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Formation of an effective education and career advancement methodology for management information systems organizations.

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FORMATION OF AN EFFECTIVE EDUCATION AND CAREER ADVANCEMENT METHODOLOGY FOR MANAGEMENT INFORMATION SYSTEMS ORGANIZATIONS

by

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ABSTRACT

Two major difficulties facing Data Processing/Information Systems managers are the inability to keep their personnel up to date with recent technological advances and the lack of meaningful development of their employees' careers. Both of these factors contribute heavily to an Information Systems installation's difficulty to satisfy and retain their personnel. A recent study indicated that, while most Information Systems personnel are lured away from their present employers by high money offers elsewhere, these people do not seek higher offers until after disillusionment with their present situation has developed. (36,Nestman)

This thesis presents a background of these problems and recommendations on how to solve them by establishing an effective education and career advancement methodology to be followed by MIS managers. Such a methodology should produce significantly increased personnel retention and, thereby, improve not only the morale of the employees but reduce the

need to engage in costly recruitment and hiring work.

While it is recognized that this thesis does not itself produce a full and complete methodology, it does present enough detail to facilitate an MIS organization's formation of a methodology, with enough flexibility to allow adaptation for specific needs and circumstances.

It is recommended that MIS organizations establish an education and career advancement methodology, using this thesis as a guide or reference. Experience gained by utilizing such a methodology should be used in modifying the methodology as necessary, as well as present opportunities for further research.

CHAPTER 1 -

PRELIMINARY DISCUSSION OF THE THESIS

1.1. Early Conditions in MIS

Roughly 25 to 30 years ago, in the early days of data processing, computer-associated activity was radically different than that of today. For young people entering into computer-related professions today, the conditions which existed at that time prove difficult to visualize. The main emphasis of the business at that time was with computer hardware and its utilization. The importance of other aspects of computing were dwarfed by comparison. There was an excellent reason for this.

When computers first came into being, they were monstrous. Large rooms, or occasionally an entire building, were required to house the first computers. The technology of the time included vacuum tubes, transistors, and electrical circuitry visible to the naked eye. For many years, the cost of computer hardware acquisition, operation, and maintenance was the predominant cost of a data processing

department. Further, the amount of time required to service a computer was often immense, resulting in computer unavailability for critically long periods.

The software used by computers for data processing was very limited. Standard compilers existed to convert source code written in the two major high-level languages of the time, COBOL and FORTRAN, into machine-executable code. Yet, a significant amouunt of programs needed to be written directly in assembler, or machine-executable code. System software was provided to facilitate control of the computer for scheduling program runs, data accesses, etc. Software, as well as applications programs, concentrated on efficient use of available computer hardware facilities, as this was the best way to improve cost and performance.

Similarly, the interfaces between computers and the people using them were slanted toward efficient use of the computer facilities. Access methods to the computer by data processing personnel were limited to keypunch cards and punched tape, both for programs and data input. The storage medium for data between jobs was primarily magnetic tape. Outputs from the computer were restricted to punched cards, punched tape, and paper listings from line printers. In

short, the state of the art was batch processing.

1.2. Early MIS Personnel

The very first programmers worked strictly with machine language instructions, as no higher-level languages existed at first. Because machine instructions varied from computer to computer, programmers were forced to become dedicated to particular machines. With the advent of COBOL and FORTRAN, two higher-level languages which were primarily machine-independent, programmers now could program for different computers with greater ease. Programs written in these languages were easier to write and understand, and were largely portable from one computer to the next. Because these two languages handled a large portion of the programming requirements of the time, and because primary consideration for improvements was given to hardware, the state of the art in programming remained stable for a long period of time. New languages were developed as time passed, but wide acceptance of these was prevented by the limitations in computer input/output technology of that time.

Operations, meanwhile, was responsible for execution of virtually every job and communication with the computer. They stored, prepared and/or distributed every punched card deck, punched or magnetic tape, and paper printout involving the computer(s) and all its peripheral devices in the computer center. This often required several people per shift working in operations, each dedicated to a particular phase of operation. This system was very costly, but was required to achieve maximum efficiency of the computer hardware.

Because new technologies did not emerge rapidly, education of computer personnel did not present a major problem to DP managers. A person's training in one or two areas was sufficient to work for many years with little further development. Also, because the business was new, computer workers found satisfaction in the novelty and excitement of these new marvels. Thus, a particular computer shop was able to hold its personnel with as much ease as other professional departments. Retention of DP personnel was not a major concern.

1.3. Current Conditions in MIS

Much has changed in every facet of computer systems technology since the early days of computing. In many respects, the conditions of those times have been reversed in today's MIS environments.

The area of biggest change since that time has undoubtedly occurred in computer hardware. Computers have shrunk in size from the huge early computers to today's toy-sized processors. They have become so small in recent years that the terms used to designate different sizes of computers range from minicomputer to microcomputer to mini-microcomputer. The processors themselves have diminished from desk-size to the size of one integrated circuit chip. The circuitry of these processors is microscopic, so much so that they can be produced only by use of high-powered microscopes and other special equipment in super-clean environments.

Further, because of the diminishing sizes of the equipment, computer hardware can be mass-produced far more cheaply than ever before. In an age when the cost of everything else rises swiftly with the tide of inflation,

computer hardware costs continually plummet. The cost and ease of availability of computer capacities improve almost daily. In fact, many people now can afford and are buying computers for their own personal use. As a result, hardware is generally no longer the predominant source of concern among MIS managers when dealing with computing costs and inefficiencies. Also, reliability and maintenance of computer systems has significantly increased because computer parts have become interchangable, with the cost of spare parts being far less overall than the cost of maintenance without them.

1.4. Current MIS Personnel

People using computer systems now can directly communicate with the computer with ease through the use of teletype and cathode ray tube (CRT) terminals. Programs can now be entered, edited, executed (with output coming directly to the terminal), tested, debugged, and placed into production by the user from the terminal. Data input and retrieval, communications with other terminal users and the system operator (in a networked computer), and interactive programs are a few of the new technologies available to com-

puter users. Computers can and have become very friendly and easy to use, with instructions and help provided, for both MIS professionals and casual users of the programs written. This has led to the development of new languages to capitalize on this new environment, including interactive languages such as BASIC, query languages, and data base management systems, with their corresponding languages.

Because of the new on-line and real-time environments, computer programs have also become user-oriented. Programs must now provide sufficient instructions to untrained users not only to insure proper input but to provide easily understood error messages when the user enters a value incorrectly. Human factors consideration must be given with programs written to promote friendliness with the user.

Operations personnel no longer have to be involved with every data input and output in the computer center. That load has been eased by the use of interactive terminals for both input and output. Despite this, operations faces ever-increasing workloads because of the dramatically expanding demand for computer or data processing services overall. In addition, the computer center faces tremendous increases in changing and adding of computer equipment, due to swift ob-

solescence of old equipment and required increases in computing capacity. This places increasing burden on operations to be constantly learning to use new equipment in addition to their normal activities.

No longer can an MIS department do an adequate job solely with programmers. Systems analysts and designers are now required to determine the best configuration of hardware and use of software to satisfy the total needs of the system's users. Specialists in the fields of user relations, human interfaces with systems, and user education and training are often necessary to achieve successful implementation of information systems. Further, many computer development departments find it very difficult to keep up with all the requested system and program development due to the fact that much more of these services are being demanded than can be supplied by existing personnel.

Another problem information systems management must deal with is the vastly increased level of knowledge and sophistication of users of their systems. Users have come to understand the capabilities of computers far more than before, and thus are both more demanding of better quantity and quality of computer service and less patient with MIS

when results are not achieved as anticipated. This results in more pressure on MIS to come up with better performance with its systems.

1.5. Statement of Problem

One of the major difficulties facing Information Systems managers and planners is the inability to keep Information Systems personnel current with recent technological advances in all areas of the computer business - hardware, software, programming, planning and management skills, etc. Several factors contribute to this dilemma.

As new technologies emerge, MIS personnel must be trained in their use to be able to take advantage of these new features. The more rapidly technology advances, the more difficult it is to keep current with it.

Because of the burgeoning demand for technical and professional personnel that exists today versus the corresponding supply, MIS personnel are often being enticed by opportunities for better paying jobs elsewhere.

Dissatisfaction of information systems personnel continues to be a growing problem for many MIS managers. This has resulted not only from the intense competition for MIS talent mentioned above, but also because too often MIS jobs become too routine, lacking challenge and opportunity for professional growth. Many MIS people believe they can get a more well-rounded background by working in several different jobs and situations than in remaining with one job. With a better background of experience, a person is more able to take advantage of promotional opportunities when they occur.

Often, MIS managers find themselves unable to properly anticipate and prepare for meeting future personnel skills requirements.

An effective means of combatting these difficulties would be the establishment of an education and career development program for MIS personnel. Such a program ought to include a process by which MIS planning objectives are matched with education required to meet these objectives, as well as career development plans for individuals in each position within MIS. Once an educational and development program has been established and is yielding desired

benefits, several problems remain regarding the integration of this program into MIS management and planning.

Often managers are willing to approve programs to educate their people to improve on-the-job performance and promotability while being unaware of, or vastly underestimating, costs associated with the program. When unanticipated expenses, or unforseen delays in project development, are experienced due to the education or career development program, the program often is delayed, reduced, or eliminated altogether. The costs associated with a career development program for MIS personnel, both in time and money, need to be effectively measured and identified, and compared to the cost of not educating and developing personnel to meet future needs.

In long-range planning for MIS, it is necessary to be able to accurately compare costs associated with career development for alternate long-range plans under consideration by MIS. This enables the long-range planner to better estimate the overall effects of various long-range strategies and to determine the best plan to follow for the future.

Occasionaslly, education and career development programs are affected by sudden and unexpected changes in the MIS environment. This would include constraints such as budget for education and career development, cancellation of courses, availability of new courses, changes in personnel requirements for on-going projects, additions or deletions to available MIS personnel, etc. Any career development program must be flexible enough to handle adjustments to schedules caused by unforseen changes in these factors affecting the program.

1.6. Thesis Objective

The objective of this thesis is to develop a career development methodology for MIS personnel that can be used to optimize an MIS manager's (and thereby the company's) effectiveness in preparing an MIS department for the future and improving relations with its personnel. Such a system should be generalized in format, yet effective in establishing or automatically maintaining a development program and integrating it into the planning function of MIS management. This methodology would require integration of factors such as the following:

1.) Educational areas, or categories, that are available and/or desirable for use in developing MIS personnel for future projects and promotions. This would cover all of the functional areas of concern for MIS personnel - applications programming languages, software and operating systems, computer operations, systems analysis, hardware and communcations support, budgeting and planning skills, managerial and team leading skills, etc.

2.) Individual employees, both present and anticipated, in each of the functional areas of the MIS organization, the skills they have mastered at this point in time, future planned levels of expertise, and courses and programs required to resolve the difference.

3.) Current information systems in production or under development and proposals for new information systems, and their personnel/skill level requirements.

4.) Educational courses and seminars that are or will be available for use in developing MIS personnel for current and future projects and promotions. This would include dates, times, and places of course offerings, availability of reservations for such courses, and prerequisite education and/or skills required for courses.

5.) Critical evaluations of the quality of courses or seminars in which MIS personnel are involved. With this, decisions can be made regarding whether a course or seminar proves satisfactory in teaching skills or which of two or more similar courses provides better education per dollar invested.

6.) Costs associated with educational opportunities, including time (man-days) and money, and their effect as constraints to planning and utilization of desired skills. If costs cannot be stated precisely, accurate estimates should be included.

7.) Desired and or possible career path improve-

ments and promotions, and requirements necessary to achieve those improvements. Career path improvement could involve lateral transfers to positions inside, and outside of, MIS; such as Computer Operators, Computer Center Supervisors, Programmers, Systems Analysts, Hardware or Software Technicians, Communications Specialists, and management positions both in and out of MIS. This would include minimum education and skills prerequisites necessary for achievement of such goals.

8.) A personnel evaluation and feedback mechanism for use in documenting reviews of performance and career development with MIS employees. This could also be used as part of a prioritization of project assignments as well as a definition of promotional possibilities within and outside MIS.

9.) Long-term planning considerations and cost (time and money) estimations for the future of MIS. This should include the capability of including and evaluating not only the present approved MIS LRP, but also possible future long-

range plans on a "what-if" basis.

Factors to be Integrated into an Education and Career Advancement Methodology

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1.) Educational Areas, or Categories

2.) Employees of MIS

3.) Current Information Systems

4.) Available Courses and Seminars

5.) Evaluations of Courses/Seminars

6.) Education Costs

7.) Possible Career Paths

8.) Personnel Evaluation & Feedback Mechanism

9.) Long-term Planning Considerations

Figure 1.

CHAPTER 2 -

GENERAL ISSUES REGARDING MIS CAREER DEVELOPMENT

2.1. Introduction

In the course of discussing the formation of an education and career advancement methodology for an MIS organization, it is important to address certain general issues regarding MIS organizations and their effects on the establishment of such a program. This chapter presents these general issues and the problems that must be overcome as a result.

