INFORMATION TECHNOLOGY AND HUMAN RESOURCE MANAGEMENT:
A CASE STUDY OF ORGANIZATIONAL LEARNING

by

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(1985)

Submitted to the Sloan School of Management
in Partial Fulfillment of
the Requirements of the Degree of
Master of Science in Management

at the
Massachusetts Institute of Technology
May 1988

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ABSTRACT

The introduction of information technology into the workplace represents a challenging change to which management and workers of a company respond in various ways. Appealing to managers are the benefits derived from automation which eventually translate into greater competitiveness by means of labor cost reduction and/or state-of-the-art technology. On the other hand, such technological innovation frequently involves changes in the job design, the employment level and the qualification structure of the workforce.

Building on an earlier study of the same technology by Michael Morley, this thesis examines the introduction of an automated order processing system by a large U.S. telephone company. The research hypothesis states that the higher the degree to which qualification issues are taken into consideration in the planning and implementation of technological change, the higher the probability that the new technology will achieve its goals. Since the case study is written in the perspective of a Human Resource Manager, the analysis is concentrated on critical factors affecting the decision-making process and the outcomes of the change process.

The case study compares two local offices where the same technology has been introduced at different points in time and with very different results in terms of transition performance. By holding the technology factor constant, the analysis was expected to identify those factors which accounted most for the differences in performance.

A key result of the analysis is the relative superiority of a Human Resource transition strategy which favors the early selection and training of the workers for the new job and reaches a high employment level right from the beginning. The additional labor cost of such an advanced and extended staffing is largely outweighed by its benefits which derive mainly from a significantly shorter transition period and a better learning performance of both managers and employees.

Thesis Supervisor: Dr. Paul Osterman
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INTRODUCTION

"It has often been stated that manpower adjustment is the most difficult and important element of technological change (Lawrence 1969; Mumford and Pettigrew 1975), and one which is all too often ignored in the pursuit of organizational goals such as financial and technical efficiency."
(Davies 1986, 15)

This report is a success story of technological change in a large organization. A key factor to success was management's ability to integrate technical and financial goals of the project with a serious and credible commitment to the employees of the company. It is not a story with an easy flow of events or perfectly matching roles of actors. Rather, it is a story of disruptive events, of trial and error where the pendulum swings between periods of hectic growth and slow movements. The main focus of the case study is on learning: individual workers learning how to perform on new and old jobs with new technologies, and managers, technical experts and support staff learning about the new technology and work organization by practical experience.

I started this case study because I was interested in the process of technological change. One of the most important thing I have learnt through this research project is how important it is to keep everybody and everything in a learning mode over the period of transition. Like many other social activities, effective learning requires motivation and ability as well as opportunities and resources. To combine these four elements in a balanced mixture for each individual is impossible in a project which has the complexity level of the one I've studied here. As a guideline for management's actions, however, this balance largely
influences the workers' perception of the change process and the new work environment, and - mediated through these perceptual factors - the effectiveness of the change process. For example, if a manager hires the lowest possible number of employees for a new job involving a new technology, a major systems problem is likely to create relatively many and more serious problems over a longer period of time, because people are put under so much pressure that they simply stop learning and just try to survive in a mess of backlogged transactions, un-debugged programs and angry customer calls. If such conditions prevail for an extended period of time, it takes excellent "people skills" of a manager to maintain the motivation of his/her subordinates. On the other hand, a new work group which has been trained in a timely fashion and can start working on the new job with a gradually increasing work load will reach higher performance levels much quicker, because there is time to interact with supervisors and fellow workers, to share solutions to difficult problems, and to experiment with more efficient ways of processing a tricky transaction. Under such conditions, there are more "human resources" to call upon when an unexpected problem arises. And let there be no doubt about it: the introduction of new technologies that "informate" carries so much uncertainty that there is a sure need for these resources even under the best possible conditions.

This report is divided into four sections. The introductory part includes a review of the research literature related to four aspects of Human Resources and technological change. The second chapter in this section presents the research hypothesis and the conceptual framework
of the study. Part Two contains the descriptive analysis of the company (Chapter 3), the technology (Chapter 4), and the chronology of the major events and actions of the change process (Chapter 5). Chapter 6 concludes the second part by describing two case studies of local user organizations within the company. In Part Three, I use the descriptive data for two types of comparative analysis: Chapter 7 generalizes the findings from the two case studies and gives a cost-benefit analysis of two different manpower strategies. Chapter 8 compares the labor force objectives of the project with the actual outcomes, focusing on two transition problems: the HRM policies used for reducing the old work force and the training of the new work force. The final part of this report presents conclusions at two levels. In Chapter 9, I discuss the results of my study in the light of some of the research literature on technological change, while Chapter 10 deals with some practical implications for those who manage technological innovation in organizations.
CHAPTER ONE: LITERATURE REVIEW

The background literature for this thesis can be divided into four segments. There is a broad consensus among current analysts of technological change that there are two major manpower issues to consider in this area: The impact on the number of jobs affected (employment effect) and changes in the skills of the work force (qualification effect). The first two sections of this chapter review some of the existing literature in these two areas. - Human Resource Management (HRM) has developed out of traditional industrial relations as a professional field which deals with matching organizational goals and the needs of a changing work force (Kochan and Barocci 1985, 10; Lawrence 1985, 15). Over the past ten years, the model of Internal Labor Market (ILM) has gained in importance as an analytical tool for describing human resource policies of large organizations which can't be explained anymore by traditional labor economics (Osterman 1984; 1987). Section 3 of this chapter introduces the ILM concept and enumerates those aspects of human resource management which relate directly to technological change (i.e. selection, training, deployment and displacement). - Section 4 stresses the need for transition management and discusses the socio-technical systems (STS) approach as a model for designing a new technology. The intention of this discussion is to develop some focal points which I considered when I described the innovation process in the case studies. The section closes with a review of the major limitations of the STS theory.
1.1 Employment Effect

Industrial history shows that virtually every major technological change was coupled with changes in employment in the affected areas. What's new about information technologies, however, is that they are perceived as incorporating the possibility of a very high employment effect. And in contrast to many prior technological changes, the micro-chip based information technology penetrates the office work with tremendous speed and power.

"The potential for substantial savings in labor input with microelectronics has caused much concern and anxiety. ... Many examples of job loss or reduction in job opportunities resulting from microtechnology are already evident in many industries (Thornton and Routledge 1980). It has been argued that in such areas as telecommunications, assembly, warehousing, printing and publishing, there is sufficient evidence available in Europe, Japan and the United States to conclude that labor displacement consequences may be very severe indeed. ... Products which incorporate microtechnology have also resulted in job loss. Cash registers, for example, have led to the reduction of that industry’s manufacturing work force by 50%; and rationalization of the office, especially through the introduction of word processors, is now a real and economic possibility (Downing 1980)."
(Davies 1986, 13)

In an extensive secondary analysis, Flynn (1985) examines the impact of technological change on jobs and workers. She uses a concept of production, job and training cycles to analyze 200 case studies covering the period from 1940 to 1982, in more than 12 countries (more than 50% of the studies are from the United States). In general, she found few negative effects reported in these studies. Most of the surplus workers were reemployed (by either lateral or upward transfer). However, in individual cases the impact was very uneven. Especially hard hit were workers when a site relocation was involved (more disruption and
displacement) or when declining industries were hit (more layoffs). Flynn found three main distributional effects:

- Those workers with the lowest potential for obtaining good alternative employment suffered layoffs and demotion: low- and unskilled and older workers; highly-skilled workers in declining industries.
- Females were either deskillled or given new low-skill jobs after technological change.
- Allocation of new jobs was typically based on criteria other than ability (e.g. seniority); workers acquired new skills in company-sponsored training programs.

In addition to the impact of industry growth rates, Flynn's analysis revealed three other factors which shape the actual impact of a technological change: size of the firm, timing of the introduction and type of technology. The first two factors are briefly discussed below, while the third factor (type of technology) mainly affects qualification and will thus be presented in the next section.

SIZE OF FIRM

Smaller firms have higher barriers to successful adoption of technology: extensive capital expenditures are required, there is the problem of underutilized automated machinery, the internal pool of candidates for new higher-skilled slots as well as the company's HRD capabilities are limited and the career ladders tend to be relatively
short. Consequently, smaller firms have to turn more often to external sources for hiring new skills.

TIMING OF TECHNOLOGICAL CHANGE RELATIVE TO AGE OF TECHNOLOGY

Production life cycles lead to job life cycles because changing technologies and work methods affect the skill mix. Job cycles create training cycles, e.g. data-processing and electronics skills for programmers and computer operatives (see Section 1.3 b)).

Net total employment effects of technological change are difficult to estimate because they are usually subject to the influence of other factors which can't be easily dissociated from the technology factor.

"A major problem in this area ... is to identify whether job loss has resulted from microelectronics or from an increase in unemployment linked to quite different factors. ... It is argued that while the overall demand for labor may remain high, there might be, at least temporarily, high level of unemployment as jobs are lost from traditional sectors and potential new jobs take time to emerge. ... It should be emphasized that the job reduction argument is not a simple one. Technological change must be viewed within the context of economic, social and political factors which are influential in directing 'technological impact'." (Davies 1986, 14)

"The case studies did not isolate the impact on employment of the technological adoption from that of the non-technical factors. Moreover, causal relationships between technological adoptions and changes in employment were also hard to determine. For instance, technological changes were sometimes adopted in order to meet forecasts of rising demands. In many instances, the adoption of the change was timed to coincide with employment expansion in the firm to minimize the negative effects on the work force." (Flynn 1985, 20)
1.2 QUALIFICATION EFFECT

Similar to the employment effect, effects of microtechnology on skills also work in two directions: On the one hand, information technologies are associated with removing much of the skill contained in some jobs, thus decreasing the potential for intrinsic job satisfaction (Cooley 1979; Noble 1979). On the other hand, authors like Sorge (1976) argue that the skill level in certain jobs has been maintained or increased with the technology, or that the employees were simply retrained (shifting from mechanical to electronics skills).

According to Flynn's analysis, one of the major factors differentiating the qualification effect of a new technology is the type of technology adopted.

In production and distribution processes using highly skilled labor, craft workers are often replaced by semi-skilled workers who do routine tasks. Only a few new high-level jobs with different skills are created while all others are downgraded or eliminated.

In lower-skill production and distribution processes, disrupted workers filled new high-level jobs. Lower level jobs were often upgraded (including control tasks). Here, deskilling is rare, but there were several cases of layoffs.

Word-processing technologies create new higher-skilled jobs staffed by clerical workers whose jobs have been eliminated. There were no deskilling, downgrading or layoffs.

Data-processing technologies tend to eliminate low skill work, to create new high- and low-skilled tasks. However, disrupted workers are generally not promoted, the new slots are filled by external hires.
Layoffs are rare, because high turnover reduces the number of people seeking reemployment and generates replacement needs throughout the firm. These are fast growing non-manufacturing industries with many new employment opportunities.

More specifically, Flynn noted the following qualification effects in data-processing companies:

"Deskilling of Jobs. Lower-level clerical jobs were also the most vulnerable to deskilling when data processing technologies were introduced. These jobs often became more routine and required a smaller range of skills. As the computer or workers in newly created positions assumed accounting and bookkeeping tasks, some clerical jobs were reduced to answering the telephone, typing, photocopying and running errands.

Upskilling of Jobs. In many of the earlier cases on data processing adoptions, data manipulation and report-producing tasks were added into already existing clerical and administrative positions, thus resulting in the upskilling of jobs. Through the mid-1960s 'job enlargement' was common as clerical positions, in particular, became less specialized and absorbed many of the new computer-related tasks. However, as demands increased and occupations such as computer technician, computer programmer and systems analyst became established, instances of upskilling of clerical jobs declined."

(Flynn 1985, 14-16)

"In data processing adoptions, whether upskilling or the creation of new jobs and occupations occurred in the firms, depended on the availability of skilled computer personnel. Early adopters 'enlarged' current clerical jobs to include new computer-related tasks; over time entirely new jobs were created to perform such tasks. Coincident with this increase in new occupations at the firm, was a greater incidence of deskilling in lower-level clerical jobs."

(Flynn 1985, 19-20)

1.3 HRM POLICIES

Employment shifts and changes of the skill mix of a firm's work force may have very disruptive effects on the individual worker. Some lose their jobs, some get promoted, others are hired from outside while
some have to accept lower pay or a downgraded job. The choice of human resource policies greatly affects the way individual workers experience the technological change. Recruitment, selection, training, redeployment, leaves and layoffs are some of the major areas of human resource management (HRM) dealing directly with technological change. In large organizations, the human resource policies follow a set of rules and procedures which bear internal consistency and form a specific human resource arrangement. It is helpful to use the concept of Internal Labor Market (ILM; see Berg 1981; Osterman 1984) to describe these arrangements. In a theoretical paper, Osterman (1987) develops a preliminary typology of employment subsystems. Using four categories of rules and procedures (Job Classification and Job Definition; Deployment; Job or Employment Security; Wage Rules) he distinguishes four types of ILM systems: industrial, salaried, craft and secondary. The table on the next page summarizes the main features of each system.
INTERNAL LABOR MARKET SUB-SYSTEMS

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>INDUSTRIAL</th>
<th>SALARIED</th>
<th>CRAFT</th>
<th>SECONDARY</th>
</tr>
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<tbody>
<tr>
<td>Job Definition</td>
<td>narrow</td>
<td>broad</td>
<td>broad</td>
<td>narrow</td>
</tr>
<tr>
<td>Job Classification</td>
<td>rigid</td>
<td>loose</td>
<td>loose</td>
<td>rigid</td>
</tr>
<tr>
<td>Skill Level</td>
<td>high-low</td>
<td>high-low</td>
<td>high</td>
<td>low(-high)</td>
</tr>
<tr>
<td>In-Firm Training</td>
<td>high</td>
<td>high</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>Deployment Base</td>
<td>seniority</td>
<td>management</td>
<td>management</td>
<td>management</td>
</tr>
<tr>
<td>Promotion Base</td>
<td>seniority</td>
<td>fluid</td>
<td>fluid</td>
<td>none</td>
</tr>
<tr>
<td>Job Ladders</td>
<td>high</td>
<td>fluid</td>
<td>short</td>
<td>none</td>
</tr>
<tr>
<td>Quits</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Job Security</td>
<td>not formal</td>
<td>committed</td>
<td>not formal</td>
<td>none</td>
</tr>
<tr>
<td>Layoff Rule</td>
<td>reversed</td>
<td>???</td>
<td>???</td>
<td>LIFO</td>
</tr>
<tr>
<td>Layoffs</td>
<td>high-low</td>
<td>low-high</td>
<td>low-high</td>
<td>high</td>
</tr>
<tr>
<td>Wage Rules</td>
<td>job-related</td>
<td>merit</td>
<td>variable</td>
<td>job-related</td>
</tr>
</tbody>
</table>

Sources: Paul Osterman (1983, 350-352; 1987, 48-52); my own estimates

As Osterman points out, these subsystems can change over time.

Within certain limits, firms have a choice of different alternatives for organizing work:

"A given internal employment and training system is not examined or reconsidered until some event - technological change, changing product markets, reduced supply of an appropriate labor force, sharply rising wages, etc. - forces management to attend to the issue. At this point, the options are examined and a choice is made."
(Osterman 1987, 53)

According to Osterman's line of thought, employers - when choosing employment systems - consider potential performance of an
alternative with respect to three principal aims: cost effectiveness, predictability and flexibility.

"... each of these three objectives can have different, and conflicting, implications for the particular employment system that is chosen. There are trade-offs among the goals, and it is these trade-offs that introduce variety and dynamism into the process we are describing." (Osterman 1987, 58)

Four factors constrain the choices made: physical and social technology, labor force characteristics and government policies. The first two factors are the most important ones which are described in more detail below.

PHYSICAL TECHNOLOGY

Three dimensions of the underlying physical technology (i.e. the process through which the product gets produced, the paper processed or the services rendered) require special attention:

- Skill (level and locus of acquisition); high skill level of a technology tends to preclude a secondary employment system, but doesn't restrict the choice among the other alternatives.
- Risk (level and distribution); the higher the risk level, the higher the probability of industrial/salaried systems to be used.
- "Configuration" (ease of adjustment, centrality and seasonal fluctuations); high adjustment costs, for example, would make a stable and predictable work force economically desirable.

SOCIAL TECHNOLOGY

This dimension relates to findings from the literature on the sociology of bureaucracies. Here, there are issues like task centrality/criticality, power relations among subgroups, and status problems (i.e.
between gender-specific job patterns), but also the role of labor unions as a constraint to a firm's choice of an employment system.

In Chapter 3, I will apply Osterman's typology to my case studies and thus establish the back-bones of the Human Resource System in which the technological change process took place. Right now, let's turn our attention to those HRM functions which deal more directly with technological change.

a) Recruitment and Selection

The selection of employees mastering the required skills for handling a new technology is an important step towards achieving the expected performance improvement. With increasing complexity of the task, the staffing becomes more selective. Conditions in the internal and external labor market (for the particular skill required) shape the openness or selectiveness of the hiring decision. Furthermore, as Flynn points out, the stage of technology may be an additional factor in the selection process:

"While uncertainty surrounded the staffing and employment decisions associated with the introduction of all types of technologies, adoptions of technologies in their early phases of development were particularly difficult in terms of human resource planning."
(Flynn 1985, 23/24)

How did companies fill the new job slots? According to Flynn's analysis, most firms upgraded the incumbent employees to perform the new, higher skilled tasks created by the technological change. There are two important restrictions to this statement: The upskilling rarely affected more than a small percentage of the workforce, and apparently
the late adopters of data processing technologies didn't follow that pattern (hiring outside workers with computer skills). Process automation and word processing technologies were usually staffed by "disrupted workers" (whose jobs were either eliminated or revised as a result of the technological adoption). Seniority played a key role in determining promotions in industrial companies, because most of these workers had job security guaranteed by union-management agreements. In contrast, early adopters of data processing technologies usually didn't promote the affected clerical workers, but filled the new positions by personnel recruited from other departments in the firm. This often drained key staff from the other areas.

"This fact, coupled with the greater availability of trained workers externally, resulted in later adopters recruiting the bulk of the workers to perform new, higher-skilled jobs from outside the firm."
(Flynn 1985, 24)

b) Training

Many social scientists studying the impact of microtechnology have underlined the importance of training for reaching a new match between labor and technology, by providing proper training for both the existing and the new work force of a firm (Zuboff 1985; Schuck-Bronsema 1983, 1985; OTA 1984; Sonnenfeld and Ingols 1986; Salzman 1985). Beyond this uncontested need for skill training in the narrow, technical sense, there is also concern about the individual worker managing the transition phase of his personal and work life. A need for further socialization, career planning and an adequate support structure is addressed to the firm adopting a major new technology. The literature on organizational
change provides many good and bad examples of the relevance of transition management going beyond simple training of new technical skills (Nadler 1981; Hirschheim and Feeny 1986; Liker et al. 1987; Storey 1987; McLoughlin, Rose and Clark 1985; Warner 1986; Adler 1986; Smeltzer 1986; Fisher 1986). The bottomline of this body of research is the message that the human input and the human–machine interface require at least as much attention as the purely technical aspects of the innovation, if a new balance between performance and (social) cost of operation is to be found. The issue of transition management will be discussed more extensively in the next section of this chapter. The point to be emphasized here, however, is that training has to be viewed as a strategic factor in a broader framework of organizational change for achieving the goals of any technological adaptation. The reader interested in the relationship between training and technological change will find a more detailed discussion of the topic in Appendix 1 of this study.

c) **Disrupted Workers**

"Relatively few of the disrupted workers ... were displaced from the firms. ... With the exception of the cases on data processing technologies, some of the disrupted workers were upgraded to perform the new, higher-skill demand created." (Flynn 1985, 28)

Most disrupted workers were absorbed by growth or replacement needs elsewhere in the firm. High employee turnover also helped. Voluntary quits, hiring freezes or temporary workers, liberalized retirement plans and severance pay are ways of dealing with disrupted workers.
d) Layoffs

In most of the cases reported by Flynn, the layoffs affected less than one percent of the firm's total employment. However, a plant closing or declining industries faced with technological change led to more substantial layoffs.

"When jobs were relocated to another geographical area, workers were usually given the option of transferring. If a long commute or a move was necessary, however, workers often refused the transfer. They were, therefore, laid off ... Layoffs also occurred when there was a lack of alternative employment opportunities in the community." (Flynn 1985, 30)

1.4 INNOVATION PROCESS

Having described the two main manpower effects of microtechnology and some of the relevant human resource policies for responding to these effects, this section focuses on the question of how to manage the introduction of a new technology. Two points have to be emphasized here. First, I insist on the assertion confirmed by most of the current research literature that there is no technological determinism contained in microtechnology but a real decision-making process shaping the outcome of the process (e.g. Walton 1982; Adler 1983; Buchanan 1982; Glenn and Feldberg 1977; Storey 1987; McLoughlin, Rose and Clark 1985).

"The effects of technological change are not determined by technology alone. That is, the design of the work system that accompanies new technology is a result, first, of choices made on the basis of value judgments and, second, of the characteristics of the markets in which these choices are made."
(Kochan and Barocci 1985, 75/76)
When analyzing a technological change process it is thus important to consider the underlying values of the decision-makers as well as the power structure of the organization and to recognize that both the design of the technology and the implementation strategy are the result of a choice (and thus subject to human judgment bias and errors).

Secondly, the literature on organizational change and knowledge diffusion consistently emphasizes the need for "transition management" (Katz and Allen 1986; Liker et al. 1987; Havelock 1969; Tushman and Nadler 1986; Hirschheim and Feeny 1986). Having decided about the type of technology and how to introduce it provides no guarantee at all that the actual outcomes will match the expectations of the initiators. There is uncertainty involved in any change process which requires feedback mechanisms, flexible strategies and sufficient time and resources to deal with the unexpected. This statement is of particular relevance for change involving microtechnology, because of the potential disruptive effects contained in it (Zuboff 1982). The following paragraphs outline the dominant model for introducing change in the work place (socio-technical systems; STS). This section will be closed by a discussion of some shortcomings of STS.

Socio-technical systems (Davis and Cherns 1975; Child 1972; Cooper 1972; Taylor 1975; Trist 1981) seek to optimize the match between workers' needs for a meaningful, challenging job and the technical requirements of the new machinery, resulting in a higher quality of product and, not infrequently, in greater productivity. STS theory
predicts that there will be less resistance to the technology in such a system. Is there just one optimum STS solution for any given combination of organizational structure, worker needs and type of technology?

"Evidence to date suggests that no optimal work system has emerged from new technologies ... The types of job structure that result from technological change will vary considerably with the individuals engaged in the design process."
(Kochan and Barocci 1985, 76)

"A number of studies have provided evidence of how the impact of sophisticated technologies can be mediated by managerial actions or attitudes. Wedderburn and Crompton (1972), studying continuous process technology in three plants owned by the same organization, highlighted the strong effects of individual management within the plants on the resulting skill demands of the jobs. Similarly, Hazelhurst, Bradbury, and Corlett (1969) studied relationships between numerically controlled machines and job characteristics, and concluded that policy decision on the part of management affect the skill demanded of the operators as much, if not more, than the technology itself."
(Davies 1986, 17)

Based on this discussion, it appears that the decision about the introduction of a new technology should not only consider technical or financial performance characteristics of the technology but also can and should be guided by "social policy" (Walton 1982) in terms of the STS theory. Kochan and Barocci underline the importance of such a procedure by summarizing the various implications of the decision:

"New technology sets off a chain reaction of effects. Changes in job design affect skill requirements, compensation levels and payment systems, promotion opportunities and career ladders, social interaction and communication patterns. Further, organizational structures (the number of supervisory and management levels and division of responsibilities), as well as employment structures (use of full-time or part-time workers, subcontractors, or permanent employees), undergo changes."
(Kochan and Barocci 1985, 76)
LIMITS OF THE SOCIO-TECHNICAL APPROACH

The first limit to the socio-technical approach relates to the managerial dominance of the decision-process, which is a deficient framework, especially in settings with strong labor union presence.

"... it is perhaps surprising to find that most of the change models described in the literature do not capture the dynamics of management-union interaction ... The models advanced largely accept management's prerogative to initiate and implement change, and participation is viewed only as an appropriate managerial strategy for overcoming resistance ... None of the models include a role for the trade unions, or discuss any unique features of organizational change involving unionized employees. In view of past trade union influence, and present union interest in microtechnology, such paradigms are obviously inappropriate."
(Davies 1986, 70-71)

To what extent this criticism applies to the case studies reported here will be determined later. A priori it is not obvious why labor union representatives couldn't be included in the decision-making process and thus be represented in the change model as well as any other social actor.

The second weakness of socio-technical systems is more practical in nature and has emerged over the past few years when STS people started to turn their attention from the social side of the model to the design of the technology itself.
"It (STS; note of the author) has proved very difficult to operationalize by designers who are working on novel projects. When applied to situations where no known solutions have yet been produced (and observation of and consultation with existing workers is not possible) the 'principles' of socio-technical design may be difficult to apply."
(Blackler and Brown 1986, 291)

... ... ... 

Starting with a discussion of the major manpower effects of technological change, Osterman's ILM employment systems and Flynn's job and training cycles have been introduced as a means for classifying various combinations of organizational goals and structure, technology characteristics and training requirements within several layers of internal and external constraints. For many of these combinations, it is possible to find empirical data (aggregate or in form of case studies) illustrating the contingencies of each category. Simultaneously, these data provide support for the need of transition management. Within certain limits, socio-technical systems theory seems an appropriate approach for answering this need.
CHAPTER TWO: TOPIC AND FRAMEWORK OF THE STUDY

2.1 GOAL OF THE STUDY

An increasing body of research describes the impact of information technology on the workplace of the eighties. The technical, organizational and social effects range from merely adaptive to fully disruptive. Secondary analyses of existing literature (Flynn 1986, Freeman and Soete 1985) show a wide variety of impact across industries. In addition to the general trends revealed by these studies, more work is required to capture the local contingencies which shape the technology flow in the firm. In this thesis, I seek a better understanding of these contingencies than has been the case to now. The goal of my study is to describe the introduction of a computerized, fully automated switching equipment in Phonecorp, a large U.S. telephone company. The analysis focuses on issues of human resource management involved in technological change, more specifically on training and selection of the new work force.

2.2 RESEARCH HYPOTHESIS

Many studies reveal that training is one of the most important success factors of technological change (see discussion in Chapter 1). The nature of information technology makes training especially crucial, because it often involves a shift from manual job tasks to more abstract control tasks (intellectual skills; see Zuboff 1985, Schuck 1986). In accordance with these findings, the research hypothesis of my study can be stated as follows:
The higher the degree to which qualification issues of the work force are taken into consideration in the planning and implementation of technological change, the higher the probability that the new technology will achieve its goals.

2.3 RESEARCH STRATEGY

It is impossible to test the causal relationship of the hypothesis by using an experimental design in a laboratory setting. The complexity of the topic excludes any reductionist approach. Thus, I don't see a way to actually test the hypothesis empirically. The next best level of analysis, then, would be to describe actual examples of technological change to supply an illustration of the hypothesis and some exploratory data to further refine it.

Accordingly, I chose to conduct a number of case studies for which the technology factor could be held constant, while other factors, i.e. training of the work force, would vary, ranging from a marginal role to a fully structured and well integrated element of the implementation plan.

2.4 CASE STUDIES

Building on an earlier study by Michael Morley, I decided to analyze the implementation of FACS (Facility Assignment and Control System) in Phonecorp\(^1\), a large U.S. telephone company. FACS is a computerized, fully automated information system for connecting new customers to the telephone network. The same FACS equipment has been

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\(^1\)The names of organizations, individuals and locations have been changed by the author.
introduced stepwise in nine local Loop Assignment Centers (LACs; where all the order processing for assigning new telephone lines is done). Most of the centers which introduced FACS early in the process, experienced serious problems of various kinds during the transition. Insufficient training of the new LAC operators proved to be one of the major reasons for delaying the process and for missing the performance goals set by the plan. On the other hand, most of the centers that introduced FACS later had a smooth, fast, and efficient conversion because the major critical factors of earlier conversion projects were better accounted for.

For comparison, I chose one LAC of the early FACS conversion phase, URBAN 1, and one of the latest series, RURAL 3. Thus holding technology constant I can compare the outcomes under the hypothesis that differences in performance can be related to different implementation strategies. That's where selection and training of the new work force appear to play a significant role.

2.5 CONCEPTUAL FRAMEWORK

This study doesn't try to come up with empirical evidence in support of any causal model of technological change. On the other hand, choosing a descriptive analytical approach doesn't mean that no theoretical reflections could be included at all. In a first step I use the case study approach to simply describe one particular example of technological change. In a second step, however, I will discuss my findings in the light of the existing literature as reviewed in Chapter 1.
As a consequence, some kind of a framework has to be designed for structuring data collection and analysis. Such a framework has to satisfy two goals: a) the data collection should not be overly limited by the underlying normative assumptions of the framework; b) the data should be put in a format allowing a comparison with other studies.

