

Book Reviews

Performance by Design: Sociotechnical Systems in North America, by James C. Taylor and David F. Felten, Prentice-Hall, Englewood Cliffs, NJ, 1993, 235 pp.

Often the phrase sociotechnical systems or STS is bandied about by academics and practitioners with no clear and precise meaning. Some view it as a perspective which emphasizes that we should integrate the social and technical systems. Others view it as a set of methods to design technology for human use. Still others immediately think of self-managing work groups. Taylor and Felten have their own view which is sophisticated, carefully formulated, and based on decades of research and first-hand experience going back to the early days of the Tavistock institute. STS is more than a perspective or a set of methods, and it is definitely not a particular solution, according to these authors. Rather, it is a methodology which allows systems to design themselves in a unique way to achieve their specific purpose. The importance of designing for *purpose* is a central theme throughout the book. The emphasis is on designing organizations that can adapt, survive and prosper in a changing, complex environment. There have been many cases of organizations using the STS approach with truly remarkable results.

This book is many things. It is a how-to book on applying the STS methodology. It is a book on the history of STS. It is a compendium of methods and academic literature on STS. The focus is on North American examples, though the methodology has been applied in many countries throughout the world. It is written in clear, simple prose and will undoubtedly be read widely by academics and practitioners.

The first chapter begins by introducing the concept of STS as a methodology. The authors argue that STS is both philosophy and method. "As a philosophy it supports the value of empowerment as well as systemic focus on product and customer. As a method STS helps provide customer solutions for performance by design. This combination of philosophy and method is methodology—an informed approach to organizational improvement." (p. 1)

Chapter 1 also provides a useful map of the methodology, and the book. There are four main phases to "the process of STS". First is "discovery", in which mem-

bers of the system to be changed learn about STS and understand the paradigm shift from past mechanistic models of organization to systems thinking. Second is analysis, in which the change agents analyze the current organization by defining its boundaries, analyzing environmental demands, defining its purpose, and analyzing the technical and social systems. Third, is design of the new system. Finally, the new system is implemented. All of this is done by cross-functional teams representing the system to be designed. Typically some combination of internal and external consultants act as educators and facilitators of the process.

Chapter 2 succinctly reviews twenty-five years of STS in North America. It covers industrial practice of STS, government and foundation support for STS, academic bases of theory and practice, and private practitioners in the STS movement.

Chapter 3, “Designing for Purpose”, discusses the first step in STS—the system scan, which includes defining the purpose, system input, system output, philosophy, system boundaries, scanning the environment, and identifying some obvious “presenting problems”. The authors emphasize that no attempt at this point should be made to solve individual presenting problems. STS is a whole-systems methodology and fixing individual problems is not likely to lead to the kind of systemic change which will create a high-performing organization. This chapter includes a simple and useful way of thinking about purpose including the “mission”, which views the system as a transforming agency and economic agency, and a “philosophy”, which views the system as a mini-society and a collection of individuals with needs. The emphasis in this book on recognizing individual personalities and needs in the design process is often missing from treatments of STS and is one of the many unique features of the Taylor and Felten view.

Chapters 4 and 5 lead the reader through the somewhat abstract technical system analysis which is the traditional variance analysis out of the Tavistock school. The authors do a good job of making this complex methodology seem intuitive and straightforward. Variance analysis is very complimentary to contemporary quality methodologies which emphasize studying and improving core processes to remove unwanted variation. It has been applied mainly in routine work processes.

Chapter 4 describes how to construct a variance matrix. The analysts first define a small number of “unit operations” in which the thin being transformed into a product or service undergoes a major state change. The authors call this thing being transformed “IT” (Input plus Technology). The analysts then identify for each unit operation all the important things that can vary within IT and have an effect on the ability of the end product to achieve its purpose, i.e., variances. The matrix format allows the analyst to consider whether one variance effects (or covaries with to be more precise) other variances. A very important point they hit home repeatedly is that the emphasis here is on things that happen directly to IT as it undergoes state changes. Problems with machinery, human errors, quality checks, etc. are neither parts of unit operations nor variances. The idea is to get a pure sense of the technical system requirements to make a product

that achieves the purpose, not to identify particular problems with the current technical system that makes the product. What needs to be controlled so the system will achieve its purpose? The end result is a set of “key variances” which must be controlled for the system to be effective—the technical requirements for design. Variance analysis is illustrated with an example of cheese making and pension claim processing to represent manufacturing and service examples—both are routine processes.