Included in this chapter are discussions on differing corporate philosophies regarding hiring, educating and training MIS personnel; the problem of anticipating technological changes and how different organizations approach this issue; the conflict that can exist between organizational needs and employee needs regarding career path planning; the effects of longevity of an employee in a particular organization or job position on MIS career path planning; the need to establish education programs for MIS,

the types of educational programs that can be established, and different training techniques available; and how MBO (Management By Objectives) influences the establishment of an education and career advancement methodology.

2.2. Corporate Philosophies and MIS Education

The basic premise of any education and/or career development plan for an MIS organization is to optimize the utilization of MIS personnel talent in meeting the present and future obligations for systems developments and operations with a minimum of overall cost per systems effort. Unfortunately, organizations approach the problem of maximizing output per dollar in almost as many different ways as there are organizations trying to solve the problem. Because of the fact that the entire industry of Management Information Services is a relatively new one, and the requirements for a particular position or section within MIS are ill-defined, organizations are trying whatever method seems appropriate to them without much consultation as to the best approach to solving the problem.

The more common approaches used by organizations for

educating MIS employees are described below:

1.) Some MIS organizations seek to meet their personnel requirements without the benefit of an MIS education program at all. Their reasoning is that they cannot afford the overhead costs associated with educating their own people. This reasoning often fails to consider costs associated with recruiting and hiring people to meet their specific needs and experience requirements. These costs evidence themselves both in terms of dollars and time delays to projects requiring specific experience not found among the present MIS force. These costs are overlooked because of accounting procedures which hide them from MIS managers. Another drawback of this procedure is that MIS personnel realize that they are tied to the particular application to which they are assigned. Once these applications are phased out or become obsolete, so do they. This type of atmosphere is often detrimental to personnel productivity.

2.) Other MIS organizations seek to avoid the pitfalls of personnel obsolescence by encouraging their employees to attend courses for specific applications as

well as technical school and college programs. Tuition refund policies, paying for travel and living expenses when away from work as well as for salaries during time off the job for educational courses, etc., are some of the methods used to accomplish this. For some organizations, particularly small MIS installations, this is the most cost effective means to accomplish this. This certainly helps to alleviate the problem of present MIS personnel obsolescence, but the MIS group is at the mercy of outside instructors and organizations for their training. This creates the problem of having to measure the relative effectiveness of training and education programs provided by other sources. Because of the heavy demand for training in all areas of data processing at present, a significant number of courses and seminars are offered which are not of good quality or do not meet the educational goals they were advertised to meet. The costs associated with the extra or duplicate training required to overcome this deficiency is usually not isolated and thus is another area of hidden costs.

3.) Still other MIS organizations solve the problem with a combination of outside and in-house training and

education programs. This is prevalent among large MIS organizations and owner organizations. The amount of training and/or education required for certain subjects can very well justify the cost of overhead for employing training organizations whose purpose is specifically to train or educate MIS, as well as user, personnel in general and specific computer applications. The main drawback of this type of operation is that the costs associated with training programs are easily identifiable, while the savings which are realized are often overlooked or ignored when the parent organization is in need of cost-cutting due to shortage of funds.

When hiring, organizations are affected by their approach to education of MIS personnel, as mentioned above. Further, hiring practices are also dependent upon how well defined the requirements are for the position being filled by a new hire. The more ill-defined the position to be filled, the more likely that MIS supervisors will select individuals for hire on a subjective basis. As a result, more people are hired that are unable to perform satisfactorily in the position. In addition, when job requirements are not well defined or understood, the MIS supervisor is more in-

clined to use discriminatory methods in hiring. Below are examples of the types of discriminatory or inadequate practices used by MIS managers.

1.) Many MIS managers rely heavily on aptitude tests to reveal who can perform various MIS jobs best in the real world. Most tests, however, show only who can pass tests. There is little correlation among computer science school aptitude scores, professional DP performance, and success. (16,French)

2.) Many organizations prefer job candidates to have obtained a college degree, although there seems to be little difference in hiring preference or salary level whether one has an associate certificate or a bachelor or graduate degree. Often, the power of a degree becomes important only when seeking promotion into management levels. (16,French)

3.) Perception of an applicant's personal qualities often play an important roll in determining whether to hire the applicant. Often, personal attributes such as speech, dress, appearance, cordiality, conversational seriousness, humaneness, self-restraint and salesmanship greatly enhance an applicant's chances for landing

a job. Further, bosses tend to hire people like themselves; having the same hobbies or the same background, or even attending the same college. (16,French)

4.) Among the discriminary practices to be found practiced by MIS supervisors are:

a.) If you are over 40 and not at the managerial level, it is too late. (16,French)

b.) Females can always find functional jobs, but a woman's chances of becoming a supervisor of men are not as good as for a man. Women are accepted more readily as a manager of women. (16,French)

c.) A name that indicates an ethnic background can hinder a person's chances for success significantly. (16,French)

d.) Married people have an advantage, while singles over 30 are considered either odd or swingers. Divorce is acceptable, except at the manager level, unless the divorcee has been in

management over 5 years. (16,French)

e.) Appearance is a factor. Handsome individuals have a distinct edge over homely individuals. A sloppy appearance will almost never get someone a job. Overweight individuals also lose job opportunities and are not paid as well. Even the wrong haircut for your age can be a deterrent. (16,French)

f.) Someone who has changed jobs every year is overlooked when compared to an individual with three-year terms with in-house promotions. (16,French)

g.) Communication is important. Clear, crisp speech outshines speech filled with trite phrases or vulgarities every time. (16,French)

h.) Certain types of psychological factors heavily influence interviewers. Those who can smile and go easy are ahead of uptight or aloof individuals. Those who are dead serious about their work are a step ahead of cynics and jokers.

Sexual advances are taboo on the job. (16,French)

i.) Organizations want people who score high on company tests or have received honors, awards and leadership plaques. (16,French)

j.) Other personal attributes enhance a person's chance for a good job, such as intelligence, creativity, honesty, ambition, goals, motivation, ability to listen, attention span, likability, ability to talk, memory, competence, independence, and high golf scores. (16,French)

5.) Often, organizations believe an applicant's current earnings are a measure of growth and present worth. Systematic progress is the key. An applicant will be questioned if present salary is either below or above a normal market value for the applicant's age or experience at given job levels and classes. As a result, many organizations hire MIS personnel on the basis of normal salary ranges. This creates a situation where average people are hired over excellent individuals because the more high-quality individuals demand higher salaries. Thus, an MIS supervisor may

hire two average persons, each with a capability of one, over an outstanding individual with a capability of three. The MIS organization thinks it obtained two for the price of one, but misses an opportunity to obtain the capability of three for the price of one. (16,French)

6.) Organizations also measure a candidate's potential by the amount of management experience he has obtained over a period of years. Orderly progression through the ranks proves advantageous, while rapid rise through the ranks causes companies to suspect applicant's competence because the applicant "hasn't served their time in positions of higher management". A candidate with managerial experience but no EDP experience is considered highly suspect. Overlooked is the fact that rapid rise may only indicate that a candidate is of superior quality, or that managers must be more skilled in dealing with people than with the technical aspects of MIS. (16,French)

7.) MIS Organizations often value highly particular functional skills or specific hardware or software experience. Ability to perform the mechanical functions

expertly or to do a job without training are critical; creativity, knowledge, education, judgement, and social skills are relatively unimportant. These jobs are usually function-dependent, and are seen as dead-ends. The organization is buying a human machine, rather than a person. If the need for the function disappears, so does the position and the person. (16,French)

These different corporate philosophies and practices all influence how a company views the need for and degree of implementation of an education and career advancement methodology. To establish and achieve the most effective use of an education or career development program, these roadblocks must be dealt with in the most influencial way possible.

2.3. Anticipation of Technology Changes

The ability to anticipate changes in computer technology and educate MIS personnel in these new technologies plays an important roll in meeting new system requirements with an optimum utilization of people resources. The degree to which an MIS organization can meet this challenge is in-

fluenced by their approach to education and career advancement.

Basically, two different philosophies exist regarding the anticipation of changes in technology levels; reactive and proactive. Most MIS organizations work under a combination of both philosophies. (32,Long)

A reactive philosophy toward technological change can best be described as one of procrastination. An MIS organization utilizes a reactive approach when it waits until the occasion when a new technology is needed for a particular application at their location before educating any personnel in that new technology. This approach has one positive aspect in that MIS people spend their time on present applications until such time as new applications are needed. A negative aspect is that, often, occasions for use of these new technologies are overlooked or disregarded due to ignorance on the part of MIS personnel. This may result in comparative inefficiencies in development and/or operations, which cost the organization money. (32,Long)

A proactive philosophy, meanwhile, is characterized by a "be ready" attitude. MIS installations seek to learn and

take advantage of new technologies in their applications as soon as feasible. They are technology-driven rather than applications-driven regarding education of MIS personnel. This type of approach does solve the problem of being able to utilize new technologies and gain efficiencies in development as well as operations. A drawback to this method, however, is that an employee may be so technologically advanced as to significantly increase a person's marketable skills. This makes employees much more valuable to competing MIS organizations, who may lure employees away with significantly higher salary offers. In such a case, the organization has just trained an employee for a job with a competitor. (32,Long)

What is the best solution for this dilemma? To achieve an optimal solution to the effective education and productivity of MIS employees, a compromise position must be achieved. The organization should be somewhat proactive and somewhat reactive. The degree to which an installation should be more reactive or proactive is determined primarily by the environment in which the installation must operate.

If an MIS installation is operating in an area in which competition for well-trained persons is relatively low, an

MIS organization can afford to be more proactive in their approach. When competition is keen, an organization has two options and can use either option on an individual-by-individual basis. One option is to use a more reactive approach, thereby reducing the desirabiliy of an employee to competing MIS organizations. The other option is to continue to be more proactive with an employee's education and prevent losing such an employee to the competition by paying salaries that are equal to or better than a large majority of the competing installations.

Problems exist with either of the two options mentioned in the above situation of intense competition for hiring and retaining MIS people. If an employee is deliberately slowed in updating skills to account for technological advances, soon the individual will recognize the situation and will seek opportunities which promote better educational and, as a result, promotional opportunities. Such an individual will perceive themselves as having progressed as far as possible with the present employer and be quite willing to change employers when the right opportunity occurs.

The difficulty that arises in using the second option with employees is that while initially an employee is happy

with the high salary achieved with the present position, the novelty of this situation wears off and an employee becomes hungry to advance to new positions or seek opportunities to implement the new technologies that have been learned. Such an employee either is willing to take a career advancement move even when a salary increase is not immediately forthcoming, or will become very frustrated, unhappy, and less productive in their present position.

An effective career advancement policy significantly reduced the amount and degree of difficulties that can arise in these areas. Such a program is efficiently and meaningfully implemented when it is integrated with an education program, where each has an influencing factor on the shaping of the other.

2.4. Corporate Needs Versus Career Path Planning

When establishing an education and career advancement program for MIS, it is recognized that many conflicts will occur between the MIS organization and individuals within MIS. This is due to the fact that the two entities have different perspectives and, therefore, are motivated dif-

ferently. The organization has to be concerned about getting the best return overall for the money and time expended in MIS, and therefore must consider possible tradeoffs that can persuade a company to be less that benevolent toward the individual employee's desires for steady and consistant improvement. If an individual is seeking an opportunity to advance into a particular position and the organization cannot afford another individual in that position, the organization is definitely motivated to prevent the individual employee from achieving this objective. From a short-term business outlook, this seems a perfectly logical approach. This type of move can be damaging to the organization as well as the individual on a long-term basis, but usually such damaging effects are difficult both to predict and quantify in terms of costs to the organization. The possible damaging effects that could occur include:

1.) Frustration on the part of the employee can lead to apathy toward career advancement and, as a result, can restrict the employee's ability to take advantage of other opportunities that may come along in the future. This could happen if an employee loses motivation to continue education and improvement in new technological (or otherwise) areas which would qualify the

employee for the new opportunity.

2.) The disillusionment that can develop in an employee can take another, more costly form. The employee may decide that the opportunity to advance no longer exists within that organization during a timeframe that is satisfactory to the employee. This leads to the employee finding such a position with another organization. The recruiting and hiring costs associated with replacing such an individual are only part of the loss incurred under these circumstances. Much time and knowledge can also be lost regarding applications on which that individual was working, resulting in costly time delays to MIS projects due to relearning the degree of knowledge and expertise lost.

The reason that the probability, and therefore the cost, of such a decision is difficult to predict is that it is unclear just how many times an employee can be passed over for a career advancement opportunity before either of the above two occurrences come to fruition. Whether one lost opportunity or ten (or more) can pass before this occurs is as much related to the psychological make-up of the employee involved as any other factor. Further, while no

immediate effects may be felt by the organization at the time, the deterioration of attitude caused by such occurrences has a gradual effect over a long period of time. This can affect the employee's performance gradually, sometimes almost imperceptably. Yet, because the long-term damage is not easily identified, while the short-term gain is readily evident, many organizations overlook or ignore the trade-offs.