One convenient and conventional way to look at any change process is to define it as a problem-solving cycle and to organize it in chronological order. Usually, the process can be divided into several steps like (1) need analysis and problem diagnosis, (2) search for and creation of solution, (3) application, (4) evaluation of outcomes and feedback (e.g. Benne 1961, Lipplitt et al. 1958, Miles 1964 and Watson 1967). In this study, there is less emphasis on the first two phases and focus on the implementation aspects. Thus, the problem diagnosis and search for solution is summarized under one heading, while technological change is considered as a process involving three phases: choice of technology, implementation, and assessment of outcomes. For each of these phases, a number of dimensions have been identified which – according to the literature – bear special significance for the change process and on which the analysis will concentrate. The following chart presents the three phases and their analytical dimensions.
This simple chronological framework identifies in general terms the critical dimensions of the analysis. However, more specific directions for data collection are necessary, because the categories used so far are too broad. Fortunately, researchers of human behavior have made significant contributions in this area over the past two decades. Based on their work a more detailed structure for analysis can be developed. There are two diagnostic tools which seem particularly appropriate for the purpose of this study. The first, Havelock's Linkage Model, takes the chronological order of the problem-solving cycle and, for each stage, addresses the critical factors shaping the relationship between supplier and user of knowledge (in general) or technology (as a particular case). The second, Nadler and Tushman's Congruence Model, doesn't have a chronological perspective but focuses on organizational arrangements facilitating/inhibiting technical innovation. It thus allows for a good discussion of human resource policies used in the process because it makes the critical HRM elements more explicit than Havelock's Linkage Model. The general
characteristics of both models are described in Appendix 2 of this report.

The planning and implementation of the FACS project will be analyzed based on Havelock's linkage model and Tushman and Nadler's congruence model. The analysis will focus on those elements and relationships which strengthen or weaken the effectiveness of the innovation process and determine the outcomes of the project. In addition to such a general discussion of technological change, closer attention will be paid to those human resource policies which were used by management to facilitate the change process. In particular, their impact on employment and qualification of the work force will be examined. Putting all these elements together leads to the framework represented on the next page.
The model is divided in five vertical segments. The first two of them, Inputs and Organization, capture the relevant organizational characteristics in accordance with the congruence model. Within the organizational dimension, the focus is on one sub-system, i.e. Human Resource Management. Three aspects of the company's HRM are of interest for the purpose of this analysis: Characteristics of the work force in the terminology of the Internal Labor Market, the structure and strategy of the Training Department, and the company's HRM policies related to technological change. The remaining three segments are located on a time axis. Together, they describe the implementation process, starting with the adoption decision, moving to the actual implementation phase, and closing with a three-dimensional assessment of outcomes. This part of the framework draws heavily from Havelock's Linkage Model. The definition of the outcomes bins are based on the literature on microtechnology-driven change. The analysis of the implementation process pays special attention to the HRM strategies used and the involvement of the training people.

From this framework, I derived a catalogue of research questions, summarized in Appendix 3, which also contains a short description of my sample and the instruments I used for collecting and analyzing my data.
CHAPTER THREE: THE COMPANY

The descriptive part of the analysis starts with the organizational characteristics of Phonecorp, the company in which the technological change took place. (To be precise, the case study is located in Telco, one of the two subsidiaries of Phonecorp). Using Nadler and Tushman's congruence model there will be a brief discussion of the four input factors, the elements of the transformation process, and the fits among them. The second section of this chapter presents some aspects of the human resource system applied by Phonecorp: the Internal Labor Market model, the corporate training strategy and structure ("Human Resource Development"; HRD), and a word about the relationship between Phonecorp's HRM policies and technological change.

3.1 PHONECORP: ORGANIZATIONAL CHARACTERISTICS

The congruence model contains three major input factors which determine the core mission and business strategy of a firm. These factors are the environment, history and resources of the firm.

a) Input Factors

The recent history of Phonecorp is marked by two major events: the deregulation of the telephone industry and the split-up of AT&T in 1984. While the break-up of AT&T brought a fundamental change in the formal organization and the culture of the firm, the partial deregulation
of the telephone industry led to a major change in the economic environment to which the business strategy had to be adapted. The environmental change had two strategic implications:

- **Competition**
  Phonecorp now had to compete with other telephone companies for part of the services they offered. On the other hand, a regional telephone company was excluded by law ("Judge Green") to compete on certain markets.

- **Accelerated Technological Innovation**
  The deregulation of the telephone industry happened in a moment, when the telecommunication sector was undergoing a revolutionary change as a consequence of information technology. New materials, higher performance, more complex equipment, the substitution of analogous by digital signal technology led to a completely new business environment. Stability was one of the major characteristics of Ma Bell's services over the past 100 years; today, there is continuous change in equipment, product and services as a basic determinant of the telephone business.

The break-up of AT&T led to the creation of seven independent regional telephone companies. One of these is Phonecorp, a corporation composed of two wholly-owned subsidiaries, Belco and Telco, and corporate headquarters, the latter providing basically strategic orientation, resources and support to the two subsidiaries. As regional telephone companies the two subsidiaries are the actual business units of Phonecorp. One of them, Telco, has almost 50,000 employees and more than $13 billion in assets. Telco serves about 8.5 million telephone lines, generating an annual revenue of $6.2 billion in 1986. Telco and Belco cover different geographical areas which are also very distinct markets: Belco's customer base is more rural and has relatively low economic growth, while Telco's market is growing fast (especially in two areas: Bobtown and Corda State) and mostly urban.
RESOURCES

Telco's work force is well paid, well trained and mostly unionized. Many employees have a long relationship with the company, providing an element of stability and predictability to the company's business planning. Another element of strength in the company's resources is its technological history. Already in the old days under AT&T, Telco (under its old name and identity) provided trial sites for many new products and equipments developed by AT&T; the specific mixture of customer base and equipment installed made Telco a good test candidate. Thus, Telco accumulated a good record in technological innovation, and both employees and management developed a feeling of pride about it.

VALUES, MISSION, AND GOALS

The relationship between Telco and Belco has an interesting history. Thirty years ago, the two companies worked as a united branch of AT&T. In the early 1960s, they were split into two independent units. The break-up of AT&T brought them together again, creating a somewhat ambiguous situation for management and employees of the new corporation. There are some important differences between Telco and Belco, in terms of operating procedures, business environment and culture. Thus, Phonecorp management has to put in a lot of effort to adapt the two organizations to a new, common corporate culture. In 1986, a major PR plan has been implemented in Phonecorp to make the new corporate values explicit, show their relationship with the traditional core values of the two companies, translate them into goals and strategies and communicate this information in form of a little booklet.
and a one-page value statement to all employees. Top management tried
to play an active role in transmitting these values. Building on Phone-
corp's core values, Telco management has defined the company's mission,
goals and strategies. The following table summarizes the key elements.

**PHONECORP CORPORATE VALUES**

Customer First
Respect For The Individual
Pursuit of Excellence
Positive Response To Change
Community Mindedness

**MISSION:**
TO BE THE INFORMATION SERVICES PROVIDER OF CHOICE.

**TELCO CORPORATE GOALS**

1. Financial: Achieve a fair rate of return ...
2. Service: Satisfy customers through the timely, courte-
teous and cost-effective provision of products and
services.
3. Marketing: Be the information services provider of choice
...
4. Human Resources: Maintain a competent, fully produc-
tive, properly sized and competitively compensated
employee body committed to company goals and respect
for each other.
5. Corporate Citizenship: Do our full part in communities
we serve ...
6. Technology: Provide an economically integrated mix of
existing and new technologies to meet customer expecta-
tions and enhance our marketing and cost reduction
efforts.
7. Regulatory/Legislative: Initiate actions which promote
the service, financial and community interests of our
customers and share-owners and smooth the transition to
a competitive marketplace.

(Source: "Teamwork - to be the best there is", Telco
internal document)
Several points need to be underlined in this statement.

CUSTOMER AND SERVICE FOCUS

Telco wants to be a market-driven company. Profitability and customer satisfaction are the two most important strategic objectives by which other goals are supported as well, e.g. push for more pricing flexibility/less regulation. The slogan "To be the best there is" reflects how Telco wants to achieve this goal. These objectives are formulated at such a general level that it is difficult not to agree with them. Who wouldn't want a company which is profitable, seeks customer satisfaction and searches for leadership in its industry? On the other hand, the actual implementation of these objectives requires a translation into strategies and practical guidelines. If the means of achieving such objectives have to be made explicit, there will be decisions to be made about the relative importance of each goal in a given conflict of interests. Whether financial considerations, customer relationships or other goals will be given priority is an open matter at this point.

COST AND EFFICIENCY FOCUS

There are several strategic options to become number one in the market (see Porter's work on competitive strategy). Telco's choice is somewhat ambiguous. While management tries to minimize operating cost, they also want to maintain a high skill work force and state-of-the-art technology. It is not clear, which objective would prevail in a decision where the goals are conflicting with each other.
HIGH SKILL WORK FORCE

According to the value statement above, Telco's management wants a well qualified work force as well as competitive wages and benefits. In those areas where Telco is recruiting, the company is viewed as paying rather high wages. Does this statement mean, then, that wages should be maintained, increased or lowered? Strategy D emphasizes a participative management style.

STATE-OF-THE-ART TECHNOLOGY

The commitment to high technology builds on previous positive experience in this area. As of today, technology is a factor of major importance in an increasingly competitive environment. Telco's technology strategies emphasize flexibility and cost reduction. Implicitly, this statement makes an argument for a high skilled work force, capable of adopting a new technology quickly and making an effective use of it.

.......

To conclude the discussion of the input factors, what are the external determinants of Phonecorp’s operations? I see three major aspects in deregulation, the break-up of AT&T and Phonecorp's history. First, an newly created corporation assumes full responsibility for its own operations and gains full control over its resources while management needs to build a new identity and corporate culture, blended from two previously autonomous and somewhat different companies. Secondly, the move from a stable into a relatively competitive and faster changing
business environment requires a reformulation of the core mission without losing former strengths of the company. Top management shows clear commitment to a set of new values while maintaining older ones (customer service orientation and respect for the individual in the company), adapted to the new environment. Thirdly, a well qualified work force and a strong technological background are the major resources of the company. According to an internal survey among middle and upper level managers in 1986, both Phonecorp's and Telco's managers rated "dedicated/trained employees" as the number one strength of the company. In a summary of remarks presented at the Annual President's Conference in 1986, Telco's President Mark Miller reemphasized "the company's desire to remain a technological leader in the communications marketplace".

b) Organizational Components

TASK AND WORKER CHARACTERISTICS

Phonecorp is one of the ten biggest employers in the United States. Its basic mission, namely to provide telephone/telecommunication service to the customers, includes a wide range of jobs and tasks. The 1986 agreement between Telco and Communications Workers of America (CWA) enumerates 76 job titles ("employee titles") in 23 wage scales! In my case study, I limit my analysis on one particular segment of the entire telecommunication operations, namely the assignment process of telephone lines. Therein, only three non management job titles and pay
grades will be considered. A more detailed description of the assignment process is presented in Chapter 4 and Appendix 5.

Generally speaking, a telephone line assigner worked at two different levels of complexity:

- The Assignment Clerk (AC) processed incoming orders, looked up the required information in big data books, checked incomplete orders, transferred correct orders further down the line, and updated the customer and facilities records.

- The Plant Assigner (PA) worked on more complex orders, requiring changes in outdoor equipment (e.g. a new cable to a new customer address), and worked closely with the engineering staff who designed the plans.

The pay grades of the two job titles differ accordingly: In 1986, the AC received an average weekly wage of $327.50 (Wage Scale 14), while the PA gained on average $420.25 per week (Wage Scale 32). The old AC work contained a lot of routine, while the PA work required the ability to read engineering work orders which were sometimes very complex, and was in general performed by employees who had a lot of experience and high seniority. The Plant Assigner was a top level craft job title which provided a lot of independence to the employees; the PA work performance was difficult to monitor.

Telco's customer base grew a lot over the past twenty years. The traditional way of coping with the increasing number of new line orders was to add new people to the assignment process. For the last ten
years, however, this strategy became less and less efficient because a) the absolute number of lines led to very complicated organizational structures which were costly and difficult to manage, and b) the complexity of the lines increased dramatically, especially in the metropolitan business customer segment (e.g. toll-free lines, in-house switching units). To maintain a sufficient level of customer satisfaction in terms of order processing time and error rate, a new approach to the assignment process became necessary. The introduction of mechanized equipment provided a solution to this problem. It led to dramatic changes in the assignment job of both the assignment clerk and the plant assigner (see Section 1 in Chapter 4 and Appendix 8).

INFORMAL ORGANIZATION

As mentioned in the previous section, Phonecorp is a new organization, created to operate in the deregulated telephone business of the 1980s. Top Management started a large-scale effort to communicate their vision of the new company and its core mission and values to the employees. In accordance with this effort, the VP of Telco's main operating division, gave a good example of leadership in formulating and implementing technological innovation and cost reduction strategies in his area of responsibility. Middle level managers who tried to push in this direction got his strong support. The workers union adopted an open strategy towards technological change by negotiating formal joint procedures for the introduction of new equipment and process technology. The emphasis of their strategy was on protecting the workers affected by the change. The 1986 union-management agreement illustrates
this mutual commitment and enhances a positive climate for change which pays "respect for the individual". All these factors contributed to initiating a slow, but steady change of the traditional, very stable perception of work. Thus, the general climate became increasingly open to technological change which was viewed as inevitable and generally had a positive value attached to it. Such a process, however, takes a lot of time and faces a lot of resistance in an organization with 50,000 employees and a long history of successful stability.

FORMAL ORGANIZATIONAL ARRANGEMENTS

A detailed description of the work organization, job design and work environment in the assignment offices will be given in Chapter 4. At this stage of analysis, two observations with respect to the formal organizational structure can be made. First, Telco's operations are divided into nine regional districts which are headed by relatively autonomous district managers. In the non-mechanized world, there were several assignment offices within each district, totalling to 52 offices before FACS was started. Secondly, the division of labor and responsibilities between corporate headquarters' staff and Telco's line management was not always very clear, changed over time and was subject to some serious communication problems in the FACS case. These difficulties and ambiguities are not related to the nature of the technology or the implementation process, but are inherent in the reorganization effort of Phonecorp after the break-up of AT&T. In this analysis, it was not
always possible to determine whether a particular problem was mainly due to such structural causes or derived from the innovation process.


Before we turn our attention to Phonecorp's human resource management system, let's briefly evaluate the fit between the elements of the congruence model. In the stable environment prior to deregulation, Telco's work force had relatively high seniority and low turnover rates for most jobs. This seems to indicate that there was a certain amount of convergence between workers' and organizational goals. The fit between task and organization in the assignment process was initially good but deteriorated as the business grew faster and more volume had to be handled. The increasing mismatch led to a major reorganization of the assignment work, requiring efforts to achieve a new fit between workers, task and organization. The change introduced by FACS was more than just a minor adaptation. It was disruptive by its nature, involving all elements of the organization. This is the starting point of my case study. The next chapter will show how Telco's management handled the change process and whether they succeeded in establishing a new stable and congruent balance in the assignment work process.
3.2 HUMAN RESOURCE MANAGEMENT SYSTEM

a) Telco's ILM Characteristics

As showed in Chapter 1, Osterman (1984, 1987) classifies internal labor markets of large organizations into four categories with specific characteristics. Applying this framework to Telco, an ILM profile of Telco's work force can be built (see Appendix 4). According to this profile, Telco's internal labor market seems to be in a transition phase, moving away from a purely industrial form towards the salaried model. Thus, the internal consistency of the model is shaken up, some elements serve conflicting goals, e.g. the seniority-based compensation system and the deployment and promotion criteria. Similarly, the complex job classification structure puts a heavy price tag on any change of job definitions and work designs. Future change in the business environment will probably push Telco's ILM even further towards the salaried model.

b) Human Resource Development For Non Management Jobs at Phonecorp/Telco

Phonecorp provides extensive training programs for more than 70 non management (=craft) job titles. The Human Resource Development (HRD) Function has been formally centralized as a corporate service in Phonecorp but is geographically spread over nine states. HRD consists of two basic operations: Course Development and Instruction/Training. For the engineering jobs, training and development are organizationally united, while they are functionally split for the craft jobs (much more
Job titles and people to be trained in the latter jobs). In this study, only HRD of craft jobs will be considered, while engineering jobs and management development programs are excluded from the analysis.

There are a number of critical issues in HRD today:

TEACHING QUALITY

The regional learning centers are autonomous with respect to their teaching activities. There is no central quality control with unified standards which would assure a sufficient and similar quality level of teaching across all centers/courses/instructors. There is also variation in the number and sequence of courses an instructor has to teach. If there is a big demand for a specific course, a learning center manager has an interest to schedule courses densely to maximize output. This may sometimes lead to excessively high teaching loads, a problem to which an instructor can respond by shortening the course or by using a more superficial teaching style to manage his forces. Clearly, such consequences are dysfunctional and limit the effectiveness of the learning effort.

COURSE DEVELOPMENT FOR NEW TECHNOLOGIES

It is sometimes very difficult, or even impossible, to generate good instruction material for a course training employees on new equipment. Often, there are no job analysis data available, there are only a few subject matter experts (who are tied up in technical consulting), and there is a strong time pressure on the course developer to produce the badly needed user training material. In addition to these potential problems, in many cases, technology changes so fast that basic and
updating training can't keep up with the pace. Managers sometimes tend to evaluate the time needed to introduce a technological innovation by the availability of the equipment, material and manpower, neglecting the time it takes to match these elements before the whole process becomes more productive. However, this lead time is of critical importance in situations where the technology is new and the change implied is disruptive in nature. The FACS project provides a good illustration of such a case.

**COMPLEXITY OF THE HRD SYSTEM**

Phonecorp is a very young organizational arrangement. At the time I was conducting the case study, not all functions were designed in definite ways, there was a lot of experimenting going on to find a satisfying structure for splitting the work between corporate head-quarters and Telco. This also involved changes in the training system, e.g. relocation of the whole FACS course development staff. Such moves are not just a simple trial and error process where quick adaptations are possible. The sheer number of actors involved in the HRD function makes it look more like a driving lesson on a super tanker where even a sharp curve takes two miles to be executed!

c) **Telco's HRM policies and technological change**

Having described the organizational characteristics of Phonecorp and Telco, including a more detailed look at Human Resource Management and Development, the final section of this chapter contains some observations of how technological innovation is reflected in Telco's HRM
policies. These remarks are based on the 1986 labor agreement between CWA and Telco. The perspective on technological change underlying this contract can be summarized by three principles:
- YES TO TECHNOLOGICAL INNOVATION
- NO TO LAYOFFS
- YES TO DISPLACEMENTS

Both parties recognize technological change as a necessity for staying successfully in the telephone business. The contract stipulates several procedures for minimizing the negative effects of an innovation process involving a reduction of the work force. A Technology Change Committee (TCC) with an equal number of union and management representatives makes recommendations about alternative employment, applicability of various HRM force adjustment plans, and training provisions to be implemented in any major technological change. Employees involved in such a change are declared "surplus", a status with specific privileges like priority in job-biddings, participation in a Career Continuation Plan, eligibility for job displacement training, pay protection plans, termination allowances or early retirement plans.

When filling job vacancies, Telco's management has the right to ask all applicants to take a job-related test. Only those applicants who successfully pass the test have to be considered when staffing a new job title. Such a test has been excluded as a topic for the bargaining process. It can only be challenged by the Union through the grievance and arbitration procedure. This is an important step away from a purely seniority-based towards a performance-based deployment system. It is of
special importance for new job titles to be introduced in "technological changes in equipment, organization or methods of operation", because the new technologies often require completely new skills which incumbents in the existing jobs may not necessarily master. It is not always true, however, that management makes full use of this right. In some cases, especially in an early phase of transition, management accepts both seniority and performance as coexisting selection criteria, because there is a need for employees with subject matter experience regardless of their skill level in using the new equipment.

Phonecorp is a large corporation with two relatively independent operating units and a corporate staff which is funded by the two operating companies. The deregulation of the telecommunication industry has brought about major changes in the environment (new competitors moving into the market), while technological progress produces a lot of pressure for innovation. These forces put a heavy burden on the relatively young organizational structure of Phonecorp. Management has to deal with a mostly well trained work force with rather high seniority. It is represented by a powerful labor union which has a long record of good relationships with management. At an increasing pace, technological innovation leads to changes in the workplace to which the workers have to adapt if they want to keep their job. They have to learn new skills for new jobs or old jobs to be done in new ways. In addition, Phonecorp's management is determined to keep operating cost at the lowest
possible level. A major way of achieving this goal is to exploit the potential for labor savings contained in information technology. For the workers, such a policy translates into a double pressure: be ready to learn for a new job and/or expect to do the same/higher volume of work with less people. The informal organization – corporate culture – can be a powerful factor in such a change process. The following chapters of this report give an example of how and to what extent Phonecorp's management succeeded in using this factor as a facilitator to bring about technological and organizational change while maintaining respect for the individual employee, as is claimed by the corporate value statement.
CHAPTER FOUR: THE TECHNOLOGY

Having described in some detail the organizational characteristics of Telco in the last chapter, I now turn to the second element of the change process: the technology. This chapter briefly explains the essential features of the task, i.e. the assignment of new telephone service, to be mechanized by the technology, and concentrates in Section 4.2 on the adoption decision and the planning process. The chapter ends with a short, preliminary evaluation of the general outcomes of the project. More detailed explanations of technical terms and a short history of the FACS technology are presented in Appendix 5.

4.1 ORGANIZATIONAL CHARACTERISTICS OF FACS

This case deals with FACS (Facilities Assignment and Control System), a technology used for connecting new customers to and disconnecting old customers from the telephone network. These transactions are defined as assignment process and - for a new customer service - start with the order in-take by the customer service unit and end with the actual connection of the line assigned to a new number. The physical location where the service orders are received from customer services and processed is the Loop Assignment Center (LAC). A LAC accomplishes four basic operations:

- assign appropriate facilities to orders received from customer services (e.g. telephone number, central office and outside lines)
- build and maintain records of the telephone equipment outside the central office (Outside Plant; OSP), e.g. cables, customer addresses, remote switching equipment
- administer maintenance of these facilities (restore interrupted service)
- convert OSP jobs to work instructions for construction forces.

These four operations were handled by two types of employees:
- Plant Assigner (PA), a top-level craft job (25–30% of the total LAC work force)
- Assignment Clerk (AC), a middle-level craft job (70–75% of the LAC force).

The Plant Assigner did the more complicated work, i.e. handling engineering work orders (EWO) for OSP jobs, requiring more assignment experience and additional skills. The Assignment Clerk’s job was divided into more specialized segments of the assignment process (see Chapter 3). There was not a high mobility of ACs between these specific tasks, thus the work was fragmented and the tasks tended to be repetitive.

Technically speaking, FACS is just an intermediary step in the mechanization of the assignment process. The next phase is already in the planning stage (a system called SWITCH, aimed at replacing COSMOS; see Appendix 5 for more details). Over the years, the introduction of new assignment technology has led to massive organizational changes, as can be illustrated by the characteristics of the assignment process at three points in time: In 1980, service orders were processed in the backroom of more than 100 business offices spread over the area of four states. In each office, the chain of tasks was complete. The general structure of the assignment operation was thus highly decentralized. It was also very labor-intensive, but sufficiently fast and accurate for the current order volume. In 1984, there were only some 50 assignment
centers left, occupying about 30% less operators than in 1980 and processing a higher volume of orders at a faster speed than in 1980. The work was still divided into very specialized functions executed by employees in two job titles with different pay and status levels. The volume of incoming orders grew every year and the work flow became increasingly difficult to manage. Both factors, increasing transaction volume and reduced staffing, put employees and supervisors under a lot of pressure. - In 1987, nine mechanized LAC offices employed less than 50% of the number of operators in 1980, handling at least 20% more service orders than back in 1984. The office environment is dominated by computer-equipped work stations, the noise of printers interferes with soft background music and gentle laughter of the mostly female operators. The mountains of paper (computer print-outs and hand-written records) have not completely disappeared, but they have shrunk to little 2-inch hills aside the keyboards and video screens.

This little comparison illustrates some key characteristics of the mechanization process:

CENTRALIZATION
The number of offices decreased dramatically from more than 100 to 9. Accordingly, the job opportunities have moved away from many small localities.

DOWNSIZING
Compared to the manual office, there are less people in the mechanized office, handling more work and providing faster service with less errors to the customer and maintenance worker in the field.

WORK PERFORMANCE AND CONTROL
A computerized network of work stations gives full control over the distribution of the work and allows real-time individual and collective performance monitoring.
STANDARDIZATION
Manual intervention is reduced to the handling of exceptional cases. FACS asks for operator help by issuing a RMA (Request for Manual Assistance) whenever it cannot process an order according to its standard procedures (e.g. because of non-matching or missing information).

JOB TASKS
Having automated the processing of routine transactions, a mechanized LAC leaves more time for other job tasks: field assistance, problem-solving group (handling questions and complaints from other departments), database maintenance, or engineering work orders (the traditional specialty of the Plant Assigner and still a task requiring special skills).

4.2 TELCO AS A FACS USER

ADOPTION DECISION

FACS is not a stand-alone product which was bought by Telco to improve operational efficiency by a single piece of technology. Rather, FACS is a logical step in a sequence of technological innovations introduced by Telco since 1980 to mechanize the assignment process.

With respect to the adoption decision, this situation carries some very specific features: Telco's management had clearly articulated needs to be matched by the product. They had accumulated several years of mechanization experience in the assignment operation and other areas (e.g. the maintenance centers which handled customer complaints). Most of this experience was positive (in terms of technical performance and financial results) or had at least provided a learning opportunity in human resource issues. There was not a fundamental resistance against technological change among managers or employees. Criticism against the project had a technical focus, addressing issues of hardware performance or conversion schedules but not the general desirability of the product.
itself. Even under very conservative assumptions, FACS was a profitable option compared to the present state of affairs.

In addition to the favorable internal conditions facilitating the adoption decision, there were also some external factors which supported the purchase of FACS. Telco had a long-lasting relationship with the supplier. In fact, Telco had already bought COSMOS from Jingles, and PREMIS/LAC was developed in a joint venture between Telco and Jingles. Although a relatively advanced technology, FACS was already implemented (at least in a trial stage) in other telephone companies, e.g. Belco was the first FACS test site chosen by Jingles in 1981.

FACS PROJECT GOALS

In 1983, the FACS Project Letter established the following goals for the project:

"The overriding objective of this project is to deploy a system which mechanizes, to as great an extent possible, the processing and assignment of service orders in the LAC environment. Specific objectives to be met, if all economic benefits are to be realized by this project include:
1) 90-95% Service Order Flow Through (SOFT) in the LAC. That is, service orders which flow into and out of the LAC without any human intervention.
2) Automate common update capability between LFACS/COSMOS and other mechanized systems such as LMOS and PREMIS.
3) Capacity levels equal to those projected in AT&T planning guidelines for both Sperry Univac and COSMOS/WM systems.
4) Sperry Univac 1100/90 series hardware being available in time for deployment in Telco (10/1/84).
5) The availability of a Standard Product Line (SPL) operation system in Sperry Univac systems which will allow for operation on the Telco Data Network with TOP/X.25 protocol.
6) LAC Force savings of at least 70% over that of a P/L environment. This projection is approximately 4% higher than AT&T guidelines and is a result of Telco's LAC consolidation plans."
Two things in this goal statement capture special attention: (a) The project has a strong technical focus, four of the six objectives are related to hardware and software improvements contributing to the automation of the assignment process. (b) The main economic goal is expressed in terms of cost savings through downsizing of the LAC work force.

