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THE ROLE OF THE PERIOD OF TRANSITION IN THE IMPLEMENTATION OF INFORMATION SYSTEMS

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By
E. M. GLEASON
INVENTORY RESEARCH OFFICE

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Edward Michael Gleason

Army Logistics Management Center
Fort Lee, Virginia

June 1968

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IN THE IMPLEMENTATION OF INFORMATION SYSTEMS

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SUMMARY

This study was undertaken in an effort to develop a set of precepts that might be useful in the transition phase of NAPALM.

The transition phase is defined as that period during which the new information system is transferred from the design stage to operational status with concomitant phasing out of the old system. Three commonly-used methods of transition are compared: (1) Parallel Operation; (2) Pilot Operation and; (3) Direct Conversion. The ways in which such critical tasks as equipment installation, personnel training, file conversion, system monitoring and system modification are handled under each method are described with the conclusion that the Direct Conversion method is preferred.

During the course of this project, a study was made of the techniques followed in Project SPEED, a project under which a number of U.S. Army Depots implemented a standard information processing system. Experience obtained in this project was used in the formulation of a set of recommendations on how the transition phase can be facilitated.

A slightly less detailed version of this report was used by the author to fulfill the thesis requirement for the MBA degree at the University of Pennsylvania. This work was done while the author was a part-time employee of the Inventory Research Office in the period September 1967 to May 1968.

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Much of the information on Project SPEED was obtained from interviews with the following people:

Miss Jane O'Hara, Data Systems Directorate
U. S. Army Supply Depot
Tobyhanna, Pennsylvania

Mr. Thomas Vinson, Data Systems Directorate
U. S. Army Supply Depot
Anniston, Alabama

Messrs. Frank Marsh and Dennis Robbins
Army Logistics Systems Support Center
Letterkenny Army Supply Depot
Chambersburg, Pennsylvania

INTRODUCTION

The need for accurate and timely information that is useful in the operation of an organization is an accepted principle. Many facts are required to influence and support the decisions which must be made. All organizations have what may be called a "management information system." The degree of sophistication in these systems varies greatly; but there must exist some means for management to obtain information about operations. This information is then used for making operational decisions.

In this era of rapid change and growth, it is essential that these information systems keep pace with the needs of the organization they support. New systems are designed and developed to meet these expanding requirements. The implementation of these systems presents special problems which are the area of consideration in this study.

The situation under consideration is one in which a management information system has been enlarged and updated. New equipment has been added. Existing procedures have been changed and new ones developed. The specific problem dealt with in this paper is the process of transition from one information system to a larger, more comprehensive one. This task involves transferring the operations and responsibilities

of the organization's information requirements from the old system to the new.

Chapter I attempts to give the reader an understanding and appreciation for the role of transition in the process of information systems development. Chapter II deals with the technique of systems transition or conversion.[1] The various methods of transition are identified and evaluated with regard to what is to be accomplished during transition. Chapter III is a discussion of the personnel problems in system transition, and Chapter IV presents a comprehensive program for approaching the task of transition. The final chapter summarizes the main points in this thesis.

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[1] "transition or conversion"--these words are used interchangeably throughout the text.

CHAPTER I

THE NATURE OF THE TRANSITION PROCESS

INTRODUCTION

The purpose of this chapter is to provide an understanding of the role of transition in the process of information system development. The function of the transition period is discussed as well as the environment in which it occurs. The various tasks which must be performed during this time are identified and described. Finally, an example of a system conversion is introduced. This example is referred to throughout this paper to illustrate various points in the text.

THE IMPORTANCE OF IMPLEMENTATION TO EFFECTIVE SYSTEM DEVELOPMENT

The translation of a work of design from its blueprints into a tangible reality is critical. Unfortunately, the implementation phase is sometimes neglected. Well designed buildings may be poorly constructed. Excellent operating plans are mismanaged in execution. The design and the plan are of little value unless they are implemented properly and perform the function intended of them.

This is also true for the mangement information system which is: "a network of procedures that will process raw data in such a way as to generate the information required for management use."[1] This network must be constructed and made operable before the organization can obtain the fruits of the system design. One phase of the implementation process is the transition from the existing system to the new design. The following simplified diagram represents the process of system development.

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[1]MacDonald W. Anderson, "The What and Whereto..... Management Information Systems," Data Processing Yearbook, 1965, p. 105.

This figure[1] demonstrates that the task of system transition is the final stage of development. As the name implies, it is the link between the fully designed and prepared model and the functioning information system. It is evident from the diagram that the preparation of the system is completed prior to the start of the transition process. It must be emphasized that the time of transition is not one for training personnel or debugging computer programs. These tasks should be completed before transition begins.

The purpose of this study is to focus on the period of transition as a component of system development. By isolating and discussing the problems involved in transition, an approach to the task is developed which may be applied to such situations in an effort to insure a smooth transition.

FUNCTION OF TRANSITION PERIOD

The primary activity during conversion of an existing system to a new system is the transfer of responsibility for the organization's information requirements. This transfer must be achieved without interrupting the normal operations of the organization. The transition of information systems occurs in a dynamic environment. The organization must continue to function during the period of transition, and thus

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[1]This diagram was developed by the author from similar drawings which appear in the literature on systems development.

depends on the information system which is undergoing revision. If the conversion does not proceed rapdily and smoothly, the organization operates without adequate information. This situation could be an economic detriment to the organization.

Another task which is performed during the period of conversion is an evaluation of the system's performance. There are two reasons for the evaluation. First, it is necessary to assure that the system has been properly assembled according to the system design. Second, an evaluation could uncover flaws in the design of the system which previously have not been apparent. Also, this process of evaluation may identify potential modifications to improve the system.

Summarizing this discussion on the function of the transition period, the following goals may be identified:

1. To transfer responsibility for information from the old to the new system.
2. To evaluate the performance of the system to insure proper construction and use.

The achievement of these goals is subject to the maintenance of continued operations by the organization.

OPERATIONS OF TRANSITION

Having defined the nature of the transition process, the various tasks associated with it are now described.

