A RESEARCH PROGRAM FOR THE PROPER INCLUSION OF HUMAN RESOURCES IN
THE DESIGN PROCESS

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PURPOSE

The fundamental purpose of this research was to clarify the decision structure and methodology for the design of high technology, large scale systems with particular emphasis on the proper integration of human factors and their associated metrics. This effort was initiated after many years of study and development of a methodology (Ostrofsky, 1977a) that successfully integrates the necessary decisions to efficiently utilize resources in order to meet a design need. A morphology of design emerged from which economical applications can readily be achieved while properly integrating the constituent disciplines.

Of major concern, however, was the proper integration of human factors into emerging systems so that performance criteria for these systems would properly reflect the influence of these factors. Traditionally, equipment designers appear to be reluctant to accept this "soft" data as input to the design of equipment, particularly when there is difficulty in meeting the more easily identified hardware performance requirements. Hence the improper inclusion of human factors in equipment affects results, not only in the achievement of operational performance, but also in the maintenance of this performance. What is needed, then, is a methodology that allows for the explicit inclusion of these factors into the design process. Prior study (Ostrofsky, 1977a; Asimow, 1962) has resulted in such a process, and, while the U.S. Air Force has had similar procedures (AFSCM, 1966), they have experienced difficulty in properly integrating human factors into their systems.
OVERVIEW OF THE DESIGN MORPHOLOGY

The design morphology can be considered as the form or structure of the process required to establish and meet the defined needs.

The definition of such a structure can provide a means for more effective planning, especially when the morphology is defined to a depth which "structures" the form and content of the respective decisions at each step in the design process.

Asimow (1962) defined the life cycle of a technological system to have the phases shown in Fig. 1.

The relationship of the design process to the production-consumption cycle satisfies the notion of relating designer planner activities to user needs. The cycle activities are of particular interest to the system designer and also appear to be one of the main patterns in the socioecological system which encompasses the resulting design. Since the elements of the Production-Consumption Cycle relate to user activities, it becomes necessary for the designer to understand the nature of these activities and then relate existing technology to them so that an effective solution to the problem emerges.

In attempting to plan for the most efficient use of resources the design phases are adapted for the designer. The Primary Design Phases of Fig. 1 must consider the Production-Consumption Cycle, and, in fact, the success of the design can often be considered as a function of the degree to which the requirements of this cycle are included.

![Diagram](attachment:image.png)

Fig. 1. Phases in the design project life.