Perception of Effectiveness as a Factor in Schedule Management System Usage in Industries Involved in Department of Defense Development Programs

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PERCEPTION OF EFFECTIVENESS AS A FACTOR IN SCHEDULE MANAGEMENT SYSTEM USAGE IN INDUSTRIES INVOLVED IN DEPARTMENT OF DEFENSE DEVELOPMENT PROGRAMS

by

Lyle Adelbert Wolcott

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Education
Department of Educational Leadership

Western Michigan University
Kalamazoo, Michigan
April 1986

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PERCEPTION OF EFFECTIVENESS AS A FACTOR IN SCHEDULE MANAGEMENT SYSTEM USAGE IN INDUSTRIES INVOLVED IN DEPARTMENT OF DEFENSE DEVELOPMENT PROGRAMS

Lyle Adelbert Wolcott, Ed.D.
Western Michigan University, 1986

The extent to which a schedule management system is used in day-to-day program management operations may depend upon how useful the individual manager perceives the system to be. This study attempts to identify system-manager relationships that impact their usage by management personnel.

The study had two purposes. The first objective was to isolate attributes of the company schedule system and determine the significance of their relationship with manager opinion of the system. The second objective of the study was to investigate selected operational conditions that may impact the schedule management system and determine the significance of their relationship with manager perception of system usefulness.

A total of 268 managers from 12 industrial firms engaged in development programs were surveyed concerning their company schedule management system.

In the examination of large firms, manager opinion of schedule management system usefulness in project management was found to increase as key system elements
were improved. Participation in system goal setting, training on the system, and availability of the system to the manager for individual study of alternatives had a positive impact upon manager perception of system usefulness.

In small companies with less than 25 managers, managerial opinion of scheduling system usefulness was also found to increase as key elements of the scheduling system were improved. Training on the scheduling system also had a positive impact on manager opinion of system usefulness.
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Lyle Adelbert Wolcott
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CHAPTER I

INTRODUCTION

This study is related to research and development programs and the schedule management systems utilized by industry to administer them. One measure of the overall degree of success in program management is associated with how well programs are planned and schedules are carried out. Failure to meet established goals may ultimately lead to increased program costs. Research and development programs are well known for exceeding scheduled cost and time deadlines (Stout, 1980).

Marrella (1973) writes of technical complexity, long lead time in the development and procurement process, and uncertainty as forces that unfavorably affect projected costs and schedules. These forces must be controlled to assure that projects are completed on time and within available funding.

Since a good plan involves the establishment of standards of performance against which progress can be measured and in terms of which corrective action can be initiated, it is difficult to separate planning and control (Cleland & King, 1968). It is not, however, the intent here to argue the relative merits of planning and
control or the arena to which such systems rightfully belong.

Within industry, a number of systems are used in the planning and scheduling process. The success or failure in meeting schedule objectives may not, however, depend solely upon the particular system that is utilized, but rather upon other factors such as those operating conditions perceived by the manager to be unfavorable to individual goals or aspirations.

Statement of the Problem

The problem addressed by this study concerns the individual manager's use or nonuse of the company instituted system of schedule management. The extent to which the system is used in day-to-day program management operations may depend upon how effective the individual perceives the system to be. If the manager perceives that system goals are not in consonance with individual aspirations, the input data may not reflect actual conditions. If the manager does not believe the system to have some worth, the output data may not be fully utilized. Identification of those conditions that lead to limited usage of the system should help in improving the efficiency of the overall scheduling operation.

The purpose of this research was twofold. One
objective was to determine if in an industrial setting a relationship exists between how a manager perceives the effectiveness of key elements of the company schedule management system and the manager's stated personal usefulness of the system in day-to-day project management. A second objective was to determine if a relationship exists between selected conditions within the system operating environment and the manager's stated personal usefulness of the system in day-to-day project management.

Scope of the Study

The data used in this study were obtained from managers employed at several companies involved in Department of Defense development programs. The companies were both large and small, with the smaller firms having less than 25 managers. A schedule management system effectiveness criteria was provided to each manager to enable an evaluation of the company system in a manner consistent with that of other respondents. As stated previously, the first objective of this study was to determine if a relationship exists between manager stated usefulness of the schedule management system and key elements of the system. The system elements used in this study were adapted from the following description developed by Holtz (1966):
1. **Validity.** The information contained in the system and presented to the appropriate levels of management should reflect genuine progress.

2. **Reliability.** The data contained in the system should be consistent regardless of who obtains them or where they are obtained.

3. **Implementation.** A large number of personnel are likely to be involved in furnishing inputs and using outputs from the scheduling system. Thus the technique should be easy to explain and understand, and simple to operate.

4. **Universality of Project Coverage.** Ideally, one scheduling system should be sufficient from beginning to end of a project life cycle. All levels of management should be able to use the information in the system, and all relevant factors to be controlled should be encompassed in one system.

5. **Sensitivity Testing (Simulation).** Since management decision making involves selecting one course of action out of alternative possible courses, it is desirable to assess the scheduling implications of those alternatives.

6. **Forecasting.** One purpose of collecting data is to assess the probability of accomplishing future tasks.

7. **Updating.** Program decisions in a dynamic environment must be based on current data. The scheduling system should be capable of incorporating rapidly, and with ease, information on project progress.

8. **Flexibility.** A desirable feature in a scheduling technique is its ability to adapt easily to changes in the project.

9. **Cost.** The scheduling system should provide the required information at the lowest cost. (p. 6)
The Research Questions

The research questions listed below represent the selected conditions related to the schedule management operating systems upon which this study is based:

1. Does the schedule management system technique affect manager perception of system usefulness?

2. Does use of the schedule management system as a means of individual manager performance evaluation affect the manager's perception of system usefulness?

3. Does the amount that a manager participates in the setting of goals for the schedule management system affect manager perception of system usefulness?

4. Does the placement of overall planning responsibility with nonline groups affect manager perception of schedule management system usefulness?

5. Does the degree to which a manager plans work that falls within his/her own area of responsibility affect manager perception of schedule management system usefulness?

6. Does analysis and reporting of schedule management system results by nonline groups affect manager perception of system usefulness?

7. Does training on the company schedule management system affect manager perception of system usefulness?
8. Does the availability of terminals or other means of access to the schedule management system to investigate alternative courses of action affect manager perception of system usefulness?

Each of the above research questions was evaluated for large firms with 25 or more managers and for small firms with less than 25 managers. The partition of the data into large and small firms was done, because the conflict between individual and organization may potentially be greater as organizations become larger and programs are more complex (Bolman & Deal, 1984).

Definition of Terms

In order to minimize problems with terminology, the terms that are fundamental to understanding this report are listed below:

Planning

Planning is a systematic development of programs aimed at reaching agreed upon objectives by the process of analyzing, evaluating, and selecting among the opportunities that are foreseen (Certo, 1983).

Control

Control is the process in which management compares
expected results with actual performance and then takes steps to correct any significant deviations that have occurred (Hodgetts, 1984).

Outline of the Study

Chapter II contains a review of selected literature relating to use of a system for performance measurement of individuals, participation in goal setting, planning responsibility, analysis and reporting by staff groups, training, schedule management system availability to the manager, and the research hypotheses.

Chapter III discusses the research design and methodology. The survey instrument design, study population, sampling procedure, study limitations, operational hypotheses and analytical procedure are presented.

Chapter IV presents the findings of the study.

Chapter V contains study conclusions and recommendations for further research.
CHAPTER II

REVIEW OF SELECTED LITERATURE

In the attainment of organizational objectives, the manager usually relies upon some sort of planning and scheduling system. Associated with the implementation of such a system is the matter of determining program effectiveness and exercising control measures to keep the project on course. In many cases, control is concerned with the successful implementation of a course of action as predetermined by a decision model and a feedback capability that could either change future plans or the model itself (Horngren, 1972). This study concerns the nonuse of such systems by management personnel. According to Weinshall and Reveh (1983), the primary objective of managers is to insure the continued operation and survival of the organization. Their organizational strategies are therefore considered secondary. The nonuse of scheduling techniques by managers for day-to-day project management is not without precedence. Sapolsky (1972) reports that interviews with contractors associated with the Polaris System indicated that managers at all levels were not using the Program Evaluation and Review Technique (PERT) that was
reputed to be so successful. The system was apparently being used to satisfy Government reporting requirements.

Research Question 1 concerns the issue of whether the manager's opinion of system usefulness is related to the scheduling system that is employed by the company. It examines the various attributes of the system to pinpoint the particular area of the system that may have an impact upon the manager's perception of system usefulness. Concerning the issue set forth in Research Question 1, it is hypothesized that there is a relationship between manager rating of schedule management system effectiveness and manager perception of the system usefulness.

The review of literature contained herein is directed at the research questions listed in Chapter I. With the exception of Research Question 1, each of the questions poses an operating condition that may be perceived by the individual manager as unfavorable to his/her aspirations or goals. Of interest to this study was whether these conditions have an adverse effect on use of the company instituted schedule management system.

Where the planning and scheduling system is used as a performance measurement tool with responsibility identified to a specific individual or group, there may be
behavioral implications.

Performance Measurement and Data Reliability

The use of a management system to bring about compliance with management standards or goals is successful in many cases, but according to McGregor (1967) there are also important unintended consequences. Among these are:

1. Widespread antagonism to the controls and those that administer them.

2. Successful resistance and noncompliance by many employees at all levels up to the top (and sometimes there also).

3. Unreliable performance information because of employee antagonism and resistance to the administrative control.

4. The need for close surveillance of employees. This results in dilution of delegation which cuts into managerial time and impedes the development of workers.

5. High administrative costs. (p. 5)

The perception that excessive and unneeded information has been requested as a means of needling employees into meeting goals has, according to McGregor (1967), negative side effects. This is especially important where the individuals or units are accountable to higher echelons of the organization. Trust is an important relationship in the working place. Bennis (1984) lists trust as one of the four competencies of leadership.
It is essential to all organizations. The main determinant of trust is reliability or consistency. As pointed out by Leavitt (1972), people perceive in accordance with their needs. That is, they distort the world in relation to their own tensions. Perceptions are based upon both needs and fears.