ECONOMICS OF THE PROJECT

The project letter indicated a long-term rate of return of 48.7% of the project. The net present value of the project (calculated over a period of 15 years) was an estimated $118.4 million. The breakdown of the costs and expenses is given in the next table. More than half of the project cost stems from the purchase of hard- and software. Almost 5% of the total cost ($4.1 million) was planned to be spent on the training of the new work force and the conversion teams.
CAPITAL COST AND OTHER EXPENSES OF THE FACS PROJECT
(000's of $)

<table>
<thead>
<tr>
<th>CAPITAL COST through 1987</th>
<th>41,800</th>
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</thead>
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<tr>
<td>Breakdown:</td>
<td></td>
</tr>
<tr>
<td>- FACS Computers</td>
<td>32,000</td>
</tr>
<tr>
<td>- COSMOS Computers</td>
<td>3,700</td>
</tr>
<tr>
<td>- Work Managers</td>
<td>2,400</td>
</tr>
<tr>
<td>- Terminals</td>
<td>1,300</td>
</tr>
<tr>
<td>- Buildings</td>
<td>1,200</td>
</tr>
<tr>
<td>- Furniture</td>
<td>800</td>
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</tbody>
</table>

<table>
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<tr>
<th>EXPENSES through 1987</th>
<th>49,900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakdown:</td>
<td></td>
</tr>
<tr>
<td>- Data Conversion</td>
<td>24,300</td>
</tr>
<tr>
<td>- Conversion/Support</td>
<td>11,000</td>
</tr>
<tr>
<td>- Area User Training</td>
<td>2,800</td>
</tr>
<tr>
<td>- Corporate Training</td>
<td>1,300</td>
</tr>
<tr>
<td>- Hardware Purch./Leas.</td>
<td>8,600</td>
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</table>

IMPACT ON THE LAC WORK FORCE

The net employment impact was a big reduction of the LAC staff. During the conversion phase, however, a number of additional people had to be hired to transfer the records into FACS.

"FACS will require approximately 228 additional people in November 1984 and a peak level of 236 in the second quarter of 1986. Force reductions will begin to materialize in 1985 and net savings on the order of 1,100 people will be realized by 1988, six months after deployment ends." (Summary of FACS Project Letter, 1983, p.3).

The graph on the following page visualizes the assumptions of the project proposal. Working under the current conditions would have translated into an increase of Telco's LAC staff (non-management) from
LAC WORK FORCE

ESTIMATES FROM PROJECT LETTER, 1983

- WF UNDER OLD SYSTEM
- WF UNDER FACS
- ACTUAL NUMBERS
- LATEST PROJECTIONS
1,646 in 1985 to 1,919 in 1989, whereas FACS was expected to lead down to a force size of 473 people in 1989.

Telco's management had a good relationship with CWA and planned the downsizing in accordance with the labor agreement. They had come to the conclusion that no layoffs were necessary to adjust the number of employees to the number of assignment jobs available. Timely notification of employees about the close-down of a LAC (at least six months in advance), an early retirement incentive plan for people with high seniority, lump sum payments for quitting employees, generous relocation support, pay protection and training programs, were among the benefits offered to the manual LAC employees.

SELECTION AND TRAINING OF THE FACS OPERATORS

Between 1984 and 1986, Telco recruited mainly employees from the manual LACs for the new job. Since most of the PAs were typically older employees who had been with Telco for many years, they were particularly eligible for the early retirement incentive plan. Many of them made use of this opportunity, especially because the new job required new skills and broke with many of the work habits they had been used to. Accordingly, the work force in the new LACs had a lower percentage of PAs than the manual offices (for example, by the end of 1987, only about 10% of the LAC staff in RURAL 3 were former PAs).

CONVERSION SCHEDULE

In the project letter, Telco used Jingles' working assumptions for implementing FACS without major modifications. According to these data,
Telco expected to have 1.2 million lines (13.8%) converted by August 1986, 5.7 million lines (65.5%) by August 1986, and the total 8.7 million lines converted by the end of 1987. The 52 manual LACs would be converted in a staggered design. In such a way, the more than 200 people working in the corporate conversion teams would have a distributed workload over the whole period.

A SHORT EVALUATION OF THE GENERAL OUTCOMES

To what extent have the objectives of the FACS project been achieved? The hardware and software related objectives have been met, though in a somewhat different configuration. Efforts to achieve flow-through and downsizing of the LAC force are still under way. After the first new LACs had been opened and actual conversion started, experience showed that the objectives of the work force downsizing could not be reached. It became clear that it would take longer to convert to FACS and that it would take more people to operate the new centers. Accordingly, the work force objectives were closely monitored and corrected several times during implementation. The whole mechanization process has been delayed by almost two years. The projected performance goal is still achievable, and data of the past 12 months show that it will eventually be reached in early 1989. In Chapter 5, the technical outcomes and manpower data of the project will be presented in more detail.

The extended implementation phase reduced the potential benefits of the project. I don't have accurate financial numbers about the impact, but already a very rough calculation of lost potential salary savings may
give a very conservative estimate of the order of magnitude. The following table compares the planned to the actual/estimated number of LAC employees and managers between 1985 and 1989. Expressing the difference between the two series in manpower years, one can put a price tag on the extended conversion (based on a yearly loaded wage of $30,000 per FAS and $45,000 per manager).

**DIFFERENCE BETWEEN ACTUAL AND PLANNED LAC STAFF**

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<tr>
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<tbody>
<tr>
<td>PLANNED</td>
<td>FAS</td>
<td>1,208</td>
<td>638</td>
<td>441</td>
<td>457</td>
</tr>
<tr>
<td>MGT</td>
<td>199</td>
<td>109</td>
<td>81</td>
<td>83</td>
<td>87</td>
</tr>
<tr>
<td>ACTUAL</td>
<td>FAS</td>
<td>1,390</td>
<td>1,302</td>
<td>1,133</td>
<td>797</td>
</tr>
<tr>
<td>MGT</td>
<td>229¹</td>
<td>222</td>
<td>208</td>
<td>145</td>
<td>121</td>
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<tr>
<td>DIFFERENCE</td>
<td>FAS</td>
<td>182</td>
<td>664</td>
<td>692</td>
<td>320</td>
</tr>
<tr>
<td>MGT</td>
<td>30</td>
<td>113</td>
<td>127</td>
<td>62</td>
<td>34</td>
</tr>
</tbody>
</table>

Neglecting fancy calculations like NPV, one arrives at roughly $78 million of additional salaries (= the sum of man-years in lines 5 and 6 multiplied by the loaded salary factors). The projected savings of the FACS project would thus be reduced by this amount ($164 - $78 = $86 million). With remaining savings of $86 million in salaries alone (neglecting all other benefits of the project, e.g. potential for future automation projects and enhanced performance), the project still offers a satisfying payback.

¹My estimate, based on the management/craft ratio of planned numbers.
The mechanization of the assignment process was the main goal of the FACS project. Telco's management wanted to achieve as high a degree of automation as possible in order to respond effectively to the increasing volume and complexity of the telephone business. The FACS technology required capital investment and other expenses of more than $90 million, while the net benefits, derived mainly from the reduction of the work force, were projected to be in the neighborhood of at least $85 million. The FACS project affected the labor force of the assignment centers in two dramatic ways: reduction of the number of employees by at least 50% over a period of four years, and shift from a paper-and-pencil to a fully computerized work environment. When Telco decided to buy FACS, the technology hadn't been field-tested for an extended period of time. Thus, empirical data about the system's performance and manpower requirements were very limited. As a consequence, the project goals had to be revised several times in the light of the actual experience. The next chapter describes in chronological order the amount of uncertainty contained in all phases and at all levels of the implementation process.
CHAPTER FIVE: CHRONOLOGY OF FACS IMPLEMENTATION

This chapter presents the FACS implementation in a chronological order. The focus is on critical incidents, major events, achievements, or changes, which took place during the period of 1984–1987. I structured the presentation by four themes: FACS product, supplier training (provided mainly by Jingles), Telco’s Human Resource Management policies, and the conversion of the new LACs. The chart on the next page presents the chronology of FACS implementation.

5.1 FACS PRODUCT

The pre-history of FACS dates back to 1980, when AT&T put a product to field-test which mechanized the complete LAC work process in one single package. This integrated package, called BISCUS/FACS, was tested in an assignment center in Dallas, Texas, and was a failure. The technical possibilities were simply not advanced enough to allow a fully integrated assignment program to work efficiently. After this experience, AT&T decided to abandon the integrated approach and develop stand-alone programs for mechanizing individual steps of the assignment process. COSMOS, PREMIS and FACS are the successive products of this effort.

Between 1981 and 1987, the FACS product underwent several major revisions and enhancements. Each time, a new generic version was put to use, the training had to be adapted. Thus, FACS versions and training
developments were strongly related. The chronology chart clearly shows this relationship:

- FACS Release 13 and Training Version 1 in 1983
- FACS 14 and Training 2 in 1984
- FACS 15 and Training 3 in 1985
- FACS 16 and Training 4 in 1986
- FACS 17.0 and Training 5 in 1987
- FACS 17.X and Training 6 in 1988

In 1983, the preparations for the break-up of AT&T tied up considerable resources. When divestiture was implemented in 1984, the restructuration also affected FACS Product and Training Development. Jingles emerged as the new research and development organization, jointly owned by all seven regional telephone companies (Regional Operating Companies; ROCs) which became independent entities through divestiture.

5.2 SUPPLIER TRAINING

In 1981, an early version of FACS arrived at Belco for trial. In 1982, the same company received the contract for developing the corresponding training package as a "fair-share program". (A short word about "Fair-Share": All regional telephone companies (ROCs) are connected to a network through which training packages are developed and exchanged. Financed by those ROCs who are interested in a specific package, the HRD staff of a ROC or Jingles develops the training for the "clients" and "sells" it through the network to other interested companies. The fair-share network reduces training development costs
and enhances standardization of training and work procedures across companies."

The development of the training was subject to guidelines specified by Jingles (its predecessor organization) and based on three major assumptions:

- trainees have assignment background
- trainees know about COSMOS
- the program is transaction-based.

These assumptions reflect the product perception of the early days:

"... FACS training was expected to be very straightforward, simply instructing a set of tools to people who are already familiar with the procedures." (IP 14, p.1) Such a transaction-based program is much easier to develop since its framework is directly derived from the technical specifications of the product. Another approach would have been to take the job activities of a FACS operator and structure the training by actual tasks. This was impossible, because at that time some internal constraints in Belco didn't permit to conduct a job study or to create a training test site. Furthermore, the fair-share contract required extensive documentation for the whole training. These factors delayed the development of the training, while four other ROCs were about to start their first FACS conversion and waited impatiently for the training.

Field trials with the two-week training package (first week: service orders; second week: for EWO only) during the third quarter of 1983 showed that the first two assumptions on which the development work was based were not matched by reality. This created frustration among trainees who felt overwhelmed by the extensiveness of the material and
anger among instructors and course developers who had to recognize that their work assumptions had been inadequate.

Put under pressure by dissatisfied early users Jingles decided to take the FACS training development out of the fair-share network and to continue it in-house. For that purpose, a special FACS department was created within Jingles. Among others, one of the FACS training specialists left Belco and started working in the new department.

Within five months, Jingles' FACS staff rewrote the training, simultaneously adapting it to the new FACS version to be released in early 1984. The training now took two weeks, but remained transaction-based and was instructor-led. Thus, the instructor played an important role in the effectiveness of the training. Jingles assumed the instructor to be a FACS expert himself.

During the summer 1984, developers and instructors taught FACS to supervisors and managers in several companies. The general feedback from the line people was negative. One ROC pushed for a fully spelt-out (scripted) manual which could be read literally by the instructor. Jingles didn't share that view because the mechanized environment required a more flexible training approach. In two panel meetings organized by Jingles, FACS staff and training people debated about the best improvement strategy. The line people wanted the system up and running as fast as possible. Therefore, they had a need for fast training improvements, i.e. rewrite the weak parts of the existing material. The training professionals wanted a more systematic product development, based on a job study to get the data for designing a task-oriented training. It was decided to go both ways simultaneously, and while one group conducted
a job study, several other teams rewrote the existing documentation. In early 1985, Jingles synthesized the input of the various teams into a new training package which was field-tested over the summer. The feedback about the new training confirmed the superiority of the task-based approach. The basic structure of the course was approved, only minor changes were necessary. The mismatch of the trainees' background and the course level was still a problem. Thus, two fair-share projects were started for developing an introduction module and a module about COSMOS for non-assignment employees. While the introduction module was finished in time, the COSMOS package needed to be redesigned after negative feedback from the field trial and was only available by October 1986.

In November 1985, Jingles started the preparations for a follow-up study. The evaluation was conducted to determine the effectiveness of the current training and to identify any variables that affect training. More than two hundred questionnaires were completed by FACS operators and supervisors in eight ROCs, and more than 90 employees were observed on the job. The results of the study gave valuable insights into how employees actually worked with FACS, their use of the documentation, and the effectiveness of the training. The diffusion and discussion of the final report led to several significant improvements, e.g.

- revision of parts of the methods and procedures documentation to enhance its usefulness (only 33% of the observed operators followed the procedures described by the documentation)
- additional on-the-job training after the formal FACS course (98% of the supervisors surveyed thought this necessary)
- stronger focus on the quality of the training delivery (of those operators who had been trained exactly as the written material prescribed, 89% followed methods and
procedures on the job, compared to 33% of the total sample).

Beyond a general acceptance of the new training, the study found several areas where improvements could be made. In three months, Jingles redesigned the training package in accordance with these comments (e.g. additional practice cases and lengthening of the training to give trainees time to absorb the material presented). Version 4 of the FACS training consisted of four modules:

- Introduction to FACS (3–4 days)
- User Operations 1: Assignment (10–12 days)
- User Operations 2: EWO (8–10 days)
- COSMOS Assignment (5 days)

Not all FACS operators had to take all four courses. Employees with sufficient assignment experience didn't have to take the introductory course. Similarly, operators with COSMOS background were exempted from the corresponding course. Only those employees assigned to EWO had to take the EWO course.

In October 1987, the FACS training curriculum version 5 was issued. It has been adapted to the enhancements contained in the new FACS version 17.0. In the second part of 1988, version 6 of the training packaged will become available. The new training will be longer, contain more modules (n=18), more guidelines and treat complicated order processing in more depth. It aims at integrating the existing modules and splits the training in two phases to enhance the relationship between teaching and practical exposure. The proposed package looks as follows:

- Basic FACS (4–5 weeks)
- Advanced FACS (2–3 weeks)
- EWO (2 weeks).
5.3 TELCO'S HRM STRATEGIES

With respect to human resources, two major changes accompanied the implementation of FACS in many companies. The first is the consolidation of all FACS operators in one single job title, the second is the introduction of a pass/fail test at the end of the user training.

FACILITIES ASSIGNMENT SPECIALIST (FAS)

In the manual LAC of 1984, the Plant Assigner had already lost quite a few of his higher-level tasks because of previous mechanization (COSMOS, Premis/LAC) and the redistribution of quasi-engineeriel work back to the engineering department. FACS led to the standardization of all major assignment tasks at a comparable skill level. In addition, the new environment involved terminal work for all employees. "The duties performed in the Mechanized FACS/LAC are significantly different than those performed by either Assignment Clerks or Plant Assigners in the Manual Centers. Some of the manual job duties have been eliminated, some simplified and others changed to where they require primarily systems interface. Because of these changes all duties can now be performed by a single title." (Employee Coverage Material, 2-86, p.1)

In February 1986, Telco's management informed the Union representatives about the introduction, starting March 1986, of the new job title of Facilities Assignment Specialist (FAS). With an average weekly wage of $349, the FAS was classified at a slightly higher wage scale than the Assignment Clerk ($327.50) but at a significantly lower scale than the Plant Assigner ($420.25). Two issues raised controversial opinions from union and management.
The first was a matter of wage dispute and concerned the pay protection of the Plant Assigner working as FAS. An agreement was reached about this topic in July 1986, by which the PA/FAS would continue to get his pay for another three years after the job title change.

Another debate emerged over the issue of EWO work. Management’s perspective of the issue was the following: "The controversy ... has been whether FAS’s would be expected to 're-engineer' jobs when such jobs could not be built or completed as submitted. It is our policy that major problems with an EWO will not be resolved by the FAS in the FACS LAC, but will be referred back through appropriate channels for resolution with the Outside Plant Engineering organization" (Internal Letter, EVP Network, 7-86). On the other hand, CWA claimed that the work in a LAC couldn’t be done without having a PA doing some engineering work. Individual LACs varied in the amount of work on major EWO problems done by their local PAs. Basically, the issue was subject to a managerial decision about job allocation between the engineering department and the LAC. The dispute was settled by another agreement prescribing that a PA doing more specialized EWO work would get compensated by an additional pay differential. Clearly, Telco's management wanted to reduce the number of such cases to a minimum and instructed the LAC managers to apply the job description regarding EWO work by the letter.

These were the only issues creating some "waves" about the new job title. As their nature shows, it was not a clash of completely antagonistic views about the change per se, but rather a union attempt
to provide better conditions to those employees who were the losers in the change game.

Compared to a similar case in the mechanization process of the maintenance centers (1979/80), the consolidation of the LAC job titles went smoothly and was not subject to political debates. A mechanism which helped greatly in the introduction of the FAS title was the implementation of several regional staffing agreements. These contracts between local management and union representatives interpreted the general agreement and allowed a flexible adaptation to local contingencies. Thus, each LAC manager could negotiate transitory conditions which matched the specifics of the local labor market and the particular stage of FACS implementation. Two examples illustrate the variety of situations which existed:

(1) In one location, the FACS LAC had already hired about 50% of the total number of its staff, when the FAS job title was introduced. This center, URBAN 1, was located in a metropolitan area with a relatively large number of employment alternatives available. Rather than accepting the downgrading of his job, a PA would seek (and most probably find) a better paying job outside FACS.

(2) Another FACS LAC, RURAL 2, had not started hiring yet. It operated in a more rural zone with less job alternatives. Here, many of the PAs could be expected to apply for a FAS job. In order to extend his current salary over the longest possible time period, a PA would "play the clock" and apply as late as possible for a FAS job. According to the "surplus deployment
plan", the PAs had job-bidding priority, and seniority was the prime criterion for getting hired. Under these conditions, the staffing of the new center was very difficult to plan, because the old LACs were closed down one after another, and all hiring decisions during the conversion had to be made in consideration of the job priorities of employees in LACs which were still operating. In this situation, the local staffing agreement allowed the FACS LAC manager to pool the employees of ALL LACs in the area and hire his staff on the base of seniority of all candidates simultaneously.

PASS/FAIL TEST

As a general rule, all applicants for the FAS job title had to take a screening test, the "FACS/LAC Mini-Course", in order to become eligible candidates. Those employees currently working in a mechanized LAC or having at least six months of mechanized assignment experience were exempted. Failure to pass the test, however, didn't mean that a candidate would be canceled from the list of applicants but simply represented a deficiency "that would affect the chances of being selected for the title" (Employee Coverage Material FAS, 1986, p.4).

The selected applicants were sent to a two-week FACS training which was concluded by a pass/fail test at the end of the course. This test had been developed in six months by Phonecorp's Human Resources Group and was introduced two months after the staffing agreements had been signed. Again, the staffing agreements provided different implementation strategies for the P/F training. For instance, in one area of
Belco, it was not introduced at all, because already 80% of the FACS conversion had been accomplished and management was afraid to lose people because they would not pass the test. At Telco, however, the conversion rate was only around 20%. Many more FAS had to be hired, and management wanted a standardized procedure to make sure that the new operators had reached a sufficient performance level when they were sent to work. Thus, a positive test result was a prerequisite for getting the new job title, unless a candidate had a sufficient assignment background to be exempted from the screening test. In this case, he had to take the training, but didn't have to pass the P/F test at the end. He had to "show mastery" of the material covered by the training instead, a pure formality.

The development of a pass/fail test for a job preparation training is a complex procedure. It requires careful pretesting and a large documentation, because there is always the threat of a union grievance addressing the validity of the test. The development steps for the FACS P/F test:

- Curriculum developer designs tasks
- First-level supervisors work as subject-matter experts
- A job study determines the critical tasks and critical abilities
- Learning objectives are formulated
- Tests are developed
- Subject-matter experts review the material
- 4 subtests are created (3-4 problems)
- Field-trials with 40 trainees (without P/F).

According to one of the test developers, the average rate of Telco candidates failing in the test is around 18% (over the period of the last 18 months). However, not all of those who take the training have taken the screening test. Those who have passed the screening test, have an
average failure rate of only 5-10%. Apparently, the test is rather well
built, because out of the many grievances following the introduction of
the P/F training test, none attacked the validity of the test. Further
aspects of the P/F training will be discussed in Chapter 7.

5.4 CONVERSION OF THE LACS

One of the main benefits of FACS in the perspective of Telco's
management was the limited number of employees needed to run the
mechanized assignment centers. Thus, the total number of centers could
be reduced from 47 to 9 FACS LACs.

The fourth horizontal axis of the chronology chart at the beginning
of this chapter shows the conversion of the new assignment centers.
Three aspects of the graph should be commented here. First, although
the names of the centers are fictitious, they reflect an important
intention of the conversion strategy: Telco started with the large, more
complex centers in the metropolitan areas and converted the less
complex centers in the rural zones last. Secondly, the nine FACS centers
differ in size. The chart shows these differences by the thickness of the
lines representing each center. Thus, URBAN 1 and 2 were about twice
the size of MIXED 1, 2, 3, and RURAL 2. The exact number of lines per
center can be found in Chapter 8. Thirdly, the graph illustrates the
large variation in the time period required for conversion. URBAN 1 will
be fully converted after 48 months, while RURAL 2 (substantially smaller
than URBAN 1) will reach full conversion after 18 months only.
Converting the old paper records into a computerized database and switching live operations over to FACS was a very complex task, involving several key categories of actors: the conversion teams and the FACS support staff at corporate headquarters, the Information Systems people and the managers, supervisors and employees of the local LACs. Major sources of uncertainty were

- THE HARDWARE/SOFTWARE CONFIGURATION
  (Could it process the scheduled number of transactions? Would the system be on-line 90% of the time? What about response time?)

- THE QUALITY OF THE CONVERTED RECORDS
  (How many errors were already contained in the paper records before they were converted? How many errors were added through conversion?)

- THE PERFORMANCE LEVEL OF THE NEW FACS CENTERS
  (Would there be enough new operators moving out of the manual LACs? Would they be properly trained? Could they perform at the projected level? Would management be able to handle the increasing volume of converted lines?)

- THE PERFORMANCE LEVEL OF THE MANUAL LACs
  (Could the level of customer service be maintained during conversion? Would there be enough experienced supervisors and workers left in the manual LAC?).

At Telco headquarters, up to 200 employees were transferring the old records into the FACS database, thus preparing the "cut-live" of the new FACS centers. This section describes the FACS implementation from the perspective of the corporate conversion managers. This view from the "top-center" will be completed by a local perspective when I describe the same process in two case studies at the level of the FACS center. I chose this double approach because it is important to see that the goals and constraints of the implementation process were different for each category of actors.
INITIAL CONVERSION STRATEGY AND IMPLEMENTATION PROBLEMS

The initial objective was to achieve a conversion rate of 400,000 lines per month. The graph on the next page charts the conversion performance of the total company. It shows that this objective was reached only once. The initial strategy was to convert two FACS centers at a time at full speed. Another two centers would then be started, such that there would never be more than 4 centers in conversion at the same time. This strategy was based on the assumption that there was only a limited number of people available who could support FACS at Telco's headquarters. More centers in conversion at the same time could not have been handled by them.

The managers of the conversion group recognized the limitations of the conversion software already very early in the process. They claimed that the 400,000 lines per month could not be achieved with the product developed by Jingles. Their superiors, however, pushed them to continue conversion according to the initial schedule. In mid 1986, it became clear that the FACS centers couldn't handle the number of lines converted at that speed. Conversion had to be stopped. There were three human factor reasons for the halt:

- The learning curve of the local FACS people (craft and management) was underestimated (initially expected to be 3 months, then corrected to 9 months).

- The learning curve of the Information Systems people (computer hardware). In the beginning there was a lot of outage, e.g. during a period of six weeks, the whole system was down every entire monday, and it took much overtime to maintain the average 3-day processing period for a service order.
LINES CUT-LIVE PER MONTH
(Total Company)
The learning curve of the support people who had no lead time to prepare the conversion. Following the principle of "creating as you go", they had to work in a purely reactive, fire-fighting mode. Support and conversion were combined under one roof in 1987 only.

In the second quarter of 1986, conversion had to be stopped completely, and in the fourth quarter of 1986, conversion was still down at about 50% of the potential output rate. During that period, around 70 clerks of the conversion group were loaned out to other parts of the company.

NEW STRATEGY AND CONVERSION PROGRAM

Then, the conversion strategy was changed: Telco's management decided to open all remaining centers at once (mid 1987). This required a major streamlining of the support function. The staff from support and conversion decided to go into a pro-active mode in 1987. They introduced:

- HOTLINE for FACS managers (2 telephone lines), where calls would be returned within 15 minutes. This measure carries a high PR-value (providing the feeling that "somebody cares about my problems").

- ACTION-ITEMS sent upwards by LAC managers and addressing any kind of FACS problem; every month all the formal documentation on Action-Items is sent to all FACS line managers.

- FACS TO REMEMBER, a bulletin answering questions from the field and up-dating FACS people on important news coming up in HQ (as a fill-in between new methods and procedures updates, which happens about every 12 months).

- the FACS FORUM, a monthly newsletter, to compensate for a long previous stream of negative news about FACS and to create pride and ownership.
While the conversion strategy was successfully adapted to the human factor limitations, the conversion software had to be improved, too, allowing for better scheduling and control. Jingles required a lead time of 18 months to enhance the performance of the conversion software. At Jingles, the conversion project had very low priority because it didn't carry a cost savings tag on it (no immediate/direct payback like FACS). In addition, Jingles conversion software performed even worse because Telco's Information Systems people (those who had developed PREMIS/LAC) adapted the product to take into account PREMIS/LAC features. They resisted FACS anyway, because their product, PREMIS/LAC, offered 80% of the FACS features for only 20% of the cost. Why change to FACS? They blamed the users for the poor performance.

In early 1986, the conversion group managers turned to an outside vendor for a better product. They found a specialized single-product company with ten employees which developed another conversion software in sixty days. The new product allowed 39% higher output, 50% higher speed, with 50% of the former hardware and the same number of clerks. The cost was $625,000 a year (Jan. 86 to Feb. 89), net gains amounted to around $32 million. All the clerks had to be retrained and the equipment had to be changed without interrupting or delaying the conversion process and without losing productivity. They felt that this period was a terribly hectic time. In the second quarter 1986, the
problems were at their peak ("It was like drinking from a fire-hose"), but by 1987, the situation had improved considerably.

* * * * *

FACS is not only a neatly confined piece of information technology to be taken from the shelf and put to use immediately. FACS has a history as a product which has to be taken into account if one wants to understand the complexity of the implementation process at Telco. Product enhancements and revisions of the training package continued over the four years of implementation, each time increasing performance and responsiveness to the users' needs. In addition to changes in technology and training, Telco modified important aspects of its HRM policies over the same period of implementation. The introduction of a single job title consolidated the work tasks of the FACS operators, while two pass/fail testing procedures were added to the selection and training of new operators in order to achieve a good match between individual abilities and the skill requirements of the new job. Finally, a closer look at the implementation process from the corporate conversion manager's perspective showed the difficulty involved in planning such a complex technological change. There remains a residual of uncertainty which can't be removed by planning but rather requires monitoring of the actual implementation in order to check the validity of the planning assumptions and to correct major discrepancies. In the case of FACS, the projected conversion rates were not achieved for various reasons and the strategy had to be changed in the middle of the process. With that
background information, we can now turn our attention to the local FACS centers to get a different perspective of the same events.
CHAPTER SIX: THE FACS CENTERS

From the description in the last chapter, it should have become clear that the implementation plan has been changed several times and adapted to new technical constraints as well as to the lessons which could be drawn from the staffing policies used by the early FACS LACs. The purpose of this chapter is to document this development by comparing the experience of both the first and the last FACS centers. The base for this comparison are two case studies described in full length in Appendix 6. The following two sections present only the summary characteristics of both centers.

6.1 URBAN 1: AT THE BEGINNING OF THE LEARNING CURVE

a) General Characteristics

With a total of 1.475 million lines, URBAN 1 is the biggest LAC in Telco. It consolidates the records of seven manual LACs in a large metropolitan area. The rapidly growing number of lines and the complexity of the wiring (high percentage of large and/or complex business customer services) make the conversion very difficult. In 1984, the FACS model assumed an annual growth rate of 2-3%, whereas URBAN 1 lines grew at a rate of more than 10% per year!
b) **Conversion Performance**

The 1983 FACS Project Letter defined the conversion schedule for URBAN 1 to start in December 1984 and to be accomplished by the end of 1986. Several revisions of this schedule followed quickly over the following years. The most recent plan gives a conversion phase of 48 months (ending November 1988) with a staffing level almost twice as high as initially (138 FAS vs. 70 FAS scheduled in 1983). In November 1987, URBAN 1 had converted roughly 1 million lines (68%). There remain two manual LACs to be converted in 1988. With a yearly auto flow-through rate of 88.6% for 1987 (January to October), URBAN 1 was above company average (86.5%) but remained below the initial goal range of 90-95%. However, the trend in the flow-through data indicates that the 90% threshold should definitely be reached in the coming months.