Just as an organization's actions can bring about a negative consequence for an individual employee, an employee's actions can be beneficial to that employee but harmful to the organization. This occurs primarily under two circumstances:

1.) When an individual puts intense pressure on MIS management to permit advancement to meet the individual's career path schedule, the organization may be put in the position of having to oblige the individual to keep from losing the employee at that time. If such an advancement happens too quickly, both the organization and the employee are put in a position that can have long-term detrimental effects. An employee who has advanced too rapidly often is not

prepared to meet the challenges of the job, and thus the organization suffers the inefficiency of an incompetent in the position when someone with more qualifications could do a better job for the same pay. The employee is also hurt in that such inability to accomplish the job can result in a tarnished reputation, which adversely effect a person's chances for further advancement. Often an employee in this position will not consider such possible long-term ill-effects and will make such a move to obtain the obvious or perceived short-term gain, hoping to avoid the possible long-term effects.

2.) The other alternative an employee will take upon being passed over for advancement or falling behind a career advancement schedule is to pursue employment with an MIS in a competing organization. This results in the problem to the organization of having to recruit, hire and orient a new employee. Beyond that, however, the employee runs the risk of moving to a job that provides worse opportunity for advancement and personal development than with the present organization.

As with the situation where the organization's actions hurt the employee, when the employee's actions hurt the organization the costs in lost opportunity on a long-term basis are difficult to predict and quantify. Thus, many employees who pursue this type of course choose to trade the possible long-term losses for the real short-term gain, or choose not to recognize the possibility of long-term detriment.

The solution to the dilemma of the organization and the individual employee working at cross-purposes in an education and career advancement methodology is cooperation between the two parties. When the organization and the individual work together in planning and pursuing career development for the employee, the amount of losses can be reduced to an optimal compromise, thereby benefitting both members of the partnership.

2.5. Effects of Employee Longevity on Career Planning

The effects of the amount of time an employee has spent in a particular organization or a particular position has a large amount of significance for an employee's potential for

career advancement opportunities. The effect that longevity in a position has on an employee's opportunities are considerably different that the effect of longevity with a particular owning organization.

As mentioned previously, after a certain period of time in a position, continuing tenure in that position has an inverse effect on an employee's prospects for career advancement. The threshold period of time is generally considered to be approximately 3 years. Employees in a particular job longer than that amount of time are looked upon as being settled and not as interested in or qualified or motivated for promotion as one who has not been in their current position as long. Further, an individual who has been in a particular position for a number of years has progressed in salary such that even a lateral advancement at best means little or no salary increase, and often would result in a salary cut. Many individuals facing this possibility either are unwilling or unable financially to take such a salary cut to improve career position.

The effect of changing jobs and employing organizations too rapidly, however, is exactly the reverse of that of the individual who has been in the same position for the same

organization for years. A person who changes jobs too rapidly is perceived as having one of three possible problems, listed below, all of which seriously hamper an employee's chances for career advancement.

1.) The employee is incompetent, and not a good hiring risk, (16,French)

2.) The employee has difficulty operating in an office or MIS environment and has prohibitive trouble communicating with other people, (16,French) or

3.) The employee is too fickle or restless to be a good employment prospect. (16,French)

Repairing the damage that either situation results in is difficult, but the organization and the employees can benefit if a means of preventing future occurrences of this condition can be used. By funneling the planning efforts of both the employees and the MIS supervisors into a common blueprint, an education and career advancement program can significantly reduce the number of future occurrences of this situation.

2.6. The Need to Establish Educational Programs

A key ingredient to any career advancement methodology is the process by which opportunities for improving the education level of persons within MIS are made available. A career advancement methodology that is not integrated with an educational program for MIS employees will be rendered ineffective, due to the fact that many employees are unable or unwilling to pursue furthering their education without any assistance or motivation. Thus, employees will meet a roadblock in their career paths if they do not achieve the education level required for the next step.

It is important to remember that, for a career advancement methodology to be effective in guiding employees toward advantageous career path directions, each step of the career path has to be properly supported with the education required to meet that step. If this is not the case, employees will be led to dead end alternatives in their career path planning and will not benefit from the career advancement plan. Further, a position which is not supported with the education required to qualify for that position, no in-house expertise will be developed for that position, which

will require hiring new employees to fill the jobs. If the position is a desirable one to the present contingent of employees, this will erode the confidence placed in the career advancement program by the employees and render it ineffective.

The size and the scope of the education program an MIS installation should undertake is largely dependent on several factors, such as:

1.) Size of MIS organization,

2.) Size and financial status of owning company or organization,

3.) Availability and cost of outside instruction, and

4.) Degree of cooperative educational effort available from other local MIS organizations.

When an MIS manager makes a decision regarding the degree to which the MIS organization will become involved in the education of their employees, the manager must consider these factors as they pertain to the organization's situa-

tion. Small owning organizations often are not large enough financially to justify to their stockholders the added overhead costs of providing formal educational courses to their employees via their own education or training departments, if such even exist. Conversely, large MIS installations and large owning organizations with multi-site MIS organizations often have enough requirements for the same types of courses to be taught to justify education organizations and entirely new facilities dedicated to education of MIS personnel. Thus, small companies are constrained to sending their people to outside educators or having outside educators train their people on-site on a contract basis, while large companies can have greater flexibility in their choices of educational methods.

Often, local education programs such as colleges and other institutes of higher learning can provide necessary instruction for MIS employees in certain general areas. Such schools are essential in providing the capability for employees to continue their education by seeking their next degree, be it undergraduate or graduate. Tuition assistance and refund programs provide an immensely effective incentive to employees to continue their education and upgrade their skills level. In addition, if enough interest can be

generated in providing financial and tutorial leadership among the various other MIS organizations in the local area, colleges and schools can often upgrade their degree and course offerings to better meet the needs of the business community they serve.

If no college or institute of higher learning is available, local MIS organizations can also form an educational cooperative that teaches common subjects to employees of all of the cooperative organizations. This can often help to meet the demand for education where facilities would not be available otherwise.

In the area of providing in-house education to MIS employees, several types of instruction can be made available. These include:

1.) Multi-media training aids, such as videotapes and voice-only taped instruction,

2,) Correspondence courses that can be taken on the employee's own time,

3.) On-line computer aided tutorials,

4.) Commercially available textbooks and teaching materials that may be obtained for classroom use,

5.) In-house classroom courses taught by in-house personnel, and

6.) In-house courses taught by outside consultants.

Multi-media training aids are the most widely used in-house teaching form in today's MIS environment. (32,Long) Multi-media aids provide several features that make them desirable to many MIS organizations, including their modular nature, the convenience of using video or other replay equipment in a classroom or assembly environment, and their ability to provide good quality instruction without developing in-house instruction expertise first. Among the problems with using such aids in teaching employees is the inability to respond to questions or requests for clarification of points taught in the lesson.

Correspondence courses also provide a modular concept toward teaching and also is a learning tool that can be used at the employee's own pace. Correspondence courses are

usually most effective in teaching introductory courses, or courses required as prerequisites for other courses that are necessary to meet an MIS employee's educational objectives. Correspondence courses also do not provide meaningful follow-up explanations, but often more experienced personnel can assist by answering these questions.

Another source of educational opportunities for MIS people is sponsored by many consulting groups and DP professional societies. Often taking the form of seminars or symposiums, such offerings can be very useful in obtaining information on state-of-the-art technologies and philosophies used in the MIS industry. The major disadvantage of these opportunities, especially if they are not located nearby, is the costs associated with attending them. It is also true that the quality of such offerings, especially by individuals of unknown reputation, often cannot be relied upon.

2.7. Integrating Management By Objectives (MBO) Into a Career Advancement Methodology

A productive education and career advancement program becomes an effective management tool when the management operates via the Management By Objectives (MBO) method. Such an education and career advancement methodology can be used as an incentive to motivate MIS employees to meet mutually acknowledged advancement goals and professional development objectives.

An education and career advancement methodology is, in itself, an example of MBO. Employees are put on a educational track with the objective of positioning for the next career move. The next career move, or move alternatives, are also outlines as an achievement objective, with a time-frame or schedule to use as a benchmark.

MIS education and career advancement programs can be integrated into the mainstream of the MIS manager's planning by utilizing the information provided in the program to plan for personnel requirements and costs. Conversely, the supervisor can help to shape the employees' objectives to more coincide with the organization's needs and forecasted

available opportunities. In short, an education and career advancement methodology can be an effective tool in both short and long-range personnel and technological planning.

CHAPTER 3 -

DETERMINATION OF SHORT, MEDIUM, AND LONG-RANGE CAREER ADVANCEMENT GOALS FOR EACH PERSON WITHIN MIS

3.1. Introduction

When called upon to perform a task or solve a problem, an approach must be developed to facilitate completion of the assignment in an organized fashion. This approach often develops into a series of cyclical steps which include defining the objective(s), determining the constraints, developing a method for performing the task or solving the problem, implementing the method developed, and evaluating results.

This same procedure can be used to effectively establish and maintain an MIS education and career advancement methodology. Objectives can be defined, plans and benchmarks of performance established, action taken to meet these benchmarks of performance, and results of actual performance evaluated. The first of these steps, the determination of career advancement objectives, is discussed

below.

Need For an Established Program For Each Person Within MIS

It is possible for an MIS manager to establish a career development program that consists of documenting possible career path movements for individuals within a particular position and leaving the pursuance of these possibilities to the individual's initiative. This method certainly would be easier to implement and maintain. Much of the effectiveness that could be achieved in an education and career advancement program would be lost, however, with such a procedure.

Giving individual attention to each MIS employee in such a program would require more work on the part of both the supervisor and the employee, especially in the initial stages. The benefits that are derived from individual treatment of employees can make the expending of this extra effort pay off handsomely. Enlightened MIS managers would take time to produce a more effective and higher quality program, realizing that it is an investment in the future of not only the employees, but the MIS and the governing organizations as well. There are many reasons for this:

1.) Documentation and explanation of standards for job specifications of an employee's present function, as well as those functions to which the employee may seek to advance in the future, are established or improved. This enables the employee to make a more intelligent decision regarding which step(s) to take in a future career path.

2.) A better understanding can be achieved between supervisor and employee concerning the employee's potential for movement into specific job functions. An employee is not left believing that a particular job change is reasonable without knowing the supervisor's opinion, and vice versa.

3.) Individual attention can significantly improve the morale of the MIS employees, and thereby, the organization as a whole.

4.) Knowledge of employees' future goals and aspirations improves the ability to plan for future job requirements in MIS.

5.) Misunderstandings between supervisor and employee can be addressed more easily, and general dissatisfation of any employees can be discovered and dealt with more quickly.

Topics Included in This Discussion

The remainder of this chapter discusses a framework for a methodology to follow by which employee/supervisor interaction can be achieved. It includes a discussion of the central position of employee/supervisor interaction in producing an effective system of career advancement goal determination, the benefits of interaction both for the employee and the supervisor, and methods and procedures to be used in establishing a system of career advancement goal determination.

3.2. Employee/Supervisor Interaction

At the heart of any career advancement program is the phase in which an MIS employee and supervisor communicate to each other concerning the direction of the employee's education and career advancement plan, and the amount of progress achieved in meeting that plan. Often, the degree of success or failure of such a program is directly related to the quantity and quality of interaction between MIS employee and supervisor.

Chronologically, employee/supervisor communications occur in the center of activity in an effective career advancement methodology. Before this, an employee gives thought to what would be a desirable career path to follow, often with only a vague idea of how that fits into the MIS organization's, or even the overall owning organization's, plans for the future. The MIS supervisor, meanwhile, has an idea how the employee fits into the organization's plans for future growth or change, but only a vague idea of how the employee perceives the situation. The feedback that each receives from the other in this interaction is critical in supporting the plans for the future of both the employee and the supervisor.

The benefits which can be gained by both parties, the employee and the supervisor, are enumerated in the paragraphs below.

Importance to MIS Employees

Several benefits are gained by the MIS employee from communicating with the employee's supervisor. These include the following:

1.) The MIS employee is better informed of other jobs which are available, both within and outside MIS, that could influence the employee's decision regarding future plans for career advancement. The employee is better able to choose a path that is more closely aligned with the employee's talents and interests. The employee is also better informed of what types of job activities are performed by positions for which the employee is available, and what are the requirements for movement into such a position. Standards of performance for future possible job positions are also known. This is valuable information for helping to shape an employee's thoughts toward a career path that would optimize the employee's opportunities to take advantage of openings for favorable and enjoyable jobs within MIS in the future.

2.) Knowledge of both the MIS and parent organizations' plans concerning expansion or contraction of various job opportunities within and outside MIS gives the employee a more realistic view of just what the relative outlook for entering into certain job positions are. In addition, an employee can become aware of what other MIS employees' career advancement plans are, and can take appropriate action toward developing the employee's own optimal career advance-

ment plan. An employee is better able to position for anticipated future openings.

3.) The employee receives personal encouragement over the fact that the organization is taking an individual interest in the employee's career. The employee realizes that the organization cares about their development, and that the organization, as well as the employee, is concerned about avoiding skills obsolescence.

4.) The employee is likely to develop an increase in loyalty to the organization because it is perceived as a good and progressive organization for which to work. This manifests itself in greater concern for the problems of the organization and an increased desire to find workable solutions for these problems.

5.) The employee is afforded an opportunity to improve communications with the supervisor. This improved communication leads to a better understanding of why a supervisor thinks and reacts in a certain manner under different circumstances, and the employee is better able to adjust the employee's own behavior toward the supervisor. This results in improved opportunity to take advantage of new job posi-

tions as they result.