Argyris (1971) notes that management systems are supposed to help with complexity. However, the systems provide an increase in control that cause the manager to feel pressure, a lack of choice and psychological fear. These can lead to a decreased sense of responsibility and poorer performance. Uncertainty and ambiguity in assignments are a direct cause of this effect. Argyris (1971) further states:

If management information systems achieve their designer's highest level of aspiration, they will tend to create conditions where executives will experience (1) reduction of space and free movement, (2) psychological failure and double bind, (3) leadership based more on competence than formal power, and (4) decreased feelings of essentially. These experiences will tend to create genuine resistance to management information systems. (p. 275)

Concerning manager overload, Drucker (1985) states:

With the advent of the desk-top mini-processor, the manager risks being overloaded with paper and data. Indeed the critical problem will not be how to get or how to process the information, but rather to define what the information really is. This task cannot be left to that mythical creature the "information specialist." Information is the manager's main
tool, indeed the manager's capital, and it is he that must decide what information he needs and how to use it. (p. 36)

Several empirical studies (Hofstede, 1967; Lowe & Shaw, 1968) indicate that submission of excessive resource requests and easily achieved standards is a common practice. Organizational slack, or redundancy as it is now called, was used by Cyert and March (1963) to explain how organizations smooth out fluctuations by accumulating "fat" under favorable conditions and using up the slack when they experience less favorable times. McGregor (1967) reported that in one company, top management acquired:

incontrovertible evidence that many of the performance measures upon which they relied were in fact unreliable, because the data was "fudged" in one way or another. The evidence suggested that this phenomenon existed not only at the lower levels, but well up into middle management. (p. 9)

The above research associated with performance measurement emphasizes the fact that people are faced with uncertainty on the job, and they may have negative perceptions concerning management systems that feature procedures that may have an effect upon their goals and aspirations. Further, system data reliability may suffer as a result of these perceptions. Research Question 2 addresses the use of the schedule management system as a means of measuring individual performance.
and its impact upon manager perception of system usefulness. Concerning these factors, it is hypothesized that there is a relationship between use of a schedule management system for individual performance measurement and manager perception of system usefulness.

One method of reducing uncertainty among managers may involve participation in the goal setting process.

Participation in Goal Setting

According to Trewatha and Newport (1979), planning is the fundamental and primary management function for performance of the manager's job.

The amount of participation by the individual manager in the establishment of goals for the schedule management system may also affect perception of system worth. Heilman and Hornstein (1982) point out that many believe, and there is support from social psychology theory, that if people participate in making decisions they will be more committed to the decisions and will work harder to implement them. Participation may also stimulate motivation. According to Research Institute of America (1981):

The more people can control their own work, the greater their stake in doing it right. And so the more opportunities a supervisor gives employees to make decisions about their own work - to plan it, to develop solutions to their own problems - the greater the...
chances of having a highly motivated work force with inner discipline. ... People are most likely to follow rules, to enforce an order, that they themselves have created. (p. 14)

White (1984) claims that rarely is the worker given the authority, recognition, and chance for growth and achievement that promotes motivation. Stout (1984) points out that threat feelings may be reduced in the work force by creating a feeling of equality. Bogue (1972), in discussing the relationship between administrator integrity and organizational climate and productivity, writes of a supportive and trusting organizational climate as being conducive to high production. Nash (1983) points out that it is the perceptions that managers and their employees have of formal and informal policies, structures, and systems that guide management behavior and influence overall organizational performance. Nash (1983) further believes that participation in management seems to be one criterion that differentiates positive climates from negative ones.

In setting of goals, Bradford and Cohen (1984) state:

In most cases, however, it is more productive to set up an interactive process between superior and subordinate to explore a range of possibilities before a decision is made. Usually a considerable amount of talking it over, "chewing on it," looking at what is initially a vaguely defined goal from different angles must occur before a definition firmly captures the interest of the leader and
members. (p. 116)

The Japanese are well known for their approach to participation. Probably the best known feature of the Japanese organization is their participative approach to decision making. Everyone in the organization who will feel the impact of an important decision is involved in making it (Ouchi, 1981). Speaking of the Japanese method of management, Drucker (1971) states that they involve the people who will have to carry out the eventual agreement in the process of obtaining consensus. Only when all of the people who will have to carry out the agreement have come together on the need to make a decision will the decision be made to go ahead.

Concerning the setting of standards, McGregor (1967) states:

Actual performance under any control system is significantly affected by who sets the standards and at what level they are set.

...The employee reaction will be determined not by the objective standard, but by how he perceives it. Perception is influenced by feelings needs, and attitudes. (p. 7)

Trewatha and Newport (1979) report that "At Texas Instruments, for example, executives have found that employee turnover has been significantly lowered and output moderately increased by allowing assembly line workers to participate in setting their own goals"
Dermer (1977) points out that self directed behavior changes may be effected by agreement with objectives that are established. Scanlon (1973) believes that the organization is better when participation occurs. From a technical standpoint the potential of the employee is fully utilized, thus guaranteeing maximum exploration and analysis.

Katz and Kahn (1978) state that individuals want to be involved in decisions that effect their own fate. Trewatha and Newport (1979) discuss the involvement of managers in planning and express the viewpoint that it is based upon the idea that the success of a plan depends on commitment to the plan by those responsible for performance. Welsh and Lavan (1981) found that a participative climate is related to organizational commitment. It emphasizes achievement, goal setting, and a sense of individual responsibility. Lack of commitment by employees is, according to Sherwin (1972), behind much of the behavior blamed for high costs and poor service. Kahalas (1978) expresses the idea that:

goals are useful as motivators only to the extent to which they are understood and supported. In terms of planning, it is critical for the planners and all others involved in implementing the plan to have a clear picture of their objectives if the plan is to have any chance of meeting these objectives. (p. 84)
Cherrington and Cherrington (1974) believe that participation in planning is job enriching and a positive reinforcer for most people.

The idea of totally separating planning from doing is not deemed acceptable from a behavioral standpoint. People are more inclined to accept a plan when they have participated in its development (Trewatha & Newport, 1979). The success or failure of a plan depends upon both attitudes and needs of the participants. Trewatha and Newport (1979) provide the example "when budgets are imposed on organizational members without a consideration of their needs and attitudes, the result may be a sense of frustration rather than one of higher productivity" (p. 186). Trewatha and Newport (1979) further point out that there is the possibility that operating managers will not use a system that they have not been influential in developing.

The foregoing review indicates that people perform better when they are allowed to participate in the planning process. In regard to the setting of goals, there is indication that where participation occurs, the worker supports the goals. The absence of participation in the setting of goals for the company schedule management system may lead to apathy. Adams (1975) in investigating possible conflicts between management
users and information system operating personnel con­
cluded that apathy in lieu of conflict might exist.
Research Question 3 concerns participation in goal
setting and the effect that lack of participation has on
the manager perceived usefulness of the schedule manage­
ment system. Concerning these factors, it is hypothe­
sized that there is a relationship between the amount of
manager participation in setting goals for the schedule
management system and manager perception of system use­
fulness.

The location of overall planning responsibility
within the organization may also impact manager percep­
tion of schedule management system usefulness.

Planning Responsibility

Management, as pointed out by Hodgetts (1984),
entails planning, organizing, directing, and controlling.
The manager can, by performing well in each of these
areas, get things done through people.

According to Scanlon (1973), planning is the first
function of management. The direction that a program
will take, the objectives, and the means of achieving
them must be determined before any other material
function can be undertaken. Planning allows some
assurance in meeting goals in an uncertain environment.
Establishment of organizational goals and objectives, formulating the policy to carry out the objectives, short and long range plans to implement the policies, and detailed procedures to accomplish each plan constitute the four phases of the planning function (Scanlon, 1973).

In a study of corporate planning and control in German industry, Topfer (1978) found that only 40 percent of the 355 firms interviewed made each echelon of the management structure responsible for planning and controlling its own activities.

In discussing planning and control, McLaren (1982) points out that management is faced with the dilemma resulting from the attitudinal problems of the people being controlled and the dilemma that arises from the location or position of the control or evaluation mechanism in the organizational structure. According to McLaren (1982):

The dilemma in planning revolves about who is to do the planning. If each manager is to do his own or her own planning, there is a tendency for it not to be done, or not done for very far into the future, or not done comprehensively enough to mesh with the plans of others. To overcome these tendencies, a separate planning unit can be created. However, this does not necessarily resolve all problems, because now the tendency is to have plans for the organization that will not, or cannot be implemented by the line or are not done in time, or are so comprehensive that they are abstract. (p. 61)
Likert (1967) indicates that job satisfaction as well as performance are related to the opportunity for self control and to the amount of responsibility that a job provides. Drucker (1977) states "... self control means stronger motivation: a desire to do the best rather than just get by. It means higher performance goals and broader vision" (p. 67).

In discussing public organizations, Stout (1980) points out that the principle of accountability creates a need for the manager to reduce liability and protect against public embarrassment. The ever present threat of embarrassment forces most public executives to seek ways to reduce their political risks, thereby protecting themselves and their organization. The protective action may so dominate the manager's actions that it takes precedence over immediate goals.

People want to assume responsibility and be accountable for planning and achieving their own goals. Research Questions 4 and 5 attempt to determine if the manager's perception of schedule management system usefulness is affected when the responsibility for planning activities that fall within a person's own area of work or job function are placed elsewhere, such as in a staff organization. It is hypothesized that there is a relationship between manager perception of schedule
management system usefulness and assignment of overall planning responsibility to line or nonline organizations. It is further hypothesized that manager perception of schedule management system usefulness is related to the amount of planning that a manager performs in his own functional area.

The use of a staff organization for analysis and reporting of schedule management information may have undesirable side effects.

Analysis and Reporting by Staff Organizations

Generally, the staff organization operates the model or technique that measures the program's progress. The problem with a separate planning department is that the line organization may perceive them as adding to the work of the project.

In discussing line and staff relations within an organization Shea (1984) points out that line and staff people may irritate each other in a myriad of ways, even when they are providing vital services for each other. Since the line provides employment for staff personnel while staff help the line workers get the job done, they necessarily get in each other's way at times. Lanford (1981) attributes lateral conflict in part to high task interdependence and overload, which

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tend to heighten the intensity of either interunit antago­nisms or interunit friendliness and increase the magnitude of consequences of unit conflict for organizational performance.

