The Differences between STS and Participative Design (PD)

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There are two major competing methods for changing an organization from one designed on the first principle, redundancy of parts, to one designed on the second principle, redundancy of functions. Both of these methods as they are practised today are offspring of the original theory and method of sociotechnical systems (STS), analysis and design. (Emery F, 1959, 1978)

While both are offspring, STS looks very like its parent. Participative Design is an adaptive mutation, adapted to today's environment.

A Sociotechnical System (STS) is simply that.

There is today a confusion about what `socio-technical' means. The name was coined in 1949 to describe a new unit of analysis. Rather than separate analyses of the social structure and the technology, the new approach examined both and the relationships between them as a system in its own right.

A section of one of our old production lines with a person with a narrow, unskilled set of actions at every station and a section supervisor carrying responsibility for control and coordination of the section is a sociotechnical entity. It is a sociotechnical system built on the first design principle. `STS' does not imply any particular form of organization.

Therefore, `STS' as it is sometimes used today to imply a design principle 2 or democratic structure only causes confusion. It destroys the concept of a unit of analysis by specifying a type, thereby removing a useful tool for the analysis of organizations. Worse than that, it avoids identification of the basic determinants, the genotypical characteristics, of a particular sociotechnical system, namely, the design principles.

Source of the confusion

The confusion arises because as the study of sociotechnical systems progressed, it became apparent that if the enterprise goals were to include high productivity and quality, low wastage, sickness and absenteeism etc, there had to be a form of work organization suitable for human beings. (Trist and Bamforth, 1959) Psychological and physical health in and commitment to the workplace were found to flow from a congruence between the social and technological systems. The principle was joint optimization of social and technological. (Emery F as above)

When the principle of joint optimization is applied to a sociotechnical system, it becomes necessary to take into account not only the traditional economic and technological criteria for measuring organizational well being but also a third set, the human criteria. The example given above of a Design Principle 1 sociotechnical system is one in which the principle of joint optimization does not apply. When this type of sociotechnical system is analysed in terms of the six human criteria, as they are in a PD workshop, they are usually found lacking.

The History of STS in the USA

Lou Davis is the father of STS in the USA. He was apprenticed to the Tavistock team in the early days when a great mass of experimentation with different forms of work was occurring and the

method was itself was evolving. It was the long detailed, expert performed and experimental method that Davis took back to UCLA.

All of that was necessary in the experimental phase so that there could be high confidence in the scientific reliability and validity of the results. But the experimental phase finished with the Norwegian National Industrial Democracy Project.

Over time in the USA, that old method has been somewhat refined. It is however, basically the same arduous, expert based procedure as it was in the 50s and 60s. The experts have changed. Rather than the social scientists of the 60s, they are now an organizational or divisional `design team' trained up to collect the data, do the analyses and provide the redesigns for the organization or division. The process is still heavily dependent on consulting academics and practitioners.

A brief history of sociotechnical systems analysis and redesign in the context of the shift in Australia to Participative Design is given in the 1989 introduction. The confusion today about what 'sociotechnical' means is a result of not knowing the history.

Critical methodological differences between STS and PD

Table (below) summarizes the key differences between STS as it practised in the USA today and PD.

1. *Two Meanings of Expert*. The first two points describe the expert dimension of STS as opposed to the participative nature of PD. THE design team in STS plays the same role as did the outside experts. Part of the design team's role, because they are separate from the rest, is to attempt to sell their redesigns. Even if they are bought, they are seen as imposed with all the problems of subtle resistance this raises. In PD however, all of the workers are the experts as nobody from the outside can have the same intimate and detailed knowledge of a given workplace. The process results in a collectively agreed solution which is less likely to generate resistance.

2. *Concepts / Design Principles.*

The next two points address the central role of conscious understanding of the design principles. An Australian manager whose factory was currently going through STS said that the design team couldn't explain what they were doing. They had no basic concepts, only a superficial and hazy impression of what the steps were supposed to do. They were frustrated with having to follow the detailed process because they knew all about the variances anyway. In addition, they could not see a clear relation between the process, the rationale and the goals.

In the PD workshop, the design principles are given upfront with their associated structural building blocks. There is never any doubt about the choices involved or what they mean. The tools provided relate explicitly to the design principles.

There is a danger for those who even successfully complete the STS process in that although they may end up with a DP2 organization, they won't really recognize it or know why. This imparts a degree of vulnerability to their redesign. If they can't explain it clearly and simply in terms of its motivation and rationale, they will be subject to the changing whims and fortunes of others who can use conceptual arguments and who are more powerful and articulate than themselves.

More immediately, however, they are likely to compromise with a resulting mixture of design principles, a solution that simply will not work in practice. At the moment, we have a rash of such designs utilizing the concept of TLC - a supervisor behaving as trainer, leader and coach. (see *The Concept of TLC*)

3. *Process.*

The STS design team must firstly be trained in the method. It involves a long process of detailed and precise steps drawn from industrial engineering and social science. It is an elaborate research task.

When the research is complete, the design team must then use the results to carefully balance (jointly optimize) the social or human resources with the technology towards the enterprise goals. It is a demanding task and one for which most workers have little training or patience, given all the above. A lot of STS projects fail before completion.