6.) The employee is permitted an opportunity to inform the supervisor of the employee's own situation regarding desires, interests, and needs. Recognizing and planning for the employee's particular situation is a career advancement plan is more comforting to the employee, and favorably alters the employee's view of the organization for which the employee works.

Importance to MIS Supervisor

The MIS supervisor also gains several benefits from communicating with the employees for whom the supervisor is responsible. These include the following:

1.) Information concerning the interests and plans of the employees working for the supervisor permits a better understanding of what an appropriate career advancement plan should consist for each employee.

2.) Knowledge of the employees' interests should better prepare the supervisor in planning for excesses and shortfalls in future personnel requirements. This should vastly

improve the supervisor's ability to prepare both short and long-range plans for personnel requirements in MIS. The supervisor is also able to better funnel the employees' thoughts toward anticipated openings.

3.) The supervisor is in a better position to offer encouragement and direction to the employees working for the supervisor to improve their skills level to prevent technical obsolescence for them. This helps the supervisor's position in that the organization avoids the costly turnover problem of having to release employees who can no longer perform up to requirements and hiring new employees to replace them.

4.) The supervisor benefits from productivity gains from employees as a result of the increased morale and loyalty gained from each, due to the increased attention given to each employee's individual needs.

5.) An opportunity to get to know the employees better, and improve communication with them, is afforded the supervisor. This enables a supervisor to better appreciate how employees might react or think under different circumstances, and allows the supervisor to adjust to the employee

under these circumstances. This helps to improve a supervisor's effectiveness in averting difficulties or meeting them with a minimum of disruption. Improved performance can result on the part of the employees.

6.) The supervisor is given an extra opportunity to increase the employees' awareness of the problems faced by the MIS organization, as well as the parent organization as a whole. This should help to clear up misunderstandings on the part of the employees and thereby improve their understanding of and appreciation for the organizations' actions as a whole.

3.3. Career Advancement Goals Determination - Methods and Procedures

This section presents a framework for a methodology which should facilitate implementation of an effective system for determination of short, medium, and long-range career advancement goals for each MIS employee. It outlines possible techniques to be used for gathering and exchanging information to provide employee/supervisor interaction, what should be included as part of a career advancement goals

plan for each employee, and a means by which periodic reviews of progress against the career advancement plan can be conducted.

Techniques for Exchanging Information

The most important phase of the career advancement goals determination, as mentioned previously, is the exchange of information that occurs between the employee and supervisor. This can be accomplished using two different procedures; employee questionnaire, and interview between employee and supervisor. The manner in which these two procedures are interrelated is illustrated by Figure 2 on the next page. The two procedures are presented on the pages following Figure 2.

Career Goals Determination - Flow of Procedures

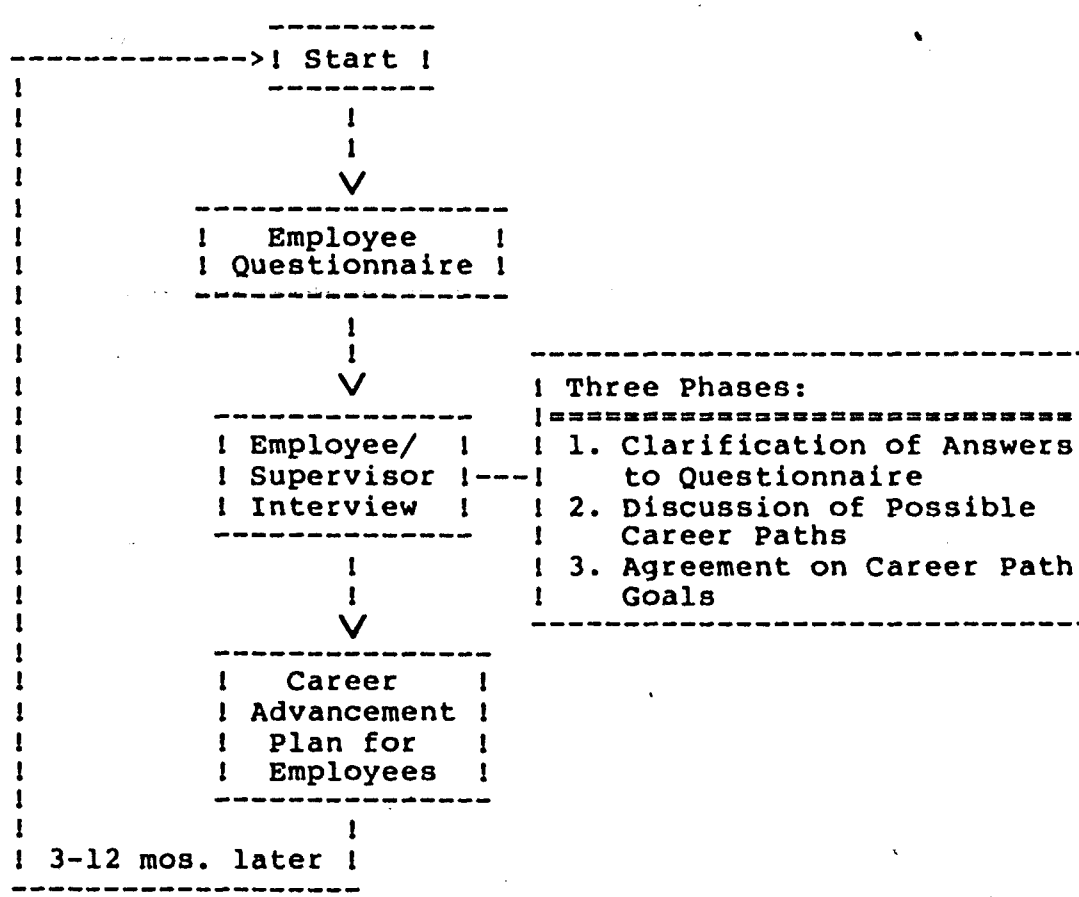

Figure 2.

1.) Employee Questionnaire -

The employee questionnaire is the mechanism to be used by MIS employees in organizing their thoughts concerning education and career advancement goals prior to an interview with the supervisor. It presents the employee with the opportunity to give serious consideration to degree of satisfaction with progress in current job as well as aspirations for the short, medium, and long-range future.

This questionnaire should permit essay-type replies on various issues of possible employee concern; including rating of progress and satisfaction of present position, description of the position's strengths and weaknesses as well as the most and least enjoyed phases of the job, areas of interest in other jobs either within or outside MIS, personal interests which may enhance or conflict with certain phases of a possible position change, and degree of satisfaction with interrelationships with other employees within MIS. It also should include other information about the employee, such as accomplishments on and off the job and additional education completed since the last review, if this information has not been documented elsewhere.

The employee should be permitted and encouraged to fill out the questionnaire only after giving considerable thought to the answers. Enough time must be given to the employee to do this thoroughly prior to the interview, although it is recognized that some employees may require more time than others. The employee should also be encouraged to complete the questionnaire in private, perhaps at home, and that the employee's response should be kept confidential by both the employee and the supervisor.

The employee questionnaire will be most effective when an atmosphere of honestly and fairness is fostered both on the part of the employee filling out the questionnaire and the supervisor reviewing it. This is a balance that is difficult to achieve, but both parties must strive for such a climate as much as possible. Lack of honesty can lead to mistrust on the part of the supervisor or the employee and will render the whole career advancement process much more ineffective. Being overly complimentary or critical in assessing the situation can lead to misinformation which could lead an employee to be unhappy in a present or future position, or cost the supervisor in excess training obtained and not used or in extra recruitment of personnel.

2.) Interview Between Employee and Supervisor -

Once the employee questionnaire is completed, the employee and supervisor should meet to discuss the employee's career situation and develop a career advancement plan for the employee. To conduct the interview in a more effective manner, it should be conducted in a quiet area where interruptions can be minimized.

The interview will likely proceed in three phases. The first phase will consist of a review and expansion of the employee questionnaire. The supervisor will ask for clarification of points not well understood from the questionnaire, while the employee will expand upon answers as necessary to provide enough detail and background to facilitate understand of the employee's position on any particular answer given in the questionnaire.

Once the employee's position is clear, the second phase of the interview can begin. The supervisor presents an analysis of possible and likely career steps for the employee to take based on the employee's responses to the questionnaire and the supervisor's assessment of the employee's potential. Any details concerning what the proposed future career positions would entail or what the

education and experience prerequisites are for a job should be presented. An explanation of any conflicts between what the supervisor forsees for the employee and the employee forsees should be discussed at length to eliminate any misunderstanding which may exist. The supervisor should also inform the employee of what prospects are forecast for the short, medium, and long-range future of the MIS organization for particular career positions aspired to by the employee.

Following this, the supervisor and the employee should be in a position to enter the third and last phase of the interview. In this phase, the employee and the supervisor should come to an agreement concerning what career path(s) the employee will be pursuing. This agreement should include a list of progress benchmarks to be achieved to maintain the career path(s) chosen and a timetable for achievement of these benchmarks. This agreement should be documented as the career advancement goal plan for the MIS employee and should be signed by both the employee and supervisor and included in the employee's official record. The employee questionnaire should be attached to the agreement. Every effort should be made to come to an agreement, but when an agreement cannot be reached on a certain issue,

the employee's position should become a part of the career advancement plan and the supervisor's objection should also be stated.

As with the employee questionnaire, the interview and the employee's career advancement plan document should be kept confidential by both the employee the supervisor. Fairness, honesty and tact should also be employed by both parties in the interview to achieve an optimum result from the career advancement process.

Items Necessary for a Career Advancement Plan

What should be included in this career advancement plan to be devised as described above? What items are pertinent regarding promotion or lateral possibilities for which an employee can prepare prior to the advancement opportunity? Is the employee "on schedule"? These are questions whose answers will be discussed below:

1.) A long-range, or "ultimate", career position goal should be established for the employee. This provides the end point that the career advancement plan should be aiming toward. It is not always possible, especially with young

employees, to be specific concerning an exact function or level for which to aim. Older employees, meanwhile, who have been in a particular position for much longer, have a much better idea what their career aspirations are. Often an older employee will set as an ultimate goal the next position level which would prove to be a promotion, believing that such a conservative approach more closely matches their realistic expectations for themselves. This approach may seem reasonable to such an employee, but will result in shutting off other possible career moves which could be advantageous. It is best for the employee to set a long-range goal that is at least two or three levels higher than their present position, in order to allow sufficient flexibility to permit the use of alternative career paths. The ultimate goal in that case may seem unrealistic, but may point to an opportunity that otherwise would be overlooked.

2.) At least two different career advancement paths should be enumerated for the employee. The paths would consist of a prioritized list of positions, including function and level, which the employee could follow in sequence to proceed toward the long-range career position goal. This list of career positions should be constructed to include both lateral and promotional moves as deemed reasonable by

the employee and the supervisor. A discussion of possible alternatives for career movement from various positions within MIS is presented in a later chapter entitled, "Alternate Career Paths for MIS Employees". The selected career paths for an employee should optimize the employee's opportunities for both desirable and likely career positions, as this should improve the chances for success for the employee.

3.) Education and experience prerequisites for each position in the career advancement paths should be detailed in the employee's career advancement plan. This is necessary so that the employee is aware of the requirements that must be met to qualify for a job and to prepare to meet them as needed so that the employee may be able to take advantage of the career move as soon as possible. The employee may need additional education which can be gained only over a period of years (college degree work, for example).

4.) An approximate time frame should be detailed for the employee for each career path. This time frame serves as a schedule, or benchmark, that the employee can follow to measure the relative success of efforts made to improve career position versus the plan. An employee or supervisor

can gauge whether the employee is on schedule, and both can take appropriate action to rectify any problems which develop causing an employee to fall behind schedule. The time allowed for each move to a new job function or level should be sufficient so that the employee can meet all education and experience requirements at a pace agreed upon by the employee and the supervisor, taking into account the employee's ability to meet the schedule.

On the next page, Figure 3 shows a sample layout of a career advancement plan document.

Sample Layout of a Career Advancement Plan

CAREER ADVANCEMENT PLAN FOR MIS EMPLOYEE

Date_____Location_____
Employee: Name_____Soc.Sec.#_____
Current Position_____
Current Supervisor_____

ULTIMATE CAREER POSITION

_____

Possible Career Paths Toward Goal:

1st Position Path Code		Educ. Req.	Exp. Req.	2nd Position Path Code		Educ. Req.	Exp. Req.
___	_____	_____	_____	___	_____	_____	_____
___	_____	_____	_____	___	_____	_____	_____
___	_____	_____	_____	___	_____	_____	_____
___	_____	_____	_____	___	_____	_____	_____
___	_____	_____	_____	___	_____	_____	_____
___	_____	_____	_____	___	_____	_____	_____

MILESTONES FOR ATTAINING CAREER ADVANCEMENT GOALS

Description	Achievement Date

Employee Signature_____Date_____
Supervisor Signature_____Date_____

Figure 3.

Periodic Review of Progress

The final step of the process of determining career advancement goals for individuals within MIS is to provide a review, or feedback, mechanism to the employee on a periodic basis. While this is not the most time-consuming portion of the career advancement plan, a review of the progress an employee is making to reach the goals set forth within the career advancement plan proves to be critical to the success of the career advancement program. Any program which is dependent on establishing a set of criteria for performance requires a means of reviewing the performance to-date in light of the criteria established, or the set of criteria that has been established will be forgotten and become meaningless. An MIS employees' career advancement program is no exception to this statement.