Equipment and Supplies.--The initial concern is that the necessary equipment and supplies be available to support the system, e. g. the proper type of magnetic tape, paper for the printer, forms necessary for clerical procedures, etc. These materials should be available in sufficient quantities to sustain operations until a normal usage rate is determined.

File Conversion.--This is the first physical act of changing from the old to the new system. The existing data base of the organization must undergo revision in both its medium of storage (tape, puched cards, magnetic surface) and its various formats. All of these data files must be converted to their configuration under the new system so that the new computer programs can be used.

Monitoring the System.--Once files have been converted and the routine system operations are being performed, the system must be monitored to insure that it is functioning properly and that there are no flaws in the system. An approach to this problem is considered in Chapter IV.

System Modification.--As the system continues to operate, flaws may be discovered which may be attributed to poor design or to errors in the use of the design. These flaws must be corrected.

The tasks of transition which are identified in the preceding paragraphs, comprise the activity which occurs during system conversion. They are considered again in Chapter IV where a comprehensive strategy for accomplishing system transition is evolved.

AN EXAMPLE OF A SYSTEM CONVERSION

One of the difficulties in examining the problem of system implementation, and specifically system conversion, is that there is no typical situation. Each conversion has unique aspects. It is valuable, however, to refer to an actual system transition in order to illustrate various points in the text. In the material which follows, references are made to a system conversion which was performed by the U. S. Army under Project SPEED. This project was conducted by the U. S. Army Supply and Maintenance Command[1] to update and standardize the data processing equipment and operating procedures at its major supply depots. The SPEED system was implemented at ten depots located throughout the United States. A complete description of Project SPEED is found in the Appendix.

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[1] now the Army Materiel Command.

SUMMARY

The purpose of this chapter has been to provide an understanding of the nature of the transition process with a newly designed information system. The function of transition within the scope of system development has been identified. Finally, the various tasks which are incorporated in the period of transition have been defined .

In the next chapter the techniques which may be used in making the transition to the new system are enumerated and evaluated. A recommendation is made as to the technique which is most efficient in system transition.

CHAPTER II

THE METHOD OF TRANSITION

Introduction

The purpose of this chapter is to examine the alternative methods that may be employed in the task of phasing in a new information system. The various methods are identified, and a brief description of each is presented. These techniques are then evaluated on the basis of how well they accomplish the goals of system conversion, which were enumerated in Chapter I. As a result of this discussion, a recommendation is made as to the proper approach to the problem of system transition.

Techniques for System Conversion

Following is a description of the three basic methods which are used to accomplish the phasing in of a new information system. It is possible that in certain situations an entire system may not be converted at one time. It is often true that a system is made operational in sections. For example, different geographical locations within an organization may be converted separately, or functional application areas such as cost accounting or payroll could be implemented at

different times. In such cases, the methods which are described here are still applicable.

Parallel Operations

One method of making the transition from the old to the new systems is that of parallel operations. This is the simultaneous operation of both systems. The output of the new system is compared with that of the old to determine if it is performing adequately. These operations continue until it is decided by management that the new system is operating satisfactorily. At this point, the activity on the old system is suspended; and the new system assumes its role in the operation of the organization.

Pilot Operations

This method is similar in principle to parallel operations. While the existing information system continues to operate, input data from a previous time period is used by the new system; and the results are compared to those obtained with the old system using the same input data. As with parallel runs, pilot operations are intended to validate the new system under "live" conditions.

Direct Conversion

With this method, the operations of the old system are terminated; and the new system is put into use immediately after all data file and program conversions have been made.

These conversions would be made over a weekend or during some other non-operational period for the organization. In this method, there is no period of comparison between the old and new systems.

The three techniques described above are those generally used in making the transition of information systems. The question dealt with next is whether any particular one of these methods has advantages which make it desirable for use in all situations. First, the advantages and disadvantages of each method are considered.

ADVANTAGES AND DISADVANTAGES OF EACH METHOD

Parallel Operations

Advantages.--1. The primary advantage of parallel operations is that the organization has the opportunity to debug the new system completely before discarding the old system. Parallel operations extend this advantage since they encompass the entire system including procedures external to the computer. This simultaneous operation of both systems permits both evaluation of the new system and comparison of its performance with that of the former system.

2. Since the organization can still rely on the old information system, there is no pressure on the new system. Its performance can be carefully evaluated, flaws corrected, and modifications can be made without having an

adverse effect on the functioning of the organization. In this way, the new information system is operating smoothly by the time it assumes the responsibilities of the old system.

3. A period of parallel operations provides the users of the system with the opportunity for learning their roles in the new system. The machine operators as well as the functional personnel in the various application areas receive the benefit of "on the job training." This experience is of great value when the new system assumes complete operation.

Disadvantages.--1. The initial drawback to parallel operations is that operating two systems requires that extra personnel be hired, or that the usual staff be required to put forth greater effort. The former is an expense, and the latter is a strain on the personnel which may become an expense. The physical and emotional demands on an organization during system conversion are great, and the added burden of operating two separate systems may contribute to more problems than it solves.

2. If the organization is not adequately staffed for parallel operations, there is a tendency for the operating personnel to neglect the new system. Their chief responsibility is to perform the operational tasks assigned to their group. With this order of priority, parallel

operations might be ignored by the personnel in favor of completing their normal workload. This action prolongs the time of parallel operations and consequently delays the introduction of the new system.

3. One further disadvantage of parallel operations may be considered. In an article appearing in the March-April, 1964 issue of the Systems and Procedures Journal, John F. Barnicle writes as follows:

> There are indications that this practice (parallel operations), rather than eliminating start-up bugs, helps create additional problems. So long as an analyst feels that a parallel run will be made, he subconciously knows that there is a device for catching his omissions and perhaps does not achieve his maximum effectiveness during the development of the system. The dotting of "i's" and crossing of "t's" is left to be picked up during the parallel run.[1]

Although this might be difficult to prove, such an assertion is not completely unreasonable.

