David (P.G.) Herbst

Design and Change in Ship Organization[1]

Socio-Technical and Psychodynamic Variables in Ship Organization Design

The problems encountered in designing ship organizations differ in a number of respects from those met with in developing new forms of organization in factories. In designing a factory organization, we can generally start off with the specification of an established or a new technology and generate possible types of work organization in terms of the requirement of achieving joint optimization of the total socio-technical system.

In ship design, on the other hand, the critical decisions that have immediate implications for the social and work organization on board are concerned with the choice that exists with respect to the allocation of tasks requiring human intervention which can be located either on board or ashore. These, in turn, create alternatives in terms of manning by a continuous crew or a temporary crew, or by means of shore-based personnel. Since there exists in this case a wide range of possible technological alternatives, we can, instead of taking a specific technological system and working out the requirements for a supporting social system, consider the possibility of working the other way round. That is, we can attempt to specify initially the essential requirements for a social organization on board and then work backward to discover the critical supporting technological conditions that would need to be satisfied with respect to ship design.

The Conventional Sequence of Socio-Technical Design

The basic design variable is the allocation of tasks on board and ashore. The basic tasks include navigation and engine control, engine and instrument maintenance, ship maintenance, ship-shore communication, loading and unloading and catering.

[1] A reproduction of chapters 3–6 in *Socio-Technical Design: Strategies in Multidisciplinary Research.* London: Tavistock Publications, 1974. First published in *Tidsskrift for Samfunnsforskning* 10:371–400, 1969.

In principle, each of these task sectors can be wholly or partly shore based. If tasks are split up so that one part is carried out on board and the other part ashore, then the significant decision variable is the location of task components that involve

- decisions requiring a high level of skill and judgment;
- work and decisions at technician level;
- unskilled and semiskilled labor.

Decisions made at this point are crucial since they have direct implications for

- the extent to which the total task allocated to the ship provides conditions for autonomy and self-regulation;
- the communication requirements between ship and shore (this is not a purely technical problem since a great deal of relevant information on the ship cannot easily be recorded, transferred and adequately responded to ashore);
- the possible work-role and social structure; and, given this,
- the possible career structure;
- educational and training requirements.

The possible manning requirements are continuous crew on board, supporting transient crew and land based manning.

The unit for socio-technical analysis will need to be the total set of tasks required for effective ship operation, wherever they happen to be located. It would appear to be feasible to look at the design for manning chiefly from the point of view of optimizing the social system and then look at the supporting conditions required in terms of tasks or task components which should be allocated to a continuous crew on board.

Given the manning requirements on board, the next decision variable is the departmental structure established which further restricts the possible work organization and career structure. The final decision variable is the shift structure and shift-allocation pattern. The socio-technical design problem can thus be broken up into a sequence of decisions (Figure 1).

If we look at what can be done in terms of immediate organizational changes that are required on board in consequence of the changes in technology that have been introduced over time—the decreased size of crew and the increasing difficulties of recruitment—then it is clear that the change process will have to go in the reverse direction of the design sequence. Thus, in experimental programs concerned with the integration of deck and machine crew, changes in shift structure have been used to facilitate changes in interdepartment relationships (A. Trist, 1968). Changes of this type cannot, however, go beyond a certain point insofar as major decisions are already built into the ship design and into the existing work-role, career and status structure.

As long as technological change was relatively slow, it was possible to find ways of adjusting the social organization to a given technological system. The