The career advancement periodic review is a procedure by which an evaluation is made comparing the career advancement goals and target dates of an employee with the progress made by the employee toward that goal. It will usually consist of an interview or meeting with the supervisor to determine what has been accomplished by the employee to

reach the goals set forth, and a discussion of the corrective action that may be taken on the part of both the employee and the supervisor or organization.

This review should be documented and the document included with the employee's career advancement files by both the MIS organization and the employee. One effective method to accomplish this is to have both the supervisor and employee document relevant facts as they view them on forms designed for the purpose prior to the review meeting and then complete the forms during or following the meeting to include the results of the meeting itself. These documents should be signed by both the supervisor and the employee to indicate that each has seen the other's document, although they may not agree, and each should keep a copy of the other's document for their career advancement files.

When a significant difference is discovered between the goals/target dates and the amount of progress achieved by the employee, it is not always a sign of employee failure or neglect. An equally likely possibility is that the conditions that existed when the goal/target date were initially established have changed sufficiently to render the particular standard meaningless at review time. If this is the

case, an evaluation of the goal or target date is in order.

This review is not the same as a performance review, although conceivably some of the information that is exchanged in the career advancement review would also be appropriate for a performance review. The career advancement review also should not be used as justification for increasing or decreasing the employees' salary. Such things are connected already to a performance review, and to extend that responsibility to a career advancement review can lead to distortions of the review as well as animosity toward the review process. Neither of these climates aid an employee's willingness to follow a career development plan or to put trust into the career advancement process in general.

The amount of time that elapses between reviews, known as the review cycle, should be standard for all employees in the MIS organization, or at least standard for all employees sharing common functions or reporting responsibilities. The recommended minimum review cycle is 3 months, while the maximum is 1 year.

If a review cycle is less than 3 months, an insufficent amount of time would have elapsed to report a significant

amount of progress toward achieving the goals such that the review would be fairly meaningless compared to the time and effort required for conducting reviews. Indeed, many supervisors and employees would object to reviews occurring more frequently than every 3 months simply because of the amount of work that would be involved.

When a review cycle extends beyond 12 months, however, the problem is exactly the opposite. Too much time will have elapsed for corrective action to have been taken in a timely manner to benefit the employee sufficiently to justify the work necessary to maintain the career advancement plan. While the former situation will almost never occur, this latter condition could occur easily if both the supervisor and employee do not observe the review cycle and conduct the review sessions as scheduled. This is because people will usually tend to defer this kind of activity due to preoccupation with day-to-day work activities.

Upon completion of the employee's career advancement review procedure, the career advancement plan goals and target dates should be updated to reflect the passing of time and conditions that have changed since the last review. If a significant amount of changes are needed for the em-

ployee's plan, the career advancement plan should be reestablished, using the procedures set forth for that purpose. In any event, an employee's career advancement goal plan should be completely reviewed and reestablished at least every 2 years.

CHAPTER 4 -

ALTERNATIVE CAREER PATHS FOR MIS EMPLOYEES

4.1. Introduction

Computer professionals have been traditionally looked upon by management as technical specialists. Their chances for advancement have been limited by this view, in that many opportunities for career advancement have been vertically oriented. This limiting scope has prevented many from gaining valuable experience in areas related to, but not vertically in line with, their own positions. As a result, many opportunities for career advancement, both promotional and lateral, have been overlooked within installations. These opportunities could provide much-needed broadening of an individual's experience base, enabling them to take advantage of other significant promotions. Without this, many MIS employees become stifled in their present jobs and dissatisfaction results. People perceive themselves as being in dead-end jobs.

One aspect of an effective education and career

development program for MIS employees should be the identification and pursuance of career paths. Career path possibilities need to include not only the traditional, vertical paths, but also some alternates which are not generally recognized but can provide valuable broadening of horizons for MIS employees. This chapter seeks to identify many of these possible career path alternatives for incorporation into an MIS career development program.

4.2. Installation Size vs. Career Paths

One aspect that has to be considered when trying to identify possible alternative career paths is the effect that installation size has on the number and types of jobs available in MIS. With a small MIS site, there is a limit on both the number of jobs available and the amount of different types of jobs available. An advantage of this, however, is that any one job will have a higher variety of tasks to be covered. MIS people is small installations must often wear more than one hat.

Medium and large installations generally have more different types of jobs available. This allows for more oppor-

tunity for movement from one job to another. One drawback to this kind of environment is that jobs tend to be more well defined and specific, and opportunities to gain a broad background from a particular job a usually considerably more limited than with smaller installations.

Because of the considerable disparity of types of jobs available between small, medium and large MIS sites, identification of the possible career paths will be reported on two sections; one for medium and large size sites, and one for small MIS sites.

4.3. Career Path Possibilities in Medium- and Large-Sized Installations

Identification of MIS Job Positions

Before traditional and alternative career path possibilities for medium and large installations can be discussed, it is necessary to define what MIS positions are available. It is virtually impossible to specify job titles which are generally recognized as standard throughout the industry. Thus, the job titles presented below are intended

only as descriptive labels and should be adapted to the corresponding job titles for a particular installation. Their purpose is merely to define what job functions exist in a typical, medium or large MIS organization.

The jobs to be included in this discussion are as follows:

1.) Director of MIS - In charge of all MIS organizations. Responsible for long-range planning, budgeting, and operations.

2.) MIS Section/Department Manager - Responsible for particular departments or functional areas of an MIS organization.

3.) User Liaison - Acts as first level interface between MIS departments and end users; represents users when operational problems occur. (13,Crane)

4.) Long-Range Planner - Forecasts the future needs of, and requirements for, MIS organizations for the long-range future.

5.) Configuration Management Technical Specialist - Responsible for the technical aspects of computer network operations. (33,McManama,et al)

6.) Supervisor of Computer Operations - Responsible for all computer, support, and peripheral operations during the work shift. Assigns operators as needed, deals with vendor engineers, and insures that corporate and MIS department rules and procedures are followed. (13,Crane)

7.) Senior Data Communications Analyst - Specializes in network design, traffic analysis, and data communications software. Performs simulation and modeling tasks, defines standard block sizes and message formats, and works with persons in other departments on the evaluation and selection of communications processors, telecommunications access methods, and protocols. (13,Crane)

8.) Data Communications Analyst - Works with senior data communications analyst on large projects or solo on small efforts to define data communications specifications.

9.) Senior Technical Control Specialist - diagnoses problems with common carrier communications equipment, deals with service interruptions and outages, examines and validates carrier chargers, monitors on-line equipment status, and installs independently-obtained equipment. (13,Crane)

10.) Technical Control Specialist - Works with senior technical control analyst in several areas of responsibility or works alone in handling smaller projects or one area of responsibility.

11.) Senior Systems Programmer - Technical specialist in one or more components of systems software. Excells in problem determination and repair. (13,Crane)

12.) Systems Programmer - Specializes in the support of one operating system component or subsystem such as a compiler. Capable of modifying utilities or installing changes to operating systems. (13,Crane)

13.) Systems Programmer Trainee - Has a good background in DP and knows or is learning assembler language.

(13,Crane)

14.) Senior Computer Scientist - Leads problem-solving and programming efforts concerning engineering problems such as hardware, software, human factors, simulation, and other operations research applications. Primarily concerned with user-department-dedicated, research-oriented programming efforts. (33,McManama,et al)

15.) Computer Scientist - Works with senior computer scientist on large projects or alone on small projects in the solution of engineering problems and applications. (33,McManama,et al)

16.) Computer Scientist Trainee - Learning to define problems, design and test solutions, and write programs to solve engineering applications. Works under direct supervision on one project at a time. (33,McManama,et al)

17.) Senior Microcomputer Specialist - Excells as a generalist in a single make/model/configuration of microcomputer hardware installation, applications design, programming, testing, and initial production

operation. Can troubleshoot, diagnose, and frequently can repair hardware and software as required. (13,Crane;33,McManama,et al)

18.) Microcomputer Specialist - Works with senior microcomputer specialist in all phases or alone on some phases of work on a single make/model/configuration of microprocessor installation, application design, programming, testing, and initial operation. (13,Crane;33,McManama,et al)

19.) Microcomputer Specialist Trainee - Has a good background in computers and has programmed in assembler language, learning responsibilities of servicing a single microcomputer. (13,Crane;33,McManama,et al)

20.) Senior Systems Analyst - Leads analysis effort on major projects. Confers with users to define MIS projects, formulates statements of problems or objectives, and designs solutions. Primarily concerned with inter-departmental or non-research systems. (13,Crane)

21.) Systems Analyst - Works with senior analyst on large

projects or solo on small efforts to define MIS projects or project segments, or to iron out details in specifications. (13,Crane)

22.) Apprentice Systems Analyst - Learning to define MIS projects or project segments, or to iron out specifications details. Works under direct supervision. (13,Crane)

23.) Senior Applications Programmer - Works with a variety of program designs or specifications of program changes to maintain existing programs. Primarily concerned with inter-departmental or non-research systems. (13,Crane)

24.) Applications Programmer - Usually works on only one or a few types of applications, qualified to work alone. (13,Crane)

25.) Applications Programmer Trainee - Learning to program. Usually works under direct supervision at one item at a time. (13,Crane)

26.) Senior Computer Security Specialist - Has lead respon-

sibility for protection of data and computer resources.

27.) Computer Security Specialist - Concerned with protection of data and computer resources. (13,Crane)

28.) Senior Data Base Administrator - Leads analysis of file organizations for shared data, creation of data dictionaries, standards for the use of data, and insurance of data integrity and security. (13,Crane;33,McManama,et al)

29.) Data Base Administrator - Analyzes an application's computerized information requirements, coordinates data collection and storage needs; organizes data. (13,Crane;33,McManama,et al)

30.) Senior Documentation/Technical Writer - Responsible for systems documentation and/or manuals for application systems for user and internal reference. (13,Crane;33,McManama,et al)

31.) Documentation/Technical Writer - Writes manuals for users or documentation of applications systems for in-

ternal use. (13,Crane)

32.) Senior Information Center Librarian - Responsible for organizing and maintaining the information center, or library, of technical documentation. (32,Long;33,McManama,et al)

33.) Information Center Librarian - Assists senior information center librarian and assumes responsibility of upkeep of library of technical documentation in absence of senior information center librarian. (32,Long;33,McManama,et al)

34.) Senior Standards and Procedures Specialist - Responsible for all standards and procedures applicable to the MIS organization and their functions and operations. (32,Long)

35.) Standards and Procedures Specialist - Establishes and maintains all standards and procedures applicable to a particular phase of MIS in the execution of their function. (32,Long)

36.) Senior Information Systems Auditor - Responsible for

auditing of all MIS operations, documentation, development, and accounting. (33,McManama,et al)

37.) Information Systems Auditor - Works with senior information systems auditor on large audit efforts or alone in auditing one or a few phases of information systems. (33,McManama,et al)

38.) Senior Education and Career Development Specialist - Leads in planning, training, and documentation efforts of educastion and career development program for MIS organization. (32,Long)

39.) Education and Career Development Specialist - Works with senior education and career development specialist in all areas or alone in one area of the education and career development program for MIS. (32,Long)

40.) Senior User Services Specialist - Coordinates efforts of user services staff teams in providing guidance to users.

41.) User Services Specialist - Knowledgeable in broad as-

pects of MIS; provides guidance to users; helps in debugging specific problems and understanding system procedures. (13,Crane)

42.) Lead Computer Operator - Responsible for the operation of large-scale computers for an 8-hour shift or for the operation of one computer system in a multisystem site. (13,Crane)

43.) Computer Operator - Assists in running computers and may operate the central console in the absence of the lead operator; mounts and dismounts magnetic media, monitors and logs events, and services printers. Works with production control and scheduling staffs. (13,Crane)

44.) Lead Production Control Clerk - Responsible for the data control function during an 8-hour shift or for the data control function of a single site in a multisite organization. (13,Crane)

45.) Production Control Clerk - Prepares jobs for processing, enters the appropriate job commands, and gathers output for post processing. (13,Crane)

46.) Lead Field Service Technician - Responsible for the repair of hardware equipment and determination of software problems.

47.) Field Service Technician - Vendor-trained electronic technician who can service mechanical equipment, repair/replace malfunctioning electronic components, and perform software problem determination. (13,Crane)

48.) Lead Quality Assurance Technician - Responsible for the monitoring of the performance of computer operations to assure performance quality is maintained within specified limits. (48,Utley)

49.) Quality Assurance Technician - Performs statistical performance analysis on various components of computer operations to assure proper operation and efficiency within limits specified either internally or by hardware or software vendors. (48,Utley)

50.) Lead Scheduler - Monitors data management functions of production work to make sure that the system is func-

tioning normally; provides point of contact with the programming staff. (48,Utley)

51.) Scheduler - Schedules the flow of jobs into the computer during an 8-hour shift or into one computer in a multicomputer site; insure that correct files are available, libraries are in place with the correct modules, that the control cards are ready, and that documentation is available. (48,Utley)

52.) I/O Control Aide - Responisble for the operation of one or more I/O devices during an 8-hour shift. (32,Long;48,Utley)

53.) I/O Control Aide Trainee - No previous dp experience necessary, learning the operation of one or more I/O devices; operates same under direct supervision.