Pilot Operations

Advantages.--1. It allows the computer programs of the new system to be tested completely with actual data and on the final computer configuration. These conditions are not always possible to duplicate at a manufacturer's data center. Time constraints prevent the extensive use of representative data. In addition, the equipment configuration

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[1]John F. Barnicle, "Communications, Parallel Runs and Effective Systems," Systems and Procedures Journal, March-April, 1964, p. 41.

which is used by the customer may not be available so that a true system simulation is not achieved.

2. Pilot Operations also provide training for the equipment operators who may not be completely familiar with the operation of the machine prior to its installation. Although some of the operators have been sent to a manufacturer's school and local training sessions have been provided, there is no substitute for actual experience on the equipment.

3. Because the pilot operation is conducted off-line with data from a previous time period, an accelerated schedule is possible. Thus, a month's processing work may be completed in considerably less than a month's time. This allows a complete test of all applications in a relatively short time.[1]

Disadvantages.--1. It does not provide a test for the operations and procedures which are external to the computer. In order for the system to function efficiently, the manual procedures which direct information to the computer and also make use of the machine's output, must perform as well as the computer routines. Under a plan of pilot operations, the external operating procedures for the new system would be conducted during a separate cycle, and because of time limitations, on a less complete basis than the computer programs.

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[1] Irving Solomon, Management Uses of the Computer, pp. 164-165.

2. The use of pilot operations necessitates double file conversion. The data files of the old system would have to be converted into the format used by the new system so that pilot operations could be conducted. After the decision is made to adopt the new system, the files must be converted again. The reason for the double conversion is that the changes which occured in the existing files during the time of pilot operations, make the files which were constructed for pilot operations obsolete.

Direct Conversion.

Advantages.--1. The primary advantage of the direct conversion method is that it is the least expensive. Since the only concern of the organization is with the new system, the number of additional personnel required is negligible.

2. This method does not present as great a physical burden to the operating personnel. All of their efforts may be directed toward accomplishing their workload by the use of one system--the new.

3. Those involved in managing the conversion process are able to make a more rapid evaluation. Since the functional personnel are working exclusively with the new system, any flaws would become apparent more quickly.

Disadvantages.--1. There is no protection for the organization in the event that the new system becomes inoperative. With direct conversion, there is no parallel system to serve as back-up while the new system is being debugged. The general performance level of the entire organization could be seriously lowered if the information system on which it relies is not functioning.

2. With the abrupt change from the old to the new system, there is no opportunity for the users of the new system to become operationally familiar with their duties in the direct conversion method. They must understand the system operation before it actually begins, so that they are capable of using its procedures accurately.

3. The direct method of conversion also produces a great mental strain on the system users. They are performing their duties under a new set of rules. The additional effort and concentration that is required for this task undoubtedly has an effect on their performance.

In order to make a meaningful evaluation of alternative courses of action, one must be aware of the essence of the task, i. e. what is to be accomplished by these plans. In the problem under study, the objectives of the transition process must be clearly understood before an operating plan can be developed.

FUNCTION OF TRANSITION PERIOD

As discussed in Chapter I, the objective of the transition is to transfer the responsibility for information requirements from the old system to the new. However, the constraint which must be considered is that the organization which uses the information system must be able to continue operations with a minimum degradation in its performance.

Prevailing Opinions in the Literature

The existing literature on the subject of system transition overwhelmingly views this period as a time for validating the new system, i.e. comparing it with the old system to uncover any flaws. In addition, the time of transition is looked upon as a period for training the users in the operations of the system.[1] The latter opinion considerably broadens the scope of the transition process. Referring to the listed advantages of parallel and pilot operations, one can see that they are based on this premise. Both of these methods do indeed aid in proving the new system and training the personnel. The question raised is the following: Are personnel training and system debugging valid activities during the transition period?

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[1] Ibid, X and XI; Ralph W. Fairbanks, Successful Office Automation, ch. 15; J. H. Herrett, "Transition and Conversion," Data Processing Digest, September, 1966

SCOPE OF TRANSITION PERIOD

Personnel training and system perfection may be part of the transition period, but only in the sense that they are a continuing part of system operation. The improvement of the operations of an information system in its personnel and procedural components is an on-going process. The major portion of system validation and personnel training should be concluded prior to system transition.

Another task which is ascribed to the period of transition is that of comparing the performance of the new system to that of the old. The merit of this exercise is questionable. In general, a newly developed information system is more integrated than its predecessor. For this reason, it is difficult to compare the output of each in all applications.[1]

What is required during the transition is a scheme of evaluation. The purpose of this scheme is not primarily to prove the design of the system but rather to determine that the system is operating as intended. It is expected that design flaws may be uncovered, but the evaluation which is made during the transition period is only concerned with the assembly of the system and its use.

It may be concluded from this discussion that the questions concerning the capability of the new information

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[1]Barnicle, "Communications, Parallel Runs," p. 41.

system should be settled before the system is installed. The time of transition should be used to insure that the system design is being followed.

Summarizing this approach to the period of transition, it can now be said that the primary task in transferring information systems is that of assembling the elements of the system as specified in its design. The design should have been validated at an earlier time.

EVALUATING ALTERNATIVE METHODS

The three methods for accomplishing system transition are now considered in terms of what they must provide.

Parallel Operations

The advantages of this method are that it allows for the perfection of the new system and provides personnel training. Since these tasks should be completed as part of another phase of system development, they are not a consideration in this author's definition of system transition. Parallel operations, therefore, are desirable only in the event that some phases of preparation are neglected.

Pilot Operations

This method is undesirable for system transition because it too provides benefits which should not be necessary if adequate preparation is made. Pilot operations are useful in the process of debugging computer programs and should be employed for that purpose.

The advantages of parallel and pilot operations are shown to be irrelevant for the task to which they are assigned. If the plan for system implementation is well designed and if its schedule and objectives are met, there should be no need for system debugging and personnel training during the period of transition.

Direct Method of Conversion

Since parallel or pilot operations should not be required, the direct conversion method is the logical choice for implementing system transition. This is the least expensive method since the manpower required is the same as for normal operations.

The following disadvantages were cited for the direct conversion method: (1) no back-up system to compensate for a failure with the new system; (2) the sytem users are not given an opportunity to become familiar with their roles in the new system; (3) the direct conversion method causes a mental strain on the personnel affected by the system conversion. In order to justify fully a recommendation to use direct conversion, these disadvantages must be considered.

