

Behavioral Systems Analysis: Fundamental concepts and cutting edge applications

Part V Illustrative Applications

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Part I of this series of articles:

- describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and general systems theory
- asserts that knowledge from both disciplines is important for practical work because
 - behavioral knowledge about how each person will act within a specific environment and
 - general systems knowledge about how organizations and other living systems functionis essential in today's complex world
- describes $B = f(O, E)$ as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Part II provides a way to analyze any activity into 3 essential components, using the 3 term contingency. The 3 term contingency is the smallest meaningful unit for analyzing individual performance. Part II then describes three different service models used by successful consulting firms. Each firm, in a different way, helps managers apply the 3 term contingency and associated principles within business environments.

Part III describes the smallest meaningful unit for managing organizational performance, the adaptive system. The adaptive system concept is the basis of the total performance system diagram that shows the 7 essential components of an adaptive system. If any one of the 7 components is weak or missing, intelligent performance is very difficult or impossible.

Part IV describes the Value Set, a concept from general systems theory that helps keep the most important organizational variables in focus. It then introduces 3 additional general systems concepts, the concepts of homeostasis, interconnectedness, and living system. These 4 concepts plus 3 described in Parts I, II, and III, support the notion that long term success for any organization in a changing world requires managing it as a whole, not as a collection of separate parts.

Part IV ended with a description of seven lessons learned in doing behavioral systems analysis. But the concepts are not enough.

"Intellect in itself has no power to move; it must be intellect directed to a certain end; in other words, it must be practical." Aristotle, Nicomachean Ethics, VI, 2

Three Cutting Edge Applications of Behavioral Systems Analysis

One of these two cutting edge applications is old and the other two are both new and ongoing. The applications are cutting edge because they do something all too rare: they explicitly, persistently, and effectively apply the theory and technology of behavioral systems analysis. They

- explicitly seek to manage the total organization as an adaptive system rather than taking a piecemeal approach
- use the adaptive system model and the 3 term contingency
- emphasize aligning processing systems with the demands of receiving systems.

Experience has taught each of us, at one time or another, that piecemeal tactics do not work. Now would be a good time to stop redoubling efforts to make piecemeal tactics work and move on to assure that cutting edge practices become standard practices.

Application #1—An Application in Education

The first application I will describe uses diagrams of the learner as an adaptive system, the instructor as an adaptive system, and the classroom as an adaptive system very similar to those in Part III. It involves learning how to perform competently in my responsibility-for-everything job as Chief of the Reading Improvement Service, University of Michigan. The work is both cutting edge and over 30 years old.

The research study validated the adaptive system diagram. The research was conducted in the Reading Improvement Service and in several classrooms in two different elementary schools. It was action research, carried out over significant periods of time with real students in real settings. The agreement with the principals, teachers, and staff was that the first priority was that anything we did should benefit students. The second priority was that it should be perceived as a benefit to the teachers and administrators involved. The third priority was that it would generate data for the research. The priorities reflected the values and responsibilities of the people involved. An important side benefit of the priorities is that they assure what researchers call external validity, meaning that the results can be generalized to other settings. This benefit was important to me because it was done as my doctoral dissertation, *The Classroom as a Self-modifying System*.

The research demonstrated that a) the diagram could be used to provide a meaningful description of a classroom, a learner, and an instructor and b) providing the learners and the instructor with improved feedback enabled them to “self-modify” and improve performance. The data showed that, given a bit of coaching and encouragement from teachers, learners could use receiving system feedback to manage their own performance. Performances included

- accurate completion of school assignments in several different school subjects,
- adhering to a behavior code generated and self-managed by fifth grade students,
- effective use of a resource center, as well as
- reading and learning more effectively within the university.

Performance of individuals and classrooms improved, as measured by both processing system and receiving system feedback. The most visible technology used was feedback supported by graphs showing individual performance. The other technology used can be found in Part III which is my web page at Western Michigan University. (Click to the Reading Clinic case in PSY 651 Behavioral Systems Analysis.)

An important feature of the way the research was done and in the way I continue to do behavioral systems analysis work is that the analysis moves from the outside in, from results to outputs, and from outputs to processes.