54.) Magnetic Media Librarian - Maintains the library of magnetic tapes, disks, and/or cartridges. (32,Long;48,Utley)

55.) Magnetic Media Librarian Trainee - No previous dp experience necessary, learning to properly maintain mag-

netic storage media; works under direct supervision.

56.) Data Entry/Terminal Operator - Operates one or more data entry devices; or operates terminal and telecomm facilities remote from central site. Requires only general supervision. (32,Long;48,Utley)

57.) Data Entry/Terminal Operator Trainee - Trained in keypunch or terminal operations; learning to operate data entry device(s) or remote terminal and telecomm facilities under direct supervision.

It is recognized that this list is rather exhaustive and that many large as well as mid-size MIS installations may not have every function listed above. It is also recognized that some medium and large size installations do not distinguish between the general function of systems analyst and applications programmer. They combine these functions into a general function known as programmer/analyst. While both of these points are germaine to the discussion, the functions used in this discussion can be appropriately combined and/or adapted to suit the needs of a particular installations.

Possible Career Paths For Each Job Function

All of the possible career paths which could be considered reasonable for each of the jobs listed above - both traditional and alternative - are shown below. These career paths are classified as either promotional or lateral steps.

One important point to keep in mind when discussing possible career paths for MIS employees on any level is that there is always the option of moving into a functional user's organization either in a staff position on as part of management. Experience in a functional user's organization helps an MIS employee to gain the valuable perspective of perceiving information systems as well as non-information systems problems from an entirely different viewpoint.

Figure 4, on the next three pages, shows the possible career paths for each employee within MIS.

	MOVEMENT FROM:	MOVEMENT TO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
1	Director of MIS	----------B-
2	MIS Sect./Dept. Mgr.	P LL----------B-
3	User Liaison	PL L----------B-
4	Long-Range Planner	PLL ----------B-
5	Cfgn Mgt Tech Spc	-PPP LL-L-L--L--L--L----------PL
6	Spvr. of Comp. Opns.	-P--L L-L-L--L-----L----------L----------PL
7	Sr. Data Comm. Anal.	PPPPLL -L-L--L--L--L----------PL
8	Data Comm. Analyst	----PPP PLPL-PL-PL-PL----------B
9	Sr. Tech. Ctl. Spc.	PPPPLLL- -L--L--L--L----------PL
10	Tech. Control Spc.	----PPPLP PL-PL-PL-PL----------B
11	Sr. Sys. Programmer	PPPPLLL-L- --L--L--L--L--L---L---L-----L----------PL
12	Systems Programmer	----PPPLPLP -PL-PL-PL-PL-PL--PL--PL----PLL----------B
13	Sys. Programmer Trn.	-------P-P-P -PL-PL-PL-PL-P---P---P-----PP----------B
14	Sr. Computer Scient.	PPPPLLL-L-L-- --L--L--L----L-L-L-L-L-L-L----------PL
15	Computer Scientist	----PPPLPLPL-P -PL-PL-PL---PLPLPLPLPLPLPLL----------B
16	Computer Scien. Trn.	-------P-P-PL-P -PL-PL-PL---P-P-P-P-P-P-PPL----------B
17	Sr. Microcomp. Spc.	PPPPL-L-L-L--L-- --L--L------L---L----------PL
18	Microcomputer Spc.	----P-PLPLPL-PL-P -PL-PL-----PL--PL------L----------B
19	Microcomp. Spc. Trn.	-------P-P-PL-PL-P -PL-PL-----P---P------PL----------B
20	Sr. Systems Analyst	PPPPLLL-L-L--L--L-- --L--L-L-L-L-L-L-L-L----------PL
21	Systems Analyst	----PPPLPLPL-PL-PL-P -PL-PLPLPLPLPLPLPLL----------B
22	Appr. Syst. Analyst	-------P-P-PL-PL-PL-P -PL-P-P-P-P-P-P-P-PPLL----------B
23	Sr. Appl. Programmer	-PPP------L--L--L--L-- --L-L-L-L-L-L-L-L----------PL
24	Appl. Programmer	----------PL-PL-PL-PL-P -PLPLPLPLPLPLPLPLL----------B
25	App. Programmer Trn.	----------PL-PL-PL-PL-P -P-P-P-P-P-P-P-PPL----------B
26	Sr. Comp. Secur. Spc	-PPP------L--------L--L-- -L-L-L-L-L---L----------PL
27	Comp. Security Spc.	----------PL-------PL-PL-P PLPLPLPLPL--PL----------B
28	Sr. Data Base Admin.	-PPP---------L-----L--L--L- -L-L-L-L---L----------PL
29	Data Base Admin.	----------PL----PL-PL-PLP PLPLPLPL--PL----------B

Figure 4a - Career Path Possibilities for MIS Employees in Medium/Large Companies

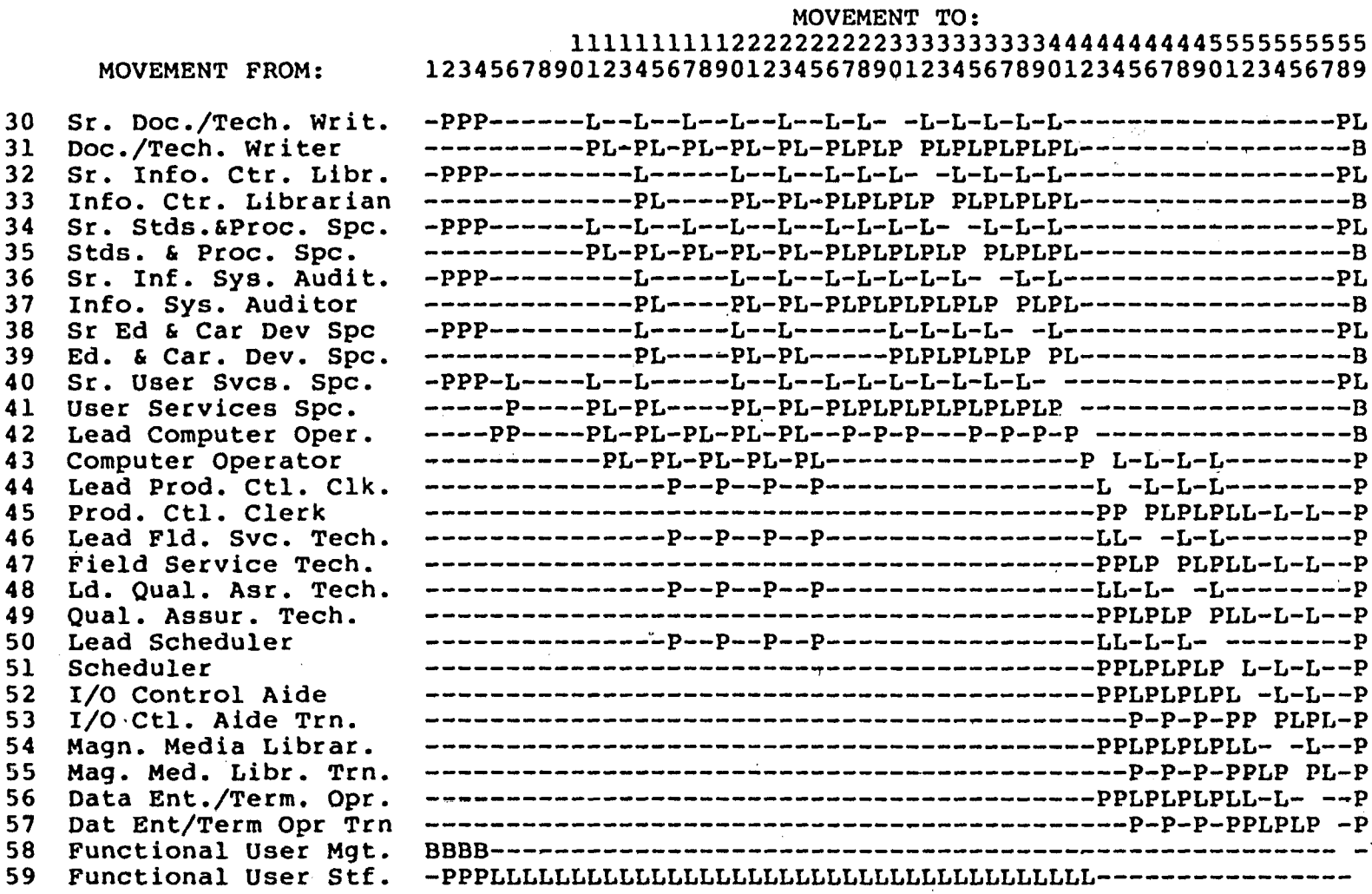

Figure 4b - Career Path Possibilities for MIS Employees in Medium/Large Companies

Legend for Figure 4:

Movement From: - The employee's current position, from which career path movements are to be made.

Movement To: - All of the position possibilities that exist within MIS to which movements can be made.

P - Promotional movement possible

L - Lateral position movement possible

B - Both promotional and lateral movement possible, depending on specific position being considered.

4.4. Career Path Possibilities in Small-Sized Installations

Identification of MIS Job Positions

In some ways, a small MIS organization is merely a microcosm of a medium or large installation. Occasionally, the same jobs are performed by considerably fewer individuals. In these instances, often the amount of work required for a task that in a large installation would be a separate job classification, is less than a full-time job in a small installation. Many, if not most, small installations also have little or no engineering applications for MIS to manage. In such a case, the same group of applications programmers often are responsible for both business and engineering applications.

In general, job functions in small installations are either identical to its counterpart in a large installation, or is a composite of two or more job functions found in large installations. Three frequent examples of this are described below:

1.) Senior Systems Analyst/Programmer - Leads analysis and formulation of program design on major projects. Confers with users to formulate statement of objectives, designs solutions, and develops effective programs. (13,Crane)

2.) Systems Analyst/Programmer - Works with senior analyst/programmer on large projects or solo on small efforts to define MIS projects and develop applications. (13,Crane)

3.) Systems Analyst/Programmer Trainee - Learning to define problems, design solutions, and program. Works under direct supervision on one item at a time. (13,Crane)

For a particular small MIS organization, the best way to identify the job titles for which career paths movements are available is to review the list of job titles for large institutions and adapt them to the particular case. If a job describes a full-time position as is, this job description can be used directly. If a fill-time position is best described by a consolidation of two or more of the job

descriptions for a large MIS organization, then both the job descriptions and the possible career path movements should be consolidated accordingly. If a job is not performed within MIS but is performed within the functional user community, these jobs can be included with a note that the jobs are outside of MIS. If a job is not performed either within MIS or the user community, this job description is then discarded.

Possible Career Paths For Each Job Function

As mentioned previously, in small installations job functions are more general in nature and fewer in number. This results in a smaller number of options available in transferring jobs. The best way to chart possible career paths is to use the condensed group of job descriptions obtained via the method described in the paragraph above. Condensing the career paths from the list for large organizations in the previous section can be done in one of two ways.

The first method is to directly combine those career paths associated with the condensed job title listing in the same manner as was done to develop the listing initially.

This simplifies the career path advancement planning process by focusing only on distinct jobs within a small MIS organization.

The second method is to leave the list of possible career paths for large installations intact, except for eliminating those possibilities which are non-existant within both the MIS organization and the user community. While this provides more detail than is necessary to guide changes in job position within a small installation, it focuses in on specific functions which may be only part of a person's tour of duty, or performed full-time by only part of the people assigned to a particular job position.

CHAPTER 5 -
OTHER ASPECTS OF EDUCATION AND CAREER ADVANCEMENT WITHIN MIS

5.1. Introduction

This thesis has discussed issues involved with the formulation and establishment of an effective education and career advancement plan for MIS organizations, including the determination of such a program and alternatives available to traditional career paths in MIS. This chapter will deal with a few issues which are also involved in the implementation of an education and career advancement methodology.

Included in this chapter will be a discussion of the various aspects of cost/benefit analysis for this plan both for MIS and the owning organization, long-range planning considerations regarding an education and career advancement methodology, and data requirements for such a plan.

5.2. Cost/Benefit Analysis (Within and Outside MIS)

As mentioned previously in this thesis, one of the difficult aspects of implementing a plan such as an education and career advancement methodology is the need to justify the expense of the plan on an economic basis. This is because the costs associated with implementing and maintaining the plan are often easily estimated, while the benefits to be achieved are usually difficult to measure and don't occur in the short range results. Many organizations take the position that in order for the expense of such a program to be justifiable, the program has to produce an economic, or cost/benefit, analysis which clearly shows that an advantageous financial situation will result from the program.

It is important, first of all, to emphasize the fact that, for all the inherent difficulties associated with measuring the benefits that may be derived from an education and career advancement methodology, the savings that occur are nonetheless very real. They manifest themselves in cost avoidance for the MIS organization.

For those organizations that do require a solid

economic justification for such a plan, certain costs and monetary benefits can be identified as being associated with the plan. These costs and savings are discussed in the sections below.