The lack of a back-up system during system transition is no different than the situation which exists under normal operating conditions. What happens if, at some future time, the computer is unable to function? There is no parallel system then to continue operations. Emergency manual procedures are developed for use in such situations. Although the period

of transition is a time when a system breakdown is more likely to occur, the problems which are created can be overcome by these same methods. Having a complete system operating in parallel seems excessive.

The second objection to direct conversion is that the operating personnel are not completely familiar with the system. This objection is based on an assumption that orientation and training of personnel are not completed in the earlier phases of system implementation. If the overall plan of system implementation is well conceived, the personnel who are affected by the system conversion are adequately prepared to carry on the operations of the new system. The period of transition should not be used for training personnel in the use of the system.

The last objection is that the abrupt change with direct conversion results in considerable strain being placed on the operating personnel. This is indeed true, but this strain can be held to a minimum with sufficient training in advance of conversion. It can also be said that the strain of direct conversion is no greater than that experienced with parallel operations where the personnel are attempting to work with two separate systems.

The foregoing discussion has dealt with the objections to using direct conversion as the method for system transition. It has been indicated that these objections are based on the concept that the period of transition is a time for personnel

training and verification of the system design. It is the premise of this author, that this is not the case.

The paragraphs that follow relate the experiences of the U. S. Army with a system transition under Project SPEED.

EXPERIENCE OF TRANSITION WITH PROJECT SPEED

Pilot Operations

The task of converting the information systems at the supply depots to the SPEED was approached in the following manner. Complete SPEED hardware systems were installed at two depots. Pilot operations were conducted for two months to debug the computer programs before the system was installed at the remaining depots. These pilot operations were an integral part of the preparation of the system. When the decision was made to begin conversion at the remaining depots, the groups from the pilot operations were divided to assist with the transition at these other depots.

Use of Direct Method

The direct method of conversion was employed in making the system transition at the supply depots. Files were converted over a weekend, and the SPEED system was in use immediately. Provisions were made within the depot and within the entire Army supply system to compensate for a failure in the SPEED system during conversion. No major breakdowns were

experienced, however, and each depot was able to maintain the normal flow of materiel.

SUMMARY

The purpose of this chapter has been threefold. First, the three methods for achieving a transition between information systems have been identified and examined. The advantages and disadvantages of each have been enumerated. Second, the objective and the scope of the goals of transition period have been defined so that a method could be selected which would most completely satisfy the objective. Finally, the three methods have been evaluated in terms of the requirements for the transition process. The direct method of conversion has been selected as the most desirable since it requires the least amount of resources. The methods of parallel and pilot operation are more expensive, and the benefits which they offered are not related to the role of transition in the whole process of system development.

As an example of the use of the direct conversion method for system transition, a brief description of this phase of Project SPEED has been presented. The successful experience obtained from this project helps to lend merit to the suggestion that the direct conversion method be employed in system transitions.

The next chapter considers the personnel aspects of system transition. The various problems involved in this

process are exposed and recommendations are made for their solution. The role of management in system transition is also discussed.

CHAPTER III

THE TRANSITION PROCESS: PERSONNEL CONSIDERATIONS

INTRODUCTION

The purpose of this chapter is to consider the role of personnel in the process of system transition. First, personnel are identified as a basic element of an information system, and then their role within the system is discussed. The problems posed by personnel during system transition are enumerated and discussed. Recommendations are then made as to ways of avoiding these problems. Finally, the role of line management during transition is considered, and their proper function during transition is discussed.

THE IMPORTANCE OF PERSONNEL IN TRANSITION

The importance of personnel in the transition from one information system to another is aptly expressed in the following statement:

> The introduction of any new system of operation faces its greatest obstacles in changing the habits of people.....The human problems exceed the technical problems in complexity and difficulty. Failure to realize the presence and nature of these

> human problems creates a high risk of failure for the entire undertaking.[1]

System transition would be greatly simplified if the only personnel requirement were that the staff be adequately trained. Training is necessary, and indeed vital; but it is only a part of the effort required.

PERSONNEL IN SYSTEM OPERATION

The basic elements[2] of a management information system may be identified as follows:

1. Equipment
2. Personnel
3. Data Base
4. Computer Programs
5. Operating Procedures

Personnel are an integral part of an information system. They are not an external entity which merely use the system as a tool in their operations. Knowledge of this fact is critical for effective design and implementation of information systems. Poor performance by this element can disable the system as effectively as a machine breakdown or errors in the computer programs.

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[1]Richard G. Canning, Electronic Data Processing for Business and Industry, Appendix I, p. 316.

[2]Perry L. Rosove, Developing Computer-based Information Systems, p. 106.

THE ROLE OF PERSONNEL IN THE SYSTEM

The personnel associated with the management information system may be divided into two categories: those who operate the system, and those who use it. In many situations the distinction is not clear; some individuals who use the system in their functional activities are also part of the network which channels information into the computer, and thus are involved in the system operation.

Both categories of personnel play an important role in the successful operation of the information system. Those concerned with the system operation must perform the various tasks which keep the system functioning and responsive to the needs of management. The users of the system must employ its output effectively so that the organization can profitably use the data.

In view of the importance of personnel to the functioning of the information system, it is understandable that they are also of prime concern in the process of transition. This subject is discussed in the following section.

THE ROLE OF PERSONNEL IN TRANSITION

The individual, as a part of the entire system, plays the following role during the time of system transition. He is responsible for carrying out the changes in operating patterns which are a result of the new design. It is through his efforts that the transition to the new system is really

accomplished. The personnel must be capable of performing their respective tasks correctly so that the system can function.

New information systems usually incorporate new ideas and methods. If the individual is not receptive to these methods, there are many subtle ways in which he can provide resistance. An individual is not receptive to a new system if he is concerned about its effect on him. Does he have the ability to perform his new function? Would he retain his prestige within the group? Perhaps there is even a possibility that his position might be abolished. It is beneficial for the success of the transition if the personnel affected by the system change do not feel threatened, so they accept this change at least to the point that they do not disrupt system operations.