Chapter 5 then describes the variance control table. With this table we are shifting from pure characteristics of IT as it is being transformed to an examination of activities used to control variances in IT. This table considers only the key variances and for each variance displays where the variance occurs in the system, where it is observed, where it is controlled, and who actually controls it. In an existing system these would be descriptions of current control methods. In addition there are some design specifications which include the activities required to properly control each variance, information needed for control, and any suggestions at this point in the analysis for job/organization design and changes in technology. Once again the authors caution that these are only suggestions to be recorded at this point. Design should wait until the later joint optimization phase.

Chapter 6 goes on to describe the social system analysis which emphasizes communication and role relationships needed to control variances in IT. This in many ways is the most disjointed and abstract chapter. I do not think the problem is with the authors’ treatment, but rather with the methods themselves that have become part of the STS tool kit. The steps include identifying “focal roles” which are key to controlling variances, identifying expectations by others for this role, building a “role network” which shows the kinds of communication linkages between the focal role and other roles (arrows can be one-way or two-way and length reflects intensity of communication), and then evaluations of each link based on the GAIL model taken from the work of the sociologist Talcott Parsons. GAIL stands for Goals, Adaptation, Integration, and Latent functions (what the authors call “Long-term development and maintenance”). These are the four functions which Parsons argued any social system must find a way to meet to survive. The STS role network tries to identify whether dyadic relationships achieve each of these four functions. The social system grid summarizes the GAIL functions for a particular focal role in relation to vertical links, horizontal links, cross group links, links outside the system, and “non-social aspects”.

My problem with this method comes from personal experience attempting to teach it to professionals and students. It is abstract, time consuming, grows in complexity exponentially and when all is said and done it is not clear to me it is worth the time and confusion. There has to be a simpler way with a more straightforward punchline if groups of relatively uninitiated practitioners are going to carry out this analysis.

One criticism I do have of the authors’ treatment in this chapter is that the example changes. We start with a cheese and insurance company case for the technical system analysis, then move to a “tanker terminal example”. I know

from experience that students strongly dislike changing the example midstream in the teaching of a set of methods.

Chapter 7 talks about individual quality of work life and we return to a lucid, straightforward treatment. The simple theme of four “Cs”—competence, centrality, commitment, and control—is simple, yet very appealing as a way to think about individual needs. There is a very good example of how the design team of one plant developed their own methods for assessing QWL. Participative data collection and analysis is emphasized by the authors—experts coming in and performing complicated analyses from the outside is not encouraged. Simpler methods like analyses of open-ended interviews to categorize what helps and what hinders are preferred by the authors.

Chapter 8 now shifts the reader from highly structured analysis to the highly unstructured magic of design. The authors summarize principles of design from Albert Cherns and Louis Davis and then suggest design should be a creative team process of imagining the ideal design. The ideal design is then evaluated based on the technical and social system requirements from the prior analysis and the design principles in the step the authors call “joint optimization”. A “provisional design” is then developed which is presented to other members of the system for feedback and is always open to improvement.

Chapter 9 is a good treatment of important implementation issues. These include evolutionary versus revolutionary change, sources of resistance to change, roles in the change process, and team development. It is short and makes a number of important points grounded in examples from the authors’ rich experiences.

Chapter 10 addresses the issue of “redesigning for renewal”. What happens when the organization matures and starts to become routine? It is important that the organization continues to improve and adapt to changing conditions. There is a very useful set of forms, tables, and simple questionnaires so members can evaluate where they are and develop plans for improvement.

Finally, Chapter 11 on the future of sociotechnical systems takes up the important issue of using STS for knowledge work. Up to this point the examples have all been from relatively routine work systems. The authors argue that the same methodology, with some modification, can be used for analyzing knowledge work. There will not be a clean, linear flow of unit operations, but they give an example of engineering work where variance analysis was usefully applied anyway. They offer the intriguing insight that what generally happens in these systems is an ambiguous set of inputs with no clear starting points being transformed into a relatively concrete output. They also discuss the importance of managing paradox, i.e., addressing two or more seemingly conflicting goals simultaneously. This chapter whets the appetite for an in-depth treatment of STS applied to non-routine work. No one else, to my knowledge, has tried to stick as closely to conventional variance analysis for knowledge work. The work is intriguing, but more information is needed for anyone to understand how to actually use variance analysis for knowledge work.

Overall, I am delighted that someone has taken the time to document the clas-

sical STS methodology as it has evolved over the years through practice. This book is loaded with insights, practical methods, rich examples, and simple tools and techniques. It is a valuable resource for anyone embarking on a major organizational change. It should also be useful in university courses as a supplemental reading source on STS. I recommend it highly.

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