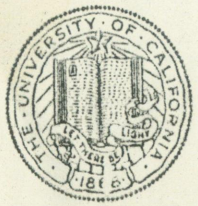

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A REPORT OF PRELIMINARY FINDINGS FROM THE 1976 "WORK ORGANIZATION STUDY" PILOT SURVEY.

by

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Improving the quality of working life has become a frequent subject for discussion among managers, engineers, trade unionists, and researchers. Much earlier attention has been focused on aspects of wages, working conditions, supervision and human relations at work. More recently the content of the work itself has become a major center of attention in this discussion. It has become increasingly clear that satisfaction of the traditional aspects of quality of working life has not had the hoped for effects on reversing the manifest and world-wide signs of employee alienation in both blue collar and white collar work over the past decade. Experiments in changing job content, on the other hand, have been shown to affect positive change in a variety of outcome variables such as absenteeism, product- and process-sabotage, grievances, costs, and productivity.

Most of the investigation has taken place in the design and organization of factory work, particularly assembly lines and continuous process operations; although some evidence is beginning to accumulate in the computerized white collar area, and service industries.

One of the keys to the success of redesign experiments has been the active collaboration of all principals to the creation of the process -- the managers and executives who sponsor the idea, the employees who will live with it, the social scientists who advocate and research it, and the engineers and other technical people who design it. This collaboration is not always complete, for many redesign activities are undertaken without the employees cooperation, and/or without designer advice and consultation. Of these various principals in the redesign process, there has been a smaller involvement of engineers and systems designers in the experiments undertaken in the United States than, for example, in Northern Europe or Israel.

The Center for Quality of Working Life is actively engaged in the study of work system design in the United States, and is in close contact with other investigators and managers around the world. It is of major importance to the further development of work system design activities that closer involvement among technical designers, managers, trade unionists and social scientists be stimulated. Our experience collaborating with engineers and systems designers has been meager, but mainly positive. In most cases we find a sympathetic stance by designers toward the responsibility to the operators of the systems they design; but it is rare to find much knowledge of what is possible, or the existance of a management mandate to convert these sympathies into action. As a first step in furthering this mutual engagement of designers with managers,

with unionists, and with social scientists, we have undertaken to study and document a set of the views and attitudes of production engineers and computer systems analysts. We are hopeful that this information can be of use to engineering managers and engineering educators, as well as to designers themselves.

This paper presents some of the general findings of a pilot research study undertaken in early 1976 with a small sample of technical designers (production engineers and systems analysts employed in California industry).

We have some evidence, much of it over 20 years old, that production engineers as a group adhere to a set of criteria that most people would agree are critical to the design of productive, efficient systems. We are quite sure that these criteria were, and are, rewarded and supported; not only by engineering schools and organization managers, but by the professional engineering societies as well. Despite these findings, little is known about the status of such criteria among engineers and systems analysts today, in face of the variety of pressures for changes at the work place, and the more evolutionary changes in products and production technology. We also know little about the dilemmas and role conflicts experienced by technical designers which can be traced to the organizations by whom they are employed.

The purpose of this research is to identify and describe the current criteria for job design, to evaluate the effects of several types of constraints technical designers might experience in their designs, and to begin to explore some attitudes toward systems, people and the organizational concerns and choices available in organizational and work systems design.

In measuring these aspects of technical designers' perceptions, we wanted to take into account possible differences between those who design industrial production systems (engineers) and those who design computer information and decision-making systems (systems analysts). Drawing on the findings of others as well as on our own previous research, we designed a pilot questionnaire through which we would ask engineers and systems analysts to describe various aspects of the design of work systems. This questionnaire was mailed to small random samples of engineers and systems analysts (120 of each) obtained from selected strata in the subscription lists of Factory and Datamation magazines. Recent experience with mail questionnaires in survey research led us to expect a fairly low response rate, less than 30 percent. The actual return rate (using a follow-up letter) for engineers was in excess of 35 percent, and for the systems analysts it exceeded 40 percent.