PERSONNEL PROBLEMS ASSOCIATED WITH TRANSITION

1. Insufficient Training.--One obvious problem with respect to personnel is that they may not be adequately prepared to perform their assigned duties under the new system. This situation seriously handicaps the transition process. If machine operators are not familiar with their equipment, job processing time could increase significantly[1] or errors could result in files being destroyed. Errors by clerical personnel

[1]Robert H. Gregory and Richard L. VanHorn, Automatic Data Processing Systems, p. 647.

could also hamper the task of system conversion. Forms improperly completed or the incorrect interpretation of the machine output may cause unnecessary complications.

It is unrealistic to expect transition without mishaps; however, the degree of training and system familiarity which the personnel bring to the conversion process, greatly affects its success.

In Project SPEED, for example, the training of personnel was carried out by each depot. The machine operators at each depot possessed a varying degree of skill prior to SPEED. Since the training of these operators for the SPEED system was not co-ordinated, the result was that the level of competence of operators was not uniform. This was especially noticeable when the data files were converted. Some depots were able to convert more rapidly than others due to the skill of their operators.

2. Negative Attitude Toward the System.--The other major problem associated with system personnel is their acceptance of the new system. As stated earlier, personnel may be antagonistic toward the new system, and this attitude could affect their performance. Rosove gives the following reasons for possible dissatisfaction: (1) unfamiliarity with information system technology; (2) personnel not having participated in the development of the system; (3) personnel not having participated in the planning for system transition; (4) personnel

not having been prepared for the new system by training and/or orientation.[1]

The first and the last reasons are related to insufficient training and are considered in the next section. The issue of personnel participation in system development and transition planning raises other questions which are dealt with in this chapter.

AVOIDING PERSONNEL PROBLEMS

Adequate Training

The point has been established that personnel competence is a crucial ingredient in a successful system transition. The training of the individuals who operate and use the system is not part of the transition process but its importance demands some consideration.

The objective of any training program is to prepare the individual to perform his assigned tasks with an adequate degree of skill and accuracy so that the overall system will function effectively. The achievement of this goal is somewhat complicated in the situation under study. It is not a case of training new personnel coming into the organization. The problem is one of retraining people to do their jobs by different methods. It is a task of unlearning as well as learning. Another impediment to the task of training is that the personnel must continue to operate the old system during the training period. With the direct conversion of systems, personnel are required to make an abrupt switch in operating procedures. This situation is not conducive to effective training.

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[1] Rosove, Developing Computer-based Information Systems, p. 287.

In developing a training program two approaches should be taken. The first is to educate personnel in the general functions and purposes of the entire system. The other is a specific and detailed instruction program for each task in the system. The reason for the latter is obvious so let us consider the value of the first.

By informing the personnel involved with the system of its basic concepts and objectives, they may appreciate more fully the various tasks which they will be required to perform. If the functional personnel are not oriented to EDP the adjustment to its demands for accuracy can be difficult. A program could be designed to provide broad knowledge about the system initially and progressively narrow in its scope until it reaches the detail of each individual job. As the attention to specific details increases, the concern with the entire system is reduced. While narrowing the scope of attention, the program should not neglect to make personnel aware of how their work fits into the system and interrelates with the work of others.

The three main considerations in the training process are: (1) the development of the program, (2) the implementation of this program and, (3) the scheduling of the implementation.

Program Development

Chapter VIII in Rosove* is an excellent reference on training program development. The development of a specific training program is unique to each system; however, he offers useful guidelines for this effort.

*Perry E. Rosove, Developing Computer-based Information Systems.

Implementation

The implementation of a training program presents some interesting problems. Who should conduct the program? Where should the training take place? Examining the first question it can be said that in a situation such as the one under consideration, i.e., essentially a "one time only" effort, it would be well to involve as many users as possible in the training function. There are two reasons for this. First, it eliminates the need for a large formal training organization which will not be needed once the new system is operational. Second, it demands a strong commitment on the part of the users since they will be responsible not only for the operation of the system but also for insuring that their personnel are prepared for such operations.

With multiple installations of a basic system, such as Project SPEED, the initial training, as well as the development of the program, is best handled by a central group. This would help insure some degree of uniformity in the general level of competence. Personnel at some installations may be more sophisticated in EDP than others. These variations could be made up by more intensive instruction at the local level. The central group would set the standards and goals for the system personnel, serve as instructors for the local managers and representatives and advise local instructors in the training of personnel.

The previous discussion gives some indication of how to approach the second problem. It would be impractical to have everyone involved in the system trained at a central location. In addition having a central group perform all the training functions would not achieve the degree of involvement

of local personnel that seems desirable. Thus training local representatives with a central group at one location and then having these representatives carry on the instruction appears to be a reasonable compromise.

In Project SPEED two methods were used. Initially, training programs were developed and implemented locally. Later, training packages were sent out from the central group. These were detailed instructions for specific tasks. Local personnel then used these as a basis for training. There was not a great deal of central control of the training effort. This caused some problems in the initial period of system operation. The level of ability at certain installations was not adequate during the transition period, causing delays.

Scheduling

The timing for the implementation of the system training program is of vital interest. One of the goals of the program should be to have the personnel adequately prepared when the system becomes operational. The achievement of this goal is complicated by the fact that the people who are being trained are also involved with their duties under the old system. The training must be scheduled so as not to interfere with their normal work. In addition, it would be most advantageous to complete the program as near as possible to the time when the system transition is to take place. Should the program end in advance of the conversion date, there is the danger that the personnel could lose some of their knowledge of the system.

It is reasonable to assume that some time during the normal work week could be set aside for system training. Initially the sessions would be of a

general nature, explaining the total system and its concepts. Later, closer to the time of system transition, more intensive sessions could be conducted, possibly after normal working hours. The actual schedule of training sessions could remain flexible so that the training would be completed simultaneously with the start of system conversion.

Acceptance of New System

Insuring personnel acceptance of the new system is a problem which should be dealt with at the start of system planning. Personnel who are to work with the system should be included in its development; and hostility to the new system may be avoided.