Boileau (1976) points out that in streamlining Boeing Aerospace they reduced the number of planners from 140 to 20. This was possible, because planning was actually being infused into the line managers. The separate planning department was writing reports for other planners. Management was neither participating in the planning or using the information. Regarding the use of planning and reporting techniques, Boileau (1976) states that the lesson learned was:

most planning and reporting techniques are good up to the point that the technique becomes more important to the people involved than the data that it reveals. What many reporting systems tell us is that we made a mistake. As such, they are historians, but what we sorely need in this business are prophets—or at least something reporting in real time. (p. 6)

Nolan (1982) in a management survey found that in the majority of companies today, the large centralized data processing department is no longer the bastion of arcane knowledge. There was an erosion of power from the data processing manager as cheaper and smaller computers spread throughout the organization. In spite of this, Nolan (1982) finds that many managers are still stuck in the molds of the seventies. Trewatha and Newport (1979)
point out that the use of various planning specialists can create problems in an organization.

In discussing the behavioral aspects concerning control of complex programs, Maciariello (1978) lists a number of intrinsic characteristics that create potential problems of control. These characteristics are:

1. Potential organizational conflicts and power struggles are inherent within the matrix structure because of overlapping and diffuse distribution of responsibility and authority between program and functional management.

2. Close integration of activities performed by diverse, highly specialized disciplines is required.

3. Cooperation among personnel of different functional disciplines is difficult to achieve on complex programs because of the highly specialized training of most functional personnel.

4. Complex programs are often initiated without full knowledge of the basic method or technology required to achieve desired results. Unanticipated problems and opportunities are normal outcome of activity for this class of programs.

5. Program plans for complex programs are likely to be in a continuous state of flux and modification, reflecting unplanned consequences of program activity.

6. Complex programs often require original solutions to many technical problems. There are likely to be alternative solutions to these problems, each of which has its own advocates, thus adding stress to the problem-solving activity.

7. Conflicts are likely among programs as they compete for common functional resources.

8. Information on current progress always includes major elements of uncertainty because
of potential effects of size and complexity upon the outcomes.

9. Bias often creeps into status reporting, since it is normal organizational instinct for personnel to want to withhold negative information concerning the progress of a program.

10. Program complexity creates a barrage of problems for both program and functional management with the result that these managers often find themselves in a "fire-Fighting" position, a posture that does not lend itself to orderly planning and control. (p. 191)

Large companies are more apt to contract for complex programs than smaller firms, and thus they may face different behavioral problems with regard to program management. In discussing human resources, Bolman and Deal (1984) refer to the theories of Maslow, McGregor, and Argyris in pointing out that conflict between individual and organization gets worse as organizations get larger. This is attributed to greater impersonality, longer chains of command, an increasing number of complex rules and control, and more educated and affluent workers.

The use of a separate staff for analysis and reporting of schedule management system results could bias the manager perception of the system effectiveness. Research Question 6 addresses this potential problem to determine if a relationship exists between these variables. It is hypothesized that there is a relationship between manager perception of schedule management
system usefulness and the analysis and reporting of system output by a line or nonline organization.

Training on the schedule management technique may have some impact upon manager support of the system.

Training

Training or the lack thereof may have some effect upon how the manager views the system. According to Shea (1984):

Before employees take on a new task—whether machining a part or making a presentation to the board of directors—they deserve an explanation and demonstration. They should be allowed to perform under helpful guidance until they master the skill and knowledge required. (p. 47)

Many times, conflicts between line and staff in the workplace are due to a lack of understanding each other's function. Concerning this, Shea (1984) points out that conflicts between line and staff are best dealt with by training sessions than are directed at explaining the line and staff concepts, the jobs of each, and the inherent difficulty in the relationship between the two.

According to Scanlon (1973), effective communication with the staff specialist requires that the manager have at least a basic understanding of the schedule management techniques and must be aware of their advantages and limitations.
In evaluating early Program Evaluation and Review Technique (PERT) applications, Dunne, Ewart, and Nanney (1976) report that a 1963 survey team found that:

1. PERT had not replaced contractor management procedures which had developed over the years, but was used as a complement to them.

2. PERT did not lend itself to active day-by-day monitoring and control of a program. The lag in the updating and maintenance of networks of several levels of detail precluded such a use.

3. ... Successful PERT systems need the support of top management and adequate numbers of trained personnel that understand the PERT technique. (p. 47)

Industry, according to Wohlking (1971), looks to training as a means of improving on-the-job performance. Training programs are available, to a large extent, in industry. Peterfruend (1976), in a study of education in industry, reported that in a sample of 62 large firms only five offered no in-house programs, three used no out-of-house training, and two had no training programs at all. Barton-Dobenin and Fodgetts (1975) in a study of industrial firms reported that smaller firms did not participate in management training programs to the same degree as larger firms. Harwood (cited in Zemke, 1979) sampled 125 manufacturing firms that were located across 50 states and found the most common training objective was to improve communicative skills and understanding.
In a study of management training, Sullivan (1971) reported that 30 of 46 large companies believed work teams involving several levels of management should be trained together, because in subsequent tasks they work better together.

Adams (1976) in a study of job satisfaction resulting from training found in a sample of 56 first line supervisors that neither being selected for or the completion of training resulted in the increase of job satisfaction. However, Mitchell (1978) points out that the theory of a happy worker is a productive worker is not supported by research over the years. Satisfaction and performance were only weakly related. Wohlking (1971) believes that most management training programs where conventional training methodologies are utilized result in limited, if any, attitude change on the part of the participants.

Research Question 7 addresses whether training that enables the manager to individually use the schedule management system has an impact upon the manager's perception of system usefulness. It is hypothesized that there is a relationship between training on the schedule management system and manager perception of system usefulness.

The availability of the system to evaluate
alternative courses of action may also impact the manager's opinion of the system.

Schedule Management System Availability

Concerning the investigation of alternatives, Lanford (1981) states:

Perhaps, the greatest single error made in planning is the selection of the first developed course of action. With the availability of the computer, the system manager is able to work out in detail a large number of complete alternatives. Armed with this technically developed plan, the system manager, versed in the theory and practice of organizational behavior, may predict the behavior or support of those responsible for implementing the plan. (p. 175)

Research Question 8 concerns the impact of schedule management system availability upon manager opinion of system usefulness. It is hypothesized that there is a relationship between availability of the schedule management system to the manager for the evaluation of alternatives and manager perception of system usefulness.

Summary

The use of management systems as control and individual performance measurement devices has an impact upon the perceptions that managers have. Participation in goal setting is desired by most people. Managers like
to be responsible for their own actions, and they prefer to do their own planning. Staff and line managers have frequent disagreement concerning their functions. This could be improved by better communications and training. Training does not appear to affect job satisfaction and attitude toward the organization. Large companies inherently have more complex programs than smaller firms. More program complexity results in increased problems of communication between the personnel assigned to work on the programs located at large firms.

Availability of the schedule management system to the manager for use in evaluating alternatives is an important factor in the planning process.

Research hypotheses have been presented concerning each of the research questions and related material.

Chapter III contains the design and methodology used to evaluate the study objectives. The chapter includes the survey instrument design, the study population, sampling procedure, study limitations, operational hypotheses, and analytical methods.
CHAPTER III

DESIGN AND METHODOLOGY

As stated in the first chapter, one objective of this research project was to determine if a relationship exists between how a manager perceives the effectiveness of key elements of the company schedule management system and the manager's stated personal usefulness of the system in day-to-day project management. A second objective was to determine if a relationship exists between selected conditions within the system operating environment and the manager's stated usefulness of the system in day-to-day project management. This chapter discusses the survey instrument design, hypotheses, and the statistical approach to the problem.

Survey Instrument Design

Data for the study were obtained by a survey instrument mailed to managers of twelve companies involved in Defense Department programs concerning development of combat vehicles. The diverse geographic location of the companies precluded direct interview. The firms ranged in size from 11 to 135 managers. All of the firms developed either systems or major subsystems.
The questionnaire is located in Appendix A. It was designed to provide the information necessary to evaluate the research project objectives set forth in Chapter I. Specifically, the survey instrument provides a manager's evaluation of the company schedule management system usefulness along with information concerning the system operational environment that may affect the manager's perception of system usefulness.

Each manager was asked to rate the company schedule management system effectiveness in accordance with a criteria listed under survey question 16. The criteria isolates the desirable features of a schedule management system. Managers were also asked to rate the usefulness of the company schedule management system in the day-to-day management of their project on a continuum from 1 to 10. These two data sets formed the basis for a statistical evaluation regarding the first objective of this study, which was to determine if a relationship exists between key elements of the schedule management system and manager stated usefulness of the system in day-to-day project management. The hypothesis addressed in objective one states that there is a relationship between manager rating of schedule management system effectiveness and manager perception of usefulness. The evaluation of each criterion independently from the rest
allows the pinpointing of schedule management system features that may have an impact upon the manager's use of the system.

In addition to the above variables, several questions within the survey instrument were designed to provide specific information concerning the environment in which the system operates. The data were used in evaluating the remaining hypotheses concerning the second objective of this study, which was to determine if a relationship exists between selected conditions within the system operating environment and the manager stated usefulness in day-to-day project management. The hypotheses relating to the second research objective are presented later in this chapter. Questions concerning the operating environment constitute one variable. As with the first objective of the study, the remaining variable is the schedule management system usefulness rating provided by the manager.

A pilot study was conducted to prevent later problems with the survey instrument.

Pilot Study

The understandability of the questionnaire located in Appendix A was verified by surveying a random sample of ten managers of similar projects. Each manager was
asked to participate in the pilot study in a face-to-face discussion. The transmittal letter and survey instrument were furnished to each manager with the request that all questions be answered and comments concerning the questionnaire and its understandability be provided. All ten questionnaires were returned completely answered. No problem with the survey instrument was indicated by any of the participants. None of the responses from the pilot study were used in the main study analyses.

The study design, however, does have certain limitations.