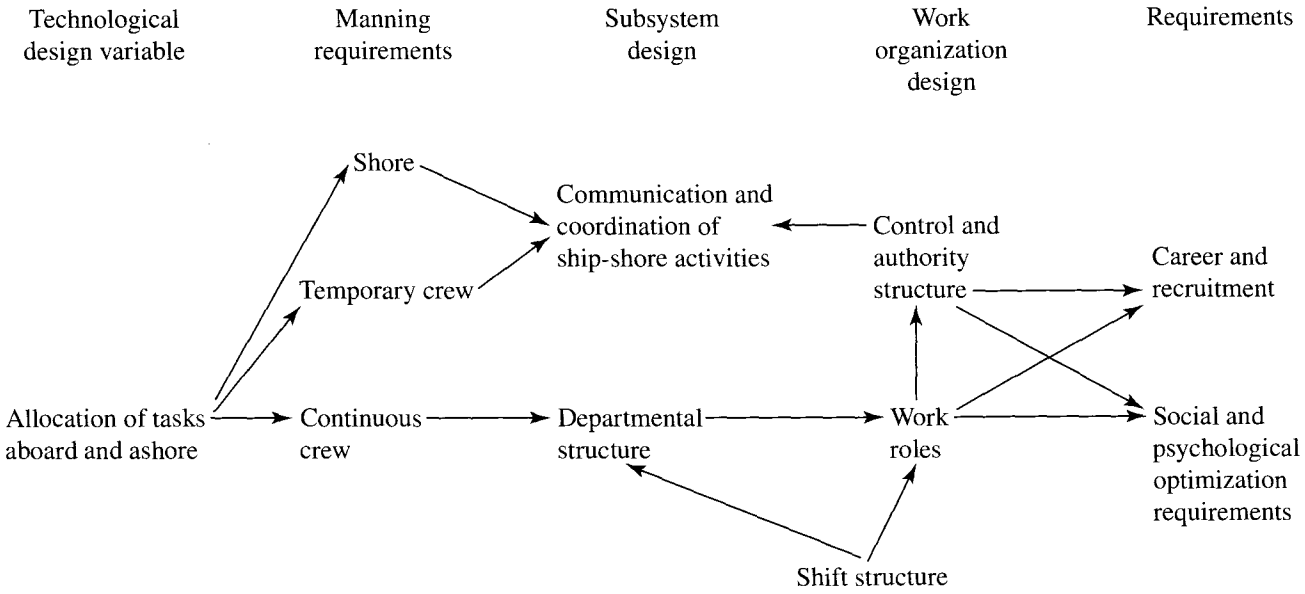

Figure 1. Socio-technical design sequence.

main contribution of socio-technical analysis at this stage lay in showing that, even within the restrictions imposed by a given technological design, a choice of alternative types of work organization existed. It was therefore possible to work toward joint optimization of the techno-economic and the social systems. But this type of static socio-technological analysis is no longer adequate to cope with the current problems of the shipping industry. The present rate of technological change is such that, before a new form of organization on board can be established (together with new training and recruitment schemes, new career structures and pay systems), further technological changes will already have disrupted the conditions for the maintenance of the new social organization. This appears to be a major contributing cause of the emergence of turbulent and potentially uncontrollable environments (Emery and Trist, 1965/ Vol. III).

It is no longer sufficient to utilize the possibility of organizational choice unless the possibility of technological choice is utilized at the same time. Changes in technology have to be directively correlated with changes in social organization over the same period. Policy decisions with respect to changes in social organization over initially the next three to five years have in this case to be coordinated with the choice of new ship designs so that the type of technology and design chosen for new ships that will come into operation is, as far as possible, consistent with, and supports, the direction of social, educational and organizational development. This possibility did not exist earlier when, as a rule, only a single techno-economically feasible solution to a problem was available. At present, the limitations lie not so much in the possibility of generating alternative types of technological design as in the possibility of being able to specify, within the limits of techno-economic feasibility, the essential social and psychological conditions that have to be satisfied by the technological design we wish to implement.

As a first step it is necessary to consider the characteristics of the existing culture and organization on board merchant vessels. Whatever new organization develops has to grow out of the existing one. Field studies were carried out on a number of Norwegian ships: a car bulk carrier on the Europe-East Coast of America Line, a cargo vessel on the Europe-West Coast of Africa route and a factory fishing vessel in the North Sea (Thorsrud et al., 1967).[2] While the purpose of the initial field studies was to collect data on existing technology and organization, a later field study was concerned with identifying potential directions of organizational change and development. Just as autonomous work groups were originally discovered in the course of field work in coal mines in northern England, where in a number of places they had been

[2]So far, only relatively few social scientific studies of seafaring have been carried out. Of particular relevance are Aubert and Arner (1959), Arner and Hersson (1964) and Barth (1966).