Other benefits may be derived from user participation in design. The personnel who are involved in a particular functional area are keenly aware of the information required for that function. This knowledge is invaluable to the system analysts and designers who are striving to construct a system that satisfies these information requirements. In addition, exposure of personnel to the developing system should facilitate training in the use of the new system.

It is obvious that not everyone can be included in the development of the new system. In reality only those who can make a real contribution to the effort should be considered. This representative participation should be sufficient to convince the majority of personnel that the new system is being designed to aid them in their work.

> This notion of the importance of user participation in the work of the developer as a basis for psychological acceptance of the final product is not an impressionistic hypothesis but is based upon a considerable amount of experience in information system development and research in the behavioral sciences.[1]

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[1] Ibid.

In Project SPEED, for example, the system design committee was composed of individuals from each supply depot in the system. The content and formats of the data files were developed with the help of representatives from each depot. This was an important area for user participation since each depot had certain unique requirements which it felt should be included in the data base. By discussing these requirements and working out compromises among the representatives, the system designers were able to develop a data base which satisfied the participants.

The conclusion which is reached from the preceding discussion of personnel problems is that they have their basis in the manner in which the system is developed and implemented. To avoid these problems at the time of transition, the system planners must provide for user participation during development and must insure that all personnel are properly prepared for the operation of the new system.

THE ROLE OF LINE MANAGEMENT IN SYSTEM TRANSITION

During the period of system transition, the line management serves two important functions. First, it coordinates its efforts with the system designers in executing the plans for system conversion. The department manager must have a detailed knowledge of the schedule and the operations required for conversion. It is the responsibility of these managers to insure that the schedules are met and that the required operations are performed. The system designers are not capable of operating each department until transition is complete. Thus, it is critical that line management fulfill this leadership role in implementing the changes for the new system.

The second role which is required of line management is that of serving as judge of the system's performance in each department. The

department head, with his detailed knowledge of the operations under his direction, is invaluable in assessing the effectiveness of the new system. The reports that line management give to the system designers enables them to determine the over-all performance of the new system. In addition, the careful attention of the managers to the new operations assists in identifying flaws in the system or incorrect usage of new procedures.

The department manager, then, plays two roles during system transition. First he directs and implements the changes under the new system. He also serves as a monitor, insuring that procedures are followed correctly and informing the system designers on the system's performance.

SUMMARY

In this chapter, the personnel component of information systems is considered in relation to its effect on a system transition. Serving as both users and operators of the system, personnel are responsible for executing the changes in operating patterns which have resulted from the design of the new system. The problems which may be presented by personnel in this effort are related to (1) insufficient training, and (2) a negative attitude toward the new system.

To avoid these problems, it is recommended that a comprehensive training program be designed and completed before transition; and that functional personnel participate in the development and implementation of the system. Descriptions are given as to how these areas were handled in Project SPEED. Finally, the role of the line manager during transition is discussed. He is seen implementing the changes and monitoring the performance of the new system.

In the following chapter, a program is developed for achieving the goals of system transition.

CHAPTER IV

A PROGRAM FOR SYSTEM TRANSITION

INTRODUCTION

In this chapter a program for accomplishing system transition is developed. The elements of this program are based on the tasks which must be performed during the transition process.

A program for system transition is a vital part of the implementation of a management information system. Planning such a program should begin as soon as the design of the new system is completed. The conversion from the old system to the new is the climax of the development process.

The success of this conversion is dependent upon two factors: First, the preparation which has gone into the new system and second, the manner in which the conversion is executed. Preparation of the system is not within the scope of this study although some suggestions for easing the problems of personnel are made in Chapter III. The execution of the transition is of concern, and a program is now presented which seeks to achieve the goals of transition which are listed in Chapter I.

THE TASKS OF TRANSITION

Within the goals of system conversion there are certain specific tasks which must be completed. First, the new system is put into operations. The data files are converted; the new equipment begins operating; and new operating procedures are used. The next task which is performed is that of monitoring the operations and making corrections where necessary. Changes may be required due to flaws in the system design or simply because operating procedures are not followed accurately. Finally, after the new system has completed at least one processing cycle, i.e. when the system has performed in all application areas, an assessment is made of the system's performance to determine how well the system is meeting its design specifications. As a result of this evaluation either the system is accepted as is, or modifications are proposed for system improvement.

The program which is developed for system transition must accomplish these tasks while insuring the continued operation of the organization.

ELEMENTS OF THE TRANSITION PROGRAM

A program for system conversion is composed of the following elements: (1) a plan of conversion which prescribes the manner in which responsibilities are transferred to the new system, (2) a plan for monitoring the system performance and making corrections or modifications, (3) a set of criteria

on which to base an evaluation of the system once it is operating, and (4) emergency operating procedures which allow essential operations to continue in the event of a major system breakdown.

The Conversion Plan

Once the new information system is considered ready for installation, the process of system transition begins. There are two aspects to this task which must be considered.

1. Conversion of data files.--This is the first step of the conversion process. As a result of the new system design, much of the data used by an organization is stored in different formats or mediums (magnetic tape, puched cards, etc.). The existing files must be converted so the computer programs used in the new system can function.

If the volume of files to be converted is not too large, conversion could occur over a weekend or some other non-operational period for the organization. If there are a great many files to convert, a schedule could be devised so that the task of conversion is spread over a longer period. Files which require very little updating could be converted in advance. The files which are used most often could be done just prior to system transition. Finally, the remaining files could be converted as they are called upon for use in the new system.

2. Method of Conversion.--This problem is discussed in detail in Chapter II. The conclusion reached is that the

best method is the direct conversion. It accomplshes the essential purpose of transition while requiring the minimum resources.

It is not always necessary that an entire information system be converted at one time. The structure of the organization and the relationship between the old and the new system may be such that a multi-stage conversion is possible. This would ease the burdens on the organization, and it is recommended where practical. The techniques and principles considered in this study with respect to complete system conversion also could be applied to a multi-staged conversion.

