. Actually, this book does not have a lot to do with motor-cycles. But, the narrative does provide us with an in-depth consideration of our dual processing capability although Pirsig uses different terms to speak about it. He refers to the "classical" way of looking at the world and the "romantic" view of things. These views are seen as antagonistic. Indeed we find few individuals who seem to work comfortably from either perspective. We can elaborate Ornstein and Pirsig's ideas a bit to see what relevance they have for "creative" systems professional.

Here are pairs of words to suggest the primary emphasis of two different ways our brains process data:1

Left Brain Right Brain

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The left hemisphere of the brain approaches things in a very logical manner. On the other hand, the right side is a nonlogical

¹For a small percentage of people, the specialization described here is reversed. What is true for the right applies to the left and vice versa. processor. Our left brain is sequential. It goes about processing in a step-bystep fashion. On the other side, the right hemisphere does things simultaneously. It takes hold of a task and does it all at once. The left hemisphere looks at the world in a causal way. In other words, phenomena are meaningfully related through cause and effect. B is caused by A and C in turn by B. In contrast, the right brain works in a synchronistic mode. This implies that we find a meaningful relationship between two or more phenomena even though a causal linkage does not exist. Further, our left hemisphere is analytic. It looks at things in a piecemeal fashion. The right side likes to view things in a big picture way holistically.

In our culture, these pairs may be associated with the way we traditionally distinguish the masculine and feminine ways of looking at the world. We tend to use the descriptors on the left to describe a male member of our society. He is very logical. On the other hand, we frequently hear an implied slur in "She's so illogical (meaning nonlogical)." But in the theme we are developing here, that is an all right way to be. In fact, that is the other half of our way of being. In our culture, we allow women to develop their nonlogical capabilities. As a consequence they tend more frequently to exhibit the descriptors on the right than males do.

We can also use Pirsig's view of our dual information processing ability. As suggested above, he talks about the difference between the classic and romantic approach. These antagonistic world views can be summarized as follows:

Classic Romantic

| Reason | Inspirational |
|-------------|---------------|
| Laws | Intuitive |
| (Masculine) | (Feminine) |

The classical view is a reason oriented approach. For example, the field of law is a very classic left hemisphere approach to the world. On the other hand, the romantic view of the world is an inspirational and intuitive kind of thing. How often do we hear the expression "She's very intuitive." We much less frequently use the phrase to apply to men. But intuition characterizes right hemisphere processing. We can feel Pirsig's views best through his own words. (11, pp. 66-67):

The terms classic and romantic, . . ., mean the following:

A classical understanding sees the world's primarily as underlying form itself. A romantic understanding uses it primarily in terms of immediate appearance

The romantic mode is primarily inspirational, imaginative, creative, intuitive. Feelings rather than facts predominate. "Art" when it is opposed to "Science" is often romantic. It does not proceed by reason or by laws. It proceeds by feeling, intuition and esthetic conscience. In the northern European cultures, the romantic mode is usually associated with feminity, but this is certainly not a necessary association.

The classic mode, by contrast, proceeds by reason and by laws--which are themselves underlying forms of thought and behavior. In the European cultures it is primarily a masculine mode and the fields of science, law and medicine are unattractive to women largely for this reason.

This hopefully provides a clearer understanding of the dichotomy that appears to exist in our human biocomputer, at least as Ornstein and Pirsig see it.

In addition to this material that appears to lie outside our field, some literature that is a little closer to home has picked up on this theme. For example, some items have been published in popular management journals. The theme we are pursuing here has been presented by Leavitt (6, 7). In this two-part series, he develops several points. For one, Leavitt criticizes management school curricula for being essentially left hemisphere dominated. We should complement this emphasis with nonlogical work for people in schools of management. Mintzberg also approaches the subject (9). This material suggests the planning function is primarily a logical, rational, left hemisphere activity. On the other hand, the essence of management appears to be right hemispheric, non-logical type approaches to the world.

Although these articles are recent, the ideas are not new in management literature. Over forty years ago Barnard developed the same theme (2, p. 302):

I have found it convenient and significant for practical purposes to consider that these mental processes consist of two groups which I shall call "non-logical" and "logical" . . In ordinary experience the two classes of intellectual operations are not clearly separated but meld into each other. By "logical processes" I mean conscious thinking which could be expressed in words, or other symbols, that is, by reasoning. By "nonlogical processes" I mean those not capable of being expressed in words or as reasoning, which are only made known by a judgment, decision or action.

If this material represents an emerging perspective for management, what does that imply for systems professionals?