Study Limitations

The repeatability of the study may be affected by shifts within the population and by rapid advancement of management information systems. Within industry, there is a turnover in managerial positions through reassignments, promotions, and leaving to work at other companies. In addition, as programs are completed, the company may change their method or technique of schedule management. This study, however, is not related to a specific schedule management system or manager. It should be capable of being replicated and generalized to other similar management programs if the procedures
outlined herein are followed.

The source of data for the study is subjective. That is, the measures rely upon the manager's own testimony for observing and reporting behavior. The questionnaire is composed of easily understood questions, the respondent was informed that all replies were to be treated confidentially, and the questions were uniform from subject to subject. However, the respondents were also informed that the questionnaire was coded for follow-up purposes. This may have led to some inflation of the ratings by managers concerned with being identified. Six questionnaires from the main study mailing were returned with the comment that they did not want to participate, because the survey instrument was coded.

The sampling procedure assured each manager in the population an equal chance of being selected.

**Sampling Procedure**

A total of 15 companies involved in development of combat vehicles or their subsystems were contacted by telephone and asked to participate in the study by providing an organization chart that showed their managers by name and position. The list of companies was obtained at the Detroit Arsenal. Twelve companies responded by furnishing an organization chart. The
remaining three companies stated that their policy was not to provide such information. The dissertation was therefore based solely upon the data obtained from the twelve companies that provided a means of access to their managers.

In order to determine how managers in large companies perceived the schedule management system as opposed to those employed by small companies, the firms were divided into two groups. Those companies that had 25 or more managers were placed in one group. The remainder of the companies were placed in a second group for evaluation. The evaluation of large and small firms was done separately for three reasons. First, a larger firm may have a more complex schedule management system with more personnel involved than would a small firm. As pointed out by Maciariello (1978), program complexity often causes problems for both the program and the manager. Also, because of size and distance between operating organizations, communications in large companies may be more difficult than in smaller more informal firms. In addition, less participation in training was found by Barton-Dobenin and Fodgetts (1975) in small firms than in the larger companies.

A random sample was drawn from each company chart at each organizational level using a table of random
numbers and procedure outlined by Chow (1969). The sample size was calculated by using a procedure shown by Krejcie and Morgan (1970). The population or number of managers in each company, the sample size selected, the number of responses, and the percent of sample size responding are listed in Table 1. The sample size was calculated for a 90% confidence level, a population proportion of .5, and a standard error of estimating the proportion (expressed as a proportion) of .05. The sample size calculated for each company was divided into top, mid, and first line management categories in proportion to their percentage of the total managers at the company. The resulting number of managers at each management level was then randomly drawn. Six managers who were in staff positions and responded "other" were placed in the management level indicated by the company organization chart. Stratified sampling assured representation at all levels.

Data collection was accomplished by survey.

Data Collection

A total of 365 questionnaires were mailed to the managers selected by random sampling procedures. The initial mailing produced 198 responses for a return rate of 54.2%. Each questionnaire was coded to reduce the
Table 1

Study Population, Sample Size, and Response Rate

<table>
<thead>
<tr>
<th>Company</th>
<th>Population (Managers)</th>
<th>Sample Size (Managers)</th>
<th>Responses (Sample %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>41</td>
<td>36</td>
<td>25 (69.4)</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>13</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>3</td>
<td>135</td>
<td>90</td>
<td>83 (92.2)</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>14</td>
<td>12 (85.7)</td>
</tr>
<tr>
<td>5</td>
<td>67</td>
<td>54</td>
<td>43 (79.6)</td>
</tr>
<tr>
<td>6</td>
<td>44</td>
<td>38</td>
<td>25 (65.8)</td>
</tr>
<tr>
<td>7</td>
<td>28</td>
<td>26</td>
<td>13 (50.0)</td>
</tr>
<tr>
<td>8</td>
<td>21</td>
<td>20</td>
<td>11 (55.0)</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>10</td>
<td>7 (70.0)</td>
</tr>
<tr>
<td>10</td>
<td>46</td>
<td>40</td>
<td>27 (67.5)</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>11</td>
<td>10 (90.9)</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
<td>13</td>
<td>4 (38.7)</td>
</tr>
<tr>
<td>Total</td>
<td>448</td>
<td>365</td>
<td>268 (73.4)</td>
</tr>
</tbody>
</table>

expense of follow-up letters. Two weeks later, a second request was posted to 167 managers who had not answered the first letter. This resulted in 50 replies for a return rate of 29.9% or an overall response rate of 67.9%. A third and last request was made to the remaining 117 managers who had failed to respond to the first two requests. The third letter yielded 20 returns.
for a response rate of 17% or an overall rate of 73.4%.

The third letter asked that the survey form be returned if the addressee did not want to participate in the study. It also requested that a reason be given for nonparticipation. A total of six blank forms were returned with the statement that they did not wish to participate, because the survey instrument was coded and could identify them. An additional 20 questionnaires were returned without comment. The distribution of respondents by managerial level is shown in Table 2.

Table 2

Distribution of Respondents by Management Level

<table>
<thead>
<tr>
<th>Management Level</th>
<th>Number of Managers</th>
<th>% of Total Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Level</td>
<td>51</td>
<td>19.0</td>
</tr>
<tr>
<td>Mid Level</td>
<td>176</td>
<td>63.7</td>
</tr>
<tr>
<td>First Line Supervisor</td>
<td>35</td>
<td>13.1</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Of the 268 managers that responded, 66.7% were employed in line positions and 33.2% were classified as staff. The initial cover letter and the two follow-up letters are contained in appendices B, C, and D respectively.

Relationships between the variables represented by
the survey data were evaluated by testing of hypotheses.

Hypotheses

The hypotheses listed below correspond to the research questions and hypotheses discussed in Chapter II. Hypothesis 1 pertains to the evaluation of key attributes of the scheduling technique and their relationship to manager opinion of schedule management system usefulness. Hypotheses 2-8 pertain to the system operational environment and its impact upon manager opinion of the schedule management system usefulness.

Hypothesis 1: Scheduling Technique Effectiveness Versus System Usefulness

It is hypothesized that there is a relationship between manager rating of schedule management system technique effectiveness and manager perception of system usefulness.

Null Hypothesis

Managers who rate the schedule management criterion effectiveness high will rate the system usefulness high in the same proportion as managers who rate criterion effectiveness low.
Alternate Hypothesis

A greater proportion of managers who rate the schedule management system criterion effectiveness high will rate system usefulness high than is the case of those who rate criterion effectiveness low.

Hypothesis 2: System Used for Individual Manager Performance Evaluation Versus System Usefulness

It is hypothesized that there is a relationship between use of a schedule management system for individual manager performance evaluation and manager perception of system usefulness.

Null Hypothesis

Managers who perceive the schedule management system is used to evaluate their individual performance will rate system usefulness high in the same proportion as managers who perceive the system is not used for individual performance evaluation.

Alternate Hypothesis

A greater proportion of managers who perceive the schedule management system is not used to evaluate individual performance will rate system usefulness high than is the case of those who perceive the system is
used as a means of individual performance evaluation.

**Hypothesis 3: Participation in Goal Setting Versus System Usefulness**

It is hypothesized that there is a relationship between the amount of manager participation in setting goals for the schedule management system and manager perception of system usefulness.

**Null Hypothesis**

Managers who participate a high amount in system goal setting will rate system usefulness high in the same proportion as managers who participate a low amount.

**Alternate Hypothesis**

A greater proportion of managers who participate a high amount in system goal setting will rate system usefulness high than is the case of those who participate a low amount.

**Hypothesis 4: Nonline/ Line Overall Planning Versus System Usefulness**

It is hypothesized that there is a relationship between manager perception of schedule management system usefulness and assignment of overall planning
responsibility to a line or nonline organization.

**Null Hypothesis**

Managers who perceive that overall planning responsibility is placed in a line organization will rate system usefulness high in the same proportion as managers who perceive that overall planning responsibility is placed in a nonline organization.

**Alternate Hypothesis**

A greater proportion of managers who perceive that overall planning responsibility is placed in a line organization will rate schedule management system usefulness high than is the case of those managers who perceive overall planning is placed in a nonline organization.

**Hypothesis 5: Amount of Planning in Own Functional Area Versus System Usefulness**

It is hypothesized that manager perception of schedule management system usefulness is related to the amount of planning that a manager performs in his/her own functional area.
Null Hypothesis

Managers who do a high amount of planning of work in their own functional area will rate system usefulness high in the same proportion as managers who do a low amount of planning.

Alternate Hypothesis

A greater proportion of managers who do a high amount of planning of work in their own functional area will rate schedule management system usefulness high than is the case of those who do a low amount of planning.

Hypothesis 6: Nonline/ Line Analysis and Reporting of System Output Versus System Usefulness

It is hypothesized that there is a relationship between manager perception of schedule management system usefulness and the assignment of responsibility for the analysis and reporting of system output to a line or nonlinear organization.

Null Hypothesis

Managers who perceive that responsibility for the analysis and reporting of the schedule management system output is assigned to a line organization will
rate system usefulness high in the same proportion as managers who perceive that responsibility for analysis and reporting of the schedule management system output is assigned to a nonline organization.

**Alternate Hypothesis**

A greater proportion of the managers who perceive that the responsibility for the analysis and reporting of the schedule management system output is assigned to a line organization will rate system usefulness high than is the case of managers who perceive that responsibility for the analysis and reporting of schedule management system output is assigned to a nonline organization.

**Hypothesis 7: Training on System Versus System Usefulness**

It is hypothesized that there is a relationship between training on the schedule management system and manager perception of system usefulness.

**Null Hypothesis**

Managers who receive training on the schedule management system will rate system usefulness high in the same proportion as managers who receive no training.
**Alternate Hypothesis**

A greater proportion of managers who receive training on the schedule management system will rate system usefulness high than is the case of those who receive no training.

**Hypothesis 8: Availability of System Versus System Usefulness**

It is hypothesized that there is a relationship between the availability of the schedule management system to the manager for the investigation of alternatives and manager perception of system usefulness.

**Null Hypothesis**

Managers who have access to the schedule management system for the investigation of alternatives will rate system usefulness high in the same proportion as managers who do not have access to the system.