Monitoring the New System

After the new system begins to function, it must be observed to see that it is functioning correctly. In order for this to be done effectively, there must be close co-operation among the departments involved in the transition and with the system designers. The proper atmosphere is important here. Unpleasantness among departments or department managers who view the system designer as a threat, interferes with the process of monitoring the new system. Some suggestions are made in Chapter III to reduce this problem.

The purpose of observing the system closely following conversion is to determine if it is functioning correctly; and if it is not, what the causes are. Some factors to consider are (1) the length of processing time required for different

jobs. This includes both manual and computer processing time. How does this processing time compare with design estimates? If it is significantly longer, the reasons should be ascertained. (2) The number and nature of input errors which are discovered by the computer indicate either a flaw in the system or incorrectly followed instructions. (3) The output of all stages of the system should be closely watched to determine its validity and utility.

It is probable that errors would be uncovered as a result of this observation, and they must be corrected. If the errors are of a technical nature such as incorrect logic in computer programs or faulty operating procedures, the proper personnel should be available so that corrections can be made immediately. If human errors are present, the system designers must work with the line management to determine the source of the trouble. They system analyst should avoid, however, being placed in the position of running a department. He should remain in his role of a consultant and work with line management to solve the problems.[1]

It is important that channels of communication be kept open between the operating departments and the system designers. First, it is necessary to inform the designers and those conducting the transition of flaws and errors which are discovered so that they can take immediate action. Second,

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[1]Fairbanks, Successful Office Automation, p. 192.

after correcting these errors or making any changes in the system, the operating departments should be aware of the changes to that they can make the necessary adjustments.

Criteria for Evaluation

The final phase of the transition process is the assessment of the performance of the new system. After the first processing cycle of the new system has been completed, the system designers and the organization management should conduct a complete review of the results. Specific factors such as costs, processing time required, various measures of organizational performance, and the satisfaction of management should be considered.

Cost figures should be known for the old system's operation and also design estimates of those under the new system. These values can be compared to the actual costs of the new system. It is necessary to know that the first processing cycle is not as efficient as later ones. The costs associated with it, however, should give some indication of the true value. If these costs are considerably higher, an investigation is justified. System costs and other measures of performance should be developed in advance and carefully considered so that they are valid.

After the initial evaluation is complete, a decision can be made about the system. If no major faults are uncovered, the system can continue to operate while gradual modifications are made. In general, information systems are

subject to constant changes which are a result of the shifting goals and needs of the organization. Thus the evaluation at the conclusion of the first processing cycle is just the first in a series of such reviews.[1]

Emergency Operating Procedures

Since the organization must continue to function during system transition, a comprehensive strategy should provide for the possibility of a system breakdown. Although the new system may be thoroughly tested, there is always a chance that a mishap could occur. This possibility exists at all times, but the probability is higher during the initial period of system operation.

The ideal time to formulate these emergency procedures is during the design phase of system development. At this time the operations of the organization are undergoing a comprehensive analysis to determine the requirements for the new system. It should be possible to identify the critical operations which must continue if the organization is to function. Once the critical operations are identified, alternative procedures for performing these operations can be devised which would be used in the event of a system breakdown. They would not be as efficient as the regular system, but they would allow the organization to remain operable. Examples of such

[1]Solomon, Management Uses of the Computer, p. 174.

safeguards would be provisions for processing important jobs at other locations or the separate maintenance of duplicate data files in the event the original are destroyed.[1]

In Project SPEED, emergency provisions were made at two levels. First, manual procedures were set up so that in each depot, materiel requisitions could be processed and issue orders released. In this way, the necessary flow of materiel was maintained through each depot even if the system was not operating. In addition, the schedule for installing the system at the depots was arranged so that a depot that was being converted to the SPEED system was backed-up by another depot. Copies of the data files from the depot being converted were held at the back-up depot. They were also expected to absorb some of the supply load in the event that the depot undergoing conversion could not satisfy all of its customers.

SUMMARY

A program for information system transition is composed of four parts:

1. A plan for system conversion which includes a schedule for data file conversion and the direct conversion of operations from the old system to the new system.

2. A plan for monitoring the initial operations of the new system. The intent of this plan is to insure

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[1] Gregory and VanHorn, Automatic Data Processing Systems, p. 659.

correct operation of the new system and to identify any system flaws.

3. A plan for evaluating the performance of the new system upon completion of a specified operating period. This is the final phase of system transition. From this evaluation, a decision is made to continue with the system or make modifications.

4. A set of emergency procedures which can be employed to execute the essential functions of the organization in the event of a system breakdown.

In developing this program, an assumption is made about the system implementation process. This assumption is that all system testing and personnel training are completed prior to the transition period. The transition period is not viewed as a final test for the system.

The purpose of this chapter has been to present a program for the conversion of information systems. The following chapter is a summary of the main points of this thesis.

CHAPTER V

SUMMARY

The purpose of this thesis has been to examine the period of transition of a new management information system. The purpose of this transition is defined and some important problems associated with the process are discussed. In Chapter IV, a program for system transition is presented. The main points of this thesis are now summarized.

1. Purpose of Transition

The purpose of the transition process is to transfer the responsibility for the organization's information requirements to the newly designed system. To accomplish this purpose, the system operations must be converted to the new design, and then an evaluation must be made of the system's performance.

2. Conversion of Operations

Three methods of completing the physical change in the system are: (1) parallel operations, (2) pilot operations, and (3) direct conversion. After evaluating these methods in terms of the goals of system transition and role of transition in system implementation, the direct conversion method is judged most acceptable. It is the simplest method and requires the least resources.

3. Personnel Considerations

People are an integral part of an information system. As such, they play an important role during system transition. It is essential that they are prepared for this role and are receptive to the new system. Thorough training is required to familiarize all personnel with their new duties. This training should be completed before system conversion occurs. The attitudes of the personnel toward the new system are a source of concern. By including individuals from the organization in the process of system development and by adequately training personnel, the new system may be generally accepted.

The line managers of the organization are seen playing a leading role in directing the change to the new system and co-operating with the system designers in monitoring and evaluating the new system's performance.