What factors have led to such a massive revision of the initial objectives? First, there was a general performance problem with the hardware (system failures and a lot of down-time) during 1985. Secondly, the staffing of the FACS/LAC was delayed and, thirdly, the performance level of the LAC work force was lower than expected. During several months, the problem was downplayed by Telco's top management who required the continuation of operation at the planned conversion rate. In mid-1985, however, when the service of FACS lines was massively slowed down and a huge backlog of unprocessed RMAs was accumulated, the problem got so bad that conversion had to be stopped completely for three months. A new conversion phase in late 1985/early 1986 led to a repetition of the problem, and conversion was halted again for several
months in 1986. As previously, URBAN 1's employees had to work a lot of overtime to process the backlog.

c) HRM Strategy and Outcomes

With hindsight, URBAN 1's data for 1985 show that there were two major shortcomings in the assumptions, on which management built their response to the problems of the first year of operation: first, they didn't anticipate correctly the impact of their manpower plan and, secondly, they underestimated the learning curve of the FACS operators.

EXPECTED OUTCOMES OF THE STAFFING POLICY

The manpower strategy used by URBAN 1 in 1985 led to an insufficient level of staffing in the first year. There are two main reasons which have led to this situation. If the district manager, responsible for the operational effectiveness of the new LAC, wanted to reduce cost by maintaining the staffing at the lowest possible level, this policy had certainly an impact. On the other hand, one of the major concerns of Telco's management was to prevent layoffs due to the implementation of FACS. This led to a manpower strategy which actively supported LAC workers to move into FACS or to look for other jobs in the company. The way, by which this strategy was implemented in 1985, led to dysfunctional effects which may also explain URBAN 1's low staffing level. Indeed, a LAC operator was notified about the close-down date of his center as early as possible. And as soon as the conversion of his LAC was started, he moved into a "surplus" status, giving him special
rights in the job search. For many PAs (and, to a lesser extent, ACs) the new work environment was less attractive than the manual LAC (lower pay, terminal work, less responsibility, relocation). Accordingly, they tried to find a new job outside of assignment. URBAN 1 was located in a fast-growing metropolitan area providing relatively many job opportunities. Thus, they would consider the FACS job only as an ultimate possibility if nothing better showed up. And since they had a priority right in bidding for the FACS job, they could afford to wait until the very last moment to do so. The conversion strategy prescribed that only one LAC at a time would be converted/closed. In the case of URBAN 1, the average manual LAC released roughly 25 operators at a time. Given the low attractiveness of the FACS job and the availability of alternative jobs, this pool of candidates proved to be too small to fill all the slots in URBAN 1.

The insufficient staffing level of URBAN 1 in 1985 seems to be the combined effect of these two factors. - In addition to the technical and the manpower problems, there was a third determinant of the early implementation phase: the performance level of the operators.

UNDERESTIMATED LEARNING CURVE OF FACS OPERATORS

When URBAN 1 started to cut-live, the new operators had gone through a one-week training session with the transaction-based curriculum developed first by Jingles. "They don't need to know how the system works, they have to know how to do transactions. It's enough if the supervisor knows about the why." Ironically enough, it appeared that some supervisors knew less about FACS than the operators. The limits of
this training package have already been discussed in an earlier chapter. In any case, a FACS operator in URBAN 1 in 1985 needed a lot of additional on-the-job training (to be provided by the supervisor) and support (from headquarters). Given the technical problems and the tight staffing, it's no surprise that there was no slack resource available to answer this learning need. Thus, the learning curve of a FACS operator was much longer than expected. On average, it took anything between six and nine months before a FACS operator was able to work at full performance level (with high variations among individuals).

6.2 RURAL 3: AT THE END OF THE LEARNING CURVE

a) General Characteristics

RURAL 3 is one of the four FACS LACs which were opened simultaneously in the first half of 1987 as a result of the change in the conversion strategy (see Section 4 in Chapter 4). It consolidates 1.1 million lines from seven manual assignment centers spread over an area of more than 50,000 square miles. In contrast to the economic environment of URBAN 1, RURAL 3's operations have a lower growth rate. The customer base includes a much smaller proportion of business customers and/or complex wiring. The population lives in smaller cities and the work force is less mobile than the one in the big city where URBAN 1 is located.
b) Conversion Performance

Conversion in RURAL 3 started in May 1987. According to the current plan, RURAL 3 is expected to complete conversion after a period of 22 months (February 1989) or even earlier. By November 1987, 320,000 lines (29% of the total) have been converted. The annual flow-through rate for 1987 is at 91.9% and was never lower than 91.4%. There were no major system problems (down-time or insufficient performance), the cut-live activities happened exactly as scheduled.

Before RURAL 3 started to cut live the first group of its own lines, the center processed 75,000 lines for two other LACs in April 1987. These centers used different procedures, e.g. in interfacing with engineering, and provided a good learning experience. The first lines from RURAL 3 were phased in smoothly (100-150 RMAs from the other center and 30 in-house RMAs per day during the phasing-in).

c) HRM Strategy and Outcomes

RURAL 3 operated right from the beginning with the single new job title (FAS). Staffing the new center started well back in 1986. At the end of the summer 1986, the RURAL 3 FACS manager was appointed. He immediately hired an associate manager for handling the staffing of the center (a two-year position similar to a personnel function). They interviewed all 28 supervisors in the seven manual LACs to fill five supervisor positions. In December of 1986, the supervisors were sent to the FACS training.

Starting also in December, up to three groups of eight FAS each were selected. The new employees received the two-week FACS training
taught by RURAL 3's training supervisor in the old LAC. None of them came from assignment. All trainees passed the P/F test at the end. Until the end of February 1987, all FAS and supervisors were sent to work in URBAN 1 (for a period of up to six weeks), before they all moved into the new facilities in RURAL 3 (March 1987).

What followed was a period of custom tailored on-the-job training. The RMA supervisor identified people with learning problems. Those FAS went to the training supervisor for a one-on-one training. In summary, the selection and introduction of the FACS operators on-the-job was carefully planned and the work load was kept low enough to allow for an intense learning and performance improvement.

6.3 DIFFERENCES BETWEEN THE TWO CASE STUDIES

The purpose of the two case studies was to document what I consider being one of the central features of the FACS project: the organizational learning process through which Telco's FACS management has gone during the first three years of implementation. When conversion will be accomplished in early 1989, both LACs will most probably have reached a very similar level of operational effectiveness: a flow-through rate higher than 90%, some 11,000 lines per employee, and a management/craft worker ratio of 15-16% (8-10 employees per first-level supervisor). Thus, the case studies don't demonstrate any difference in the long-term regular operation performance. They rather illustrate the difference in how the two centers managed the transition from a manual to a mechanized work environment.
a) Differences in the cut-live pattern

The analysis starts off with the cut-live pattern. The graph on the next page gives the cumulated number of converted lines per employee for both URBAN 1 and RURAL 3. In order to get directly comparable curves, I chose the same starting point for both centers. Thus, the time dimension on the X-axis has no real date. The picture is quite revealing. RURAL 3's transaction load grew much smoother to reach the final full load around 11,000 lines, while URBAN 1 quickly reached for an extremely high load which they couldn't maintain in the second year. Such high peaks translated into high backlogs of RMAs and put the system under a lot of stress, while at RURAL 3, the continuously growing ratio facilitated the learning of the personnel in the early phase. The graph shows a clear difference between the conversion strategy of the early and the late center. URBAN 1's early fluctuations reflect the (inadequacy of the) conversion rate assumptions of Jingles' FACS model. They were corrected several times and the two curves follow a similar pattern afterwards.
CUMULAT. NUMBER OF LINES PER EMPLOYEE

![Graph showing the cumulative number of lines per employee over four years, with data points for Urban 1 and Rural 3.]
b) Differences in the staffing strategies

The next graph illustrates the different staffing strategies of the two cases. Let's look at URBAN 1's first five quarters of implementation. Until April 1986, there was no slack resource in the system, the number of employees very tightly matched the number of lines converted. Remember that URBAN 1's employees had to work a lot of overtime during this period to handle the backlog of RMAs and the newly converted lines. Compare this to RURAL 3's total conversion phase. They were "over-staffed" right from the beginning, additional resources allowing for sufficient learning time without overtime and overload. URBAN 1's manpower strategy changed later in 1986, when some slack was introduced and maintained over most part of the final conversion period.

The general chronology of the FACS project revealed major differences between the early and the late stages of implementation. The technical problems inherent in the hardware, the early versions of the conversion software and the FACS product have already been noted, as well as the deficiencies of the early training packages, while the different manpower problems were described as a function of the geographical and economic characteristics of the environment. However, this list is not complete. As a result of the comparison in this chapter, another factor has to be added to the list: There was also an important difference in the staffing strategies of the two centers. URBAN 1's management was in perfect harmony with the dominating company values put forward by top management, when they chose a rather restrictive initial staffing strategy, in contrast to RURAL 3's "advanced staffing"
approach. In its initial phase, the staffing at URBAN 1 was even below the scheduled level. They hired operators with assignment background who didn't have to take a standardized training and test. RURAL 3 was "over-staffed" right from the beginning, its work force was composed of a majority of employees with no assignment background. Most of them had to take a standardized training with a pass/fail test at the end. How important are these differences in the staffing strategy? Do they really affect conversion performance? The next chapter will examine these questions in the general context of all nine FACS assignment centers.
The real issue for Telco is the effectiveness of the transition process. Based on the learning curve concept, one would expect that the early starters were less effective than those centers who started converting last. Since there is no real substitute for the actual learning process, there is not much management could do, except for optimizing the learning process itself. If, however, there are performance differences between centers which can't be explained by the learning curve concept, one has to ask about other determinants of the conversion process. Some of them may be extrinsic, but some may also be process-related and thus subject to manipulation by management. If such factors can be identified, one would have a key to performance enhancements through strategic decision-making.

This chapter tries to shed some light on these issues by classifying all Telco FACS centers according to their conversion performance (Section 7.1) and by calculating costs and benefits of two alternative staffing strategies (Section 7.2).
7.1 CONVERSION PERFORMANCE OF TELCO'S NINE FACS CENTERS

a) Classifying the nine FACS assignment centers

In an attempt to apply my findings to all FACS LACs in Telco, I classified the nine centers according to a selection of factors which I considered as potential determinants of the conversion performance. Some were external to the LACs, like the characteristics of the customer base or the local work force, others were internal, like the staffing strategy chosen by the LAC management. After several trials, I decided to reduce the number of factors to five:

- GEOGRAPHICAL CONTEXT
  The geographical context of a LAC is either urban, mixed or rural. It is perfectly correlated with several other variables of the implementation process: the cut-live date of the centers (see first graph in Chapter 5), since the urban centers were the first to be opened, followed by the mixed centers, while the rural centers were opened last; as a function of the learning curve expressed by the cut-live dates, other external factors which are time-bound show the same variation pattern: hardware failure rates, quality of the training package, and proportion of employees with no assignment experience. Since this criterion stands for several major variables working in the same direction, one would expect this combination of context/time-related factors to have a strong impact on the conversion performance.

- DATABASE QUALITY
  A few LACs had a relatively high proportion of inconsistent manual records. When they were converted into FACS, these inconsistencies (e.g. between COSMOS and Premis/LAC data) resulted in an increased number of RMAs which caused additional work, slowed down the conversion process, and led to a lower flow-through rate.

- DISTRICT MANAGER SUPPORT
  The FACS LACs were placed under the authority of a district manager who decided about the hiring of the new employees and the deployment of the manual LAC work force in accordance with the local staffing agreement. The district manager's support was either active, neutral or passive.
- STAFFING STRATEGY
The staffing strategy of a LAC could be of two types: advanced (like in RURAL 3) or tight (like in URBAN 1). An advanced strategy was relatively costly in the short run and was not the normal case following the standard staffing procedures of other cases. Therefore, an advanced strategy required active support by the district manager, while in the case of a tight strategy, such support was not necessary, since this case was the expected action in regular circumstances.

- COMPLEXITY
Not all LAC centers had the same customer base to serve. The centers in rural areas had a relatively low proportion of large business customers and/or complex wiring, while others, mostly centers in urban areas, had a higher degree of complexity to deal with. Given the importance of standardization for a smooth conversion to FACS, the complexity variable may have a crucial impact on the conversion performance. I had to separate it from the Context factor, because the correlation between the two factors is not high enough.

The classification of the LACs according to these five dimensions is based on my personal estimate. However, it was discussed with several experts from the FACS staff at Telco Headquarters who know all centers well. In addition, existing numerical data about the centers corroborated the classification (e.g. for the complexity variable, data on monthly and annual changes in the customer base of each FACS LAC were used). Fortunately, the classification proved to be pretty robust, and no major ambiguities could be found in it.

Why didn't I consider training as an independent determinant of conversion performance? The reason for this decision doesn't lie in the lack of relevance of this factor, but rather in the high general level of training provided during the whole conversion process. It was thus not possible to distinguish between lower and higher levels of training.
quality, except for the learning curve effect included in the context dimension.

**CHARACTERISTICS OF THE NINE FACs ASSIGNMENT CENTERS**

<table>
<thead>
<tr>
<th>CENTER</th>
<th>GEOGR. CONTEXT</th>
<th>DATABASE QUALITY</th>
<th>STAFFING STRATEGY</th>
<th>MGT. SUPPORT</th>
<th>COMPLEXITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>URBAN 1</td>
<td>urban</td>
<td>good</td>
<td>late</td>
<td>passive</td>
<td>high</td>
</tr>
<tr>
<td>URBAN 2</td>
<td>urban</td>
<td>good</td>
<td>late</td>
<td>active</td>
<td>low</td>
</tr>
<tr>
<td>URBAN 3</td>
<td>urban</td>
<td>low</td>
<td>late</td>
<td>active</td>
<td>medium</td>
</tr>
<tr>
<td>MIXED 1</td>
<td>mixed</td>
<td>low</td>
<td>late</td>
<td>passive</td>
<td>medium</td>
</tr>
<tr>
<td>MIXED 2</td>
<td>mixed</td>
<td>low</td>
<td>late</td>
<td>passive</td>
<td>medium</td>
</tr>
<tr>
<td>MIXED 3</td>
<td>mixed</td>
<td>good</td>
<td>neutral</td>
<td>neutral</td>
<td>medium</td>
</tr>
<tr>
<td>RURAL 1</td>
<td>rural</td>
<td>good</td>
<td>early</td>
<td>active</td>
<td>low</td>
</tr>
<tr>
<td>RURAL 2</td>
<td>rural</td>
<td>good</td>
<td>neutral</td>
<td>passive</td>
<td>low</td>
</tr>
<tr>
<td>RURAL 3</td>
<td>rural</td>
<td>good</td>
<td>early</td>
<td>active</td>
<td>low</td>
</tr>
</tbody>
</table>

To get the problem index, I used a three-point (or two-point) scale, where numerical values between 1 and 3 were attributed to each of the cells (1=low problem potential, 2=medium/neutral, 3=high problem potential). Then I calculated the "problem index", simply the sum of the scores of each LAC. The result:
LAC CLASSIFICATION BY PROBLEM INDEX

<table>
<thead>
<tr>
<th>Rank</th>
<th>Context</th>
<th>DB</th>
<th>Staff.</th>
<th>Supp.</th>
<th>Compl.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>RURAL 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>RURAL 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>RURAL 2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>MIXED 3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5.</td>
<td>URBAN 2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>6.</td>
<td>URBAN 3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>7.</td>
<td>MIXED 1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>9.</td>
<td>URBAN 1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

Comparing the classification of the FACS centers by their problem level, one can see that the chronological order has not been completely maintained. Some early centers rank in the middle of the classification, some mixed centers have moved down the line. On the top, however, there hasn’t been much change, those centers which started converting last seem to be the least problematic. Next, I had to find an appropriate way to determine performance differences among assignment centers.

b) Calculating a performance measure

I calculated a performance measure by comparing the proportion of the total conversion time used by each LAC to the proportion of the total lines converted by the same center. This way, I could control for the difference in size among centers. According to the most recent conversion plans, all LACs combined will have used 236 months for converting the total of 9.2 million lines. Based on these numbers, I calculated the performance index as shown in the next table.
### COMPUTATION OF THE PERFORMANCE INDEX

<table>
<thead>
<tr>
<th>CENTER</th>
<th>% OF CONV. TIME</th>
<th>% OF TOT. LINES</th>
<th>DIFFERENCE</th>
<th>ON A 10-PT. SCALE</th>
<th>PERFORMANCE CAT.</th>
<th>LINES/MONTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>URBAN 2</td>
<td>11.9</td>
<td>15.8</td>
<td>+3.9</td>
<td>10</td>
<td>++</td>
<td>52,110</td>
</tr>
<tr>
<td>RURAL 3</td>
<td>9.3</td>
<td>11.9</td>
<td>+2.6</td>
<td>8.4</td>
<td>++</td>
<td>49,690</td>
</tr>
<tr>
<td>URBAN 3</td>
<td>11.0</td>
<td>11.9</td>
<td>+0.9</td>
<td>6.4</td>
<td>+</td>
<td>41,980</td>
</tr>
<tr>
<td>RURAL 1</td>
<td>10.2</td>
<td>11.0</td>
<td>+0.8</td>
<td>6.2</td>
<td>+</td>
<td>42,000</td>
</tr>
<tr>
<td>MIXED 3</td>
<td>8.9</td>
<td>8.9</td>
<td>0</td>
<td>5.3</td>
<td>0</td>
<td>38,980</td>
</tr>
<tr>
<td>RURAL 2</td>
<td>8.1</td>
<td>7.8</td>
<td>-0.3</td>
<td>4.9</td>
<td>0</td>
<td>37,660</td>
</tr>
<tr>
<td>MIXED 1</td>
<td>9.3</td>
<td>8.1</td>
<td>-1.2</td>
<td>3.8</td>
<td>-</td>
<td>33,680</td>
</tr>
<tr>
<td>MIXED 2</td>
<td>11.0</td>
<td>8.8</td>
<td>-2.2</td>
<td>2.6</td>
<td>-</td>
<td>30,990</td>
</tr>
<tr>
<td>URBAN 1</td>
<td>20.3</td>
<td>16.0</td>
<td>-4.3</td>
<td>0</td>
<td>--</td>
<td>30,470</td>
</tr>
</tbody>
</table>

In terms of conversion performance, there are three categories of performers: two centers as top performers, a middle group of four centers with good to average performance, and at the lower end another three centers with URBAN 1 clearly at the end of the list. This classification is confirmed by a second, related performance measure, the average number of lines converted per month. Only URBAN 3 and RURAL 1 switch places within the same performance category. Thus, I think the performance measure is pretty robust.

At this point, there are several options for explaining differences in conversion performance among assignment centers. The first hypothesis is the starting point of the study: the existence of an organizational learning curve as main determinant of implementation performance. Under this hypothesis, the CONTEXT order ranking should be correlated...
highest with the performance ranking. Having gone all the way to build
a combined indicator of potential barriers to successful implementation, a
second hypothesis assumes the problem index to show a higher correla-
tion with performance. Finally, I have to make sure that there is no
simpler answer to the solution by asking: Taken separately, is either one
of the other factors I identified as important for the conversion process
superior in explaining the outcomes?

c) *The Determinants of Conversion Performance*

**HYPOTHESIS ONE: THE LEARNING CURVE AS MAIN DETERMINANT**

Already a quick glimpse at the performance table is enough to see
that there is no systematic relationship between the CONTEXT variable,
as an expression of the learning curve hypothesis, and the performance
outcomes. The Spearman Rank Correlation Coefficient is .15. Thus, the
first hypothesis is very weak.

**HYPOTHESIS TWO: THE PROBLEM INDEX AS MAIN EXPLANATORY
VARIABLE**

How well does the problem index predict the conversion perfor-
mance of the nine LACs? Comparing the rank orders in both classifica-
tions the following picture appears:
The fit is better than under hypothesis one, but not overwhelming. Two of the mixed centers, URBAN 1, and RURAL 3 show a performance which would have been predicted correctly by the problem index. However, all other LACs performed differently than one would have expected based on the problem index. The Spearman Rank Correlation Coefficient is .59. Is there a better explanation possible for describing the observed pattern?

HYPOTHESIS 3: SINGLE FACTOR DETERMINANT

Looking at the following summary table, it appears that there is a very strong correspondence between the performance index and a single other factor: MANAGEMENT SUPPORT.

The Spearman Rank Correlation Coefficient is .77, the highest of all single factor correlations with performance (for COMPLEXITY, the coefficient value is .55, for STAFFING STRATEGY the coefficient is .40). This is already a high correlation, but another combination of factors reaches even a higher value. In fact, the combination of STAFFING STRATEGY and MANAGER SUPPORT has a correlation coefficient of .81.
# FACS Centers by Conversion Performance

<table>
<thead>
<tr>
<th>CENTER</th>
<th># OF LINES</th>
<th>GEOGR. CONTEXT</th>
<th>DB QUAL.</th>
<th>STAFF. STRAT.</th>
<th>MGMT. SUPP.</th>
<th>COMPLEXITY</th>
<th>PROBL. INDEX</th>
<th>CUT LIVE</th>
<th>DURATION (mths)</th>
<th>LINES/MONTH</th>
<th>PERF. CAT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>URBAN 2</td>
<td>1,460,000</td>
<td>urban good</td>
<td>late</td>
<td>active</td>
<td>low</td>
<td></td>
<td>9</td>
<td>7-85</td>
<td>28</td>
<td>52,000</td>
<td>++</td>
</tr>
<tr>
<td>RURAL 3</td>
<td>1,100,000</td>
<td>rural good</td>
<td>early</td>
<td>active</td>
<td>low</td>
<td></td>
<td>5</td>
<td>5-87</td>
<td>22</td>
<td>50,000</td>
<td>++</td>
</tr>
<tr>
<td>URBAN 3</td>
<td>1,100,000</td>
<td>urban weak</td>
<td>late</td>
<td>active</td>
<td>medium</td>
<td></td>
<td>11</td>
<td>2-86</td>
<td>26</td>
<td>42,000</td>
<td>+</td>
</tr>
<tr>
<td>RURAL 1</td>
<td>1,010,000</td>
<td>rural good</td>
<td>early</td>
<td>active</td>
<td>low</td>
<td></td>
<td>5</td>
<td>4-87</td>
<td>24</td>
<td>42,000</td>
<td>+</td>
</tr>
<tr>
<td>MIXED 3</td>
<td>820,000</td>
<td>mixed good</td>
<td>neutral</td>
<td>neutral</td>
<td>medium</td>
<td></td>
<td>8</td>
<td>3-87</td>
<td>21</td>
<td>39,000</td>
<td>0</td>
</tr>
<tr>
<td>RURAL 2</td>
<td>720,000</td>
<td>rural good</td>
<td>neutral</td>
<td>passive</td>
<td>low</td>
<td></td>
<td>8</td>
<td>5-87</td>
<td>19</td>
<td>38,000</td>
<td>0</td>
</tr>
<tr>
<td>MIXED 1</td>
<td>740,000</td>
<td>mixed weak</td>
<td>late</td>
<td>passive</td>
<td>medium</td>
<td></td>
<td>12</td>
<td>3-86</td>
<td>22</td>
<td>34,000</td>
<td>-</td>
</tr>
<tr>
<td>MIXED 2</td>
<td>810,000</td>
<td>mixed weak</td>
<td>late</td>
<td>passive</td>
<td>medium</td>
<td></td>
<td>12</td>
<td>6-86</td>
<td>26</td>
<td>31,000</td>
<td>-</td>
</tr>
<tr>
<td>URBAN 1</td>
<td>1,480,000</td>
<td>urban good</td>
<td>late</td>
<td>passive</td>
<td>high</td>
<td></td>
<td>13</td>
<td>12-84</td>
<td>48</td>
<td>31,000</td>
<td>--</td>
</tr>
</tbody>
</table>
Thus, everything else being equal, the staffing strategy/management support dimension is the best predictor of conversion performance.

To summarize this discussion: The difference in the conversion performance among the nine LACs can't be completely explained by one single factor, especially not by the learning curve. If it is true that, on average, the later the beginning of the conversion, the better the performance, there still are some important exceptions to that rule which refer to additional determinants. The single most important one appears to be the staffing strategy/management support factor. For example, looking at the low performers among the LACs, it is safe to say that even if other factors (like database quality, complexity or context) have a neutral to positive impact, the performance stays low if management support is negative. Similarly, there is no top or good performance possible without an early staffing policy and/or strong management support. This discussion illustrates and underlines the importance of the role of the decision-makers in the technological change process. Top quality human resource management can overcome technical shortcomings or lack of experience, but - as the data suggest - no other factor can effectively cancel out the negative effects of a faulty staffing decision or lack of support from upper management.
7.2 COST–BENEFIT CONSIDERATIONS OF DIFFERENT MANPOWER STRATEGIES

In the previous section, the case was made for an advanced-staffing/management-support strategy. As a matter of fact, its superiority in terms of conversion performance was demonstrated. LACs using such a proactive strategy achieved a monthly conversion output of roughly 50,000 lines per month, while the low-support LACs—regardless of their position on the time axis—were stuck at roughly 30,000 lines. What is the cost of higher performance? Is the increase in salary cost of the proactively staffed LAC compensated by the benefits of a faster downsizing of the manual assignment centers? The goal of this section is to shed light on these issues. To summarize what follows, it appears that the proactive strategy (P-Strategy) is not only superior in conversion performance but also maintains a substantial cost advantage over the low-support strategy (L-Strategy), ranging anywhere between 780,000 and 1.3 million dollars for a typical FACS LAC.

The following calculations are based on assumptions described in more detail in Appendix 7. Taken together, these assumptions give the best possible case for the L-Strategy while they are very restrictive for the P-Strategy.

First, I calculated the real staffing costs for URBAN 1 (L-Strategy) and RURAL 3 (P-Strategy). In a second step, I compared these numbers to the corresponding opposite case. Finally, I applied my little model to URBAN 2 and MIXED 2 and calculated the impact of both strategies on these two cases.
I started by calculating the manpower cost of conversion in RURAL 3. This would serve as an example of the proactive strategy and provide the baseline for the comparison with the hypothetical case of a low-support center of the same size. The table below summarizes the calculations of the net wage bill for both strategies. Note that I compare a period of 36 months in both cases. In other words, I add the cost of 14 months of full, regular operation under the P-Strategy (period 2) to the salary cost of the conversion period (period 1) to compare it to the same time span under a low-support policy. I did this, because I couldn't put a price tag on the difference between a line in conversion and a converted line. Of course, this is an extremely restrictive condition favoring the L-Strategy. It appears that even under these conditions, the P-Strategy is financially more attractive than the L-Strategy by at least $780,000. Thus, the manpower policy chosen for staffing RURAL 3 did not only achieve higher conversion performance but was also financially superior to a tight approach.
COMPARISON OF RURAL 3 AREA LABOR COST UNDER P- AND L-Strategy
(MAN MONTHS)

<table>
<thead>
<tr>
<th></th>
<th>L-Strategy</th>
<th>P-Strategy</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD 1</td>
<td>3,278</td>
<td>3,420</td>
<td>-142</td>
</tr>
<tr>
<td>PERIOD 2</td>
<td>1,596</td>
<td>1,200</td>
<td>+396</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>+254</td>
</tr>
</tbody>
</table>

254 Man-months = 254 x $2,500 for Craft Jobs = $635,000
Management Jobs: .15 x 254 Man-months x $3,750 = $142,875

COST ADVANTAGE OF P-Strategy = $777,875

In the second case, I want to see whether this finding also holds for the opposite situation, where URBAN 1 actually implemented the L-Strategy. The table below presents the result of the wage bill calculations. Similar to the case of RURAL 3, the P-Strategy combines higher performance with lower cost. In this case, the financial benefit amounts to $1.13 million.
COMPARISON OF URBAN 1 AREA LABOR COST UNDER P- AND L-Strategy (MAN MONTHS)

<table>
<thead>
<tr>
<th></th>
<th>L-Strategy</th>
<th>P-Strategy</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD 1</td>
<td>6,366</td>
<td>6,458</td>
<td>- 92</td>
</tr>
<tr>
<td>PERIOD 2</td>
<td>3,040</td>
<td>2,584</td>
<td>+ 458</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>+ 364</td>
</tr>
</tbody>
</table>

364 Man-months = 364 x $2,500 for Craft Jobs = $ 910,000
Management Jobs: .15 x 364 Man-months X $3,750 = $ 218,400

COST ADVANTAGE OF P-Strategy = $ 1,128,400

The same calculations for two other borderline cases show results consistent with the findings of RURAL 3 and URBAN 1. The use of an P-Strategy in URBAN 2, the top performer of all LACs, led to benefits over a low-support manpower approach of $1.3 million. The use of the L-Strategy in MIXED 2, the second lowest conversion performer, cost an additional $400,000 when compared to the early staffing alternative (see Appendix 7 for detailed calculations).