The Results

Occupational Similarities in Views about Job Content and Work Organization

1. Job Design Criteria - The rank ordering of seven criteria for choosing tasks which would be undertaken by production operators was very similar between the two groups.

Table 1

	Total Rank Order	
	Engineers	Systems Analysts
Maximizing throughput per unit of time	1	1
Efficient use of machine resources	2	2
Making jobs as simple to perform as possible	3	4
Reducing manpower	4	5
Providing management with better information	5	3
Providing more job satisfaction	6	6
Minimizing floor space requirements	7	7

The first two criteria are well known in engineering practice and values, and both groups rate them the same. That the systems analysts would rank the management information systems third is also not surprising, since a known product of computer systems has been the creation of additional information. That both groups would give a high rank to the criterion of making jobs simple to perform and a low rank to that of improving job satisfaction is in substantial agreement with studies made over 20 years ago. The values behind making work simple and job satisfaction are frequently considered opposites of one another; that they can also be seen as independent of the first two criteria is an indication of a similar design choice by both groups.

2. Development of Jobs from Tasks - We asked three questions dealing with the configuration of tasks in typical jobs, as well as with the responsibility of various groups in ordering tasks in the production process and in combining them into jobs. The order of the results in these three questions is shown below.

Combining tasks into jobs.

Table 2

	Total Rank Order	
	Engineers	Systems Analysts
Assign each employee a specific group of tasks as a full time job.	1	1
Assign each employee one particular task as a full time job.	2	2
Assign each employee one particular task and rotate employees at intervals.	3	4
Assign each employee a whole production process as a full time job.	4	3
Assign groups of employees to specific groups of tasks allowing them to assign the individual tasks informally among themselves.	5	5

Only the reversal in order of assigning production operators a whole production process distinguishes between production engineers and systems analysts.

Responsibility for choosing or ordering tasks in the production process.

Table 3

	Overall Rankings By	
	Engineers	Systems Analysts
Line Foremen	1	3
Production Engineers	2	2
Systems Designers	3	1
Industrial Engineers	4	4
Personnel Analysts	5	5

Engineers rating foreman as most responsible for this activity is not immediately understood, especially since systems analysts responded in a more expected manner.

Responsibility for combining tasks into jobs.

Table 4

	Overall Rankings By	
	Engineers	Systems Analysts
Supervisors or Line Foremen	1	1
Production Engineers	2	4
Industrial Engineers	3	3
Systems Designers	4	2
Personnel Analysts	5	5

High agreement on this question is noted between the engineers who design industrial production systems and the analysts who design computer information and decision-making systems. Both groups see line supervisors as very central to the combining of tasks into jobs, and they see themselves as second in responsibility for this in their own design activities.

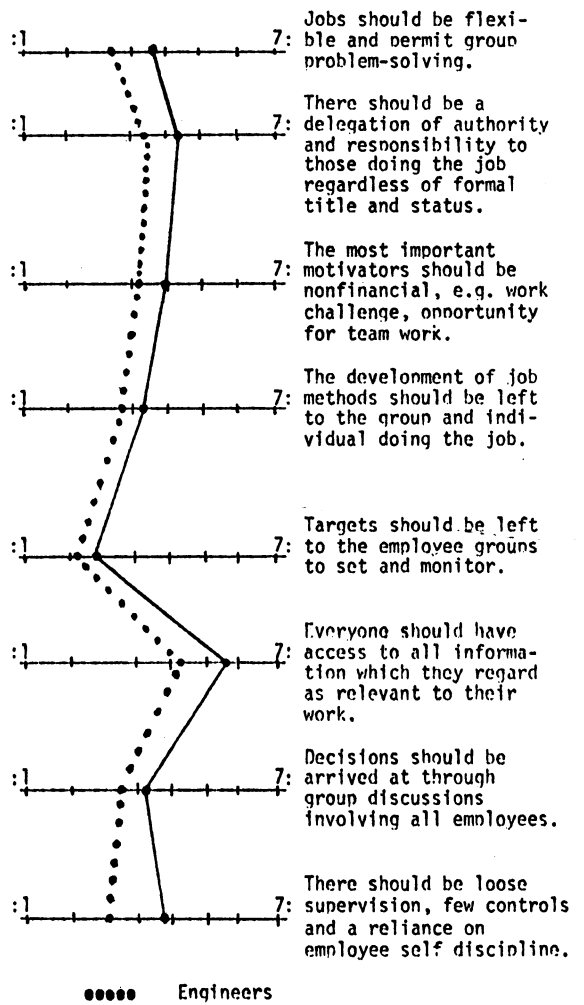
3. Constraints on the Assignment of Production Tasks to Production Operators. Several questions were asked about the effect of various potential restrictions. The modal results are as follows:

Table 5

Degree of Constraint by:	Modal Response: Engineers	Modal Response: Systems Analysts
Centralized Personnel Policies	"Little Extent"	"Very Little Extent"
Union-Management Agreements	"Some Extent"	"Very Little Extent"
Federal or State Legislation	"Some Extent"	"Little Extent"
Top Management Policies	"Little Extent"	"Some Extent"
Physical Requirements, Training Requirements, Working Conditions	"Some Extent"	"Little Extent"

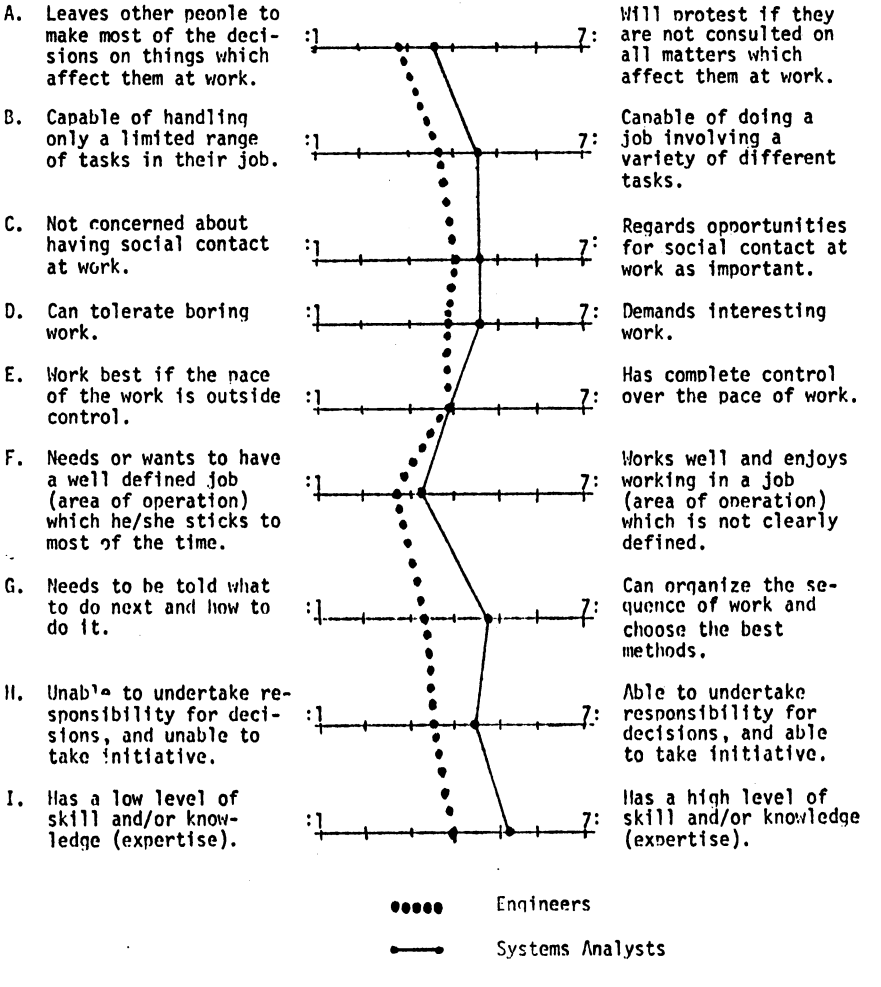
The engineers see union contracts, legislation, and the physical/training requirements as reasonably constraining, while the systems analysts report that top management policies cause some restrictions in assignment of tasks to people. These differences would seem to reflect differences in industrial characteristics and labor market features in the organizations employing these two sets of technical designers.