4. A Program for System Transition

A program for effecting a system transition includes the following elements:

a. A schedule for conducting the conversion of data files to new system formats.

b. The direct conversion of system operations to the new design.

c. A plan for monitoring the performance of the new system to insure proper installation.

d. A review of the results of the system's first processing cycle. This review is used for an

evaluation of the new system and for discussion of any proposed modifications.

e. Emergency operating procedures to carry out essential organization functions in the event of a major system breakdown during transition.

It is believed that this paper presents an accurate picture of the process of system transition. An awareness of the nature of the process and of the problems involved should affect the degree of success in such an undertaking.

A P P E N D I X

PROJECT SPEED

BACKGROUND

Project SPEED (System-wide Project for Electronic Equipment at Depot) was initiated by the U. S. Army Supply and Maintenance Command in November, 1960. The purpose of the project was: (1) to define the supply depot operational and management Automatic Data Processing (ADP) requirements, and (2) to devise the best integrated data processing system within the limitations of available equipment for installation during the calendar year 1963. The ultimate objective was to improve efficiency, and thereby to reduce costs.

At the start of the project, the participants included the six Ordnance Corps supply depots. Later the three depots of the Signal Corps were added. The subsequent reorganization of the Army eliminated the distinction among depot missions. The primary reason for the initiation of Project SPEED was the knowledge that the existing equipment (IBM 305, 650 and 1410 with random access) could not adequately handle the supply and financial work load of the larger depots. Most were operating on a three-shift basis with little time for preventative maintenance.

Greatly simplified, the depot supply functions fell into two main areas: the acquisition of material and the issue of that same material. The many tasks which were necessary to accomplish this basic purpose were the source of SPEED applications. To develop these application areas, a System Design Committee was formed. It was comprised of top management and staff personnel from the participating depots. This group conducted studies at their home depots to determine optimum ADP support for each potential application area. From these studies, twenty separate areas were developed where ADP support could provide substantial management benefits or definite financial saving. These application areas accounted for the major ADP work load at the depots.

In designing the SPEED system, certain basic concepts were kept in view. First, it was desired to have immediate access to particular data. The second concept was to have

the capability for remote inquiries into the computer. Another concept was the maximum elimination of files which required manual manipulation and maintenance. The fourth concept was that the system should give management maximum assistance rather than just to perform housekeeping functions. The final goal was to standardize to the greatest extent possible, data elements, files, methods, and reports within the SPEED system.

Of the twenty application areas which were enumerated in the initial depot study, nine were selected for implementation during the first phase of the project. Following is a brief description of these areas.

Supply Stock Accounting

This function involved the processing of a variety of supply transactions for inventory control and updating records. The ADP equipment in the previous system handled records for items normally stocked at the depot. Off-line clerical files were maintained for the remaining items in the Army supply system. Delays were caused in processing these transactions, since items rejected required clerical research and re-entry.

With the extensive capability of the proposed configuration, records on all items in the supply system could be stored for random access. This permitted all valid input to be completely processed for established stock numbers.

Shipment Planning

Prior to SPEED, shipping schedules were prepared with limited ADP processing to determine the impact of weight and volume for shipments to each customer. Extensive off-line punched card files were required to provide necessary information such as, national motor freight and uniform freight classification codes, freight classification descriptions, and other coded data required in freight planning. In the SPEED system this information was in magnetic surface storage. In addition relevant data on customer due dates and material destination was accessible to facilitate shipment consolidation opportunities.

Location and Inventory

The old system maintained ADP records of location and quantity for all items. However, only the primary location was used. Secondary locations were kept in a punched card

file. The SPEED configuration permitted up to twenty separate locations to be monitored for each item. In addition a bin planograph was maintained in disc storage to assist in assigning locations to new items and secondary locations for existing items. The system also inventoried regular stock items using statistical sampling techniques and classified and major items on a 100 percent basis.

Army Field Stock Control System

This involved the maintenance of property accounts at all activities supported by each depot. The SPEED system converted punched card files to magnetic tape. This considerably reduced the time required for updating files and preparing stockage list and records.[1]

Maintenance of Rebuild Consumption Data

Rebuild consumption files consisted of accumulated data on items consumed in the Depot Maintenance and Rebuild Programs. The data was used for monthly analysis of the requirements established, versus the use rate, to determine the necessary adjustments to stock reservations and financial requirements. These files were stored on magnetic tape in the SPEED system rather than on puched cards as in the previous system.

Financial Inventory and Stock Fund Accounting

This application used the output of stock accounting program to update basic financial inventory and stock fund records. SPEED system provided random access storage of this data. This permitted in-line adjustment of Financial Inventory Accounting records after stock accounting processing was completed. Records were arranged in report format to facilitate the preparation of periodic reports. Customer billing records were on random access and updated daily.[2]

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[1] Subsequently removed from depot responsibility.

[2] Ibid.

Supply Performance Reporting

This area involved the accumulation of data for performance evaluation in accomplishing the supply mission at each distribution depot. The preparation of these reports using Electronic Accounting Machine equipment precluded timely analysis of supply performance. The increased response time of the SPEED system allowed the compilation of data and preparation of reports in time to improve the supply function.

Change Letters

Change letters are used for updating stock catalogs due to alteration in stock number, price, unit of issue, etc. In the old system only a limited amount of data could be maintained in random access storage. Considerable off-line clerical processing was required. The SPEED system permitted storage of all change data on magnetic surface and thus complete in-line processing was possible.

File Maintenance

This area involved the maintenance at each depot of such files as item data, stockage lists, in-stock, etc. The time required under the old system for updating these files resulted in periods when file data was either unavailable or unreliable. Under SPEED all records were on magnetic surface and were updated from a single source.

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13 ABSTRACT

This report considers the process of transition in the implementation of a new information system involving the period when responsibility for the new system is transferred from the design to the operating organization. Methods of parallel operation, pilot operation and direct conversion are discussed, along with the techniques by which the tasks of equipment installation, personnel training, file conversion, system monitoring and system modification are handled under each method. Experience obtained under Project SPEED, a project under a standard information processing system was implemented at a number of U.S. Army Depots, is used to develop a set of precepts that should serve to facilitate the transition process.

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