The message for the LAC manager is clear. My calculations show that even under the most restrictive assumptions the high-performance conversion strategy is also financially more profitable and should be used whenever possible. When evaluating a proactive versus a low-support manpower strategy, care should be taken to consider the full conversion period and the complete assignment work force, because the P-Strategy has a higher start-up cost which bears upon the budget of the FACS.
LAC manager, while the additional force savings in the manual LACs are not under his responsibility. Thus it is important not to examine the FACS LAC HRM policy at the level of the assignment center but at the higher district level, covering the complete (manual AND mechanized) assignment operation.
CHAPTER EIGHT: OUTCOMES: EMPLOYMENT, QUALIFICATION AND HRM POLICIES

This chapter provides a summary of a more extensive discussion contained in Appendix 8 where I compare the outcomes of my study to the more general issues and trends put forward by other researchers of technological change (see Chapter 1 and Appendix 1). In the first section, employment and qualification issues derived from technological change were summarized. Section 2 documents the shifts in Telco's Human Resource model prompted by the technological change. While the first two sections give a macro-perspective of the problem, Section 3 discusses in more detail the specific HRM policies used by Telco to achieve the manpower objectives of the FACS project. There will be answers to questions like: Who lost his job as a consequence of the introduction of FACS? Where did the surplus workers go? Who got the new FACS jobs? Does the training concept used in FACS match the features of the technology?

8.1 EMPLOYMENT AND QUALIFICATION EFFECTS

In terms of employment and qualification effects, the FACS case is not a typical example of late adopters in the data-processing industries, since Telco upgraded the lower-skilled former assignment job and didn't recruit outside the company for filling the new job openings. In addition, FACS contributes to reverse the trend of downgrading typical female
jobs in the economy, because the great majority of the new jobs are staffed with women.

However, some general determinants of employment effects in technological change also apply well to the FACS project, e.g. industry growth rate, size of the firm, or a less traditional factor like the product-life cycle model applied to shifts in the skill distribution. If one accepts the fact that mechanization could/should not be prevented from moving further into the assignment process, the FACS project represents general positive outcomes at the employment/qualification level. However, there was a minority of workers who paid for the improvement of the majority of assignment operators by a loss in their own work status and pay. Telco exploited the potential for standardization inherent in the technology by simplifying the job classification in the assignment work. In a unionized work environment, such a measure is subject to negotiation between management and the labor union. The local chapter of CWA had joined Telco's management in accepting the principle of technological change as a legitimate tool for doing business. Thus it could not prevent the FACS project from being implemented. But by the same token, the union also had to accept the human resource implications of the technology, which — in this example — allowed Telco to make a strong case for revising the job definitions in the assignment process. As a consequence, the union representatives focused their bargaining strategy on negotiating the best possible transition conditions for all workers concerned, especially the Plant Assigners, who lost the most in the process. Telco's management acknowledged this position and offered a generous benefit package, including three-year pay protection for Plant
Assigners, early retirement incentive plan, lump-sum payments for quitting workers (one-year salary), retraining, career orientation assistance, and other features. These financial and non-financial incentives allowed for a smooth transition without major labor-management conflicts.

8.2 Shifts in the ILM Model

In Chapter 3, Telco's internal labor market (ILM) was presented as a hybrid combination of the classical industrial and the salaried models. Applying Osterman's conceptual work to the FACS case, one can see that the latter provides a good example of technological change pushing some important dimensions of Telco's ILM away from the industrial towards the salaried model. Among Osterman's four factors shaping the ILM options available, the physical and the social technology retain particular attention. The first factor mainly affects changes in the task, while the second factor stands for changes in the informal organization.

The introduction of FACS has transformed the assignment work from a paper-and-pencil activity into a computer-based operation with a terminal/keyboard interface. It enhances the shift of several ILM characteristics towards the salaried model, especially by the consolidation into a single job title, a widening of the entry port into the assignment work, a shift towards more ability/performance-based selection criteria, a larger variety of tasks and increased mobility of operators between these tasks.
8.3 HRM POLICIES

a) Recruitment and Selection

With respect to the recruitment and selection policies used, many features of the FACS project are consistent with the literature reviewed in Chapter 1. In particular, two points require special attention. First, there is the relationship between task complexity and selectiveness of the staffing. In the case of FACS, this relationship is two-fold: a) a mixture of down- and upskilling of existing jobs by the introduction of the FAS job title which, for the majority of the people concerned, represents an upgrading of the former assignment job; b) a different set of skills required for the "informed" work environment and checked by performance tests before and after the training. Thus, the FAS job is more complex than the old assignment job and, simultaneously, its different skill requirements allow a broader recruitment base. Both elements lead to a more selective hiring process.

Secondly, according to Flynn's findings, one had to expect more HRM planning problems in the early phase of the FACS project than in the subsequent periods. Comparing the experience of URBAN 1 and RURAL 3, I can confirm this statement (see Chapter 6). There was indeed a higher amount of uncertainty involved in the early staffing decisions at URBAN 1, resulting from the interplay of the "No layoffs"- and the "Low cost"-guidelines. However, as the analysis in Chapter 7 suggests, there was no determinism in the events, since some of the early LACs didn't have the same staffing problems, while some of the
later LACs did have them. Thus, one has to differentiate this relationship by introducing other intervening factors.

Finally, let's have a closer look at the patterns contained in the staffing policies of the two LACs I analyzed. What happened to the manual assignment workers? Where did they go? Who became the new FAS?

DEPLOYMENT PATTERNS

By the end of 1984, 255 operators were working in seven manual LACs of the district to be consolidated by URBAN 1 (64 Plant Assigners, 191 Assignment Clerks). By the end of 1987, Telco's headquarters estimated that 196 people worked in the same district, 104 of them in URBAN 1, 92 in the remaining two manual LACs. The next table shows the distribution of the work force.

ASSIGNMENT WORKERS IN THE URBAN 1 AREA IN 1987

<table>
<thead>
<tr>
<th></th>
<th>URBAN 1 FACS</th>
<th>Manual LACs</th>
<th>Outside Assignm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACs</td>
<td>58</td>
<td>73</td>
<td>60</td>
</tr>
<tr>
<td>PAs</td>
<td>7</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>Non-LACs</td>
<td>39</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>104</td>
<td>92</td>
<td>98</td>
</tr>
</tbody>
</table>

According to these numbers, 98 employees left the assignment work between 1984 and 1987 and went elsewhere, while 65 of them moved into FACS. There is a clear difference between PAs and ACs: more than 50% of the PAs have already moved out of assignment, while less than a third of the ACs followed the same pattern so far.
Before RURAL 3 started cut-live, 169 operators worked in seven manual LACs (by the end of 1986). A year later, the district had 170 operators, of which 119 worked in the five remaining manual LACs and 51 as FAS in RURAL 3. The next table summarizes the distribution of the work force.

**ASSIGNMENT WORKERS IN THE RURAL 3 AREA IN 1987**

<table>
<thead>
<tr>
<th></th>
<th>RURAL 1</th>
<th>FACS</th>
<th>Manual LACs</th>
<th>Outside Assignm.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Town</td>
<td>Out of Town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACs</td>
<td>9</td>
<td>6</td>
<td>95*</td>
<td>25*</td>
</tr>
<tr>
<td>PAs</td>
<td>3</td>
<td>1</td>
<td>24*</td>
<td>6*</td>
</tr>
<tr>
<td>Non-LACs</td>
<td>32</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>44</td>
<td>7</td>
<td>119</td>
<td>31</td>
</tr>
</tbody>
</table>

*These numbers are my estimates. The total of 119 operators in manual LACs and 31 operators moving out of assignment are official numbers.*

In 1987, two manual LACs were closed and 50 operators became surplus. RURAL 1 hired 19 of them, 31 moved out of assignment. While I don't have confirmed numbers for the PA/AC split-up for those who moved out of assignment and the work force in the remaining manual LACs, one can find an interesting difference in the mobility pattern of the new FAS. In fact, the surplus PAs who don't live in the town where RURAL 3 is located are much less likely to take a job in FACS than their fellow workers in town. The same pattern applies to the ACs, but the proportion is more balanced. The majority of the new work force has no assignment background. This pattern will be further enhanced by the closing of the remaining LACs which are located in different towns.
and, therefore, there will most probably be a smaller number of assignment people willing to move out of town for taking a FAS job.

TRANSITION STRATEGIES

Based on these numbers, the transition strategy for the workforce of the manual assignment centers can be constructed. A surplus assignment operator, either PA or AC, has four options available: apply for a FACS job, quit, take an early retirement (if enough seniority), or look for another job within Telco, but outside assignment. In the region served by URBAN 1, 65 of the 163 surplus people (40%) moved into FACS, while 60% chose one of the other three solutions. In the region served by RURAL 3, 19 of 50 surplus employees (38%) went into FACS, the remaining 62% moved out of assignment. Thus, the proportion of assignment operators redeployed in FACS is almost identical in both cases. However, there is a large variation in the local rates of employees working in the rural area: While 45% of those employees who work in the same town where RURAL 3 is located went into FACS, only 30% of the assignment operators working out-of-town moved into FACS. The final ratio will most probably be closer to the latter number, since the remaining manual LACs are located in other towns. Thus, three out of five assignment workers moved out of their former job category. Depending on their seniority with the firm, the geographical location they work and live in as well as the job title they had previously, manual LAC workers have several options with different levels of attractiveness. Although I don't have exact numbers for each of these
options, the information gathered from various interviews allows me to classify the options as a function of their probability:

- Most probably, a Plant Assigner would either take an early retirement or try to find another job with Telco, outside assignment but at the same pay level. Less probable but still an option for the PA would be to take a FACS job if he didn't have to move. The least probable option is to move to a new town to take a FACS job.
- Most probably, an Assignment Clerk would try to find another job with Telco in the same location. As a second option, he would consider to apply for a FACS job in the same location. As a third option, he would probably consider quitting if another job was available in his area. If this option doesn't exist, he might consider commuting to a FACS job in another town.

To summarize the discussion of transition strategies, it is safe to say that only a very low percentage of surplus workers will actually quit Telco, while the most probable overall strategy will be to take a job outside of assignment but with the company. The transition patterns, however, vary as a function of the worker category (ACs and PAs).

b) Training

Based on my literature review, I expected training to be a critical factor in the successful implementation of technological change, especially in the case of information technology. Intuitively, it is obvious that a new product or process technology will not achieve its expected performance goals unless it is properly used by the operator and monitored by the manager/supervisor. Therefore, operators and managers must be provided with sufficient training to master the new technology.

From the managerial point of view, then, the objective is to get sufficient, timely training at low cost. This raises three fundamental questions:
- Who will be trained?
- What will be taught?
- How will it be taught?

According to Flynn's analysis (see Chapter 1, Section 1.3.b), one would expect to see two training patterns in the FACS project: In the early phase, the new operators would be selected mainly from the manual assignment office; they would be taught very specific and rather narrow skills; and the training location would be at work or close to it. In a later phase of implementation, an increasing number of people with no assignment background would be trained; the skills would be more general and taught in facilities off-the-work. It appears that this is more or less what happened in reality. The only major difference between the expected outcomes and the actual events is the lack of a qualified workforce available outside assignment in the second phase. The pool of applicants was not widened because of a change in the external labor market, but rather because the skill requirements had become less assignment-specific (technology enhancements led to a more user-friendly product which was easier to learn and the training program was also massively improved).

Has the FACS training been adapted to the characteristics of the new technology or is it conceived and delivered in the traditional sense described by Schuck (see Chapter One)? The answer is a clear NO CHANGE, since the training development and the instruction process described in Chapter 4 bear all the features of the traditional approach: The course developer writes the new training based on the methods and
procedures delivered by the engineers. The training is divided into task modules, based on a highly structured user manual and delivered in classrooms. If Schuck is right, then the new FACS operators just learned enough "to be able to push buttons, but not enough to be able to push the business". However, in the two FACS LACs I examined, there were some signs of the new pedagogy postulated by Schuck to provide training appropriate for the informated work place. The presence of a full-time training supervisor in RURAL 3 supports the continuous, interactive on-the-job learning. A nesting group like the one used by URBAN 1 provides an excellent introduction to the work, with hands-on, real-time experience in a protected environment. Although somewhat limited, the mobility between different job tasks has improved under FACS and allows an operator to learn several aspects of the assignment process. In URBAN 1, management invites employees' suggestions for improvements of work design and procedures. This plan seems to work pretty well, since more than 50 contributions have been made within 18 months, some of which led to substantial improvements, e.g. a decrease of the average holding time on monitors for field-assistance from 5 to 2.5 minutes. Although these examples are encouraging, there remain several factors enhancing the traditional work environment: The FACS training concept continues to teach people "what to think but not how to think", and supervisor role definitions and the according incentive system still put low priority on the coaching function (i.e. providing learning support).
Although there were several training problems emerging during the FACS implementation, especially during the early stages of the process, the current situation shows a favorable picture of the learning organization, delivery and outcomes, both at the organizational and the individual level. The conversion of the assignment process seems to have reached a phase of stability at a performance level in the neighborhood of the initial (optimistic) objectives set by the FACS project team in 1983. In other words, the major sources of uncertainty contained in the change process have been identified and removed. The efforts put into the training of both operators and supervisors at various levels have certainly contributed to achieve these goals. As a matter of fact, once it became clear that the learning curve of a FACS operator was much longer than Jingles' initial model assumed, most FACS managers adapted their manpower strategy to the new situation and began staffing early, despite the increase in the wage bill. This staffing decision had a critical impact on both the general conversion performance AND the learning performance of the new operators.

The training variable took a different meaning than I expected when we started my analysis. It clearly had a positive general impact on the outcomes of the change process, but it didn't differentiate between individual FACS centers, because it was subject to a company-wide policy which made sure that there was not too much variation in local training implementation.

Training as a critical success factor was imbedded in a set of other determining variables which were changed over time. In the early phase, the FACS product and the corresponding training were of low quality. At
that time, even an additional investment into the training effort would not have resulted in a major learning improvement, because the external conditions (lack of experience, system downtime, high conversion rate, tight staffing) didn't support such a measure. When the conversion and staffing strategy was changed (late 1986/early 1987), training also had improved considerably and facilitated the learning process. In the early phase, training could not have made a decisive positive contribution against other negative factors, while in the later stage, its importance was recognized by the decision-makers, and it received increased attention to produce the positive learning results I have described. Had the training investment remained insufficient, it would most probably have slowed down the process, but Telco's revised implementation strategy put the right emphasis on training and effectively prevented such an event. This is not to say that the training issue was solved identically across all FACS LACs. There was considerable variation between the centers, e.g. URBAN 1 moved very late to a pro-active learning strategy, while RURAL 3 had it right from the beginning. However, once Telco's management was committed to the new strategy, it pushed it forward in all centers and didn't accept major training deficiencies any longer.
CHAPTER NINE: UNDERSTANDING TECHNOLOGICAL CHANGE

The goal of this chapter is to discuss the findings of the study in the light of the initial research hypothesis. But first, I want to locate the study in the more general context of social research on organizational change and Human Resource practices.

9.1 ISSUES RAISED BY THE CASE

The FACS study is an example of office work automation ("mechanization" in the terminology used by Telco's management), directly affecting the work of computer operators, a clerical job using VDT and executed dominantly by women. The goal of the automation project was two-fold: a) reduction of operating cost by downsizing the work force, and b) continue to standardize the assignment process in preparation for future change in technology. This section starts by discussing the FACS project in the larger context of studies on Office Automation, followed by a comparison between the FACS manpower strategy and other studies on work force downsizing.

a) Implementation Of New Office System Technologies And Women Clerical Workers

Probably the most comprehensive empirical study of office automation (OA) over the last few years has been conducted by a group of researchers under the direction of Alan Westin from Columbia University.
"The centerpiece of the research was a program of on-site visits to 110 organizations implementing office system technology." The sample centered on those companies and government agencies which had a reputation as "advanced" and "active" users of office system technology or for having "good human resources policies". Westin summarizes the trends among organizations they studied in eleven points (p.316ff). The following paragraphs discuss the trends that relate directly to the focus of my own case study.

MANAGERIAL CHOICE

Westin found no technological determinism in the application of technology, but rather significant variations at all levels (industry, organization, department, work unit, job). Of special interest is the finding that "there were often significant variations in how supervisors and unit managers were applying top management 'OA policies' to clerical workers." (p.316) Clearly, such a pattern also existed in the FACS project, including the variation in design and implementation strategies over time and between individual FACS centers. These findings provide further support for the basic assumption underlying the Socio-technical Systems Theory, which emphasizes management's choice at various points in the change process and the idiosyncratic outcomes of these decisions. As an example taken from FACS, a District manager decided about the staffing strategy of a FACS center and thus affected the quality of the conversion process by tightening/expanding available manpower early in the process.
Westin also notes that management's HRM model and policy was "the strongest single variable in how the quality of work life aspects ... were being perceived and addressed." (p.316/17) The case studies on the two FACS centers provide ample data illustrating this finding.

POSITIVE PERCEPTION OF OFFICE AUTOMATION

"Confirming the results of various national office worker surveys conducted in the past 3 to 4 years, a large majority of the clerical women I interviewed (in the 80 to 90 percent range) expressed positive comments about having VDTs to use in their jobs. Specifically, they reported important quantitative and qualitative improvements in their job performance as a result of the new office systems, and they were glad to have VDT skills which they believed would make them more 'marketable' for jobs both within and outside the firms for which they were working. Furthermore, even those women clericals who did not like the content of their jobs very much, or who were upset at the manner in which the new technology was introduced at their workplace, did not attribute the problems to 'the machine' as such, but rather to the way that their management was structuring jobs or work settings around the new technology." (p.317)

This statement about the general attitude of clerical workers towards office technology has powerful implications for the perception of work and job tasks by these women. However, looking at the case of FACS, one should be aware of an important limitation of this statement. In fact, it is not very surprising that women working with VDTs had a positive attitude towards the technology. But what about those women
clericals who aren't sitting at a terminal or those women who moved out of the work because it became computerized? For instance, the women working as FAS were basically self-selected, i.e. the former PAs and ACs who were critical towards FACS or automation in general would not take a FAS job – if they had a choice not to do so. Thus, based on Westin's study and consistent with the FACS study I only can conclude that the acceptance of the technology by VDT operators (and not by the workers in general) is very high and not a source of major problems.

The expectation of many operators to increase their mobility based on the mastery of computer skills applies to the FAS as well, although with some important restrictions. The FAS' mobility is mainly intra-organizational, since the assignment work is a very specific job in the telecommunication business. There aren't many employers in any given region who would require that type of skills. Even within Telco, the move to a higher-level/better-paid job is defined by fairly restrictive rules (seniority and screening test) under which a set of skills like the one learned for operating FACS has only a very limited usefulness.

IMPLEMENTATION PROBLEMS

For a majority of the clerical women interviewed by Westin et al. the general positive attitude towards the technology was accompanied by several types of VDT problems which the women wanted to be addressed by their managements. Some of the problems were a function of how the technology was applied (ergonomics, job design, computer-based monitoring), others were specific to women workers (pregnancy concerns from VDT use, pay equity). Examples of the former category of problems can
also be found in the FACS centers. LOMS will increase the supervisors' possibilities of monitoring individual and group performance on the job and may thus raise issues of control and power between workers and management. Similarly, the job design was handled differently by the FACS centers (e.g. rotation of all employees between all FACS jobs), and not all FAS were enthusiastic of any given solution adopted.

JOB REORGANIZATION

"The feelings of women we interviewed were significantly shaped by whether managements were providing task variety and interesting activities in the new VDT jobs, or whether they were providing retraining and new job opportunities for clerical employees ..." (p.318). The FACS job involves five different types of tasks which differ considerably in their level of complexity, work flow, social interaction, autonomy and routine. If the FACS management wants all the FAS to be able to perform on all five tasks and therefore applies a job-rotation rule, the FAS job is clearly an example of job enrichment compared to the manual assignment work. However, sometimes there tends to be a conflict of interests between task attractiveness and the employees' preferences. Database maintenance is considered to be rather boring routine work, field assistance involves a lot of interaction with people over the phone while RMA processing can be very tricky but also very frustrating for the less analytical minds. Considerations of flexibility in staffing open slots in case of an emergency have to be weighted against workers' motivation to prefer working on certain tasks rather than others. - In terms of exit possibilities, Telco put a lot of effort in placing those
surplus assignment workers who didn't want to go into FACS in new jobs outside assignment. These arrangements included job training, moving expense and other benefits.

TWO PHASES IN OFFICE AUTOMATION IMPLEMENTATION

Westin describes the development of OA implementation in two phases. The first era, between 1978 and 1983, was characterized by vendors stressing productivity and reduction of labor costs and who offered few ergonomically designed terminals and workstations. "This was partly because they saw no user willingness to pay for such features" (p.320). Between 1983 and 1985, OA implementation entered the second era, marked by vendors who were more responsive to criticism and showed greater user consciousness "by providing ergonomically sound products and major user-education campaigns" (p.320). It is striking to see the similarity between these developments in the general OA market and the changes in the supplier-user relationship between Jingles and Telco.

Based on the findings of his study, Westin develops a checklist of "good user policies". It is interesting to see Telco's score on this list with respect to the FACS implementation. The following scores are my personal estimates.

HUMAN RESOURCES INVOLVEMENT
In this dimension, Telco's score shifted from poor in the early stage to good in the later period (see next chapter).

TOP MANAGEMENT COMMITMENT
Good (see next chapter)
TASK FORCE TO GUIDE PEOPLE-TECHNOLOGY ASPECTS
Good; the FACS project was carefully planned and got
good/sufficient support from corporate staff during the whole
conversion process.

JOINT UNION-MANAGEMENT COMMITTEE FOR EMPLOYEE
INVolVEMENT PROGRAM
Good, since the labor contract stipulates the creation of a
joint committee.

ERGONOMIC STANDARDS
Good; without being an ergonomic specialists, I think Telco
did a very impressive job in designing the FACS workplace.
During all my interviews I never heard a major complaint
about the ergonomics of the new job.

"FAIR WORK MEASUREMENT" SYSTEM FOR MONITORING
PERFORMANCE
Undetermined, since the technology allowing performance
monitoring has just been put in place.

MONITOR HEALTH AND COMFORT OF VDT EMPLOYEES,
KEEP THEM UPDATED ON RESEARCH
No data on this criterion.

EMPLOYEE-CENTERED TRAINING PROGRAMS
Good; the basic FACS training is machine- rather than
employee-based, but the training on-the-job is custom
tailored and clearly employee-centered.

SUPERVISOR TRAINING ON IMPLEMENTING NEW SYSTEMS
Non-existing

CONTINUOUS COMMUNICATION PROGRAM COVERING
POSITIVE ACHIEVEMENTS AND PROBLEM-COPING INFOR-
MATION
Good; since 1987, Corporate FACS staff edits the FACS
newsletter and other periodicals for FACS users.

COVER WOMEN'S EQUALITY AND SPECIAL WORKPLACE
NEEDS
No data on this criterion.

COMPARE APPLICATION TO DEVELOPMENTS IN RESEARCH
AND POLITICS REGARDING VDT
No data on this criterion.

Overall, the picture looks fairly positive. It seems that Telco has
integrated the majority of Westin's criteria in the implementation plan.
On the base of these rough and subjective estimates, I would consider Telco as a company applying most of the "good user policies" to the introduction of new technology.

b) **Downsizing The Work Force Without Layoffs**

Looking at the structure and policies of Telco's Internal Labor Market one finds that Telco has an understanding of employment security that is similar to IBM and DEC. Case studies on work force reductions at these two firms confirm the similarity between their HRM approaches.

**LABOR FORCE ADJUSTMENT AT IBM**

Greenhalgh, McKersie and Gilkey (1986) describe a major work force adjustment at an IBM plant in Burlington, involving major shifts between direct and indirect labor and the redeployment of several hundred employees without having to recur to layoffs. An amazingly rich set of tactics were used to control inflow and outflow of workers in the plant, paying close attention to the single most important HRM principle at IBM: respect for the individual. The options ranged from the elimination of the buffer work force to the normal attrition, cancellation of contract services, involuntary lateral transfer, downgrading and relocation to other plants. The most palatable of these options were strictly voluntary, and the workers showed an amazing level of cooperation, even when called upon to make various kinds of sacrifices while at the same time IBM had a very good year in terms of sales and profits. This commitment of the workforce was the result of a long-term relationship
between employees and the company to which the latter had made firm commitments time and again. Built on such trust, management used a multi-level communication strategy to convince the employees of the necessity of the downsizing regardless the apparent absence of a productivity or demand problem in the current situation. The plant management had established a strategic long-term plan which had to be balanced with the short-run objectives. Greenhalgh et al. consider this balancing between short-term and long-run, between corporate and plant-level initiatives, and between line and staff personnel to be key to the success of the project. However, the success of the whole operation also depended largely on the implementation skills shown by plant management and HRM professionals.

What can be learned from the IBM experience in terms of employment security? "... IBM unilaterally offers employment security to its workers because management believes that the benefits, though difficult to quantify, are large even in relation to the costs. For example, IBM workers appear to return the company's commitment to them in the form of loyalty, flexibility, and willingness to go along with changes that might seem inconsistent with their short-term interests. Such predispositions are invaluable in a company that must constantly adapt to changes in its environment." (p.47) Although working in a different industry under different conditions (Post-Deregulation) and having to deal with a unionized work force, Telco's HRM policies show strong similarities with IBM: employment security, respect for the individual, and a history of strong commitment of both management and workers to the corporate values. And similar to IBM's market, Telco is operating in a business
environment of fast technological change and growing competition, requiring flexible and quick responses to changes in the external business conditions. In exchange for their commitment towards their employees, both companies enjoy a relatively high flexibility in redeploying their work force. In the case of Telco, union explicitly supports technological change as a legitimate strategy for preserving the company's competitiveness even if one of the most important results of the change lies in the cost savings stemming from force reductions. It is the employees' perception of the fairness used by management to implement such change which seems to explain this mutual support. To an extent which can't be assessed it may be that the absence of a more attractive alternative when confronting the inevitable change further shaped workers' perceptions and attitudes in favor of a cooperative solution.

LABOR FORCE REDUCTION AT DEC

Our second example in this context is a case study of a downsizing effort undertaken by Digital Equipment Corporation (DEC) in the early 1980s as described by Osterman (1986). "For DEC, employment continuity has been a constant and conscious practice since the company was founded" (p.2). DEC experienced fabulous growth of the demand for its products over several years and was anxious to meet delivery commitments at any price. Such a strategy led to very high manufacturing staffing levels. On Black Tuesday in October 1983 "the news about DEC's worst quarter in its history hit the stock market, and the stock dropped from 90 to ... 64 within three weeks" (p.10).
Following this day, the company introduced a headcount showing a disproportionate size of direct labor. Simultaneously, the company developed a contingency plan for redeploying DEC employees. In contrast to the IBM case, the initiative for the so-called "Transition" strategy came from corporate staff who had to convince DEC plant managers across all the US to buy-in. Consistent with DEC's general problem-solving approach, the Transition Process was conceived as "a decentralized process integrated through centrally-determined organization-wide principles and the use of centralized resources" (p.15). A task force developed several specific ways for "available" employees to find new employment: "For indirect labor, reassignment (with or without relocation) was the primary emphasis, followed by outplacement. Retraining was tied in with reassignment, since it occurred only once a job was offered and accepted. Direct labor people were more likely to be given temporary work assignments or to be offered incentives to separate from DEC voluntarily. Relocation was discouraged for direct labor. This limited the retraining opportunities for direct labor people in remote areas, since the new jobs would require relocation" (p.22).

After 13 months, DEC had accomplished its major goal. Overall headcount for manufacturing was reduced by more than 17%, which was a much higher rate than could have been achieved by attrition. According to Osterman's view, "it appears that the Transition Process did succeed in reducing and rebalancing the manufacturing workforce to a considerable degree ... Clearly, DEC's values and its tradition of employment security were preserved. No layoffs occurred, and the transition process preserved a high degree of choice for the individual
employee" (p.38/39). What were the success factors? Osterman cites "... the decision to make the process broadly consistent across DEC ... but responsible to local needs; the decision to let plants implement the process as they saw fit, but with strong guidance of a central staff group; the emphasis on counseling and the preparation of managers for this role; maintaining a wide variety of options for employees, ... and a large degree of choice for individuals; and the commitment to the organization's values" (p.39).

Clearly, there are several similarities between the DEC experience and the FACS project. The distribution of initiatives, roles and responsibilities between corporate staff and local management was consistent with the organizational culture of both companies and was a major factor for increasing acceptance of the overall plan. The variety of options available to surplus employees, supported by corporate resources, was a manifestation of management's attempt to respect the individual worker especially under these difficult circumstances. The considerable investment and effort shown by corporate support staff provided the necessary resources for a smooth transition and had a favorable impact on the cooperation of the line personnel.