**Alternate Hypothesis**

A greater proportion of managers who have access to the schedule management system for the investigation of alternatives will rate system usefulness high than is the case of those who do not have access to the system.

A discussion of the survey data and its
applicability to the analyses is required to fully understand the procedure used to evaluate the hypotheses.

Analytical Procedure

The procedure used to analyze the hypotheses necessitated some consolidation of the data.

Data Used for Objective 1 Analyses

The first purpose of this study was to determine if a relationship exists between the variables of manager supplied effectiveness rating and manager stated system usefulness. A criteria listed in survey question 16 provided the information concerning the first variable. Each criterion was analyzed independently to pinpoint the relationship to a particular feature of the overall scheduling technique. Managers rated their schedule management system against each criterion as either excellent, good, fair, or poor. Excellent and good ratings were consolidated into the high group for evaluation, with the fair and poor ratings comprising the low group. The second variable in each evaluation was also dichotomized to allow a contingency table test. The data for this variable was obtained from survey question 21. Managers rated system usefulness on a continuum of 1 to 10. Ratings of one to five were placed in a low
category, with ratings of six to 10 included in a high category. The dividing point was selected adjacent to the median.

The second objective of the study also requires an explanation of the raw data and how it was consolidated to fit the analytical procedure.

**Data Used for Objective 2 Analyses**

The second purpose of the study was to examine specific conditions within the schedule management system operating environment to determine if a relationship exists with the managers rating of schedule management system usefulness. These conditions were previously presented in this chapter by Hypotheses 2-8.

The data comprising the first variable used in the evaluation of Hypotheses 2-8, were obtained from survey questions 7, 5, 1, 3, 15, 18, and 9 respectively. Data from survey questions 5, 1, 3, and 15 were dichotomized to permit contingency table testing. Data from questions 5 and 3 were consolidated with "completely" and "mostly" replies composing the high group and "partially" and "very little" the low group. Data from questions 1 and 15 were dichotomized into line position and nonline position categories. The second variable for each evaluation was data obtained from survey
question 21. Managers were requested to rate system usefulness on a continuum of 1 to 10. The data were dichotomized in groups of 1-5 and 6-10. Ratings of 1-5 were placed in a low category, and ratings of 6-10 were placed in a high category.

A nonparametric statistical test was used to evaluate each of the hypotheses.

Data Analyses

The Western Michigan University Computer Program STATPACK, programmed by Houchard (1974), was used to conduct all of the statistical analyses of this study. The chi-square test for two independent samples was used to determine the significance of difference between the two independent groups. The procedure, described by Siegel (1956, p. 104), may be used with a measurement as weak as nominal scaling. Each evaluation was performed using a 2 x 2 contingency table. A .01 alpha level for committing a Type I error was used in each test. The chi-square value with one degree of freedom was obtained via the computer. A one tailed test was conducted for every hypothesis. The region for rejection consisted of all values of chi-square which were equal to or greater than 5.41 with the results in the direction predicted by the alternate hypothesis.
Summary

A total of 268 managers contributed answers to questions posed in a mailed survey. The overall return rate was 73.4%. The survey questionnaire design, study population, limitations, sampling procedures, hypotheses, and analytical methods have been presented.

The findings of the study are discussed in Chapter IV. Chapter V contains conclusions, implications, and recommendations for further research.
CHAPTER IV

FINDINGS

This chapter presents the results of the data analyses. Data were collected from 268 managers working on military vehicle development programs. The analyses were conducted in accordance with the procedures outlined in Chapter III. The data evaluation is listed separately for the two study objectives. The data analyses are presented for both large and small firms. Large companies have 25 or more managers, with small companies comprising the remainder. All analyses were done with a 2 x 2 contingency table. All tests were one tailed. The probability of committing a Type I error (alpha) was .01. A chi-square test for independence as described by Siegel (1956, p. 104) was used to evaluate the hypotheses. The region for rejection of the null hypothesis in each case was a chi-square value greater than or equal to 5.41. The computer program used to compute the chi-square values utilizes a formula that incorporates a correction for continuity. According to Siegel (1954), the continuity correction "markedly improves the approximation of the distribution of computed chi-square by the chi-square distribution" (p. 107).
Corrected chi-square values were used in all analyses presented in this study.

Determining the relationship of the manager's perception of schedule management system effectiveness to manager opinion of system usefulness was the first study objective.

**Scheduling Technique Versus System Usefulness**

**Hypothesis 1: Scheduling Technique Effectiveness Versus System Usefulness**

The test of Hypothesis 1 was conducted to determine whether a relationship exists between how a manager perceives the effectiveness of key elements of the company schedule management system and the manager's stated usefulness of the system in day-to-day project management. Hypothesis 1 was tested for each of eight key elements or attributes of the schedule management system. The resulting analyses are presented for both large and small firms.

**Data Analyses for Large Firms**

The results of the contingency table tests for large firms are listed in Table 3. The total number of managers was 203. Each test result was significant at the .01 alpha level. In all cases, the null
Table 3
Analysis of Scheduling Technique Versus Manager Usefulness Ratings for Large Firms

<table>
<thead>
<tr>
<th>Technique Effectiveness Criterion (Hypothesis 1)</th>
<th>% of Low Criterion Raters Who Rated System Usefulness High</th>
<th>% of High Criterion Raters Who Rated System Usefulness High</th>
<th>Chi-Square Value (1, N = 203)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflects genuine progress</td>
<td>.20</td>
<td>.80</td>
<td>68.03 *</td>
</tr>
<tr>
<td>Output data is consistent</td>
<td>.28</td>
<td>.69</td>
<td>28.67 *</td>
</tr>
<tr>
<td>Easy to understand</td>
<td>.33</td>
<td>.73</td>
<td>30.86 *</td>
</tr>
<tr>
<td>Serves all levels of management</td>
<td>.31</td>
<td>.80</td>
<td>48.79 *</td>
</tr>
<tr>
<td>Allows sensitivity testing</td>
<td>.49</td>
<td>.86</td>
<td>15.92 *</td>
</tr>
<tr>
<td>Allows forecasting</td>
<td>.32</td>
<td>.78</td>
<td>32.20 *</td>
</tr>
<tr>
<td>Easily updated</td>
<td>.35</td>
<td>.69</td>
<td>21.48 *</td>
</tr>
<tr>
<td>Adapts to major project change</td>
<td>.34</td>
<td>.75</td>
<td>33.30 *</td>
</tr>
</tbody>
</table>

Note. A criterion is rated low or high. System usefulness is rated low or high.
hypothesis was rejected in favor of the alternate hypothesis, which states that a greater proportion of managers who rate the schedule management system effectiveness criterion high will rate system usefulness high than will those who rate system effectiveness low. The tests indicate that in large firms the manager opinion of scheduling system usefulness for project management improves as each criterion described in this study is improved. It follows that the attention of top management should focus on how well the company scheduling system accomplishes the task described by each criterion.

The analysis of small firms was conducted in the same manner as that of the large firms.

**Data Analyses for Small Firms**

The results of the contingency table tests for small firms are listed in Table 4. The total number of managers in the sample was 65. In all cases, with the exception of the attributes "serves all levels of management," "easily updated," and "adapts to major project change," the test results were significant at the .01 alpha level. The null hypothesis was rejected in favor of the alternate hypothesis that states a greater proportion of managers who rate the schedule management
Table 4
Analysis of Scheduling Technique Versus Manager Usefulness Ratings for Small Firms

<table>
<thead>
<tr>
<th>Technique Effectiveness Criterion (Hypothesis 1)</th>
<th>% of Low Criterion Raters Who Rated System Usefulness High</th>
<th>% of High Criterion Raters Who Rated System Usefulness High</th>
<th>Chi-Square Value (1, N = 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflects genuine progress</td>
<td>.24</td>
<td>.69</td>
<td>11.44 *</td>
</tr>
<tr>
<td>Output data is consistent</td>
<td>.27</td>
<td>.64</td>
<td>7.20 *</td>
</tr>
<tr>
<td>Easy to understand</td>
<td>.20</td>
<td>.68</td>
<td>12.05 *</td>
</tr>
<tr>
<td>Serves all levels of management</td>
<td>.35</td>
<td>.65</td>
<td>4.43</td>
</tr>
<tr>
<td>Allows sensitivity testing</td>
<td>.40</td>
<td>.85</td>
<td>6.46 *</td>
</tr>
<tr>
<td>Allows forecasting</td>
<td>.33</td>
<td>.76</td>
<td>9.97 *</td>
</tr>
<tr>
<td>Easily updated</td>
<td>.41</td>
<td>.58</td>
<td>1.25</td>
</tr>
<tr>
<td>Adapts to major project change</td>
<td>.46</td>
<td>.54</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note. A criterion is rated as low or high. System usefulness is rated as low or high.
system criterion effectiveness high will rate system usefulness high than is the case of those who rate effectiveness low. The result indicates that in firms with less than 25 managers, as each of the variables "reflects genuine progress," "output data is consistent," "easy to understand," "allows sensitivity testing," and "allows forecasting" is improved that manager opinion of system usefulness will improve. This implies that top management may improve manager opinion of the system by selecting a technique that provides good overall performance with emphasis on these areas.

In the excepted cases, the null hypothesis of no difference between the groups (low or high effectiveness criterion raters) in the proportion of managers who rate schedule management system usefulness high could not be rejected at the .01 alpha level. Therefore, the presence of a relationship was not demonstrated.

The second research objective pertained to investigation of the impact of the schedule management system environment upon manager opinion of system usefulness.

Operational Environment Versus System Usefulness

The testing of Hypotheses 2-8 was accomplished to determine whether a relationship exists between selected
conditions within the system operating environment and the manager's stated personal usefulness of the system in day-to-day project management. The results are presented separately for large and small firms. Each hypothesis is discussed in order.

Data Analyses for Small Firms

The results of the contingency table tests for large firms are listed in Table 5. The total number of managers in the sample was 203.