1.) Identification of Costs Associated with Implementing an Education and Career Advancement Methodology

Costs are a measure of anticipated additional expenses to be incurred while implementing the system. Estimates of the time and money that would be involved can usually be made fairly readily based on a knowledge of the MIS organization's particular situation. Some of the areas in which costs can be identified are discussed below:

A.) Personnel time associated with the initial investigation of education and/or career advancement plans that may be used elsewhere or discussed in references such as this thesis;

B.) Time associated with the economic analysis itself;

C.) Printing costs of forms to be used in the evalua-

tion and establishment of career paths for the MIS employees: this includes the supervisor's evaluation forms as well as those of the employee;

D.) Costs of instruction of MIS employees regarding the purpose of the education and career advancement, as well as in the methods and procedures to be followed;

E.) Time associated with supervisor participation in the evaluation of employees reporting to the supervisor;

F.) Time associated with each employee's completing the self-evaluation and participation in development of career path plans;

G.) Secretarial/clerical time required to type and file the documentation for the education and career advancement plan.

H.) Management time associated with being introduced to and informed of the education and career advancement plan;

I.) Employee and supervisor time associated with periodic review of progress and continuing validity of the career path goals of the employee;

J.) The anticipated costs of upgrading the MIS organization's education program, including the cost of:

i.) Increased time away from job in educational classes, seminars, and conferences;

ii.) Time and materials necessary for developing additional in-house courses or seminars;

iii.) Increased expenses due to an increased use of tuition refund programs for attending college and other institutions of higher learning;

iv.) Travel and living expenses associated with attendance of these courses, seminars, and conferences;

v.) Cost of educating management personnel of what is available on the outside for education of MIS people, the viability of such offerings and the

appropriateness of these offerings;

K.) The cost of increasing compensation to MIS workers, if necessary, to provide financial incentive to remain with the MIS organization;

L.) Any costs that may arise as a result of sharing the MIS organization's experiences with the education and career advancement programs to other MIS organizations or owning organizations.

These areas identified above are a list of items that can be isolated and estimated specifically as it relates to the education and career advancement program. It should be recognized that the costs are relevant to certain periods of time and should be divided into one-time costs and on-going costs. Further, on-going costs usually start at a particular point in the implementation process, and should be time-framed as appropriate.

Estimation of these costs should be as close to anticipated reality as can be achieved. Dangers exist both in purposely underestimating or overestimating the costs. If the costs are underestimated in order to cost-justify the

program, then the likelyhood of being chastised for cost overruns is high, thus lending to decreased confidence and trust in the program as a whole. If costs are overstated, on the other hand, it will be more difficult to produce a favorable economic analysis for the program.

2.) Identification of Benefits Associated with Implementing an Education and Career Advancement Methodology

As mentioned above, estimation of the value of anticipated benefits to be achieved by implementation of an education and career advancement methodology is much more difficult than estimation of anticipated costs. This is primarily due to three factors:

A.) Uncertainty in the degree of success to be achieved in implementing the plan;

B.) Uncertainty of the degree to which certain costs will be reduced even with successful implementation, and;

C.) Uncertainty as to the approximate time-frame in which savings are anticipated to begin.

One method of handling the risk associated with uncertainty of successful and complete implementation is to presume that, if the MIS or owning organization is to approve the pursuit of such a program, it will do so with the full intent of successful implementation of the program. While it is understood that this ultimately may not be the case, to base an analysis of benefits on an incomplete implementation shows a lack of confidence in the organization's management to properly implement the project. This lack of confidence could doom the project regardless of the economics of the project. Thus, the suggestion that this assumption be made in measuring the potential savings, as well as recognition of the assumption, seems reasonable.

The other two areas of uncertainty associated with estimating anticipated savings from implementing an education and career advancement program cannot be reduced by a similar assumption as was made above. In these cases, perhaps estimates can be made on the basis of the experience of other MIS organizations or other professional employee departments who have implemented a similar program. Often, however, such data will not be available and best-guess estimates may have to be made. This is certainly risky if the owning organization is applying pressure to achieve

savings that are estimated for this program. It would be advisable to emphasize that the estimated do possess a recognized degree of possible error, so that management will not be ignorant of the risks.

Identification of areas in which benefits can be gleaned and savings realized are discussed below:

A.) Reduced turnover in personnel in MIS personnel, in terms of personnel leaving the owning organization, resulting in the following savings;

i.) Reduction in recruiting and hiring costs;

ii.) Reduction in lost time costs on projects due to reduction in number of employees leaving the owning organization;

iii.) Reduction in training and orientation costs associated with hiring new employees for MIS;

iv.) Reduction in lost opportunity costs due to losing people trained for certain aspects of technical knowledge without sufficient backup;

v.) Reduction in loss of proprietary information to other competitive organizations:

vi.) Reduction in loss of technical documentation resulting from an employee's departure;

B.) Increase in employee productivity and satisfaction, leading to;

i.) Improved meeting of project milestone deadlines;

ii.) More concentration given to work performed, and therefore, improved quality of work;

iii.) Better attitudes on the part of MIS employees, which can manifest itself in improved relations both within and outside the MIS organization, and hence, less time and expense required in promotion of projects and ideas;

iv.) Better relations within the computer professional community, and thus, less cost of

recruiting the right individual when required;

C.) Increased capability of meeting future MIS management needs with current personnel;

D.) Improved knowledge of MIS functions and operations from the user community due to the increase in transfers from/to MIS to/from user organizations, resulting in improved user cooperation in design and development phases of MIS projects;

E.) Improved capability of backup for MIS personnel in both development and operations due to better knowledge of other job functions by MIS employees.

As with costs, savings estimates should accurately reflect, as much as possible, known and anticipated conditions affecting savings calculations. These estimates of savings should also be divided into one-time and on-going amounts, and a time-frame assigned to the beginning point of anticipated on-going savings figures.

Once costs and savings have been identified, estimated, and given appropriate time-frames, an economic analysis of

the potential tangible benefits can be concluded. The MIS organization should use whatever method of economic evaluation is prevalent for its organization or, in lieu of that, for its owner organization. Three methods of evaluation which are popular among organizations are Return on Investment (ROI), Discounted Cash Flow (DCF), and Net Present Value (NPV).

5.3. Long-Range Planning Considerations

Long-range planning is becoming increasingly important to MIS managers. This situation results from trends in the increasing size and budgets of MIS departments and the increase in importance of MIS to owning organizations. Unfortunately, some MIS organizations still do not have any sort of long-range planning mechanisms.

Long-range planning primarily consists of forecasting the resource needs and budgets of the MIS organization for a planning period as defined by the owning organization. This planning period is usually 5-15 years. If an MIS organization is going to implement an education and career advancement program, this program should be integrated with long-

range planning in two ways.

First, the long-range plan must make provision for budgeting time and money for the operation of the education and career advancement methodology. The long-range plan must contain sufficient allowance for extra educational expense and time allowances, time and money for evaluations of employees' situations, money for increased employee salaries to prevent upgrading of skills causing employees leaving the owning organization for better jobs elsewhere, etc. The long-range plan must also take into account the career path plans of the employees as well as the time frame of availability of the employees for job openings.

The other factor that should be considered in integrating the education and career advancement methodology with the long-range plan is the inclusion of different long-range project requirement considerations in the career planning of MIS employees. The employees themselves have to be made aware of what openings are being planned for future personnel requirements so that they are able to take that into account in their planning.

5.4. Data Requirements for an MIS Education and Career Advancement Methodology

In a system of documentation that needs to be maintained for a program such as an education and career advancement methodology, certain data needs to be kept. How many data fields should be maintained for each employee, and what type of filing or handling scheme used for the data to be kept, is an option of the particular MIS organization utilizing the education and career advancement program.

This section will attempt to identify some of the data fields that may need to be kept for the program itself, as well as to integrate the program with other MIS personnel data requirements. Whether this data is kept on a computer or in manual form should be dictated largely by the amount of data to be kept and the degree of convenience available for storage of such kinds of data on a computer data base.

Below is a list of general categories under which the data can be classified:

1.) Training or Education Matrix
2.) Skills Matrix

3.) MIS Employees

4.) Personnel/Skills Requirements for (Current) Projects

5.) Educational Courses/Seminars

6.) Course/Seminar Evaluations

7.) Costs of Education

8.) Career Path Possibilities

9.) Personnel Evaluation/Feedback

10.) Long-Term Planning

The relationships between these categories are illustrated in Figure 5 on the next page. An explanation is provided on the pages following Figure 5 concerning the data being grouped under each of the categories, as well as a listing of the various data fields under each category.

Data Requirements Categories

EDUCATION:	1. Training or Education Matrix	5. Educational Courses/Seminars
	6. Course/Seminar Evaluations	7. Costs of Education
EMPLOYEES:	3. MIS Employees	9. Personnel Evaluation/Feedback
PROJECTS:	4. Personnel/Skills Requirements for (Current) Projects	10. Long-Term Planning
POSITIONS:	2. Skills Matrix	8. Career Path Possibilities

Figure 5.

1.) Training or Education Matrix - This defines the different areas of education or training that are desirable and/or available for MIS personnel.

A.) Area/Category Title and Description

B.) Education Level Prerequisite(s)

C.) Experience Level Prerequisite(s)

D.) Type(s) of Jobs Availed by Students of the Category

E.) Skill(s) Acquired From Education in Category

2.) Skills Matrix - This classification defines details concerning all of the job categories in which MIS personnel can be employed, both at present and in the future, and the skills required to perform the work specified for each job category.

A.) Occupation (Job) Title

B.) Occupation Description

C.) Occupation Code(s) (if applicable)

D.) Occupation Level(s)

E.) Salary Curve

F.) Job Specifications

3.) MIS Employees - This details all pertinent information concerning the employees assigned, and to be assigned, to

Management Information Systems.

A.) Employee's Name - Last, First, and Middle (Maiden)

B.) Employee's Social Security Number

C.) Employee's Date of Birth

D.) Employee's Service (Employment) Starting Date

E.) Employee's Current Position:

i.) Occupation Title

ii.) Occupation Level

iii.) Salary

iv.) Current Rating

F.) Previous Position(s) With Company:

i.) Occupation Title

ii.) Occupation Level

iii.) Starting Date

iv.) Ending Date

v.) Final Rating:

G.) Previous Education:

i.) Highest Level Attained (Degree, Diploma, etc.)

ii.) Educational Area/Category

iii.) School Name and Address

H.) Skill Levels Achieved

I.) Courses and Seminars Attended (Non-college)

J.) Promotion (or Movement) Aspirations, Including Suggested Paths and Time Frames

4.) Personnel/Skills Requirements for (Current) Projects

A.) Project Description

B.) Project Phase (e.g., Development, Implementation, Maintenance, etc.)

C.) Expected Duration of this Phase

D.) Manpower Requirements - This Phase

i.) Occupation Title

ii.) Occupation Level

iii.) Manpower/Timeframe Matrix

5.) Educational Courses/Seminars:

A.) Course/Seminar Title

B.) Course/Seminar Description

C.) Course/Seminar Prerequisites

D.) Occupation Level Target(s)

E.) Course/Seminar Conducted By (Company/Instructor)

F.) Schedule of Future Courses/Seminars

G.) Location

H.) Anticipated Costs (per Course/Seminar)

6.) Course/Seminar Evaluations

A.) Course or Seminar Being Critiqued

i.) Title

ii.) Start Date

iii.) Completion Date

iv.) Location

v.) Instructor

vi.) MIS Employee Who Attended Course and Made Evaluation

B.) Course/Seminar Evaluation

i.) Strengths of Course (Comments)

ii.) Weaknesses of Course (Comments)

iii.) Suggested Disposition of Course

7.) Costs of Education -

A.) MIS Employee Time:

i.) Salary Costs

ii.) Overhead Costs of Attendance Time

B.) Registration/Tuition Charges

C.) Lab Fees

D.) Transportation Costs (To/From)

E.) Local Transportation Costs

F.) Consultant Costs (If Bringing Instructor In-House)

G.) Total Cost of Course Attendance

8.) Career Path Possibilities - This category describes all of the normal possibilities for promotion or transfer from a

particular "base" occupation position and level.

A.) Base Position Occupation Title

B.) Base Position Occupation Level

C.) Base Position Occupation Description

D.) Education Prerequisites for Base Position

E.) Experience Prerequisites for Base Position

F.) Salary Range:

G.) Amount of Experience in Base Position Required for Promotion

H.) Promotion Position Possibilities

I.) Lateral Position Possibilities

9.) Personnel Evaluation/Feedback - This category contains the pertinent information concerning performance reviews of MIS employees, as well as any feedback generated from discussion of the employee ratings in the review sessions.

A.) MIS Employee - Name

B.) MIS Employee - Current Occupation Title

C.) MIS Employee - Current Occupation Level

D.) Evaluation Criteria - Current Position - There should be a minimum of 4 and a maximum of 12 per employee.

E.) Evaluation Results - Current Position There should be one record for each evaluation conducted for em-

ployee's current position.

i.) Supervisor (Rater) - Name

ii.) Supervisor (Rater) - Occupation Title

iii.) Supervisor (Rater) - Occupation Level

iv.) Employee's Own Evaluation

v.) Supervisor's Evaluation of Employee

vi.) Comments/Feedback From Evaluation Review (Statement)

F.) Personnel Evaluation/Feedback Information for Prior Evaluations

10.) Long-Term Planning - The following information should be kept for the approved MIS Long-Range Plan, as well as for any alternative LRP's under consideration.