9.2 Training as a Key to Successful Technological Change?

In Chapter 2, I formulated a research hypothesis according to which I expected to find that training would have an important impact on the quality of the outcomes of the change process. Strong support for this hypothesis can be found in a recent study conducted by Roy
Helfgott (1987). He surveyed and interviewed managers, engineers, computer specialists and workers of manufacturing firms in the United States and the United Kingdom. The majority of Helfgott's interviewees estimate that "although training may be expensive, it's cheaper than any alternative. Hiring is costly, and because the skills needed to use computerized processes are new, new employees would be no more likely to possess such skills than current workers. ... But even if employees with the requisite skills were available in the labor market, many companies would, out of obligation, retrain present workers" (p.68). This general statement applies to a majority of manufacturing firms, but at the same time describes exactly Telco's situation. Based on his study, Helfgott outlines a sequence of training-related problems which companies engaged in a technological change project had to confront:

**JOB ANALYSIS**

"Training programs cannot be devised until the jobs for which employees will be retrained are identified and their skill requirements are delineated. Jobs must be analyzed while the technology is still being developed, which is difficult because computer-based technology is not clearly understood yet" (p.69). This statement is an accurate description of the situation in the early phase of FACS implementation. The uncertainty inherent in any new technology requires a continuous organizational learning mode in order to capture empirical job performance data as soon as they become available and to adapt the training program accordingly. Between 1985 and 1987, Jingles' FACS training staff
met this requirement and produced a series of training enhancements which quickly gained acceptance among the user community.

FINDING TRAINERS

For a new technology, the uncertainty limiting the development of a thorough job study also reduces the number of qualified trainers available within the user organization. "Relying on vendors, however, has its drawbacks. Vendors' training often is superficial. In addition, they are unfamiliar with a facility's culture and, therefore, they encounter human relationship problems. Vendors also have no responsibility for continuity in training" (p.69). Telco had a serious problem with finding the right trainers early in the process, because the corporate FACS experts were tied up in setting-up the system, the professional training staff didn't know enough about the FACS technology, and Jingles' training lacked applicability. Later in the process, local FACS supervisors with teaching skills turned into on-site trainers or classroom teachers (joining the corporate training staff). Inconsistencies in the quality of the training delivery turned out to be the next problem, because the FACS conversion was moving ahead full-steam and created high training needs which had to be met by the existing training staff. Quantity of output prevailed over quality.

WORKER RELUCTANCE TO RETRAIN

Depending on the amount of change and retraining required to perform on the new job, incumbent workers may hesitate to accept the new job, especially if there are other options available and/or their
motivation is tampered by low self-confidence or perceived selectiveness of the training program (e.g. pass/fail testing). This is a serious and widespread problem, not only for many manufacturing firms in Helfgott's sample but also for telephone companies like Telco and others (see Morley's work on New England Telephone). An important step for overcoming this problem is to carefully plan the transition strategy in terms of manpower requirements, available job options and support structures. Telco's example shows that such planning is difficult because the result of a new staffing strategy is hard to predict in the early phase of implementation. In addition, although the HRM support was available and the surplus workers had several exit options to chose from (more limited in the rural areas), some elements of the change process created motivation problems among employees: Even though the introduction of a new, single job title and the pass/fail training test were consistent with the requirements derived from the technology, they had dysfunctional side effects by scaring off some potential candidates for the new FACS jobs.

. . . .

Overall, Telco seems to have mastered the essential training problems involved in the FACS project. Is that to say that training had the strategic impact on implementation success that the research hypothesis assumed? The answer to this question is only a partial yes. Clearly, Telco was quick to recognize the criticality of the learning process for a successful conversion to FACS and invested important
resources to improve the deficiencies of the early training. Without such a move, the process would have been slower and more troublesome. My initial expectation, however, was to find contrasting implementation strategies involving good and poor training in order to assess the relative impact of the training factor. The reality of the case studies show a different picture, shifting the emphasis from training to a more general HRM policy as the critical success factor: In fact, it was the combination of early staffing, strong support from the district manager and sufficient opportunities for learning on-the-job which distinguished the high from the low conversion performers (see Chapter 7). Thus, (re)training has to be seen as one of several strategic HRM factors which together form a coherent policy and largely determine the outcomes of a technological change process.

"It has been seen time and again that intimate knowledge of the behavioral facets of the system's development is just as crucial as knowledge of the technical aspects of the system when change is being introduced" (Archie Carroll 1982, p.42, in: Morley 1987, p.10).
CHAPTER TEN: SOME THOUGHTS ABOUT MANAGEMENT OF CHANGE

In this chapter, I want to discuss some practical implications of my analysis which might be useful for those who have to deal with the planning and implementation of a technological innovation similar to the FACS project. When conceiving this chapter, I consulted Michael Morley's conclusions from his case study of FACS at New England Telephone (NET) and an internal document from Telco's Corporate FACS staff (September 1986). It was striking to see the similarity of many of the problems noted at NET and at Telco. As a consequence, most of Morley's conclusions hold also for Telco.

The remaining part of this chapter describes the major factors which worked against the success of the FACS project (Section 1) or contributed to its success (Section 2). Some factors took a negative direction in the first phase of FACS and turned into positive ones as a result of changes in the implementation strategy. Therefore, they will appear in both categories.

First, remember the historical background of the FACS project:

"... it is important to understand that the AT&T divestiture was occurring during this period. New England Telephone as well as other Bell Operating Companies were concerned with the organizational changes and their effect on the competitive nature of the business. Cost became a significant issue within NET. Programs to 'drive the costs out of the business' and to be 'cost competitive' were initiated. FACS was seen as a way to meet these objectives, and it was decided that the program should be implemented as quickly as possible -- time was significant ... This resulted in some 'learning as you go' situations. Also, Jingles was a new organization after divestiture and the relationship between it and New England Telephone was new." (Morley 1987, p.95/96)
The restructuring of the supplier organization and a new relationship between supplier and user organizations added a lot of uncertainty to the implementation process. Furthermore, a major change in the general business climate towards "cost awareness" created time pressure, prevented the consideration of STS principles in the early stage of implementation, and led to a "trial and error" learning approach. - Such was the general situation in early 1985.

10.1 IMPEDING FACTORS

(1) PRODUCT DEFICIENCIES

Telco's FACS staff had accumulated a lot of experience in earlier mechanization projects of the assignment process. They knew what they needed in terms of product features and started a tough negotiation with Jingles to get several adaptations of the generic FACS product which would best fit the already installed assignment technology. Telco's technical expertise was acknowledged by Jingles and contributed to the development of a product favoring Telco's needs (there was the threat of Telco starting its own FACS product development). However, FACS was a new product for which there existed only very limited application data. Telco's staff accepted the assumptions underlying Jingle's FACS model at face value. In an earlier chapter, I described the insufficiencies of these assumptions and the remedial actions which had to be taken to adapt the model to reality. Thus, there always remains an element of uncertainty in a buying decision of an innovative product which in the case of FACS couldn't be removed despite the high
knowledge level of Telco's staff. It is all the more important, then, to keep the organization in a learning and experimenting mode over an extended period of time in order to adjust the implementation to the evidence generated during the early implementation phase. In addition, the restructuring of Jingle's organization increased the responsiveness of Jingles' FACS specialists who strongly supported Telco's staff in troubleshooting.

(2) ABSENCE OF HUMAN RESOURCES FOCUS

Over the past decade, a large body of literature on implementation of information technologies has been accumulated. As a general trend across all these studies lies the emphasis on human resource issues rather than technical expertise as a critical success factor for any technical/organizational change. Its absence can be a major barrier to success. The FACS studies perfectly match these findings. As Morley notes: "In New England Telephone little attention was devoted in the feasibility study to the human aspects of the project. Assumptions were made regarding the transition of individuals to the new assignment. Training was given surface consideration and the Jingles package was accepted." (op.cit., p.84/85) This description also applies to the planning stage of the FACS project at Telco. As a consequence in both cases, deficient training of the new FACS operators further delayed the implementation (see below).
(3) LATE/TIGHT STAFFING AND LEARNING CURVE

According to Morley's findings, NET experienced many implementation problems because FACS managers and supervisors (and operators) were not assigned early enough. Clearly, this was also a major problem at Telco for those centers which lacked management support or applied a tight staffing strategy. The average learning curve of a FACS operator taking at least six months, a tight staffing in the early days of the FACS technology multiplied the already existing system problems by adding further error sources at the human side. More important, however, seems to be the positive impact of the opposite strategy, i.e. advanced staffing and/or management support (see Section 10.2).

(4) EARLY TRAINING

In an earlier chapter, I gave a detailed description of the FACS training and the changes introduced between 1983 and 1987. At NET and at Telco, the Jingles package was accepted as adequate by the planning group. It didn't take long to establish that the basic assumption of the training was not matched by reality (i.e. background in assignment and COSMOS) and that "the work examples used in training were unlike the actual work that would be encountered in the MLAC." (Morley, p. 90)

As shown in Chapter 5, several factors contributed to these problems (e.g. lack of job description, time pressure, heterogeneous user population, cost considerations, training delivery), most of which were addressed in the later stage of implementation. I described the steps taken by Jingles to correct these problems. It is important to recognize that the FACS project was a very complex operation involving actors of
various organizations at various hierarchical levels. Given the novelty of the product, there was no other way than "trial and error" in a "learning by doing" approach to identify the deficiencies of both the product and the training. Furthermore, it is extremely rare that innovation in the education sector precedes economic or technical developments. The normal sequence puts education in a reactive mode to changes in society and business. This is also true for FACS, since a training development according to approved standards of the educational community could not have been done without a minimum application experience. The real issue is thus not to design a training package before the technology is implemented but to have enough dedicated resources available during the process to adapt the training to changes in technology and to correct practical deficiencies as empirical data become available. It seems that Jingles (and the FACS user community) had quite some problems in applying such a flexible strategy during the early times of FACS implementation, but made an additional effort after the restructuring.

(5) ANALYSIS OF EMPLOYMENT POPULATION

Morley suggests that a more careful review of needs and interests of the work force involved in the change process would provide valuable data for planning the transfers, training and new hires. To my knowledge, Telco's Corporate FACS staff and local line management tried hard to do so, but their success was rather limited (see for instance the problems encountered in staffing URBAN 1). External factors like conditions in the local labor market, staffing agreements, management's HRM policy or seniority-based transfer rules contain a lot of uncertainty
and put severe constraints on such a planning. In any case, a passive laissez-faire strategy is no alternative to a pro-active policy, as limited as the latter may be.

(6) IMPACT ON OTHER DEPARTMENTS

FACS introduced a new way of doing business in the assignment process. Technical constraints of the system required changes in the input procedures and increased standardization of all operations. These changes also affected the operations of other departments (e.g. business offices and engineering). These mutual dependencies became really apparent when they stopped working properly as FACS got involved in the relationship. Similar to NET, Telco's FACS assignment centers were put under a lot of pressure from other departments in the early days of implementation. The business offices had to deal with angry customers who didn't get service as promised. The service representatives were quick in passing their feelings up the line to the FACS centers. At the other end of operations, cable-repairmen and installers became desperate and angry when waiting on the phone (sitting on top of a pole or standing in the middle of heavy street traffic) for information from the FACS centers while the latter experienced frequent system down-time and excessive response time from the computer. It took a lot of time and patience to deal with this situation. Clearly, more, better and earlier information about FACS would have increased the understanding of the people working in other departments. There are several levels of involvement which can be used to create understanding, cooperation, support, and ownership by other departments. Neglecting this issue in
the planning of a major project like FACS leads to an additional burden for the FACS staff (e.g. at the peak time in the crisis, one FACS center got more than 10,000 phone calls per day from angry customers and other Telco departments - over a period of several months!).

(7) QUALITY OF DATABASE RECORDS AND CONVERSION

The accuracy of the new database is crucial for a successful conversion process. Two elements require special attention: Functionality of the conversion software/hardware and performance of the conversion staff. Earlier in this study, I described the difficulties encountered in the first months of conversion: The conversion product developed by Jingles was deficient, top management maintained pressure on the conversion managers to keep a high conversion rate while the FACS centers were increasingly unable to handle the volume of the business. In contrast to NET, Telco's conversion teams had no performance problems, because they were either staffed with people who had assignment background or were trained well enough to achieve a sufficient performance level.

(8) MANAGEMENT LEADERSHIP AND SUPPORT STAFF

Following AT&T divestiture, Telco underwent a lot of organizational changes which also affected the FACS project. Several times, support staff was reorganized and reassigned within Phonecorp, some hierarchical layers were consolidated or cancelled, while the work force in assignment was gradually reduced and transformed. - There was also an important amount of turnover at the district management level. Several
managers have moved out of FACS and new ones were brought in, sometimes for a limited time period only (as trouble-shooters). The analysis has shown that the District Manager played a crucial role in the choice and implementation of the staffing policy. It was thus very important to have the right person in this position.

10.2 FACILITATING FACTORS

(1) PROJECT CHAMPION

According to Morley's report, the NET FACS project didn't have a project champion at the initial stages, mainly because management's attention was focused on the reorganization after AT&T divestiture. At Telco, I found the role of the project champion to be critical at two levels. First, the V.P. of Network was (and still is) a driving force for technical excellence and cost effectiveness. His commitment to technical innovation was also a major factor in the FACS project. In some cases, like the conversion rate in the early stage of FACS, he probably pushed too hard too long when the FACS centers were already in deep trouble. But most of the time, such commitment from top management was invaluable when the problem was to change traditional standard operating procedures to make something happen.

Furthermore, as my analysis has shown, the District Manager was a key actor in the choice of the staffing strategy. His support was a crucial factor for the conversion performance of a FACS center. In addition, he could make an important contribution by showing showing
public commitment and support for FACS when handling inter-departmental conflicts which appeared at the early implementation phase.

(2) HUMAN RESOURCE INVOLVEMENT

At Telco, human resource specialists were strongly involved in several areas of FACS implementation: The introduction of a new consolidated job title, the development of a standardized screening test, the development of a FACS training package with pass/fail tests, and the design of local staffing agreements for the surplus employees in the manual LACs and the hiring of the new FACS employees. These services were not uniformly implemented, because local managers used different procedures and/or local labor markets required different manpower approaches. In general, however, the human resource experts contributed greatly to the smoothness of the change process.

(3) UNION SUPPORT

"While a typical union reaction is to oppose mechanization because it often reduces employment levels, it may be possible to at least promote understanding of the situation", says Morley (op.cit., p.87) with respect to the situation at NET. Compared to this statement, the local chapter of CWA at Telco showed an atypical reaction, since it never opposed the FACS project despite the inherent reduction of the work force. In the new labor agreement signed in 1986, the union takes a neutral-supportive position toward technological change. In exchange, management agrees to union participation in evaluating an upcoming change and presents a number of special benefits for workers whose jobs
are threatened by technological change. In the case of FACS, union-management negotiations turned around the pay protection and job description of the down-graded Plant Assigners but never questioned the change per se. In the light of the outcomes of the FACS project, management seemed to have done a credible job by putting a lot of effort into prevention of layoffs, by facilitating lateral moves, as well as offering early retirement incentives and lump-sum payments for quits. Such a positive experience is likely to maintain union's support for future technological change.

(4) USER INVOLVEMENT

It is important to note the two aspects of this issue: As my analysis of Telco's FACS project has shown, there is an economic benefit in following an early staffing strategy. But there is also a psychological aspect which requires attention: The literature on organizational change strongly suggests that early user involvement increases acceptance and ownership of the change by the user, an important prerequisite for overcoming critical moments and carrying through an assignment despite adverse conditions. In both companies, more consideration has been given to this aspect and the situation in the later centers has improved accordingly.

Two examples may illustrate the power of this factor. Supervisors and operators of RURAL 3 were hired and trained many weeks before the FACS conversion was started. They worked for several weeks in another FACS center to gain some practical experience with the technology and had thus built up a strong group cohesion as well as
self-confidence. URBAN 2 has one of the most successful conversion records within Telco. However, the center went through a six-month period of enormous pressure and difficulty when — within four weeks — more than 200,000 lines were cut live at once without a corresponding increase in the staffing level. It was mainly the commitment of both management and operators not to let go under these difficult circumstances which helped overcome the crisis. Not a single operator quit during this period, although they had to work maximum overtime (six days of 12 hours) for many months and they were right "in the sewer", as one manager put it.

(5) TRAINING

Overall, the training issues were handled successfully at Telco, despite a very difficult time in the beginning of the FACS project. The importance of a well-trained work force is underlined by the fact that — on average — it takes six to nine months for an employee to become fully productive as a FACS operator. Such a learning-curve is surprisingly long for that job level and illustrates the disruptive change from the manual to the mechanized work environment. It also emphasizes the need for ongoing, continuous on-the-job training. As long as the technology keeps on changing, there is a need for further training (remedial, updating, refresher, new). Telco acknowledged these needs when the local FACS centers introduced various approaches for enhancing the on-the-job training (nesting group, full-time training supervisor, coaching, job rotation).
Furthermore, Jingles recognized the limits of the FACS introductory training package and is currently working on a new version which is module-based, thus allowing to train new employees according to their specific level of prior knowledge and work experience. However, it remains a difficult task to revise training during the implementation process, especially if the training is tied with a job-affecting pass/fail testing procedure.

(6) CAPITALIZE ON THE EXPERIENCE OF OTHERS

Morley reports that FACS line managers at NET didn't have/take the opportunity of learning from FACS projects in other telephone companies. To a certain extent, this is also true for Telco's managers, but some of the latter had a great opportunity to learn from within the company and most of them used this opportunity, as is illustrated by the introductory phase of the RURAL 3 FACS center. Again, this is another example of the organizational learning curve along which the FACS project was actively moved over time.

... ...

"While there have been significant difficulties with this project to date, it is expected that these negative aspects will be restricted to the short term. From a long term view, there will be many benefits. FACS will be implemented throughout NET and will contribute to the cost savings efforts of the company, and the lessons learned from this
exercise will be useful in the future as automation continues in other areas." (op.cit., p.96)

What Morley expressed as a hope for future improvements at NET has become a reality at Telco already during the second phase of the FACS project. I consider this aspect as one of the most important lessons one can learn from Telco: Over a period of only three years, Telco has shown a tremendous learning capability and in general was able to adjust the implementation strategies of later centers according to the experience of the early LACs. While it is certainly true that external factors have also contributed to improve the conversion process through product enhancements and revised training packages, it was Telco’s FACS management which showed enough flexibility to take advantage of these changes and to further correct internal problems like the conversion strategy or the staffing policy. Telco’s transition from the manual assignment process to FACS was not error-free, and other companies may have had a quicker and smoother change process. However, what is important about the Telco example is the willingness and ability to learn from mistakes, to correct actions accordingly and to stay in this "learning mode" over the whole conversion period.
APPENDICES
APPENDIX ONE: TRAINING AND TECHNOLOGICAL CHANGE

What are some of the major factors determining the quantity, quality and process of training related to technological change? A descriptive framework for answering that question at a global level is provided by Flynn (1985). She classified the case studies she analyzed according to a life cycle concept applied to production, jobs and training. As a result, Flynn perceives changes in training needs along a life cycle curve of four periods, starting with early adoption, moving successively to a phase of growth and maturity and reaching a final phase of decline or stability (Flynn 1984, 4).

The life cycle model allows to classify various case studies into a single framework (e.g. Salzman and Mirvis 1985; Adler 1986; Ryan 1984) and discuss general implications for training such as who should provide what type of training at what time in the life cycle of a technology.

With respect to the case studies presented in this paper, Flynn notes the following differences between companies:

"... the case studies on the adoption of data processing technologies suggest that whether current employees were retrained for the higher-skilled jobs depended on the timing of the adoption relative to the development of the technology. More specifically, the availability of trained individuals in the external labor market played a critical role in the employers decision to retrain workers. For instance, the cases on early adopters of the data processing technologies indicate that firms retrained their own workers for most of the new positions. ... As demands for computer-related personnel became more widespread, companies often lost the workers they had retrained to other firms. Employers thus narrowed their training to more firm-specific skills which are less transferable among firms."
(Flynn 1985, 26-27)
At the normative level, several authors have described the characteristics of the new (high-tech) workplace, derived skill requirements for the (intelligent) worker and generated a catalogue of features of the "new" technology training. Zuboff (1982) describes the double potential of information technologies: they may be used in the traditional sense as a means for automation (most probable manpower impact: labor saving and deskilling) or they may lead to a more disruptive change, opening new uses and requiring new skills ("technologies that informate"; main impact: upskilling). The informative use of technology is more difficult to achieve, because it translates into a more fundamental change not only of the work design, but also affecting the business strategy, power and control issues and the current roles of managers at all levels. The computer-mediated work leads to fundamental changes in the task: e.g. higher abstraction, less content more technical knowledge, imagination—instead of experience-based, new social interaction patterns, potential for remote supervision, the computer not as an instrument but as a source of authority, and a work flow out of the immediate control of the employee ("You can't beat the tube!"). I will come back to these issues in more depth in Appendix 8, when I will discuss commonalities of the case studies. Suffice to say here, that information technologies are not neutral but have three unique features which are subject to managerial choice:

- the quality of the employment relationship (basically the consistency between the technology design and the dominant ILM model in the firm);
- the focus of managerial control (not interpersonal behavior or physical activity anymore, but related to
attention patterns, where learning and mental engagement of employees are key to high quality performance; the nature of organization and management (composition of the labor force and work organization).

Decision in these areas lay the base for the definition of any training needs and the way they will be answered. Traditional training for a new technology focuses on precise and well-defined applications. It is practically oriented and emphasizes the use of equipment. It is task-specific, highly structured, and typically occurs in a classroom setting. Paraphrasing an example from Schuck (1985), such a training process looks like this:

1. Engineers write tech specifications.
2. Technical writers develop tech documentation into user's manual, written to eighth-grade reading level and broken down into modules, each one covering a specific task.
3. User manual is base for highly structured lesson plans, divided into task modules.
4. Five hour terminal operations session, then supervisor train workers in precisely those tasks they would be performing.

Thus, workers are given information on a need to know basis. They learn just enough to be able to monitor and control their area of responsibility. Training enhances capacity to learn objects and actions. "Workers usually learn enough to be able to push buttons, but not enough to be able to push the business."

Traditional training offers little or no opportunity to learn intellectual skills. It is reactive to "trouble", not on-going, rehashing previously taught curriculum - more objects and actions. These methods teach people what to think but not how to think.
In contrast, training for the informed workplace requires a new pedagogy that creates an environment conducive to the development of intellective skills. Not a single course or series of training events, but a reconceptualization of the work place as a learning environment and a redefinition of the role of manager in the learning process are essential steps for achieving this new pedagogy. Schuck describes several characteristics of the new learning environment and the new management role related to it (continuous interactive on-the-job learning, a manager who listens and focuses on the process of problem-solving rather than giving the right answer) and also mentions possible obstacles (traditional manager roles and peer culture, inappropriate incentive system).

What are the features of a human resource development function which allows to achieve these new demanding objectives? The focus and status of training within the HRM function has varied over time (see Lawrence 1985). Sonnenfeld and Ingols (1986) have identified five major training dilemmas in today's companies which threaten the contribution of the HRD professionals to the company's overall performance:

- expanded responsibility for training (increase in number and types of training to be provided)
- poor cost accountability (less than 1% of 1,200 major companies surveyed in 1984 assess their training cost).
- limited internal coordination (there is only little coordination among various types of training within a company).
- dangerous reliance on possibly biased experts (e.g. for doing training needs analysis).
- confusing number of training suppliers (the choice of appropriate trainers is probably the greatest training dilemma).

Having identified these dilemmas, Sonnenfeld and Ingols determine that there is a need for a new, comprehensive view of human resource renewal. They give three prescriptions for reaching this view:
- establish organizational fit between training structure and the ILM model in the company, including the development of an education and training vision for the company (not the medical model, but "managers for tomorrow" view).
- coordinate training with career systems, because there are different needs at different career stages.
- be aware of the specific needs and abilities of an adult learner.

Sonnenfeld and Ingols' contribution represents just one example of many prescriptive views in the training literature to which one can compare any training strategy applied in the implementation process of a new technology. The point to keep in mind here is that training is not an isolate HRM function, but has a strategic value and should be consistent with the new characteristics of the ILM model. It is thus subject to the same type of constraints as the global employment system of a firm.
APPENDIX TWO: TWO MODELS FOR ANALYZING THE TECHNOLOGICAL CHANGE PROCESS

HAVELOCK'S LINKAGE MODEL

Havelock (1969) conceptualizes the change process in a four-element linkage model. His model is based on the analysis of several thousand empirical studies of knowledge diffusion and utilization. The fundamental relationship in the model is the linkage between a user system and a resource system. Knowledge (technical innovation) flows between the two systems as part of a need reduction/problem-solving process.

Havelock identified seven factors that accounted for most diffusion and utilization phenomena:

1. Linkage
   The number, variety, and mutuality of contacts between user and resource system, degree of inter-relatedness, collaborative relationships.

2. Structure
   The degree of systematic organization and coordination of the two systems, the dissemination-utilization strategy and the message (coherence).

3. Openness
   The belief that change is desirable and possible. The willingness and readiness to accept outside help, to listen to needs of others and to give help, and the social climate favorable to change.

4. Capacity
   The capability to retrieve and marshall diverse resources. Highly correlated with this factor are wealth, power, size, centrality, intelligence, education, experience, cosmopolitaness, mobility and the number and diversity of existing linkages.

5. Reward
   The frequency, immediacy, amount, mutuality of, planning and structuring of positive reinforcements.

6. Proximity
   Nearness in time, place, and context, familiarity, similarity, and recency.
7. Synergy
The number, variety, frequency, and persistence of forces that can be mobilized to produce a knowledge utilization effect.

(Source: Havelock 1969, 11-20)

Havelock distinguishes between characteristics of the resource and the user systems, the innovation media (the product) and the diffusion strategy.

THE CONGRUENCE MODEL BY NADLER AND TUSHMAN (1980)

Havelock's linkage model was developed to describe knowledge diffusion and utilization in very general terms. It can thus be applied to all types of innovation processes. On the other hand, the abstractness of the notions and elements used in the model limits somewhat the possibility of capturing the wealth of local contingencies contained in a specific case. For instance, when examining innovation in educational settings, the primary focus of the analysis has to be on different aspects of the process than when looking at technological innovation in a firm. In the latter case, the user-resource relationships may be less relevant than the interactions between different sub-units inside the user system. Intra-organizational issues become critical and need to be examined more closely. For this purpose, other analytical approaches may be more appropriate, thus complementing Havelock's general model in a specific dimension where a more elaborate framework is required.

For this study, I chose to use a diagnostic framework provided by
Nadler and Tushman (1980) for analyzing organizations in terms of systems theory.

"[This model] views organizations as made up of components or parts that interact with each other. These components exist in states of relative balance, consistency, or "fit" with each other. The different parts of an organization can fit well together and function effectively, or fit poorly and lead to problems, dysfunctions, or performance below potential. Our congruence model of organizational behavior is based on how well components fit together — that is, the congruence among the components; the effectiveness of this model is based on the quality of these "fits" or congruence."
(Nadler & Tushman 1980, 39)

Three major categories of elements compose the model: Four types of inputs, four organizational components in the transformation process, and outputs at three levels. Nadler and Tushman provide a definition for each of these elements and list "critical features for analysis" for each of them.

"The organization is seen as a system or transformation process that takes inputs and transforms them into outputs—a process that is composed of four basic components. The critical dynamic is the fit or congruence among the components."
(op.cit., 47)

Nadler and Tushman define six types of congruence between system elements:

1. Individual/Organization
   Individual needs met by the organizational arrangements; individuals' (distorted or clear) perceptions of organizational structures; convergence of individual and organizational goals.

2. Individual/Task
   Individual needs met by the tasks; individuals have skills and abilities to meet task demands.

3. Individual/Informal Organization
   Individual needs met by the informal organization; use of individual resources by informal organization consistent with informal goals.
4. **Task/Organization**  
Adequate organizational arrangements to meet the demands of the task; organizational arrangements motivate behavior consistent with task demands.

5. **Task/Informal Organization**  
Structure of informal organization facilitates task performance, helps or hinders meet the demands of the task.

6. **Organization/Informal organization**  
Goals, rewards, and structure of informal organization consistent with those of formal organization.  
(Source: op.cit., 46)

The congruence model can be complemented by even more specific submodels, e.g. job characteristics model (for explaining fits 1 and 2; e.g. Hackman and Oldham 1979), expectancy theory models (for explaining fits 1–3; e.g. Vroom 1964, Lawler 1973), the information processing model (for explaining fits 4 and 5; e.g. Galbraith 1973), or an organizational climate model (for explaining fits 3, 5, and 6; e.g. Tushman 1977, Pfeiffer 1980).