Hypothesis 2: System Used for Manager Evaluation Versus System Usefulness (Large Firms)

With regard to whether or not use of the schedule management system as a means of manager performance evaluation affects the manager's perception of system usefulness, the test result listed in Table 5, contrary to expectations, did not demonstrate the existence of a relationship. The null hypothesis of no difference between groups (Managers who perceive no use of the system to measure individual performance and those who perceive the system is used for individual evaluation) in the proportion of managers who rate system usefulness high could not be rejected at the .01 alpha level. The predicted direction of the alternate hypothesis was not confirmed. The finding was unexpected in that citations
Table 5
Analyses of Operational Environment Versus System Usefulness Rating for Large Firms

<table>
<thead>
<tr>
<th>Research Question (Hypothesis)</th>
<th>Proportions</th>
<th>Chi-Square Value $(1, N = 203)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Low, No, or nonline Responses with High System Usefulness Rating.</td>
<td>% of High, Yes or Line, Responses with High System Usefulness Rating.</td>
</tr>
<tr>
<td>2. System use for manager evaluation</td>
<td>.44</td>
<td>.64</td>
</tr>
<tr>
<td>3. Participation in goal setting</td>
<td>.45</td>
<td>.75</td>
</tr>
<tr>
<td>4. Overall planning responsibility</td>
<td>.59</td>
<td>.43</td>
</tr>
<tr>
<td>5. Planning in own functional area</td>
<td>.41</td>
<td>.59</td>
</tr>
<tr>
<td>6. Responsibility for analysis and reporting</td>
<td>.59</td>
<td>.48</td>
</tr>
<tr>
<td>7. Training on system</td>
<td>.37</td>
<td>.70</td>
</tr>
<tr>
<td>8. System availability</td>
<td>.43</td>
<td>.73</td>
</tr>
</tbody>
</table>

Note. Proportion columns are either low-high, no-yes, or nonline-line Groups depending upon the hypothesis tested. System usefulness is low or high.
of Chapter II (McGregor, 1967) indicate that people resent any type of control measure used to evaluate their work. In this study, however, managers represented the upper echelon of the company, which may have had some impact upon the results.

**Hypothesis 3: Participation in Goal Setting Versus System Usefulness (Large Firms)**

Regarding the question of whether the amount that a manager participates in the setting of goals for the schedule management system affects manager perception of system usefulness, the test result in Table 5 was, as expected, significant at the .01 alpha level. The null hypothesis was rejected in favor of the alternate hypothesis which states that a greater proportion of managers who participate a high amount in setting goals will rate schedule management system usefulness high than is the case of those who participate a low amount. The test indicates that as an increase in participation occurs, an improvement in manager opinion of the system should occur. Thus, large firms should encourage maximum participation by managers in setting goals such as completion dates and costs for which the managers will ultimately be held accountable. The finding supports the citations listed in Chapter II (Heilman & Hornstein, 1982; Nash, 1983) concerning participation.
Hypothesis 4: Nonline/Line Overall Planning Responsibility Versus System Usefulness (Large Firms)

The question of whether placement of overall planning responsibility with nonline or line groups affects manager perception of schedule management system usefulness was tested, and contrary to expectations, the test result listed in Table 5 was not significant at the .01 alpha level. The presence of a relationship was not demonstrated. The null hypothesis of no difference between the groups (overall planning responsibility in nonline or line organizations) in the proportion of managers that rate schedule management system usefulness high could not be rejected at the selected alpha level. The result in this case was not expected, because citations listed in Chapter II (McLaren, 1982; Likert, 1967) concerning the assignment of planning responsibilities indicate managers like to be responsible for their own work.

Hypothesis 5: Amount of Planning in Own Functional Area Versus System Usefulness (Large Firms)

Concerning the question of the degree that a manager plans work within his/her own functional area and its affect on manager perception of overall schedule management system usefulness, the finding, listed in Table 5, was not expected. The presence of a
relationship was not demonstrated between the variables
degree of "planning own work" and the manager's per­
ception of schedule management system usefulness.
The null hypothesis of no difference between the groups
(low or high amount of planning in one's own functional
area) in the proportion of managers who rate the
schedule management system high could not be rejected
at the .01 alpha level. The citations of Chapter II
(Likert, 1967; Katz & Kahn, 1978; Drucker, 1977)
indicate that people would rather be responsible for
planning their own work. The finding is contrary to
these citations. However, Topfer (1978) reported in a
study of German firms that only 40% of the companies
surveyed allowed the organization responsible for the
actual work to do their own planning.

Hypothesis 6: Nonline/ Line Analysis and Reporting of
System Output Versus System Usefulness (Large Firms)

The the question of whether responsibility for
the analysis and reporting of schedule management
system output data by line or nonline groups impacts
manager perception of system usefulness was tested,
and contrary to expectations, a relationship was not
established. The test result, as shown in table 5, was
not significant at the .01 alpha level. Therefore, the
null hypothesis of no difference between the groups
(nonline or line responsibility for the analysis and reporting of system output) in the proportion of managers that rate schedule management usefulness high could not be rejected at the selected alpha level. The finding is not in consonance with citations in Chapter II (Maciariello, 1978; Bolman & Deal, 1984) concerning conflict within the organization.

Hypothesis 7: Training on System Versus System Usefulness (Large Firms)

Concerning training on the schedule management system and its impact upon the manager's opinion of schedule management system usefulness, the test result, as indicated in Table 5, was found to be significant at the .01 alpha level. The null hypothesis was rejected in favor of the alternate hypothesis that a greater proportion of managers who receive training on the schedule management system will rate system usefulness high than is the case of those who receive no training. The test indicates that if training on a system is provided to more managers in large firms, the overall manager opinion of the system should improve. The value of training in improving attitude is questioned by citations listed in Chapter II (Adams, 1976; Mitchell, 1978; Wohlking, 1971). However, the value of training is cited by Shea (1984) and Scanlon (1973).
Hypothesis 8: Availability of System Versus System Usefulness (Large Firms)

Availability of the schedule management system to the manager for the investigation of alternative courses of action and its impact upon manager perception of system usefulness was evaluated. The test result, as indicated in Table 5, was found to be significant at the .01 alpha level. The null hypothesis was therefore rejected in favor of the alternate hypothesis which states that a greater proportion of managers who have access to the schedule management system for the investigation of alternatives will rate schedule management system usefulness high than will those who do not have access to the system. This indicates that provision of terminals or other means of system access to more managers in large firms would improve overall manager opinion of the system. Support for this finding is cited in Chapter II (Lanford, 1981). The investigation of alternatives is considered an essential part of the planning exercise.

Data Analyses for Small Firms

The results of the contingency table tests for small firms are listed in Table 6. The total number of managers in the sample was 65. The expected outcome
Table 6
Analyses of Operational Environment Versus System Usefulness Rating for Small Firms

<table>
<thead>
<tr>
<th>Research Question (Hypothesis)</th>
<th>Proportions</th>
<th>Chi-Square Value (1, N = 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Low, No, or Nonline</td>
<td>% of High, Yes, or Line</td>
</tr>
<tr>
<td>2. System use for manager evaluation</td>
<td>.41</td>
<td>.56</td>
</tr>
<tr>
<td>3. Participation in goal setting</td>
<td>.37</td>
<td>.67</td>
</tr>
<tr>
<td>4. Overall planning responsibility</td>
<td>.53</td>
<td>.33</td>
</tr>
<tr>
<td>5. Planning in own functional area</td>
<td>.20</td>
<td>.52</td>
</tr>
<tr>
<td>6. Responsibility for analysis and reporting</td>
<td>.45</td>
<td>.56</td>
</tr>
<tr>
<td>7. Training on system</td>
<td>.28</td>
<td>.70</td>
</tr>
<tr>
<td>8. System Availability</td>
<td>.40</td>
<td>.68</td>
</tr>
</tbody>
</table>

Note. Proportion columns are either low-high, no-yes, or nonline-line group depending upon the hypothesis tested. System usefulness is low or high.
of hypotheses tests for small firms were the same
as previously discussed for the larger firms. However,
only training was found to have an impact upon manager
opinion of the scheduling system in the small firm.

Hypothesis 2: System Used for Manager Evaluation Versus
System Usefulness (Small Firms)

With regard to whether or not use of the schedule
management system as a means of individual performance
evaluation affects the small firm manager's perception
of system usefulness the test result listed in Table 6,
is not significant at the .01 alpha level. The
presence of a relationship was not established. The
null hypothesis of no difference between the groups
(schedule management system used or not used to measure
individual manager performance) in the proportion of
managers who rate system usefulness high or could not be
rejected at the selected alpha level.

Hypothesis 3: Participation in System Goal Setting
Versus System Usefulness (Small Firms)

The impact of small firm manager participation in
setting goals for the schedule management system upon
manager opinion of schedule management system usefulness
was evaluated with a result, as shown in table 5. The
hypothesis of no difference between the groups (low or
high participation in setting goals for the schedule management system) in the proportion of managers who rate system usefulness high could not be rejected at the .01 alpha level. Therefore, a relationship, contrary to expectations, was not demonstrated.

**Hypothesis 4: Nonline/Line Overall Planning Responsibility Versus System Usefulness (Small Firms)**

Regarding the impact of placing of overall planning responsibility in either line or nonline organizations upon manager opinion of schedule management system usefulness, the test result, as shown in Table 6, is not significant at the .01 alpha level. The null hypothesis of no difference between the groups (overall planning responsibility in nonline or line organizations) in the proportion of managers that rate schedule management system usefulness high could not be rejected at the selected alpha level.

**Hypothesis 5: Amount of Planning in Own Functional Area Versus System Usefulness (Small Firms)**

The amount of planning that a manager does in his/her own functional area and its relationship to manager opinion of schedule management system usefulness was evaluated with the result shown in Table 6. The null hypothesis of no difference between the groups
(low or high amount of planning in own functional area) in the proportion of managers who rate the schedule management system high could not be rejected at the .01 alpha level.

Hypothesis 6: Nonline/Line Analysis and Reporting of System Output Versus System Usefulness (Small Firms)

The question of whether assignment of responsibility for the analysis and reporting of schedule management system output data to nonline or line organizations is related to small firm manager opinion of system usefulness was tested, and the result listed in Table 6 was not found to be significant at the .01 alpha level. The null hypothesis of no difference between the groups (nonline or line analysis and reporting of system output) in the proportion of managers that rate schedule management usefulness high could not be rejected at the selected alpha level.