4. The Structure of Work - A series of questions were asked about the ideal characteristics of job and organizational structure for production employees. The profiles of the average scores are shown below.



The shape of the profiles is remarkably consistent, with the engineers tending toward the more structured side of the scales. Statistical differences between the profiles are significant for four of the eight comparisons.

5. Characteristics of Production Employees - A series of questions constructed a composite of the typical employee for which the production tasks and jobs were intended. The profiles of the average scores are presented here.



Once again the profiles of the two groups are similar in shape (significant differences for five of the nine comparisons) with the engineers tending to see employees as more passive, and more limited in skills and abilities.

6. Quality of Organizational Life - From a list of 40 potential considerations, technical designers strongly endorsed the following 15 aspects as those their companies should be concerned with (the answers did not imply that the companies did not already attend to these aspects).

What the company should be concerned with:

Table 6

	Endorsed Very Strongly	
	Engineers	Systems Analysts
Safe Working Conditions	✓	✓
Good Pay	✓	✓
Low Work Related Disease	✓	✓
High Product/Service Quality	✓	✓
Improving Productivity	✓	✓
Eliminating Scrap and Waste	✓	-
Standards of Fairness and Equity	✓	✓
Applied to Whole Organization	✓	✓
Ensuring due process to Whole Organization	✓	✓
Providing Opportunities for Careers	-	✓
Opportunities to use Knowledge and Skill	✓	✓
Opportunities to Grow and Learn	✓	✓
High Employee Morale	✓	✓
Improving Employee Motivation	✓	✓
Honest Communication among all Levels	✓	✓
Better Trust among Members	✓	✓

Respondents ranked eight approaches to changing organizations in terms of each approach's potential impact in improving aspects of organizational life viewed as worthy of concern.

Table 7

Methods of Change	Total Rank Order	
	Engineers	Systems Analysts
Train Management to be more sensitive and understanding	1	2
Provide Training for Employees	2	1
Change Organization Structure	3	4
Change Working Condition	4	5
Change Design of Jobs	5	3
Change Technology	6	6
Modify the Product	7	8
Replace People	8	7

Both groups are in substantial agreement that training of various kinds would have the most impact, while changing technology or product or replacing people would have the least impact.

Designers own Contribution to Quality of Organizational Life - In reviewing the same list of quality of organizational life aspects, technical designers viewed their own work as contributing considerably to the following items:

Table 8

	Percent reporting "great" or "very great" contribution of their work	
	Engineers	Systems Analysts
High Productivity/Service Quality	69%	58%
Improving Productivity	57%	61%
Elimination of Scrap and Waste	59%	28%
Opportunities to use Knowledge and Skill	48%	37%
Improving Employee Motivation	47%	30%
High Employee Morale	40%	34%

By and large, technical designers do not see the widespread impact of their work on comprehensive quality of working life. Although the six aspects in Table 8 are those with the highest ratings among the total list of 40 for the two groups, only those dealing with productivity or product quality are reported "contributed to greatly" by over half the sample. It would seem that the apparent choice in emphasizing simplified work over job satisfaction, shown in Table 1, is manifest in the reported greater impact of designers activity on productivity rather than on morale or motivation aspects.