In 1986, Tushman and Nadler extended their congruence model to include the analysis of organizational change in it. According to their analysis, process and product innovations occur in different variations over time, following a life cycle pattern with specific learning requirements. This framework is consistent with Flynn's product/job/training life cycle model (Flynn 1985), presented in Appendix 1. Tushman and Nadler summarize the challenge of the innovation process in a nice formula: "Managing for today while building the infrastructure for tomorrow". According to their analysis, however, "...this formula involves
a basic dilemma: building the systems and processes for the short run often undercuts the innovative process."

(Tushman and Nadler 1986, 79) Tushman and Nadler enumerate some key elements of designing innovative organizations. The underlying idea is to maximize chances of a successful implementation of a new task by managing the critical factors of the informal organization, the individual and the organizational arrangements, which are the major components of the congruence model. These critical factors are:

INDIVIDUALS

Management has to hire, train and develop a set of individuals with diverse skills and abilities, and the capacity to innovate. However, strong individual specialization must be bolstered by skills in problem solving, communication, conflict resolution, and team building. Furthermore, there is a need for a top team to help provide direction, energy and enthusiasm for the organization. These are the role models who create the condition for learning and innovation throughout the organization.

FORMAL ORGANIZATIONAL ARRANGEMENTS

These arrangements provide structures, systems, and procedures which direct and motivate behavior. They include

- Linking Mechanisms like teams, committees, or task forces, like project managers (for achieving integration and coordination for new product/process development), like formal meetings for information sharing, idea trading and building of informal relationships.

- Incentives enhancing innovative behavior, including special recognition and rewards for particularly innovative employees.
- Joint Evaluation, Staffing, and Appraisal to maximize ownership and coupling between areas.

- Job Design, Job Rotation, and Careers for motivating employees who are willing to experiment and be creative. Substantial autonomy, variety, and individual involvement offer intrinsic motivation to perform well. On the other hand, too much job-hopping can inhibit innovation.

- Education, especially management training programs for managing innovation across functions. These programs also provide an opportunity for informal contacts in a relaxed setting, nurturing both individual and organizational learning and innovation.

INFORMAL ORGANIZATION

"While formal organization arrangements facilitate corporate learning and innovation, individual creativity springs from a healthy informal organization. Several dimensions of the informal organization are particularly important in managing innovation."

(Tushman and Nadler 1986, 87)

- Core Values in highly innovative firms are clearly formulated, have a strong focus and provide a common objective to which disparate professionals and divisions can agree.

- Norms specify the meaning of core values. They are expected behaviors. "In general, highly innovative organizations have norms that stress informality in behavior, dress, and boss-subordinate relations; high work standards and individual/group performance expectations; flexibility in decision making, problem solving, and conflict resolution patterns; and strong informal linkages within and outside the organization." (op.cit., 88)

- Rewarding Risk in various forms: Provide highly visible rewards for success but often downplay the punishment for failure; little tolerance for those whose performance falls short of the organization's standards, or creating conditions that tolerate failure — and sometimes even support it.
- Informal Communication Networks are vital to innovation; informal contacts both within the organization as well as between the organization and customers, vendors, suppliers, and external professional sources.

- Critical Roles: Idea generators, champions or internal entrepreneurs, gatekeepers or boundary spanners, sponsors, coaches, or mentors. "Each of these roles is critical; if any fails to emerge informally, innovation suffers. Formalizing these roles seems to make them disappear." (op.cit., 90)

- Conflict Resolution and Problem-Solving Practices. "While formal organization arrangements are relatively more important in high-volume, low-innovative settings, the informal organization is more important for tasks that require learning and innovation; the greater the required learning, the greater the importance of the informal organization." (op.cit., 90)
APPENDIX THREE: DATA COLLECTION AND ANALYSIS

For this study, I used a methodological approach which is derived from qualitative data analysis as it is represented by Huberman and Miles (1983a, 1983b, 1984a, 1984b). According to these authors, qualitative data analysis is an iterative process made up of three major components: data reduction, data display and drawing/verification of conclusions. Every time a data collection phase is started, a new sequence of these components follows the field work (they are actually imbedded in the field work), thus allowing for modifications in framework, instruments and sampling during the research process. If properly documented, this approach is very powerful due to its flexibility and closeness to natural settings.

In their sourcebook on qualitative data analysis, Huberman and Miles (1984b, 27ff.) recommend the following steps for focusing and bounding the collection of data:

(1) build a conceptual framework (graphically)
(2) formulate research questions
(3) decide about which people, settings, events, and social processes to observe
(4) choose appropriate degree of structure for instrumentation (as a function of exploratory and confirmatory aspects of the study).

The conceptual framework was introduced at the end of the last
section. The list on the following two pages summarize the research questions derived from the framework.

A LIST OF RESEARCH QUESTIONS

ORGANIZATIONAL INPUT FACTORS
Describe the demands and constraints put on organizational action by environment.
Describe the relative quality and flexibility of the user system's resources.
Describe major historic stages of company's development. What is the current impact of key historical factors?
Describe the company's core mission, base of competition (strengths and weaknesses), operational strategies and specific objectives for output.

ORGANIZATIONAL CHARACTERISTICS OF THE USER SYSTEM
Describe the six fits of the congruence model as found in the user organization.
To what extent were the critical factors (which characterize an innovative organization) observable in the formal and informal organization of the company, and in the HRM policies of the company?

HUMAN RESOURCE SUBSYSTEM
What are the characteristics of the company's work force in terms of the Internal Labor Market concept?
What are the major human resource policies of the firm (including training)?
How is organizational and individual learning structured?
What are the available resources for training?
What does the innovation support record of the training staff look like?
Describe the involvement of the training staff in the project.

ADOPTION DECISION
Who was involved (user organization, supplier)? What was their attitude towards the project before, during and at the end of the decision-making process/implementation?
How were the goals of the operation set?
What were the goals of the project?
How much priority and centrality did the project have at that time?
What were the components of the original plan?
Where the conditions for implementation assured before start?
How was decision communicated to others?
IMPLEMENTATION PROCESS

Linkage
How was the relationship between user and resource system prior to the innovation? How did it develop during the innovation process? How was it at the end of the process? How many direct contacts and informal groups were there between user and supplier system? Did the implementation strategy fit with the problem-solving style of the user (and the supplier)? How close and accessible was supplier, were other users? What about psychological proximity?

Product
How relevant was the innovation to the user? How was the internal congruence of the innovation? To what degree was it consistent with and similar to past innovations? Was it related to and congruent with the user’s needs? How familiar was it to the user? Was the innovation coherent in form and substance, prepared systematically and ready for use? Describe adaptability, divisibility, and demonstrability of innovation. How big was the investment, how sophisticated were design and development of the innovation? Describe the profitability of the innovation for both user and supplier.

Implementation Strategy
What about the number and variety of forms and the continuity among forms in which the innovation was presented? Describe the number, variety, consistency and persistence of media used. How flexible, redundant, and systematic was the strategy? Did it support informal communication? Did it fit the user’s internal problem-solving cycle? How accessible was the innovation to the user? Did the strategy give quick and appropriate feedback to the early user? Did it provide the proper rewards to the user and the supplier?

User
Where there previous contacts with other users and suppliers? How was the internal contact between innovators, opinion-leaders and followers? Were there any specialized sub-units for retrieving and adapting innovation? Was there a pre-existing systematic problem-solving mechanism? What about internal linking roles? How open was user? Was user capable of assembling and investing his resources? Were resources sufficient? About earlier innovations: positive experience?

Supplier
Was there a coherent view of the user’s problem-solving process? Was the innovation planned systematically? Was the division of labor efficient, what about the coordination? Were the resources available sufficient? Was there a persistent leadership during the process? Who had access to user? Were their activities coordinated/synchronized?

OUTCOMES
To what extent were the project goals achieved?
What were the main employment effects?
Taking into consideration the time constraints and limited resources of a thesis project, I had to make a number of focusing decisions to assure the feasibility of the study. Thus, I decided to concentrate data collection on the implementation process from a managerial perspective and paying special attention to qualification issues (i.e. selection and training of the new work force). The main method used for data collection was an oral interview of individuals involved in the FACS project. For that purpose, I have developed an interview guideline with about 50 questions (see below).

The persons to be interviewed were selected in function of their expertise regarding my research topics and their involvement in the innovation process.
## DATA COLLECTION PLAN

<table>
<thead>
<tr>
<th>Date</th>
<th>Interviewee (number of interviews)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 8-9</td>
<td>FACS Conversion Manager (1)</td>
<td>Corporate HQ</td>
</tr>
<tr>
<td></td>
<td>FACS Corporate Support Manager (1)</td>
<td>Corporate HQ</td>
</tr>
<tr>
<td></td>
<td>Training and Development Manager (1)</td>
<td>Corporate HQ</td>
</tr>
<tr>
<td>Oct. 12-14</td>
<td>FACS Training Managers (2)</td>
<td>Corp. Training Center</td>
</tr>
<tr>
<td></td>
<td>FACS Developers and Instructor (3)</td>
<td>Corp. Training Center</td>
</tr>
<tr>
<td></td>
<td>LAC Managers and Operators (5)</td>
<td>Site A</td>
</tr>
<tr>
<td>Oct. 16</td>
<td>FACS Training Developer (1)</td>
<td>FACS Supplier</td>
</tr>
<tr>
<td>Nov. 18-20</td>
<td>LAC Manager and Supervisors (2)</td>
<td>Site B</td>
</tr>
<tr>
<td></td>
<td>FACS Conversion Manager (1)</td>
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<tr>
<td></td>
<td>FACS Corporate Support Manager (1)</td>
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</tr>
<tr>
<td></td>
<td>Director HRM (2)</td>
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</tr>
<tr>
<td></td>
<td>FACS Training Developer (1)</td>
<td>Corporate HQ</td>
</tr>
</tbody>
</table>

Of each of the 21 interviews I made an almost literal transcription which I put into a computer file on my PC. These protocols were then coded according to the variable list derived from the conceptual framework. I have written a protocol analysis program through which I can select the relevant items from each protocol for any variable combination I need. This allows me to analyze the interviews very quickly, thus having information about missing data or unclear statements available for the next field visit. The transcribed material covers more than 120 double-spaced pages. In addition to the interviews I analyzed several written documents, e.g. the FACS Project Letter, a follow-up study on FACS end-user training outcomes, statements about corporate mission, goals and values, covering more than 500 pages.
INTERVIEW GUIDELINE

I COMPANY

1. How would you describe the general business goal(s) of your company? Are there documents reflecting these goals, e.g. charta, annual reports, brochures? To what extent do you think are these goals shared by employees and top management?

2. What are the strengths and weaknesses of your company? Take a minute and write three pluses and minuses on a piece of paper. Examples: service to customer, flexibility, labor relations, turnover, salary, profits, promotion, technology.

3. How would you describe the three main business goals on which top management places the most value/emphasis?

4. How would you describe the business environment your company is in, e.g. competitive, quality-oriented, product-based? Has it changed over the past five years? How?

5. Is there an explicit statement of your company’s business strategy? How would you describe it? Has the strategy been changed recently? Many times? Why? How?

6. Do you have an organizational chart of your company? Or: Could you draw me a simplified picture of it?

7. I want to give you a short questionnaire on organizational structure. Please ask me if an item is not clear. Answer spontaneously. The questionnaire is just a very rough measure, so don’t put too much importance to it. Alternatively: Could you fill out this questionnaire and give it back to me tomorrow?

II HRM/HRD

8. Let’s change subject for a moment. I want to know more about your company’s personnel/HRM structure. Where and how does it fit into the organizational chart you gave me a few minutes ago? Could you make a detailed chart of the personnel function as well? Use my fictitious layout.


10. Let’s talk about the history of labor relations in your company. How
was the relationship between employees and management under AT&T, and now?

11. How do you think does top management see their employees? As an asset, a cost factor?

12. Tell me about the HRM/HRD managers in your company. What is their qualification/skill level/background? Their status and position within the company? Their career goals? Sex and age? How long have they been or do they usually stay in this function?

13. Could you describe the main operations of the personnel department and the training staff?

14. What the about the HRM/HRD budget? Has it changed over the past years? Who sets it? Satisfactory level?


16. Who are the people in the training staff? Background, qualification, skills? Status and position? Salary? Promotion ladders? Turnover? Sex and age?

17. What are the main responsibilities/tasks of your training staff? What do they do? How much time do they spend on each task? Do they work in groups, varying composition, individually?

18. I give you another questionnaire dealing with several issues of organizational structure and culture. Please fill it out:
   a) in red for the whole company
   b) in blue for the Personnel department
   c) in green for the HRD function, if different from Personnel.
   Alternatively: Could you fill out this questionnaire and give it back to me tomorrow?

III FACS PROJECT

19. How was the situation in MLAC before the FACS project, e.g. performance, job satisfaction, motivation.

20. Please describe the technical features of FACS to me.

21. What do you know about Bellcore? Experiences with FACS in other companies?

22. What did management expect from FACS? Is there an explicit statement of the business goals: Did they inform the employees about FACS, e.g. via in-house newsletter?
23. What were the expected organizational and economical effects of the project, e.g. reduction of work force, relocation of facilities, savings, quality, service, redeployment and retraining of employees?

24. Could you give me a chronology of the facts of the FACS project?

25. Who prepared the decision to introduce FACS? Who was in the project team? Coherent thinking within the group?

26. Describe how management came to accept the proposal. Were there many changes? Was the impact carefully evaluated and well anticipated? Operation well planned? How intense was communication with Bellcore during that period? How strong was Bellcore's influence in the decision-making process?

27. Were alternative products considered in the evaluation?

28. How much freedom/flexibility did the Bellcore FACS technology provide for organizational and economical goal choice, i.e. how high was the cost of adaptation and change?

29. Who prepared the implementation plan? Who was in the team? Line people and HRM staff? When were new managers appointed? How and when were employees informed? Other departments?

30. What was the content and timeframe of the implementation plan? How was it determined, i.e. based on empirical data or decided on the green table? Who were the key people in this stage of the process? What about Bellcore and other companies with FACS experience?

31. How were skill issues and employee job satisfaction/performance taken into consideration, e.g. fit between existing and required skills?

32. How did management approve implementation plan? Any changes?

33. Were the available resources appropriate? Was the timeframe realistic? How flexible was the plan, e.g. allowing for changes on the way? How were objectives reflected in incentive structure of management and employees?

34. Who supported the plan? What were the major critical factors raised against the plan, e.g. order of magnitude of the change involved at organizational, cultural and job level? How did top management show its commitment?

35. How and when were employees informed? Other departments?


37. How were supervisors selected and trained?
38. How were employees selected and trained?

39. To what extent were the goals achieved? Evaluate every goal in detail. How were the results/outcomes assessed?

40. How were the problems handled? Analyze case by case.

41. How were employees' motivation, job satisfaction, performance?

42. What were the major differences between previous MLAC jobs and new FACS jobs? Skill level and type, communication, control, salary, promotion, turnover, training.

43. How did the number of jobs change in every category, e.g. new jobs created, old jobs eliminated?

44. How did HRD people feel about the implementation?

45. How was their involvement, e.g. who was involved, how, how much and when?

46. How was commitment and motivation of HRD people? Were appropriate incentives related to performance in the FACS project?

47. How high was the FACS project in the internal priority list of HRD?

48. Who was the major provider of FACS training?

49. Has FACS changed anything in the HRD department, e.g. new trainers, programs, shift/delegation of responsibility, change in budget?
APPENDIX FOUR: TELCO'S INTERNAL LABOR MARKET

The following table summarizes the major characteristics of Telco's Internal Labor Market within Osterman's framework (1983, 1987; see Chapter 1). The classification reflects my own estimates.

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>INDUSTRIAL</th>
<th>SALARIED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Definition</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Job Classif.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Skill Level</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>In-Firm Training</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Deployment Base</td>
<td>X - - -</td>
<td>X</td>
</tr>
<tr>
<td>Promotion Base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Ladders</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Quits</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Job Security</td>
<td>X</td>
<td>X?</td>
</tr>
<tr>
<td>Layoff Rule</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Layoffs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wage Rules</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Some explanations are necessary to interpret this table.

JOB DEFINITION AND CLASSIFICATION

Telco has a unionized work force. The labor agreement follows an industrial pattern with narrow job definitions and rigid job classifications. Any change of the system, e.g. the introduction of a new job title, requires tedious planning and negotiation, as well as a careful assessment of the discriminatory potential of the proposed change. A concrete example will be given by introduction of FACS in the assignment office. There, two old job titles were integrated into a single new
one which led to a lengthy process involving job analysis, development of a screening test and a non-discriminatory pass/fail training test.

SKILL LEVEL AND IN-FIRM TRAINING

This category doesn't differentiate between the industrial and the salaried ILM model, because both models are characterized by an extended in-house training program and rather high skill jobs. The training system will be addressed in more detail in the next section of this chapter.

DEPLOYMENT

In accordance with the industrial union tradition, seniority is the main criterion for assigning people to new jobs and tasks. (Although there is a limit to this principle in that employees applying for a new job usually have to satisfy some basic job requirements before they become eligible.) In recent years and for an increasing number of jobs related to the use of new technologies, however, seniority as a deployment criterion has been supplanted by ability to perform. The latter is generally assessed by a screening test and a training program including a pass/fail final test. This trend is even more visible in the current promotion policy, where performance on the job has clearly become a better predictor of promotion than seniority.

The career ladders in Telco are dominantly long and well structured, although there are examples of a more fluid structure. For example, the new FACS job title was not only opened to employees with a background in assignment (the traditional prerequisite for such a job),
but to all employees who pass the test and training program for the job. Currently, quite a few segments of the job ladders at Telco are hybrid. In both models, the expected quit rate is rather low.

Telco's operations cover four U.S. states. This large spread makes a real issue of the geographical mobility of the work force. The FACS study confirms previous similar examples of deployment plans within Telco, where the job opportunities and employees' mobility pattern differed strongly as a function of urbanization (few job openings and low mobility in rural areas, many jobs and high mobility in metropolitan areas).

**JOB SECURITY AND LAYOFFS**

Through his behavior over the past decades, Telco management has shown its commitment to employment security. The labor contract, however, doesn't exclude but stipulates specific procedures for layoffs. The compensation plans are generous and differ as a function of employment seniority. The layoff rule is clearly seniority-based, bumping is a frequent phenomenon and - as can be seen in the FACS case - the internal job bidding mechanism can make staffing decisions for a new operation rather difficult. As far as actual layoffs are concerned, Telco seems to have a very good record, since all major technological innovations which had been introduced over the past ten years or so and had led to a downsizing of the work force could be implemented without layoffs. Management used early retirement incentive plans, generous lump sum offers for quits and natural attrition as main downsizing strategies. In analogy to the deployment criterion, the perceived importance of job
security varies as a function of urbanization (higher priority perceived by surplus people in rural areas). Similarly, it is more difficult for management to offer a fair job security to people who become displaced by technology in a rural area with little alternative job opportunities.

WAGE RULES

Despite the tendency to apply more merit considerations in deployment and promotion decisions, the basic compensation system is completely job-related and, to my knowledge, there is no performance-based element contained in the salary of non-management positions.
APPENDIX FIVE: TECHNICAL HISTORY OF THE ASSIGNMENT PROCESS

The LAC operations went through several stages of technical progress. In the manual phase, the order-taking unit and the order-processing unit were physically consolidated in one location. Order forms were physically moved from one desk to the next, back and forth if error checking was necessary, and involved many hands and heads before the actual assignment was accomplished.

CERTIFICATION

The first step, then, was to standardize the order-taking process by the creation of the typist function, where each order was typed and transferred mechanically to the assignment center (Loop Assignment Center; LAC). This allowed to consolidate several assignment centers in one location which was physically independent of the customer-service units. Fewer LACs handled more volume and economies of scale became possible. Accordingly, the number of Telco's LACs decreased from 102 in 1980 to 52 in 1983.

DOE

Phase two expanded the up-front standardization by introducing a computer-based order-taking system which allowed the service operator to produce a transferable service order while he was dealing with the customer (DOE = Direct Order Entering). Thus, the typist function became obsolete.
COSMOS/FMS

At about the same time, central office wiring records and telephone number lists were converted into a computerized database which allowed to automate the telephone number assignment. This conversion happened with two types of software, one - COSMOS - was bought from Jingels, the other one - FMS - was developed in-house. The two systems are different approaches to the same problem and largely incompatible with each other. COSMOS is a database distributed on mini-computers. It can be managed within Network, the operating division of Telco, whereas FMS is a mainframe system which has to be managed by central Information Systems people. Supporters of each of the two solutions claimed superiority in either technical performance or connectivity issues.

PREMIS/LAC

This set the stage for further mechanization of the LAC operations, where the main database (paper records of customer sites) was still kept manually. Sometimes in 1981, Telco started to convert the customer site records (DPAC) into a computer database (Premises Information System; PREMIS) and connected it directly to the order processing system (CORDNET) by standardizing and mechanizing the so-called will-serve record. Thus, any new service demand could be linked by the address to the available equipment and assigned by the operator based on information contained in the database. This allowed for an improved assignment quality and faster billing. The biggest advantage, however, was that a new service demand for telephone where service had existed previously
(say in an apartment where the tenant moves out and the next moves in after) could be automatically assigned without any manual intervention in the process, thus providing a force savings. The conversion to PREMIS/LAC was completed in 1985.

FACS

Already a high degree of mechanization of the assignment process was achieved. The final step was to integrate all the elements into one system capable of providing an automated interface between them, further excluding manual intervention in the regular course of operation. The software chosen to accomplish this integration was FACS (Facilities Assignment and Control System), a package of several modules, developed by Jingles. The chart on the next page presents the FACS components in the larger context of the assignment process. The introduction of FACS started in the last quarter of 1984 and is expected to be accomplished by the beginning of 1989.
SERVICE ORDER FLOW AND SYSTEMS

CUSTOMER SERVICE CENTER

DOE → PREMIS

CORDNET

LAC

SOAC

LFACS

RMAs

FACS

WM

COSMOS

USER

CENTRAL OFFICE
LEGEND

DOE  Direct Order Entry; customer service representative's interface to mech.system

CORDNET  Provides linkage between customer service and LAC for automated information exchange

FACS Components

PREMIS  Premise Information System; supports customer negotiation (e.g. address check, telephone number assignments) and service order preparation.

SOAC  Service Order Analysis and Control; interface to service order processor, generates requests to COSMOS and LFACS and outputs their assignments back to the service order processor, generates RMAs.

RMAs  Request for Manual Assistance; asks for operator's intervention for processing an assignment request (whatever the system can't handle)

LFACS  Loop Facilities Assignment and Control System; maintains mechanized inventory of outside-plant line facilities and assigns facilities requested by SOAC.

WM  Work Manager; links one SOAC/LFACS system to one or more COSMOS systems.

COSMOS  Computer System for Main Frame Operations; maintains mechanized inventory of Central Office facilities and assigns them upon request from SOAC.
APPENDIX SIX: THE CASE STUDIES ON URBAN 1 AND RURAL 3

The material is presented in chronological order, starting with the description of URBAN 1, followed by RURAL 3, and a synopsis which wraps up the two cases and puts the findings in the more general context of all nine assignment centers. Each case presentation has three sections: characteristics of the center and its environment, conversion performance over time, staffing and training.

URBAN 1 FACS CENTER: AT THE BEGINNING OF THE LEARNING CURVE

a) Conversion Performance

The following graph shows the monthly number of lines cut-live in URBAN 1. To complete conversion of the 1.4 million lines in two years, a monthly cut-live rate of about 55,000 lines should have been reached. The chart shows that in late 1985 and the first quarter of 1986, URBAN 1 even bypassed this rate, but was unable to keep up that pace. For the remaining part of the process, the conversion fluctuates around 33,000 lines per month. The graph also shows that the conversion process follows a very uneven pattern with extreme peaks and bottoms. In the final analysis, the annual number of lines converted between 1985 and 1989 lies around 350,000 lines for each of the four years. However, the monthly fluctuations were highest in 1985 and smoothed out in the subsequent years.
b) HRM Strategy and Outcomes

In the manual environment, more than 200 PAs and ACs had processed the same volume. Companywide force savings from the downsizing were expected to average about 70%. Building on the assumptions of Jingles' FACS model, Telco expected URBAN 1 to handle its 1.4 million lines with a final staff of 70 FAS. Thus, at the end of 1985, about 42 FAS were expected to handle 600,000 converted lines, increasing further to full size of 70 FAS and 1.4 million lines by the end of 1986. The actual hiring, however, looked differently: By the end of 1985, only 34 FAS were working in URBAN 1, handling some 333,000 lines. The revised staffing plan of June 1986 extended the conversion phase for an additional year and scheduled a final force of 80 FAS by the end of 1987. Another revision in the same year extended the conversion until November 1988 and raised the final force to 121. By the end of 1986, 707,500 lines were cut live, and 82 FAS were working in URBAN 1. The current staffing plan expects a final number of 138 FAS by the end of conversion. The management/craft ratio started out with a high 26% in 1985, then fluctuated between 16 and 20% (22 managers for 138 FAS (16%) in 1988).

The following graph shows URBAN 1's staffing development for the whole period. The slope of the line connecting the quarterly totals of FAS started pretty flat in 1985, increased sharply in 1986, flattened again in 1987 and makes a final jump upwards in 1988. Thus, in comparison to the annual number of lines cut live, the staffing has fluctuated much more from one year to another, especially
MONTHLY LINES CUT LIVE IN RURAL 3

(Numbers for 1988 and 1989 are most recent estimates)

LINES CUT LIVE

Thousands

1987
1988
1989
between 1986 and 1987 (it more than doubled between January 1986 and January 1987, from 39 to 92 FAS, but only increased by 16% between January 1987 and January 1988, from 92 to 107 FAS). What led to these massive changes in the staffing level?

The first twelve months of conversion contained uncertainties at several levels:

- technology (the first cut-live of real lines in a full hardware configuration using FACS)
- management (how accurate is the new database, how many RMAs will be generated, how to organize the work flow, how to balance staffing level and work load)
- operator performance (how many RMAs can be handled in what time at what error rate).

Clearly, some of these factors couldn't be anticipated. It takes the real-life experience to know actual flow-through rates and available machine time. The challenge for the FACS managers, then, is to come up with flexible and fast answers to any given configuration of performance problems and available resources. With hindsight, URBAN 1's data for 1985 show that there were two major shortcomings in the assumptions, on which management built their response to the system problems of the first year of operation: first, they didn't anticipate correctly the impact of their manpower plan and, secondly, they underestimated the learning curve of the FACS operators.

UNEXPECTED OUTCOMES OF THE STAFFING POLICY

As was mentioned earlier, the initial FACS training presented by Jingles expected the new operators to come from the manual LAC environment, thus possessing knowledge about service order processing and COSMOS. Telco's manpower plan for staffing the new FACS was
built on the same assumption which, until empirical data prove the contrary, makes sense economically (deploy the employees who have become redundant by the new technology), politically (prevent layoffs) and logically (assignment workers have best available expertise). In late 1984, the "new spirit of divestiture" had made its impact on Telco's operational goals. There was a strong emphasis on cost reduction which, in the case of URBAN 1, had two consequences: first, management wanted to move on quickly with FACS to take advantage of the savings potential of the project as soon as possible. Secondly, the implementation should use as little resources as possible. "Do it fast and at low cost!" As the description in the last chapter has shown, the emphasis on speed led to the adoption of an ambitious conversion schedule which was maintained for several months, even when data from the field signaled serious problems. This strategy put additional pressure on the people in the FACS/LAC. They were already suffering from the second "divestiture offspring", the low cost mentality, because the latter had led to an initial staffing which proved to be much too low for handling the transaction volume.

(FOR A DESCRIPTION OF THE UNDERESTIMATED LEARNING CURVE OF FACS OPERATORS SEE CHAPTER 6, SECTION 6.1 c)

... ...

In 1986, the situation started to improve. Conversion was interrupted, URBAN 1 got a new manager, new people were hired at a faster
rate. The new manager set two new objectives for the HRM strategy: He wanted to hire more people with no assignment background and to improve the performance level of the operators. A performance evaluation of the current staff led to sobering results: Of a total of 51 operators, 9 were sent back to the introductory FACS training, 33 got a partial retraining in areas where their performance was deficient, and others got increased coaching by their supervisors. In order to free the supervisors for the coaching, they created a Problem-Solving Group (PSG) for handling incoming complaints and complex questions from other departments. Furthermore, a nesting group with six trainees and a supervisor was built to provide on-the-job training on RMA processing for newly hired operators.