Hypothesis 7: Training on System Versus System Usefulness (Small Firms)

The effect of Training on the schedule management system upon manager opinion of system usefulness was evaluated. The result, listed in Table 6, was found to be significant at the .01 alpha level. The null hypothesis was rejected in favor of the alternate
hypothesis that a greater proportion of managers who receive training on the schedule management system will rate system usefulness high than is the case of those who receive no training. This indicates that small firm manager opinion of the system will improve as more managers are trained on the system. The finding concerning training is similar to that of large firms.

Hypothesis 8: Availability of System Versus System Usefulness (Small Firms)

Presence of a relationship was not established, as indicated in Table 6, between the availability of the schedule management system to the manager and manager perception of schedule management system usefulness. The test result was not significant at the .01 alpha level. Therefore, the null hypothesis of no difference between the groups (nonavailability or availability of the schedule management system for investigation of alternatives) in the proportion of managers who rate system usefulness high could not be rejected.

Summary

The findings have been presented for the two objectives of the study. The first objective evaluated the possible relationship between several attributes used to describe the company schedule
management system and manager opinion of overall system usefulness in an effort to pinpoint areas that might cause the manager not to use the system in day-to-day planning operations. It was found that in firms with 25 or more managers that all of the attributes were important in that they contributed to manager opinion of the system. In smaller firms with fewer than 25 managers, five of eight attributes used to describe the company system were found to contribute to manager opinion of the system.

In testing hypotheses concerning the second study objective, it was found that manager participation in system goal setting, training on the system, and the availability of terminals or other means of system access improved manager opinion of the scheduling system in large firms. Manager opinion of the system usefulness was found to improve in small firms when training on the scheduling system is provided.

Chapter V discusses the study results and presents conclusions and recommendations for further research.
CHAPTER V

CONCLUSIONS AND IMPLICATIONS

The investigation concerning the manager-schedule management system interface has revealed several conditions that can potentially impact the manager's opinion of the schedule management system and lead to frustration, apathy, and nonuse. A discussion of the results of the two study objectives and related hypotheses is presented along with conclusions, implications and recommendations for further research.

The Scheduling System

In part one of the investigation, an attempt was made to determine if the schedule management system or technique was related to the manager's opinion of system usefulness. In this study, the particular technique was not investigated. Rather, a description of what the system should be capable of doing was developed, and from this the intent was to focus on generic attributes in lieu of specific techniques. These system attributes may pinpoint areas for corrective action. The study was broken down into large firms with 25 or more managers and small firms with less managers. The reasoning behind division of the population into

69
two parts was that large companies are more apt to have complex programs with their inherent problems of operation as listed by Maciariello (1978).

Large Firm Systems

In examination of data from managers employed by large firms, a relationship was found to exist between the effectiveness ratings of each and every attribute and system usefulness. An improvement in the attribute results in an increase in manager opinion of system usefulness. This leads to the conclusion that the particular technique selected should be thoroughly reviewed to ascertain whether it addresses each of the attributes in a satisfactory manner.

The validity of the system in reflecting genuine progress of the program is an important consideration in providing a smooth flowing program that is free of scheduling complications. Managers faced with the stewardship of a project that uses a scheduling system that accurately portrays project status are more likely to use the system for decision making.

Data reliability also impacts manager opinion of the scheduling system. Errors in the collection of data may result in invalid results from an otherwise well designed schedule management system. Manager opinion
of the system usefulness as a management tool improves as data reliability increases.

All personnel that interface with the scheduling system should have a basic understanding of how the system operates. Therefore, the system should be easily understood by personnel who input data into the system as well as those who make decisions or recommendations based upon the system output. The overall program goals may not be achieved without such system familiarity, because the system may be interpreted incorrectly or not used at all. Where scheduling systems are easily understood by using personnel, manager opinion of the system usefulness as a management tool is improved.

The same scheduling system should serve all levels of management from the start to the end of a program. As this factor improves, the overall manager opinion of the system as a management tool improves. Different systems for evaluating program status at the various management levels of an organization may result in problems in determining the true program status.

The ability to select one course of action from several alternatives improves manager opinion of the system and may result in increased usage of the system in decision making. A desirable feature is one that facilitates the selection process through simulation,
thus easing the manager's workload.

The ability of the scheduling system to determine the probability of accomplishing future tasks is an attribute relating to longer term projects. In large firms, where the scheduling system provides this capability, manager opinion of the system improves with the quality of the forecasting ability.

Programs may change as often as daily. The scheduling system output, in order to be useful to the manager as a decision making tool, must reflect these changes. To reflect current conditions, the system must be easily updated. When this is possible, managers have a higher opinion of system effectiveness as an aid to decision making. This may lead to increased use of the system.

Large research and development programs may require major changes in design approach at some time during the development cycle. Where the scheduling system is flexible and accommodates major program changes in direction, manager opinion of system usefulness improves.

The analyses of small firm systems was conducted in the same manner as that of the large firms.

Small Firm Systems

The size and complexity of programs awarded to
smaller firms, in most cases, allows the use of less sophisticated scheduling systems. In the analysis of data from managers employed at small firms, a relationship was found between each of the attributes "reflects genuine progress," "output is consistent," "easy to understand," "allows sensitivity testing," and "allows forecasting," and the manager opinion of system usefulness. In choosing a scheduling technique for use in small firms, the above attributes should be given special consideration. A Relationship between each of the variables "system serves all levels of management," "system is easily updated," and "system adapts to major change" and manager opinion of system usefulness was not demonstrated by this study. In the case of these attributes, the small firm evaluation yielded different results than those displayed for the large firms. With fewer managers and managerial levels to contend with, the small firm manager may be less concerned than the large firm manager with whether or not all managerial levels are served by the system. The ease of updating the system and the ability of the scheduling system to adapt to major change may also be of less concern to the small firm manager, because of the size and complexity of the program to be planned. It follows that less complex programs would have less complex scheduling systems that
are inherently easier to change. This coupled with fewer managers working in close proximity to one another and ease of communication may tend to make these attributes less important in the small firm. In the survey, it was found that over 75% of the small firms had not automated their systems.

The operational environment was also found to have an impact upon manager opinion of schedule management system usefulness.

Operational Environment and System Usefulness

In part two of the investigation, an attempt was made to study selected operational conditions that might impact the usefulness factor. Seven research hypotheses defined the manager-scheduling-system environment interface. Each of the hypotheses was evaluated for both large and small firms.

System Used for Performance Measurement Versus System Usefulness

The use of the schedule management system to measure individual performance was investigated to determine if the manager's opinion of system usefulness in day-to-day program management in both large and small firms is related. A relationship between these variables was not demonstrated by this study.
This finding is not in agreement with the findings of McGregor (1967), who emphasizes the fact that uncertainty concerning management systems that measure performance may lead to personnel problems.

**Participation in System Goal Setting Versus System Usefulness**

Participation in setting goals for the schedule management system was found to be related to how the manager perceived the system usefulness in the large firm evaluation. An increase in participation resulted in a higher manager opinion of schedule management system usefulness. No relationship was demonstrated by testing of manager responses from the smaller firms. Participation in the setting of goals for one's project can improve performance according to several citations in Chapter II. The interaction between superior and subordinate and among peers leads to a relaxation of uncertainties and tensions and improvement of organizational climate. Communications may be a factor in the way that the managers view the issue. Participation improves manager commitment to the program.

**Nonline/ Line Overall Planning Responsibility Versus System Usefulness**

The location of overall planning responsibility
within the organization was evaluated with regard to its impact upon manager opinion of system usefulness. No relationship was demonstrated by this study in either the large or small firms. This finding is not supported by a research citation (McLaren, 1982) which indicates that attitudinal problems may be caused by the assignment of planning responsibility to either line or staff groups.

**Amount of Planning in Own Functional Area Versus System Usefulness**

The amount of planning that the individual manager accomplishes within his/her own area of responsibility was evaluated with regard to determining if a relationship exists with the manager's opinion of the schedule management system in either large or small firms. A large portion of the managers apparently do not plan their own work as was pointed out by Topfer (1978) in a study of management in German industry. This study did not demonstrate a relationship between the variables.

**Nonline/Line Analysis and Reporting of System Output Versus System Usefulness**

In contrast to citations of Chapter III (Shea, 1984; Boileau, 1976; Trewatha and Newport, 1979), no relationship was demonstrated by this study between manager
opinion of schedule management system usefulness and the placement of responsibility for the analysis and reporting of system output in either a nonline or line organization. This was found for both large and small firms.

Training on System Versus System Usefulness

Both large and small firm evaluations indicated that a relationship exists between manager opinion of the schedule management system usefulness and whether or not training on the system is provided. As training increased, manager opinion of system usefulness improved. The finding generally conflicts with citations in the selected literature (Wohlking, 1971; Adama, 1976) which indicate little increased job satisfaction from training programs. It does, however, support reports by Shea (1984) and Scanlon (1973) relating to the necessity of training. However, with the complexity of some scheduling techniques, it is concluded that training is required for complete understanding and optimum employment of the system.

Availability of System Versus System Usefulness

The availability of the system to the individual manager to perform investigations of alternative
courses of action was found to impact the manager opinion of system usefulness in the large firm. As availability increased, manager opinion of system usefulness improved. The necessity for such availability is supported by Marciariello (1978) in discussing behavioral aspects of complex systems. Complex programs are in a constant state of flux and are likely to require the investigation of alternative solutions. The desirability of investigating alternatives is also supported by Lanford (1981). It is therefore concluded that an easy access to the system, such as provision of terminals to the manager, will improve the quality of system output.

The small firm evaluation demonstrated no relation between system availability and manager opinion of system usefulness.

The findings have certain implications for large and small firm management.

Implications

The Schedule Management System

The schedule management system technique has been shown to impact the opinion of both large and small firm managers as to the usefulness of the system for managing projects. This implies that a manager may not
use the system to the extent that is possible if he/she is dissatisfied with the system. When dissatisfaction occurs, data that is input into the system, for various reasons, may not be completely accurate. On the other hand, the system output may not be used in program decision making. If a scheduling system is worth implementing, it should be used properly. Therefore, when selecting a schedule management technique, a review of how well the technique accomplishes the specific tasks required by the organization should be made. In other words, the system should be tailored to the needs of interfacing personnel. To accomplish this, the using personnel should participate in the selection process.