- Look outside: Begin with an analysis of the Receiving System. The work at the Reading Improvement System began by looking at the world our students were in when not attending our classes. What tasks were they required to do? (Tons of different school assignments.) How well should they do the tasks? (A lot better than they could now!) What kind of feedback did they get? (Not much, and mostly not at the right time.) What kinds of recognition, rewards, or reinforcement did they get? (Not much, mostly not at the right time.) The analysis produced more detailed answers, of course, but even at this level of detail, the analysis points toward two important conclusions. First, helping the students make small gains would not be good enough; we had to set high standards if we were to serve them well. Second, the “learning support” they received in school could not be relied upon; we had to help students learn self-management skills in addition to reading skills.
- Look at outputs: Identify specific valued tasks they perform in the Receiving System. These are the tasks they must learn to perform. This analysis was what brought us to the conclusion that our instruction should involve practice with tasks similar to and, if possible, identical to those they had to do in school.
- Look at the process: Identify effective ways to perform the tasks. This was not easy. We investigated how the very best students perform the tasks. Then we designed instruction to enable our students to do the tasks the way the best students did. It made no sense to us to ask them to practice doing what average or poor students do. Nor did it seem like a good idea to frustrate our students by asking them to do the impossible.

The behavioral systems approach specifically does not ask “What goals do most clinics set? What are their results? How do they do the instruction?” That could be done—and, truthfully, we knew all that—but looking at what the Receiving System demanded convinced us that imitating even very good reading clinics would not get the job done. Moving away from common practices or even best practices in reading was not for the faint of heart but I have since learned that it is a great way to identify a competitive edge.

Application #2—An Application in Graduate Training

Richard Malott, Professor of Psychology at Western Michigan University, has operated the Behavioral Analysis Training System (BATS) for several years. Malott believes that a good graduate program should attract good students who do superior work while in the program, graduate in a timely manner, and perform in an exemplary fashion afterwards. While many professors agree with those criteria, few set out to design a system that will meet the criteria, consistently producing measured results. Malott applied behavioral systems analysis to the initial design of BATS and continues to apply behavioral systems analysis to the operation and continuous improvement of the system. The graduate program enables students to learn behavioral systems analysis, practicing the concepts and techniques while in the program. Malott refers to it as a goal-driven system and involves the students in continuous improvement of the training system.

BATS students all do projects in which they analyze a subsystem of BATS, take data on how well it is functioning, do specific things to improve it, and take data on the results. Thus each subsystem functions as an adaptive system—students use the diagram—and improves.

Some of the subsystems were designed based upon receiving system feedback. For example, employers and former students both agreed that acquiring fluency with basic computer software packages (word processing, desktop publishing, spreadsheets, etc.) would be valuable. However, getting training in the packages was difficult, costly, and out of synchrony with the BATS curriculum. A BATS student developed a rudimentary self-study curriculum which later students developed into a self-paced and peer coached system that enables all BATS students to do all their regular school work using the software packages. Each cohort of students now has a student in charge of running the subsystem.

Students go through the program in cohorts, starting at the same time and graduating on the same schedule. The program is so effective at “on-time delivery” of graduations-on-schedule that this benefit to students is an important recruiting tool.

Graduating the incompetent is contrary to the mission, making quality assurance especially important. Quality assurance takes two forms, the normal quality assurance provided by other instructors who teach BATS students, and faculty reviews of student products. Lest people believe that students graduate on time because Malott allows academic standards to slip, all student projects are reviewed by at least two faculty members from within the Psychology Department who are not part of the BATS system.

The BATS subsystems, all run by students, generate the data and feedback necessary for effective performance. Running the systems provides practice in doing what the students will do once they graduate. Getting receiving system feedback on student performance after they graduate is done informally—Malott keeps in email contact with many of the graduates and meets with them at the Association for Behavior Analysis annual conference. Visible evidence of success of the graduates occurs in books they write, professional presentations they make, and behavioral systems analysis consulting firms

they operate. For example, in a recent internet search for materials on the Balanced Scorecard I encountered a very practical how-to-do-it book written by Mark Graham Brown who graduated several years ago. Similarly, one of the significant books in the area of behavioral safety was written by Terry McSween who earned his Ph.D. in an earlier version of the BATS system. I predict that collecting quantitative and objective measures of success of graduates will become the topic for a BATS student project soon and that maintaining the data will become a routine part of the system.

The third cutting edge application is in the private sector.

Application #3—An Application in a High-Technology Company

The second cutting edge application I'll describe occurred almost 30 years later, in the early 1990s. It was Susan Eickhoff's doctoral dissertation conducted over a span of about 2 years. (The actual work began before the study and continues today.) The research dealt with integrating behavioral systems analysis concepts, total quality management concepts, and strategy implementation concepts. The first part of the research was to integrate concepts from the three different literatures into one set of concepts that could be applied in the company. The second part applied the concepts to manage the company in a manner that accomplished the day to day work while implementing strategic initiatives.