The evolution of PD has shown that once people understand the design principles and their consequences, and are shown some quick and simple tools of analysis, they just get on with it because they want to. Most Australian workers jump at the chance of redesigning for a structure in which they can work as responsible adults. Detailed quantitative phenotypical analyses and matrices of variances are irrelevant when the essentials of design are grasped. The essences, the design principles and their associated structural building blocks are so simple that a collectively optimum and adaptive design can be done in a day.

4. *Diffusion and Cost*.

In terms of short term economics, STS compares badly with PD. It is long and chews up time off the job. In the long term it compares even less well, particularly when the frustrations and probability of failure are taken into account. What is the cost of coming up with a design that will not work in practice? What is the cost of offering redundancy packages to supervisors without adequately exploring other solutions? There are a host of such questions.

What is the cost of the uncertainty engendered by workers not knowing how the process will finally affect their jobs? Of them not being directly involved in the design process? Uncertainty, insecurity and alienation are frequently and inversely correlated with productivity. Staff with these characteristics do not comprise a solid foundation for confidence in the future of the enterprise.

And what of the multiplier effect? Diffusion requires two things, a conscious knowledge of the substance, the concepts and methods and a strong affectual or emotional component. Excitement and joy are the drivers of diffusion. (Emery M, 1986) Workers who are not enthusiastically involved in making change and who cannot articulate what it is about are not going to diffuse the concepts or the process.

The following comments come from North Americans who attended the 1991 STS Roundtable meeting in San Francisco.

“Reflecting on more than ten years STS consulting I feel that while it is an excellent tool for new plant design it is actually an impediment to organizational change...We achieved no permanent fundamental structural change as a result of STS, even though some corporations entered into prolonged and detailed STS.”

“They (managers) soon came to the conclusion that the time needed was so expensive that it seriously threatened their short term goals.”

“As a consultant who has witnessed groups get bogged down in variance analysis, I want to learn about Participative Design.”

The Adaptive Dimension

STS and PD share the goal of genotypical structural change. They differ in some critical methodological ways which amount to different relationships with the environment.

In almost all industrialized countries now, the race to change is on. Amongst populations at large, the degree of awareness of what that change means and entails varies. Many are aware that it involves significant value shifts and extensive structural change, macro and micro. Many are aware that the future of our national economic health depends on it and that time is short.

There is a deeper level of environmental trend however, and that entails people demanding greater control of their lives. They are demanding both knowledge and the right to make decisions about the different aspects of their lives, including their futures in the workplace. In brief they are demanding participative democracy following the logic of DP2.

While the proponents of STS and PD agree that the ends embody design principle 2, the means they advocate are differently related to the ends they pursue. There is an incongruence in the relationship of STS means and ends. The STS process involves a representative selection process (DP1) with consequent problems reminiscent of the political process.

PD set its sails on total congruence from the beginning. Every stage of the process follows design principle 2. Given the nature of a Type IV environment which is characterized by relevant uncertainty, only a method which locates responsibility for design with those who have to make it work will meet the demand for participative democracy and thereby reduce the uncertainty. A disjunction between means and ends can only foster uncertainty and symptoms of maladaption such as cynicism and dissociation.

In today's world with its much greater awareness of and desire for human dignity through decision making, conscious knowledge of the design principles and the six criteria which are consequent upon applying design principle 2, take centre stage. Once these are grasped and under the control of those doing the design, we have a totally open method, the basis for commitment and responsibility to improve the economic and technological subsystems leading to systemic change of the entire enterprise.

STS with its reliance on a representative process, quasi-experts and `consultation' is an appropriate method for a Type III environment. It is a Type III method is a Type IV world.

It is this overriding characteristic which helps to produce the more negative results of STS, its slowness, costs and its doubtful ability to produce spontaneous diffusion. These are signs that it is not maximizing commitment, productivity and conscious, available and conceptual knowledge of the fundamental nature of the change.

On all these counts, STS is yesterday's method. Today we don't need a hangover from the experimental past, we need action and change on the ground with a commitment to it from an educated population.

Critical methodological differences between sociotechnical system and participative design	
STS	**PD**
Two meanings of expert	
Design team selected for whole division etc Therefore, design imposed on many	Each small section designs itself No imposition. Designs incorporate individual wishes
Conscious knowledge	
Design team not given simple visual concepts of design principles based on responsibility for coordination and control Therefore, design principles never consciously understood Therefore, can end up with an unworkable mixture of principles such as TLC	All are given these conceptual tools and their consequences. Presentation takes 30 minutes. Design principles consciously understood, used and available for future change. End up with clean, lean structure of responsibility
Process	
Design team trained in long series of steps, including matrix of variances, can take months Process of analysis and redesign takes months or years	All given 2 simple tools (6 criteria and skills matrix) to analyse current organization; takes 90 minutes Analysis and redesign takes a day
Diffusion and cost	
Supervisors not necessarily involved in redesigning their futures Therefore, sometimes less than optimum solution and bad feeling Total process of years Very little diffusion	Supervisors involved with workers and management from beginning Most optimum solution for all Total process of weeks Enthusiastic, extensive diffusion

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