**Schedule Management System Environment**

In large firms, three conditions may lead to potential nonuse of the scheduling system. Large firm manager opinion of usefulness was found to be impacted by the level of participation in setting goals for the scheduling system, training on the system, and system availability for investigation of alternative courses of action.

This implies that managers should be required to participate in the setting of goals for the scheduling
system. Participation will increase commitment to the goals. Where participation does not occur, nonuse of the system may result. Managers should be required to specify goals such as time and cost of completing tasks for which they will be held accountable.

The lack of training on a system may also lead to nonuse through unfamiliarity with the system. Therefore, training should be provided to the maximum extent possible within the constraints of large or small firm budgets.

Finally, in order for the large firm manager to investigate the various alternatives associated with his/her project, access to the system should be made available on an individual manager basis. This may be done by providing terminals to each manager or placing the available terminals in convenient locations. Scheduling systems that permit the evaluation of alternatives via simulation may save considerable time and in some cases prevent costly errors in judgement. The inability of the individual to interface with the scheduling system could lead to manager disregard of the technique as a management tool.

In considering the implications of this study, management should also be aware of the limitations concerning the collection and analysis of data.
**Study Limitations**

This study has several limitations. First, it was conducted using firms that work on Federal Government contracts. Government imposed regulations concerning schedule management may affect manager opinion of the system. In many instances, the contract specifies the particular scheduling system that is to be used. The system may not be the best for the manager's individual project. The manager may also be unfamiliar with the system. Therefore, generalization of this report to other industries may not yield the same results.

The source of the data is subjective in that it relies upon the test subject to furnish the answers concerning his/her own behavior. Some inflation of the data may have occurred, because the respondents knew that they could be identified.

A mailed questionnaire is limited in that the respondent is asked to record his/her behavior within closely delineated alternatives. The use of a questionnaire in lieu of direct interview does not permit any amplification of the answers by the interviewee. Also, The evaluator is not able to note the reaction of the respondent.

According to Runkel and McGrath (1972), all forms of subjective report are highly susceptible to reactive
biases. Since the respondents know that they are the focus of the research, it is plausible that they may select roles they feel are appropriate. The survey questionnaire was coded to reduce the expense of follow-up letters. Since the respondent could be identified, in some instances, the data may reflect a position more favorable to the company position concerning the schedule system. Several questionnaires were actually returned, because of the identification factor.

Recommendations

It is recommended that a climate of trust be established to reduce anxiety concerning the management control system. This could be approached with improved training in groups to both improve communication and gain commitment on the part of the participants. Organizations should increase the level of participation in goal setting to obtain further commitment to the program and increased job satisfaction. Schedule management systems should be automated and terminals provided with easy access to allow managers to retrieve system status information and investigate alternatives. Lastly, companies should take a good look at the utility of the management technique being used to ascertain whether it is really doing the job for which it was
intended. This should be done in cooperation with the system users.

Recommendations for Further Research

Another area that might be investigated is the effect of matrix management on program scheduling. Matrix management is a management technique utilized in many large organizations today. It essentially places system managers remote from line groups. The engineering organization, for example, consists of a pool from which engineers are drawn for a particular job. Managers who are assigned the responsibility for stewardship of the program are remotely located. They draw upon the pool for support of their projects. With many managers demanding support from the same personnel, there is likely to become disenchantment with the system. Since matrix personnel are not responsible for the overall planning and direction of the program, the overall schedule may suffer. Most of the large companies investigated as part of this study utilized matrix management. The study should zero in on attitudinal problems caused by the lack of overall control by the line organization.

It is recommended that the study be confined to one large company and that interviews be attempted,
if possible, to gain the maximum insight into potential problem areas.

Another approach might be to determine problems experienced by both managers in the matrix and in program management offices.
APPENDIX A

Survey Questionnaire
Please check the answer that most nearly represents your perception of the schedule management system used by your organization. In the context of this survey, a schedule management system includes planning systems, control systems or other procedures designed to assist the manager in defining objectives, achieving effective utilization of resources, measuring program progress, comparing progress against stated objectives, and taking appropriate action. Please check only one answer per question.

1. Within your organization, how is the overall planning usually assigned?

( ) line organization manager
( ) project manager/ product manager
( ) team/ committee
( ) Planning department/ group
( ) other ____________________

2. Is there an integrated schedule management system for the program or project upon which you work that is centrally controlled?

( ) yes
( ) no

3. To what extent does your individual unit plan work that falls within its own area of responsibility?

( ) completely
( ) mostly
( ) partially
( ) very little

4. Have goals been established for your organization's schedule management system?

( ) yes (can you furnish an example)
( ) no

5. To what extent did you personally participate in the establishment of goals for the schedule management system.

( ) completely
( ) mostly
( ) partially
( ) very little
6. Are the tasks of the schedule management system directly relatable to a work breakdown structure?

   ( ) yes
   ( ) no

7. Is the schedule management system used to measure the performance of the individual manager?

   ( ) yes
   ( ) no

8. Is the schedule management system automated?

   ( ) yes
   ( ) no

9. Do all management personnel have access to terminals or have other methods of retrieving schedule management information on a one time basis?

   ( ) yes
   ( ) no

10. How often is the schedule management system output information distributed.

    ( ) yes
    ( ) no

11. Does your schedule management system identify risks?

    ( ) yes
    ( ) no

12. Does your schedule management system permit the investigation of alternate courses of action?

    ( ) yes
    ( ) no

13. Approximately how many people in your organization may be classified as managers?

    ( ) 1-25
    ( ) 26-50
    ( ) 51-100
    ( ) 101-500
    ( ) over 500
14. Approximately how many people in your organization are dedicated to schedule management?

- ( ) 1-4
- ( ) 5-9
- ( ) 10-19
- ( ) 20-49
- ( ) 50-99
- ( ) 100 or over

15. In your organization, who analyzes the schedule management system results for top management?

- ( ) planning/control group
- ( ) staff
- ( ) line organization managers
- ( ) team/committee
- ( ) other _____________________

16. For each criterion listed below, please circle only one number (4, 3, 2, or 1) which comes closest to describing your perception of the effectiveness of your organization's schedule management system.

<table>
<thead>
<tr>
<th>Effectiveness Rating Scale</th>
<th>Excellent=4</th>
<th>Good=3</th>
<th>Fair=2</th>
<th>Poor=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>System output reflects genuine progress</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System output data is consistent</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System is easy to understand</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System serves all levels of management</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System allows sensitivity testing</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System allows forecasting</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System is easily updated</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>System adapts to major project change</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

17. Please indicate the analytic technique used by your organization in the management of schedules.

- ( ) cost/schedule control system criteria
- ( ) management by objectives
- ( ) PERT-time
- ( ) PERT-cost
- ( ) CPM
- ( ) other _____________________

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18. Has your organization provided training to acquaint you with the operation of the schedule management system?

( ) yes
( ) no

19. How would you classify your level in the organization?

( ) top management
( ) mid level management
( ) first level supervisor
( ) other ____________

20. In which category would you place your position in the organization?

( ) line
( ) staff
( ) other ____________

21. On a basis of one to 10 with one being poor and 10 excellent, how would you rate your organization's schedule management system usefulness to you personally in your day to day management duties? Please circle one number listed below:

1 2 3 4 5 6 7 8 9 10

22. Please use this space to provide any comments you may care to about the effectiveness of the system you have discussed.

Thank you for your help. Please return to:

Lyle A. Wolcott
24596 Almond
East Detroit, Michigan 48021
APPENDIX B

Cover Letter
Because of your experience in the management and supervision of equipment development programs, I am asking for your help as a participant in a study of schedule management systems that I am conducting at Western Michigan University. As a professional engineer working in the management area for many years, I have found the particular technique that is used for schedule management to be an important factor in the effective implementation of the development process.

You may help in the successful completion of the study by taking just a few minutes of your time to fill out and return the enclosed questionnaire. The information provided by you will be pooled with data furnished by other managers at several companies. Because of the small number of managers in the sample taken from each company, your individual reply is important to the overall success of the study. Although the questionnaire has been coded for follow-up purposes, let me assure you that your response will be treated in strict confidence. The coding will be destroyed immediately upon receipt of the form. Neither you or your company will be identified in any manner.

When completing the questionnaire, please answer each question to the best of your knowledge. Your participation will be greatly appreciated.

Thank you for your help.

Approved by,

Uldis Smidchens, PHD
Professor

Sincerely,

Lyle A. Wolcott P.E.
Doctoral Candidate

Enc.:

Questionnaire
Addressed return envelope
APPENDIX C

1st Follow-Up Letter
Two weeks ago, a request for your help in completing a questionnaire concerning schedule management systems was forwarded. Your reply has not been received. If you have already returned the questionnaire, please accept my sincere thanks. If, however, you have not yet responded, may I ask that you take a few minutes to fill out and return the inclosed form? Your response is extremely important to a study that I am conducting at Western Michigan University.

Let me assure that your reply will be treated with strict confidence. Neither you or your company will be identified in any manner.

I am looking forward to adding your data to the many replies already received. Thank you for your help.

Approved by,  
Uldis Smidchens, PHD  
Professor  

Sincerely,  
Lyle A. Wolcott P.E.  
Doctoral Candidate

Enc.:  
Questionnaire  
Addressed return envelope
APPENDIX D

2nd Follow-Up Letter
Recently, two questionnaires were mailed to you requesting your participation in a study that I am conducting at Western Michigan University. I am still looking for a reply. If you have already mailed your response, please accept my sincere thanks. If, however, you have not yet replied, will you please add your experience to the data already collected from managers like yourself at companies located throughout the United States? Your opinion is valued as an important part of the study.

If for some reason you do not wish to fill out the survey form, may I ask that you return it in the envelope provided. It would help if a reason for non response was written on the form.

Thank you for your time.

Approved by, 

Uldis Smidchens, PHD
Professor

Sincerely,

Lyle A. Wolcott P.E.
Doctoral Candidate

Enc.: Questionnaire
Addressed return envelope
BIBLIOGRAPHY