A.) Yearly (or Quarterly) Forecasts:

i.) Personnel Requirements for Projects:

a.) Occupation Title

b.) Occupation Level

c.) Number Required for Projects Per Period

d.) Project Requirement Period Start Date

e.) Project Requirement Period End Date

f.) Percent Personnel Availability for Period

ii.) Personnel Costs:

a.) Salary Costs

b.) Overhead (Benefit) Costs

c.) Recruiting/Interviewing Costs

d.) Training and Education Costs

iii.) Network Requirements:

a.) Description

b.) Action to be Taken (i.e., Purchase, Lease, Modify, Move, Rearrange, Dispose, etc.)

c.) Associated Cost

iv.) Hardware Requirements:

a.) Description

b.) Action to be Taken (i.e., Purchase, Lease, Modify, Move, Rearrange, Dispose, etc.)

c.) Associated Cost

v.) Software Requirements:

a.) Description

b.) Action to be Taken (i.e., Purchase, Lease, Produce Own, Modify, Move, Rearrange, Dispose, etc.)

c.) Associated Cost

vi.) Training Personnel Requirements:

a.) Description

b.) Action to be Taken

c.) Associated Cost

vii.) Operations Personnel Requirements:

a.) Description

b.) Action to be Taken

c.) Associated Cost

viii.) MIS Long-Range Planning Personnel Requirements:

a.) Description

b.) Action to be Taken

c.) Associated Cost

ix.) Other Support Personnel Requirements:

a.) Description

b.) Action to be Taken

c.) Associated Cost

x.) Tangible Benefits of Projects

a.) Anticipated Material Savings

b.) Anticipated Direct Labor Savings

c.) Anticipated Indirect Labor Savings

d.) Anticipated Overhead Savings

e.) Anticipated Return on Investment

xi.) Intangible Benefits of Projects - Description

xii.) Management Priority of Projects

B.) Total Yearly (Quarterly) Costs of MIS

C.) Total Yearly (Quarterly) Tangible Savings of MIS

D.) Total Yearly (Quarterly) Personnel Requirements of MIS

CHAPTER 6 -

CONCLUSIONS AND RECOMMENDATIONS

This thesis has concentrated on the ingredients required for an education and career advancement plan for MIS. It has covered areas such as problems facing an MIS organization in implementing the plan, how to determine career advancement goals for each employee, what kind of alternatives may be reasonably selected for career paths of employees, and other related issues that must be addressed in establishing a plan.

The plan described in this thesis is presented in such a manner as to provide a good framework for the formation of a program within MIS organizations, both privately and publically owned. While detailing of specific forms and procedures may need refinement to conform to the practices of MIS groups, as well as to provide a workable structure for the implemented plan, the framework described herein permits sufficient flexibility to account for variations that exist from installation to installation in the MIS in-

dustry.

It is recommended that Information Systems groups implement this education and career advancement program as described in this treatise. Formation of this plan should produce improvements in the morale of the employees involved, increase the organization's ability to meet future employment needs with present employees, improve the productivity and skills level of the employees on their present jobs, and improve the organization's ability to retain MIS personnel longer, thus reducing employee turnover costs.

It is also recommended that, as experience is gained in the use of the program, this experience should be documented and utilized to make refinements to and improvements in the program. The value of an education and career advancement system is enhanced as the plan is more streamlined toward meeting its goals and objectives effectively.

Further research should be conducted regarding the development of more complete and tested procedures that should be followed in the operation of this plan. Other areas in which further research and development is recommended include integrating the plan with personnel recruit-

ment and procurement programs, the relative sensitivity of the factors involved in such a plan to the success of the plan, identification of costs and benefits produced by such a plan, the relative success of employees following differing career paths including the cause/effect relationships, the effectiveness of including information from the plan in the MIS long-range plan; and the computerizing of the information produced by the plan and integration of this information with other personnel and education information systems.

BIBLIOGRAPHY

1.) Abbey, Duane C., "Systems Analyst Training: Filling the Gap and What to Do Next", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 44-54, New York: Association for Computing Machinery, 1976.

2.) Addleman, Edrice, "There's No Such Thing as a Systems Analyst", Ibid, pp. 36-43.

3.) Athey, Thomas H., "Training the Systems Analyst to Solve Complex Real World Problems", Ibid, pp. 103-120.

4.) Balling, Jeffrey D., "A Little Bit of Knowledge for Those Who Byte The Bullet", PROCEEDINGS OF THE 15TH ANNUAL CONVENTION OF THE ASSOCIATION FOR EDUCATIONAL DATA SYSTEMS, APRIL 25-29, 1977, FORT WORTH, TEXAS, pp. 152-155, Washington: Association For Educational Data Systems, 1978.

5.) Beaudoin, Pierre and Lin Gringas, "Laval's Response to the Need for Specialists in the Computer/Manager Interface", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 158-166, New York: Association for Computing Machinery, 1976.

6.) Beidler, John, "Teaching Project Management", PROCEEDINGS OF THE SIXTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE, AUGUST 16-17, 1979, pp. 20-24, New York: Association for Computing Machinery, 1979.

7.) Bray, Olive, and Michael Prietula, "The Concepts of Skills Management", Ibid, pp. 44-63.

8.) Bryant, J. Howard, and David A. Ameen, "Use of Personal History, Activities, Ability and Attitude Questionairre to Predict Success as a Systems Analyst", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 133-143, New York: Association for Computing Machinery, 1976.

9.) Bryant, J. Howard, and Gene Ferguson, "Systems Analyst Activities and Skills Requirements", Ibid, pp. 79-93.

10.) Carswell, Ronald V., "There Are No Blackboards", PROCEEDINGS OF THE 17TH ANNUAL CONVENTION OF THE ASSOCIATION FOR EDUCATIONAL DATA SYSTEMS, MAY 14-18, 1979, DETROIT, MICHIGAN, pp. 228-231, Washington: Association for Educational Data Systems, 1979.

11.) Chapman, Lynn, "Grow Your Own Programmers", DATA MANAGEMENT, Vol. 18, No. 8, pp.14-16, August, 1980.

12.) Chvalvosky, Vaclav, "New Techniques for COBOL Programmers", SOFTWARE - PRACTICE AND EXPERIENCE, Vol. 9, No. 2, pp.87-95, February, 1979.

13.) Crane, Janet, "Job Description Guide", DATAMATION, pp. 102-103, May, 1981.

14.) Dance, Dennis L., "Is Anyone Here a Systems Analyst?",

PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 29-35, New York: Association for Computing Machinery, 1976.

15.) Diaz, Gregorio, "The Analyst's Game", Ibid, pp. 20-29.

16.) French, Jack, "Learn Company Tactics!", COMPUTERWORLD, In Depth-p. 1-8, February 8, 1982.

17.) Fried, Louis, "EDP Manager's Lib", MANAGING DATA PROCESSING, pp. 294-296, Alexandria, VA: College Readings, Inc., 1976.

18.) Gatto, Marianne, "In-House Training v. 'The Miracle'", DATA MANAGEMENT, Vol. 16, No. 10, p. 40, October, 1978.

19.) Gingras, Lin, "Psychological Self-Image of the Systems Analyst", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 121-132, New York: Association for Computing Machinery, 1976.

20.) Gorgone, John T., "Systems Analyst's Educational Needs", Ibid, pp. 144-157.

21.) Hansen, Owen, "Training of Business Systems Analysts", COMPUTER WEEKLY, Vol. 25, No. 631, p. 22, December 14, 1978.

22.) Harold, Fred G., "Role of the Business College in the Education and Training of Computer Systems Analysts for Public Sector Jobs", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - New York: Association for Computing Machinery, 1976.

23.) Harrington, Brian, "Organising Your Staff in Line with Technology", DATA PROCESSING, Vol. 19, No. 21-27, June, 1977.

24.) Hebert, John P., "Employee Development More Than Career Pathing", MANAGING DATA PROCESSING, pp. 330, Alexandria, VA: College Readings, Inc., 1976.

25.) Hendershot, Patricia, and W. M. Wildberger, "Use and Cost-Effectiveness of Packaged TV Cassette Courses

for Training Analysts", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 55-62, New York: Association for Computing Machinery, 1976.

26.) Ho, Thomas I. M., "Systems Analysis Perspectives", Ibid, pp. 12-19.

27.) Hooper, Richard W., Jr., "Managing the DP Knowledge Worker", MANAGING DATA PROCESSING, pp. 308-312, Alexandria, VA: College Readings, Inc., 1976.

28.) Joslin, Edward O., "Career Management: How to Make it Work",Ibid, pp. 323-328.

29.) Kerr, Edwin F., "Let's Look at Peopleware Maintenance", Ibid, pp. 320-322.

30.) Leavitt, Don, "DPers Urged to Advance Careers on Own Initiative", Ibid, p. 329.

31.) Long, Larry E., "Chapter 10: Training and Career Development", DATA PROCESSING DOCUMENTATION AND PROCEDURES MANUAL, pp. 245-256, First Edition,

Reston Publishing Co., Inc., 1978.

32.) Long, Larry E., Personal Interview, Bethlehem, PA:December 8, 1981.

33.) McManama, James, Ray Demarest, Israel Feldman, Vincent Guidace, David Skeeb, Stephen Stofko, and Carol Vaughn, FEDERAL DATA PROCESSING REORGANIZATION STUDY PERSONNEL TEAM REPORT, Washington: U. S. Office of Management and Budget, September 1, 1978.

34.) Morrison, Ralph J., "Needed: Business-Oriented Systems Analysts", MANAGING DATA PROCESSING, pp. 297-298, Alexandria, VA: College Readings, Inc., 1976.

35.) Nance, Richard E., and Walter P. Warner, ANTICIPATING THE SOFTWARE ENGINEER: THE ACADEMIC PREPARATION, Dahlgren, VA: Naval Surface Weapons Center, May, 1980.

36.) Nestman, Chadwick H., "Management of Productivity in Information Systems Oranizations", Presentation at the 1ST INTERNATIONAL & 4TH NATIONAL CONFERENCE ON

COMPUTERS AND INDUSTRIAL ENGINEERING, Orlando, FL, March 10-12, 1982.

37.) Nolan, Richard L., "Business Needs A New Breed of EDP Manager", MANAGING DATA PROCESSING, pp. 283-293, Alexandria, VA: College Readings, Inc., 1976.

38.) Oyer, Paul D., "Perspectives of the Systems Analyst: Identity, Function, Skills, and Future", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 198-205, New York: Association for Computing Machinery, 1976.

39.) Raab, B. H., "Systems Analysts Training in Israel", POST-SECONDARY AND VOCATIONAL EDUCATION IN DATA PROCESSING, Amsterdam: New York: North-Holland Publishing Co., 1979.

40.) Ryan, Kevin T., "Accelerated Program Training in a Developing Country", PROCEEDINGS OF THE SIXTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE, AUGUST 16-17, 1979, pp. 25-33, New York: Association for Computing Machinery, 1979.

41.) Sayani, Hasan H., "Changing Role of the Systems Analyst", PROCEEDINGS OF THE FOURTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE - JULY 29-30, 1976, pp. 1-11, New York: Association for Computing Machinery, 1976.

42.) Shultz, Brad, "No Natural Pathway Seen to MIS Chiefdom", COMPUTERWORLD, p. 10, December 7, 1981.

43.) Smith, Dr. Harry R., "Role Playing in Systems Analyst Training", JOURNAL OF SYSTEMS MANAGEMENT, Vol. 28, No. 12, pp. 16-21, December, 1977.

44.) Stone, Jack L., and Alexander P. Grant, "Seeing Human Problems Part of DP Management", MANAGING DATA PROCESSING, pp. 331-332, Alexandria, VA: College Readings, Inc., 1976.

45.) Taylor, Robert P., and James Fisher, "The Relative Importance of Sources of Information for Keeping Programmers Up-to-date", PROCEEDINGS OF THE SIXTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE, AUGUST 16-17, 1979, pp. 34-43, New York:

Association for Computing Machinery, 1979.

46.) Thornton, Chris, "Developing Your Staff", COMPUTER MANAGEMENT, pp. 11, 13, May, 1978.

47.) U. S. Air Force Occupational Training Center, OCCUPATIONAL SURVEY REPORT, VOLUME III. PROGRAMMING SPECIALITY. AFS 511X1, Randolph Air Force Base, TX, May, 1980.

48.) Utley, Edward H., "Entry Level Positions in Data Processing", MANAGING DATA PROCESSING, pp. 299-302, Alexandria, VA: College Readings, Inc., 1976.

49.) Venkataraman, Usha, THE DESIGN AND DEVELOPMENT OF A DATA PROCESSING TRAINING INFORMATION DATABASE, Bethlehem, PA: Lehigh University, 1980.

50.) Woodruff, Charles K., "Consideration of Selected Personality-Job Satisfaction Constructs Relevant to Project Management in Data Processing Organizations", PROCEEDINGS OF THE SIXTEENTH ANNUAL COMPUTER PERSONNEL RESEARCH CONFERENCE, AUGUST 16-17,

1979, pp. 13-19, New York: Association for Computing Machinery, 1979.

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