The company is the one I mentioned in Part IV, the one that Jon Eickhoff was managing quite effectively and heroically but, unfortunately, self-destructively because the effort required was too great to sustain. The company is plastics proto-typing company with about 150 employees and Fortune 100 clients. The company has two major service lines:

1. enabling clients to move quickly from concept to prototype by designing the molds for plastic injection production of the housing for new products, primarily in the computer and communications industries.
2. doing the first production runs, making the first few thousand products.

The first production runs used aluminum injection molds which the company must make quickly, enabling the clients to have products on the market by the time steel molds can be made for later and longer production runs. Nearly all the company's clients are large companies that have the resources to do the work that they outsource. The clients outsource only because the company can do the work faster. Quality standards must be high and the price tag is premium but, because of the speed, actually cheaper for the client in terms of opportunity costs and perhaps actual costs.

The company had evolved from a company that sent engineers to their clients to deal with special problems. They helped their clients bring products to market better and faster. As time went on, it became clear that the consulting engineers could stay home and do some of the work themselves cheaper than by flying and helping clients do it. Thus the company modified itself in response to a marketplace opportunity, in this instance very detailed knowledge of the Receiving System. The company could be successful only if it could do a project better and faster than their clients. Their clients

were their major competitors. Thus, the company's competitive edge was being able to outperform "competitors" who had access to more people, more money, and, often, more advanced technology. The competitive edge requires outstanding performance.

The behavioral systems analysis work was directed at maintaining the competitive edge by learning to manage effectively but not heroically. The work involved several different projects, tracking the results of each project, providing additional feedback (to workers, work groups and functions), and managing by tailored scorecards that cascaded downward from the managers in charge of the two major service lines.

The key to success was in making the scorecards work. The numbers demanded by the tailored scorecards were based on business strategy and current business goals. The internal measures were set based upon the marketplace results to be achieved.

Measures and goals were not based on what sales or marketing or accounting or human resources or data processing or any other function believed was reasonable but upon the unreasonable demands of the marketplace. For example, profit margins had to be maintained (in order to meet the requirements of a leveraged buy-out) while prices were maintained (in order to meet competitive pressures) and materials costs doubled (which was an external economic factor well out of the company's control.) In addition, labor costs were reduced while headcount was maintained and individual's compensation increased (in order to implement specific strategic initiatives.)

A summary of the results is simple: customer relations, on-time delivery, profit margin, and strategic goals were met. The internal measures showed improvements. Sales, profitability, and customer relationship measures met or exceeded minimum goals but did not always meet "challenge" goals. The business owners believed that, although the company had always been innovative, the innovative projects had not always fit together well. The behavioral systems approach enabled them to achieve synergistic effects rather than having one initiative compete with another.

Over 10 years have gone by so I can report on the sustainability of this cutting edge work on using a balanced scorecard to manage an organization as a system. In the world at large, more companies are edging toward being managed as systems. Kaplan and Norton (1996) articulated a similar notion and introduced the term balanced scorecard into the management lexicon. Within the company, much has changed. There are new faces, new machines, new responsibilities, and new challenges. Jon had a heart attack but it did not kill him and it did not kill the company. His wife, Sue, had been taking on more and more of the operational responsibilities and, after the heart attack, did so officially as the new CEO. Jon meddles little, supports a lot, and pursues his hobbies avidly.

The scorecards are in place and continuously refined. Jon and Sue can leave town for extended period—they are building a new home 2000 miles from the plant. But even while they are on the road, Sue is the CEO. She uses a cell phone to call in and connect her laptop to the company's information systems. She looks at her scorecard and can drill down to those of every member of her management team and everyone else, if she

wants to. But usually she does not look at the scorecards because the leadership team members give her daily email updates. She can ask questions, praise good work, and initiate corrective action. Her team likes to demonstrate that they can handle everything well when she is gone.

Not everything goes according to plan and projection. As one team member put it in an email recently “I was tempted to try to fix this without telling you but it would soon show up on the scorecard. Here’s how I’m trying to get it back on track: Any suggestions?” Sue leaves the premises, she does not neglect her responsibilities. Jon observes, coaches, and smiles.

Conclusion—an invitation to think

1. Two of the applications above are in the public sector, a human service agency and a graduate training program. The third is in the private sector in an industry in which time is of the essence. I argue that applicability to such different settings demonstrates the power of the concepts. One could argue that the only reason the concepts are applicable is that they are vague generalizations that would fit anything. What do you think? Is it the concepts are fundamental, as I allege, or are they just applicable as vague generalizations?

2. Why is Receiving System feedback more urgent at Ronningen Research and Development than it is in BATS or the Reading Service?

In Part VI, I will describe more cutting edge applications and show the current status of some of the cutting edge tools being used to do cutting edge work.

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