In combination with product enhancements and hardware improvements, these measures slowly but steadily brought the situation under control. For instance, the composition of the LAC force has changed quite a bit since early 1986. In November 1987, 39 out of a total of 104 FACS operators came from outside assignment (37.5%). In fact, 1987 is considered being the first year when all contributing factors are shaped in a satisfactory way. The 1987 conversion performance sets a realistic benchmark for future years when the most complex wire centers will have to be converted.
RURAL 3 FACS CENTER: AT THE END OF THE LEARNING CURVE

a) Conversion Performance

Conversion in RURAL 3 started in May 1987. According to the current plan, RURAL 3 is expected to complete conversion after a period of 22 months (February 1989) or even earlier. By November 1987, 320,000 lines (29% of the total) have been converted. The annual flow-through rate for 1987 is at 91.9% and was never lower than 91.4%. As the following graph shows, the monthly conversion rate is better balanced than in URBAN 1's case, averaging slightly less than 40,000 lines per month for 1987. There were no major system problems (down-time or insufficient performance), the cut-live activities happened exactly as scheduled.

Before RURAL 3 started to cut live the first group of its own lines, the center processed 75,000 lines for two other LACs in April 1987. These centers used different procedures, e.g. in interfacing with engineering, and provided a good learning experience. The first lines from RURAL 3 were phased in smoothly (100-150 RMAs from the other center and 30 in-house RMAs per day during the phasing-in).

c) HRM Strategy and Outcomes

RURAL 3 operated right form the beginning with the single new job title (FAS). Staffing the new center started well back in 1986. At the end of the summer 1986, the RURAL 3 FACS manager was appointed. He immediately hired an associate manager for handling the staffing of
the center (a two-year position similar to a personnel function). They interviewed all 28 supervisors in the seven manual LACs to fill five supervisor positions. Only 4 out of 28 wanted to go into FACS (3 of them from the local LAC). Many of them were women who didn't want to move to a new location. They stayed in their areas and, in the only district closed so far, found other jobs at the same level. In December of 1986, the supervisors were sent to the FACS training.

Starting also in December, up to three groups of eight FAS each were selected: Sixty days in advance, the FACS training supervisor had to notify the Personnel Department of the staffing needs of the center. Personnel provided her a list of applicants and their release time. The selection was based on four criteria (in order of importance): screening test (PAs didn't have to take it at all; ACs had to take it, but pass was not required), seniority, attendance, and personnel records. Then, she made the training reservations, organized on-site FACS visits for the new hires and supported the moving arrangements.

The new employees received the two-week FACS training taught by RURAL 3's training supervisor in the old LAC. None of them came from assignment. All trainees passed the P/F test at the end. Until the end of February 1987, all FAS and supervisors were sent to work in URBAN 1 (for a period of up to six weeks), before they all moved into the new facilities in RURAL 3 (March 1987).
What followed was a period of custom tailored on-the-job training. The RMA supervisor identified people with learning problems. Those FAS went to the training supervisor for a one-on-one training. 5 out of 40 needed a serious follow-up training (2 days). The others just needed some psychological reinforcement to get started. Both the employee and the supervisor had to sign a feedback sheet after the follow-up training. Four weeks later, another follow-up sheet was filled out by the supervisor. By her daily presence in the LAC, the training supervisor could easily and informally check on-the-job performance of her trainees. She got a lot of help for handling difficult problems through a hotline to Telco FACS support staff who often had unreleased documentation available and could provide direct help while she was sitting at the terminal.

The selection and introduction of the FACS operators on-the-job was carefully planned and kept the work load low enough to allow for an intense learning and performance improvement. The next graph shows the staffing plan (1987: actual numbers, 1988/1989: most recent estimates) for both FAS and management people. An important difference to URBAN 1's early staffing is the supervisor/craft ratio which is higher for RURAL 3 (10/22, or 46%, for the first quarter of operation, compared to 4/11, or 36%, for URBAN 1 for the same period). In addition, RURAL 3's management was almost fully staffed (14 of 15 final positions) already six months after conversion start (URBAN 1 staffed 80% of its final management positions only two years after conversion start). These data further illustrate the early staffing policy
MONTHLY LINES CUT LIVE IN URBAN 1

(Numbers for 1988 are most recent estimates)

Lines cut live

Thousands
applied by RURAL 3. By the end of 1987, RURAL 3 occupied 58 FAS, more than 80% from the local area, and roughly 60% of them without a background in assignment.
APPENDIX SEVEN:  COST ANALYSIS OF ALTERNATIVE STAFFING STRATEGIES

My calculations are based on the following assumptions: (1) A low-support LAC has a conversion rate of 30,000 lines per month, whereas an proactively staffing LAC converts 50,000 lines per month; (2) After completed conversion, a typical FACS center will process about 11,000 lines per employee, averaging a total staff of 100 FAS and 18 supervisors; (3) In accordance with the FACS project letter, I assume a loaded annual salary cost of $30,000 per FAS, and $45,000 per supervisor; (4) The L-Strategy is a linear function of the cumulative number of lines converted (e.g. for every 11,000 lines converted, 1 employee and roughly .18 supervisor will be added to the LAC work force); (5) A proactively-staffing LAC not only reaches full staffing level earlier than a low-support center, it also over-staffs by 40% (i.e. 40% more man-months than the linear relationship would require); this assumption is derived from the real conversion and manpower numbers of the RURAL 3 FACS LAC. Taken together, these assumptions give the best possible case for the L-Strategy while they are very restrictive for the P-Strategy case.

I started by calculating the manpower cost of conversion in RURAL 3. This would serve as an example of the proactively-staffing strategy and provide the baseline for the comparison with the hypothetical case of a low-support center of the same size. In the first (and real) case, RURAL 3 converted 1,100,000 lines in 22 months, while in the second
case, it would have taken 36 months to do the same job. The breakdown of the assignment manpower in the RURAL 3 area looks as follows:

Final number of FAS in RURAL 3: 100
Final number of Supervisors: 15
Total work force in the manual LACs before conversion: 170 craft and 31 supervisors.

The graph on the next page presents the downsizing of the manual LACs and the staffing of RURAL 3 for both the L- and the P-Strategy. The table following the graph summarizes the calculations of the net wage bill for both strategies. Note that I compute a period of 36 months in both cases. In other words, I add the cost of 14 months of full, regular operation under the P-Strategy to the salary cost of the conversion period to compare it to the same time span under a low-support policy. I did this, because I couldn’t put a price tag on the difference between a line in conversion and a converted line. Of course, this is an extremely restrictive condition favoring the L-Strategy. It appears that even under these conditions, the P-Strategy is financially more attractive than the L-Strategy by at least $780,000. Thus, the manpower policy chosen for staffing RURAL 3 did not only achieve higher conversion performance but was also financially superior to a tight approach.

In the second case, I want to see whether this finding also holds for the opposite situation, where URBAN 1 actually implemented the L-Strategy. Again, in order to make the calculations as conservative as possible, I extrapolated the tight-staffing policy of the first five quarters over the full period, although in reality, URBAN 1 switched to
URBAN 1: REDUCTION OF MANUAL LAC FORCE AND STAFFING OF FACS LAC

NUMBER OF LAC EMPLOYEES

250  200  150  100  50  0

STAFFING OF FACS LAC

REDUCTION OF MANUAL LAC FORCE

MONTHS

48  29
RURAL 3 AREA LABOR COST UNDER P- AND L-STRATEGY

<table>
<thead>
<tr>
<th>SALARY COST (Craft Jobs only)</th>
<th>L-STRATEGY (36 months) (hypothetical case)</th>
<th>TOTAL MAN-MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Force in Manual LACs</td>
<td>22 mths x 104 people + 22 months x 66 people = 2,596</td>
<td></td>
</tr>
<tr>
<td>- period 1 (22 months)</td>
<td>14 mths x 100 people = 462 2</td>
<td></td>
</tr>
<tr>
<td>- period 2 (14 months)</td>
<td>22 mths x 62 people = 682 2</td>
<td></td>
</tr>
<tr>
<td>FACS Work Force</td>
<td>14 mths x 62 people + 14 mths x 38 people = 1,134</td>
<td></td>
</tr>
<tr>
<td>- period 1 (22 months)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- period 2 (14 months)</td>
<td>14 mths x 62 people = 682 2</td>
<td></td>
</tr>
</tbody>
</table>

P-STRATEGY (22 months of conversion) (real case)

| Work Force in Manual LACs     | 22 mths x 170 people = 1,870 |                  |
| - period 1 (22 months)        | 2                                           |                  |
| - period 2 (14 months)        | 0                                           |                  |
| FACS Work Force               | 22 mths x 100 people = 1,100 multiplied by fudge factor (1.4) = 1,550 |                  |
| - period 1 (22 months)        | 2                                           |                  |
| - period 2 (14 months)        | 14 mths x 100 people = 1,200               |                  |

COMPARISON OF RURAL 3 AREA LABOR COST UNDER P- AND L-STRATEGY (MAN-MONTHS)

<table>
<thead>
<tr>
<th></th>
<th>L-STRATEGY</th>
<th>P-STRATEGY</th>
<th>DIFFERENCE</th>
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</thead>
<tbody>
<tr>
<td>PERIOD 1</td>
<td>3,278</td>
<td>3,420</td>
<td>- 142</td>
</tr>
<tr>
<td>PERIOD 2</td>
<td>1,596</td>
<td>1,200</td>
<td>+ 396</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>+ 254</td>
</tr>
</tbody>
</table>

254 Man-months = 254 x $2,500 for Craft Jobs = $635,000
Management Jobs: .15 x 254 Man-months X $3,750 = $142,875

COST ADVANTAGE OF P-STRATEGY = $777,875
an over-staffing approach in 1987. The breakdown of the assignment manpower in the URBAN 1 area looks as follows:

Final number of FAS in URBAN 1: 136  
Final number of Supervisors: 22  
Total work force in the manual LACs before conversion: 255  
craft and 46 supervisors.

The graph on the next page shows the manpower policy for the L-
Strategy (48 months of conversion time) and the P-Strategy (29 months  
conversion period plus 19 months regular operation with full staff). The  
table after the graph presents the result of the wage bill calculations.  
Similar to the case of RURAL 3, the P-Strategy combines higher  
performance with lower cost. In this case, the financial benefit amounts  
to $1.13 million. The last page of this appendix shows similar calcula-
tions for URBAN 2.
RURAL 3: REDUCTION OF MANUAL LAC FORCE AND STAFFING OF FACS LAC

NUMBER OF LAC EMPLOYEES

0 50 100 150

36 MONTHS

Staffing of FACS LAC

Reduction of Manual LAC Force

FACS LAC T-STRATEGY
FACS LAC A-STRATEGY
MANUAL LACS A-STRAT.
MANUAL LACS T-STRAT.
### URBAN 1 AREA LABOR COST UNDER P- AND L-STRATEGY

<table>
<thead>
<tr>
<th>SALARY COST</th>
<th>L-STRATEGY (48 months)</th>
<th>TOTAL MAN-MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Craft Jobs only)</td>
<td>(real case)</td>
<td></td>
</tr>
<tr>
<td>Work Force in Manual LACs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- period 1 (29 months)</td>
<td>29 mths x 155 people + 29 months x 100 people = 5,148</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19 mths x 100 people   = 950</td>
<td></td>
</tr>
<tr>
<td>FACS Work Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- period 1 (29 months)</td>
<td>29 mths x 84 people = 1,218</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19 mths x 84 people + 19 mths x 52 people = 2,090</td>
<td></td>
</tr>
</tbody>
</table>

### P-STRATEGY (29 months of conversion) (hypothetical case)

| Work Force in Manual LACs |                         |                  |
| - period 1 (29 months)    | 29 mths x 255 people = 3,698 |                  |
| - period 2 (19 months)    | 0 = 0                     |                  |
| FACS Work Force           | 29 mths x 136 people = 1,972 multiplied by fudge factor (1.4) = 2,760 |                  |
| - period 2 (19 months)    | 19 mths x 136 people = 2,584 |                  |

### COMPARISON OF URBAN 1 AREA LABOR COST UNDER P- AND L-STRATEGY (MAN-MONTHS)

<table>
<thead>
<tr>
<th></th>
<th>L-STRATEGY</th>
<th>P-STRATEGY</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD 1</td>
<td>6,366</td>
<td>6,458</td>
<td>- 92</td>
</tr>
<tr>
<td>PERIOD 2</td>
<td>3,040</td>
<td>2,584</td>
<td>+ 458</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>+ 364</td>
</tr>
</tbody>
</table>

364 Man-months = 364 x $2,500 for Craft Jobs = $ 910,000
Management Jobs: .16 x 364 Man-months X $3,750 = $ 218,400

COST ADVANTAGE OF P-STRATEGY = $ 1,128,400
### URBAN 2 AREA LABOR COST UNDER P- AND L-STRATEGY

<table>
<thead>
<tr>
<th>SALARY COST (Craft Jobs only)</th>
<th>L-STRATEGY (48 months) (hypothetical case)</th>
<th>TOTAL MAN-MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Force in Manual LACs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- period 1 (28 months)</td>
<td>$28 \text{ mths} \times 145 \text{ people} + 28 \text{ mths} \times 105 \text{ people} = 4,970$</td>
<td></td>
</tr>
<tr>
<td>- period 2 (20 months)</td>
<td>$20 \text{ mths} \times 105 \text{ people} = 1,050$</td>
<td></td>
</tr>
<tr>
<td>FACS Work Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- period 1 (28 months)</td>
<td>$28 \text{ mths} \times 79 \text{ people} = 1,106$</td>
<td></td>
</tr>
<tr>
<td>- period 2 (20 months)</td>
<td>$20 \text{ mths} \times 79 \text{ people} + 20 \text{ mths} \times 56 \text{ people} = 2,140$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P-STRATEGY (28 months of conversion) (real case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Force in Manual LACs</td>
</tr>
<tr>
<td>- period 1 (28 months)</td>
</tr>
<tr>
<td>- period 2 (20 months)</td>
</tr>
<tr>
<td>FACS Work Force</td>
</tr>
<tr>
<td>- period 1 (28 months)</td>
</tr>
<tr>
<td>- period 2 (20 months)</td>
</tr>
</tbody>
</table>

### COMPARISON OF URBAN 2 AREA LABOR COST UNDER P- AND L-STRATEGY (MAN-MONTHS)

<table>
<thead>
<tr>
<th></th>
<th>L-STRATEGY</th>
<th>P-STRATEGY</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD 1</td>
<td>6,076</td>
<td>6,146</td>
<td>- 70</td>
</tr>
<tr>
<td>PERIOD 2</td>
<td>3,190</td>
<td>2,700</td>
<td>+ 490</td>
</tr>
</tbody>
</table>

**TOTAL** + 420

**364 Man-months = 420 \times 2,500 for Craft Jobs** = $\,1,050,000

**Management Jobs: 0.155 \times 420 Man-months \times 3,750** = $\,264,000

**COST ADVANTAGE OF P-STRATEGY** = $\,1,294,000
APPENDIX EIGHT: OUTCOMES: EMPLOYMENT, QUALIFICATION AND HRM POLICIES

In this appendix, I return to the major issues extracted from the literature review in Chapter 1 and compare the outcomes of the case studies to the more general trends put forward by other authors. In the first section, employment and qualification issues derived from technological change will be discussed. Does the FACS case confirm the outcomes of Flynn's secondary analysis or to what extent does it deviate from the mainstream developments? Section 2 documents the shifts in Telco's Human Resource model prompted by the technological change.

EMPLOYMENT AND QUALIFICATION EFFECTS

a) Employment Effect

In her secondary analysis of technological change studies, Flynn (1985) summarizes her findings by three general employment effects: a) low and unskilled workers in general as well as the higher skilled in declining industries tend to suffer most from technological change, b) women tend to get deskilled jobs or new low skill jobs after the change, and c) more often than not the allocation of new jobs is not based on ability but on other criteria like seniority.

The FACS case doesn't fit well into these general tendencies. Several aspects of it show different employment effects. First, there were no layoffs derived from the introduction of FACS. Of the two job
titles affected by FACS, the lower-skilled Assignment Clerks got upgraded, while the higher-skilled Plant Assigners lost status, pay and job tasks. Secondly, the large majority of ACs are women who thus received the opportunity to move into an upgraded new job. Thirdly, the applicants for the new FACS job title had to pass a double testing and training procedure before they would be hired. Only in the initial phase of implementation was seniority the dominant selection criterion for staffing the new assignment centers. Thus, the new jobs were more often allocated on the base of ability than seniority or other criteria.

Flynn further elaborates on the determinants of employment in technological change. She distinguishes four general factors (industry growth rate, size of firm, timing of introduction and type of technology) where the fourth factor tends to affect the qualification rather than the employment of the work force.

INDUSTRY GROWTH RATE

With respect to the first factor, the FACS study is consistent with Flynn's general findings. Telco is serving medium to high growth markets and therefore has many openings for internal job transfers. It can absorb surplus workers from one division by hiring them into other divisions with higher demand for new workers. However, there are two major limits to this possibility. First, the job opportunities may differ from one location to another. In general, the more peripheral localities have much less alternative employment to offer than the metropolitan areas. The second limit lies in the manpower strategy of Telco's top
management. Telco wants to reduce the work force of its operating units by roughly 1,000 people per year. In other words, the increasing volume of work has to be handled by a decreasing number of workers. This jobless growth is only feasible thanks to the productivity gains derived from the introduction of new technologies in the work place. FACS is one of several projects which simultaneously provide the technical base for future service improvements as well as a reduction of the work force. Thus, the possible absorption of surplus assignment workers by other departments is limited by these manpower considerations.

SIZE OF THE FIRM

The size of the firm is certainly an employment-affecting factor in the case of Telco. With slightly less than 50,000 employees, Telco is one of the largest employers in the region and has a lot of manpower to fill the new job openings from within the firm. In fact, the FACS jobs were exclusively staffed with people hired from inside. This strategy is consistent with the dominant rules of Telco's internal labor market which emphasize long-term employment relationships, based on low entry ports of the career ladders and many internal training programs.

TECHNOLOGY LIFE CYCLE

The third factor to be examined is the introduction of FACS in the light of Flynn's product/job/training life cycle model presented in Chapter 1. Translating the model to a smaller scale, one gains some interesting insights about the development of the FACS product between 1984 and 1987.
With respect to the FACS study, Flynn's model predicts shifts from one phase to another at three different levels: skill level of dominant labor input, specificity of job skills, and skill training location. What are the characteristics of the FACS project in these dimensions? In Chapter 5, I presented the changes in the FACS employment policy over time: the FACS centers required more people than expected initially, an increasing number of people with no assignment background were hired (FACS became more user-friendly and required a different set of skills), and the basic FACS training was transferred from the work place to the training centers. If one extrapolates these changes in the job skills and the product improvements while keeping the employment impact at its current level (i.e. no major change in the final staffing plans) one would expect a further broadening of the skill requirements and a further enlargement of the pool of applicants (subject to careful selection).

Taking all these developments together, the FACS project can be described in the same terms as Flynn uses for describing the general technological change. The move from small job shop production to automated mass production is usually correlated with an increase in productivity, due mainly to improved knowledge about the production process. In other words, the shift from one product life cycle phase to the next is coupled with a move down the experience curve. With some restrictions, this relationship can also be found in the FACS example. However, it is not a traditional learning curve, since there is no significant difference in the final performance of the early and the late
centers (see Chapter 5). Thus, moving along the curve doesn't translate into higher productivity, but rather represents a stage with different employment characteristics. Early LACs started with operators who had an assignment background and had to cope with a more difficult system interface, while late LACs had operators with various backgrounds in front of a smoother, simpler and friendlier terminal. It is in this sense that the FACS technology has moved along a life cycle curve into a more mature phase with different job and skill characteristics.

TYPE OF TECHNOLOGY

Finally, Flynn mentions the type of technology as a determinant of specific employment effects. FACS is an example of a data-processing technology. For these industries, Flynn notes that mostly lower-level clerical positions have been eliminated by technological change. Although this statement doesn't apply to the FACS case, because such a job function didn't exist in Telco's assignment centers, Morley's study of FACS implementation in another large telephone company showed that the office clerk job of the manual LACs almost completely disappeared with the introduction of FACS. Consistent with Flynn's findings, the Telco FACS project generated many low-skilled keypunching jobs in the conversion teams (limited in time), and also led to a limited number of new highly skilled jobs (system operators, a supervisor position in the new LACs, and FACS support staff at Telco's headquarters).
b) Qualification Effect

According to Flynn's analysis of the data-processing industries, early technology adopters tend to deskill low-level clerical jobs, and to upskill other existing jobs. The latter is a function of the availability of skilled computer personnel outside the firm. Since such workers were rather rare in the 1950s and 1960s, there was more internal upskilling at that time, while today there is a large pool of computer operators available in the external market. As far as FACS is concerned, Telco is not an early adopter. Actually, they deliberately decided to postpone the introduction of FACS until other telephone companies would have acquired some experience with it to check the feasibility of the project ("We didn't want to be early Christians!"). However, Telco's employment/qualification strategy contains an element of both the early and the late adopter patterns in it. During the first eighteen months of implementation they exclusively hired people from inside the assignment environment, thus upgrading the majority of the existing jobs in this area. In a second phase, they widened the pool of applicants and started hiring people with no assignment background ("outside the assignment process", but not "outside the company"). The new FACS operators perceived their new job as an upgrading like the former assignment clerks, since by becoming a FAS most of them got a better paid job with higher skill requirements than the one they held previously.

As an overall qualification effect, then, FACS clearly led to a higher-skilled (and better paid) job for most of the new operators. There is an important minority of workers, however, who lost in this process:
the Plant Assigners. Their history provides some interesting insights into Telco's HRM policies. In the first phase of FACS adoption, from the approval of the project letter in November 1983 to the opening of the first two FACS centers in 1985, the job classification of the assignment work was not affected by the technological change. People moved from the manual into the mechanized environment without modification of their pay grade or job title. It was only after the new work tasks had actually been implemented that Telco's management noticed the potential for a single, standardized job title covering the whole assignment work under FACS.

Although it was not possible to collect reliable information about the PAs of the whole company, I have some data for the two FACS centers I analyzed as case studies. In 1984, there were more than 60 PAs working in the manual LACs to be consolidated into URBAN 1. In 1987, only seven former PAs were working in URBAN 1, while 19 PAs were still working in the remaining two manual LACs. Similarly, there were about 35-40 PAs working in the manual LACs to be consolidated into RURAL 3. Only four of a total of 51 FAS working in RURAL 3 in 1987 are former PAs. The drop-out rate for PAs in these two cases lies above 80%, whereas the corresponding rate for ACs lies somewhere between 50 and 60%.

c) Conclusions (see Chapter 8, Section 8.1)
SHIFTS IN THE ILM MODEL

In Chapter 3 Telco's internal labor market (ILM) was presented as a hybrid combination of the classical industrial and the salaried models. Applying Osterman's conceptual work to the FACS case, one can see that the latter provides a good example of technological change pushing some important dimensions of Telco's ILM away from the industrial towards the salaried model. Among Osterman's four factors shaping the ILM options available, the physical and the social technology retain particular attention. The first factor mainly affects changes in the task, while the second factor stands for changes in the informal organization.

a) Changes in the Task

FACS (and the previous mechanization projects) allowed a level of standardization of the assignment process which made a reduction of job titles possible. The strong specialization of the work tasks between ACs and PAs was abolished. Although specialized tasks with different skill levels continue to exist inside the FAS job (e.g. RMAs, EWOs, database maintenance, field assistance, problem-solving group and, sometimes, LOMS), the borders between them are less rigid, and people move easier from one to another. Thus the new job title contains broader tasks. It increases the deployment flexibility inside the assignment center and therefore facilitates manpower planning.

Using Zuboff's terminology, the FACS project is an example of a disruptive technological change, not limited to automation but leading to an inhumanized work environment with new challenges for both operators and managers. The assignment task has changed dramatically:
HIGHER ABSTRACTION

The task has moved away from paper and pencil; the transfer of information from one sheet of paper to another is substituted by a computer screen and keyboard. How difficult it was for an operator to cope with the increased abstraction in his work is illustrated by an example from the Jingles' evaluation report on FACS implementation. The study showed that many FACS operators with assignment background didn't trust the system to execute the orders as they were keyed in. Accordingly, they frequently monitored the result of a transaction by requiring a physical output of the corrected service order on the printer. Of course, this slowed down operations considerably.

IMAGINATION INSTEAD OF EXPERIENCE

Over the years it became clear that in order to be proficient, a FACS operator didn't have to have assignment experience. It was more important to have a good perception of how the computer handled the operations, which was fundamentally different from the manual assignment process. In some cases, earlier assignment experience even led to "tunnel vision" obstructing performance in the computer-based work.

A major advantage of FACS over the manual assignment is its relative ease of adjustment to higher volume of transactions. Once conversion is successfully completed, the system can handle an increasing number of service orders without having to add a corresponding number of operators. Also, the characteristics of the technology allow a better distribution of the work load over time by various means: An automated
input control system can regulate the quantity and level of complexity of incoming RMAs for each individual FAS. The database maintenance work is a complementary task which can be done by operators when RMA operations are slow, and new terminals will allow the Field Assistance people to work in multi-tasking mode, using the time while the maintenance worker is checking outside installations for working on other assignments.

The physical characteristics of the FACS technology pushed the human resource procedures further towards the salaried model by consolidating and thus expanding the assignment job tasks within a single pay grade. The new job title requires different and broader skills and thus enhances the mobility of the workers inside the assignment process.

b) Informal Organization

Another set of constraints limiting the choice of ILM models by the firm are the "social technology" characteristics. In the case of FACS, the change in the informal organization has been disruptive. The FACS centers were built in new locations, the architecture and the outlay of the office doesn't bear much resemblance with the manual environment, and — on average — more than 50% of the employees come from a very different job outside assignment.

SOCIAL INTERACTION AT WORK

In the FACS LACs, the general social network as well as the specific supervisor-operator relationships, had to be built more or less
from scratch. I didn't collect enough data from operators and first-level supervisors to paint an accurate picture of the culture in the FACS LACs, but some data suggest that there is a general theme underlying the interactions in the work place. As a matter of fact, employees and supervisors seem to share a need for learning. At the individual level, operators want to master the system to become autonomous workers. If they have a question about a procedure, they turn to their more experienced colleague workers or to the supervisor, depending on the latter's availability and knowledge level. The supervisors seek to improve the collective performance of their unit, solving technical problems by referring to the systems operator of the center, and assisting the operators in their work. There is a resource problem, however, because usually, the supervisor doesn't have more practical exposure to FACS than the FAS. Therefore, a supervisor has to balance the time needed for his own learning with the time he can spend in supporting his people. In addition to the purely technical knowledge, there are managerial tasks which he needs to handle in the new environment: distribute the workflow among group members, check for skill deficiencies, monitor output quantity and quality, interface with people from other sections, anticipate available system time and adapt staffing to it, prepare the introduction of product enhancements or new standards and procedures. Clearly, supervisors in RURAL 3 were in a better position to handle these issues, since they could draw from hands-on experience in the URBAN 1 LAC and had a lower work load than their colleagues in URBAN 1.
POWER AND STATUS

With respect to the power relations and the status distribution among new employees, there are three observations to be made: First, the new work environment tends to structure power on the base of expertise rather than assignment experience (seniority). According to many supervisors and training specialists, there is a large variation in the learning performance of the new operators, regardless of the background of the person. In a FACS LAC, fast learners who have a good feeling for the computerized work will most probably have increased their expertise-based power.

Secondly, the five tasks contained in the FACS work differ in terms of complexity/skill level and accordingly provide different status to people. Typically, the RMA handling (supplemented by database maintenance) is the starting point for a new operator. Once he has become sufficiently proficient at it, there are several options available to him: stay in RMA and become an expert, move into field assistance, join the problem-solving group or apply for EWO work (requiring an additional training course). The field assistance task represents a lateral move, based on individual abilities and preferences (field assistance involves a lot of communication with installers and repair-men over the phone). The problem-solving group (PSG) is kind of an elite task-force created to handle the more delicate problems in dealing with outside "customers" from other departments. It was introduced to relieve RMA supervisors from these problems, allowing them more time for managing their work group. The PSG work requires good people skills, an extended knowledge about assignment and FACS and a rather high stress tolerance. It
doesn't pay any better than the other FAS jobs, but provides a different set of motivational rewards to the members of the PSG group.

Finally, the EWO work has a special position within FACS. Although the traditional EWO work has been reduced by moving some of the tasks back to the engineering people outside the LACs, it still requires higher knowledge than the other assignment tasks, especially the ability to read engineering work orders. People from the EWO group have had an additional two-week training. Thus, the difference in the complexity of the task provides a first base for a difference in status. In addition, former PAs tend to work in EWO, their traditional field of expertise. Their attitude towards FACS can't be expected to be enthusiastic since they lost pay and status by the change (except for a three-year period of pay protection). Such feelings may create additional social barriers which enhance the special status of the EWO people. How high these barriers can be is illustrated by one example, where the EWO people wanted to have their own Christmas Party, separate from all other employees of the FACS center. It takes time to convert such feelings into solidarity, but a second generation of EWO workers emerging from the FACS environment will probably contribute to smooth out the problem.
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