IMPLICATIONS FOR SYSTEMS PROFESSIONALS

We frequently talk about the gap that exists between systems people and users, or the gap that exists between individuals primarily like ourselves and the people that we are trying to help. We can understand what is behind this gap through the distinction between these two different ways of looking at the world. Mason and Mitroff have succiently incorporated this issue in their psychological type variable (8). We have an opportunity to do something about the gap that exists between ourselves and the people we seek to serve.

First, we have an opportunity to better serve our organizations if we have a deeper appreciation and understanding of how a manager's mind works. In so doing, we are more likely to develop a capability that will fit that person's needs if we see how they look at the world rather than forcing our way of looking at things on them. Our second and greater long run opportunity lies in expanding our own awareness to make better use of our own biocomputers. We can enhance our creativity by relying more on our right hemisphere when we need it. With this complement to our dominant left hemisphere approach to systems, we can consciously become dual processors. We are primarily single mode processors due to our traditional Western experience. But, inherently we have the built-in capacity to be successful dual processors.

What we really mean by the systems approach is tied up in this dual processing problem. The systems approach integrates the abilities of the hemispheres: left and right. It resolves the antagonism that Pirsig talks about. We do not have to look at the dichotomy as an antagonism. It is an opportunity to use intellectual and imaginative approaches where appropriate. If this captures the essence of the systems approach, it suggests an opportunity to become more aware, creative individuals and truly earn the right to call ourselves systems professionals. To become a systems person, we must find ways of stimulating our dual processor to play an integrating role in our problem solving and opportunity realization.

HUMAN PROCESSING EXAMPLES

Three examples illustrate the application of dual processor ideas. Through these examples we can tune into experiences in our own life that represent the distinction and unity concerning our biocomputer. Here is an example that you might call an everyday story. Each of us has had something like this happen at one time or another. Here is the scenario.

You have spent all day working on a problem. Except when you have been relaxing with coffee or out to lunch, you have been putting your head right into something and trying to find a solution. You have not been successful all day, and now it is time to go home. The situation still nags at you, but you are glad to get out of the office after you have struggled so hard all day with no apparent progress.

On the way home, you crawl along in rush hour traffic with your mind diverted elsewhere. At least the left hemisphere is attending in a relatively relaxed mode to the stop and go traffic on the expressway. All of a sudden it comes to you! Like a flash the key you need to unlock the puzzle appears out of the blue. The solutions seems to have just popped into your head.

In terms of split brain research, the right hemisphere intensified work on the problem as the left side dominance was temporarily relaxed. In its synchronistic, nonlogical, simultaneous way of proceeding, the right hemisphere pulled a solution together. When it arrived at the insight, it delivered the result to the left brain so that you could express it in words. The left side is the speech hemisphere. An inspiration comes from the right, but it has to go to the left to be verbalized.

In a similar fashion, you wake up in the middle of the night: Aha! now I see. Just what you needed to unravel a situation has emerged. At some time or other each of us has had similar experiences. We all make use of the right brain. However, it does not dominate our wakefulness and hence we do not usually tune into it except as flashes. As a consequence, our right hemisphere plays a subordinate role in our personal information processing.

Another example more specifically zeros in on the other half of our bio-"Five squares" can be used computer. to experientally focus on our processing capabilities. In this game a class is divided into five person groups. For each group, there is an envelope with five smaller envelopes inside. Each member of the group receives one of the smaller envelopes containing three geometric shapes cut from poster board. Each person needs three pieces to complete a perfect square but obviously not the three they received in their original envelope.

Once the game has started, talking and body language are not allowed. The only thing a person can do is take one of their geometric pieces and pass it to another member of the group. This process continues until each member of the group has assembled a square thereby accomplishing the "stated" goal of the game. As with most games there is a stated and a real objective. The "real" goal is to learn about personal information processing. That is the setting in which the following observations are made.

Typically, some members of the group approach solving the task with a sorting, combinatorial type strategy: A left hemisphere mode. It is not unusual for one individual to end up with most of the pieces for the group on his or her (but more frequently his) desk. There he sits sorting out and trying each possibility perceived in a step-by-step logical sequential fashion.

In marked contrast, early in the game some other member of the group appears to have already "seen" the solution for all five squares. It is not unusual fo It is not unusual for that person to become increasingly impatient as indicated by foot patting and other forbidden body language which can not be held back. He or she (but more typically she) sees how every square goes together and just itches to tell the plodding person with most of the pieces to put this there and that over there and be done with it. This goes against the rules, so she just sits there increasingly impatient until the logical processor finally stumbles across the solution. There are too many combinations to keep track of without a memory aid which is not allowed in the game.

The latter individual has seen the solution intuitively through their right hemisphere capability. They have not analytically arrived at the solution. They just see it and then immediately know just how to go about putting it together. This game creates the setting for exercising left hemisphere (classic) and/or right hemisphere (romantic) problem solv-Each group works in a ing strategies. time competition to get finished. There is a reasonable amount of interpersonal tension during the coffee break following the game. A description of the material and an explanation of the rules for the five squares game appears in Weitzman (14, pp. 23-30).

One more example of a distinctive right hemisphere approach to problem solving uses the *I Chinq or Book of Changes* (15). This Chinese book that dates back before 2000 BC offers general wisdom on the conduct of one's life or specific advice on particular situations depending on how it is used. In the latter instance, the *IChing* provides consultation on a situation that you confront. Here is how it works.

You write your situation out on a piece of paper. Then you throw three coins using values for heads and tails to determine whether a solid (______) or broken (______) line is indicated. The coins are thrown six times to generate a hexagram or pattern of six lines that are either solid or broken:



With six places and two possibilities (solid or broken) for each, there are 64 different hexagrams with their own unique name and interpretation. The hexagram on the left, "preponderance of the small," represents the current setting relative Based on the to the situation posed. numbers obtained in the coin throw, certain lines in the heavgram have reached maturity and are going to change (hence the book of changes) and provide insight into the emergent situation. With the one circled line changing, the hexagram on the right, "influence," emerges to represent the future relative to the situation.

These two hexagrams resulted from throwing the coins concerning a significant situation the author confronted. It would take several pages of explanation to show how this approach proceeds and what information it provides. An excellent discussion of the use and meaning of the *I Ching* may be found in Progoff's Jung, Svnchronicity, and Human Destiny (12, pp. 21-45). The reading of the passages associated with the two hexagrams provided uncanny feedback on the particular decision situation presented.

Why use a personal experience for understanding our biocomputer potential? This approach cannot really be understood in terms of an "explanation." Here is a "feeling" for the relevance for the theme. The difference between casually and sychronistically related events is mentioned above. As an aside, Jung coined the term and wrote in depth about the concept (5).

The *I Ching* works through the right hemisphere. In the synchronistic view we have one event here and one event there that are meaningfully related but not causally linked: The statement of a personal situation as one event and the throwing of the coins as another are linked. together in a meaningful way. What was stated and what was read was acausally melded in the right hemisphere to yield knowledge about the situation.

This represents a crude attempt to explain something that does not lend itself to explanation. Such experience represents the emergence of the other half of the biocomputer potential as much as the Aha! experience in the first example and the pattern insight in the second. All three illustrate we have the potential to obtain knowledge through our nonlogical, simultaneous, synchronous, and holistic right brain to complement the knowledge we more frequently acquire through our logical, sequential, causal, and analytic left brain.

CONCLUSION

What significance do these observations have for systems development technology? They suggest some complementary topics to include along with those listed at the beginning of the paper: nonanalytic decision making, new games to play, biofeedback and the nervous system, guided imagery, metaphoric expression, androgeny and the analyst, and many more possibilities.

To claim our full systems development potential, we need to move beyond our halfbrained status to become more integrated systems professionals. By so doing, we will really begin to bring the systems approach to our work. Ideally, the person who can best apply the systems approach is the whole person. This implies the ever present challenge of growing toward wholeness. In terms of the limited perspective of these remarks, this involves expanding our awareness as dual processors.

In terms of our culturally conditioned behavior, this suggests seeking out and stimulating in ourselves the best of the traditional masculine characteristics and the best of the traditional feminine characteristics. Research by Bern indicates that fully a third of the population does not fit the sex role stereotypes of our society (3). Such people are identified as androgynes. Singer explores the creative potential of the androgyne (13).

This overview suggests that invididuals with the greatest potential as systems professionals will be androgenous men and women who are naturally less inhibited in their ability to function as dual processors. These androgenous people blend in the single personality the characteristics of the person who uses their intellect for certain kinds of problem solving and their imagination for others and blends the two together as needed.

We have only just begun to scratch the surface in learning what we can do to develop the systems potential in ourselves and in those for whom we are responsible. As we gain greater perspective, the other half of the systems development potential will emerge as we become more wholebrained and hence creative systems professionals. We should experiment with these ideas and approaches in the classroom and on the job.

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