# ADMINISTRATIVE AUTOMATION IN A SCIENTIFIC ENVIRONMENT

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One need only examine NASA's accomplishments haver its brief 25-year history to be assured that the talen and capability exist to accomplish virtually any technological goal it might pursue. NASA/Goddard Space Flight Center (GSFC) with its many experts, renowned scientists, and some of the most sophisticated computers in the world, played a major part in these accomplishments. One would think that a scientific environment then must be the ideal place to carry out administrative duties too.

In 1981, after having worked on the administrative side of the house for many years, the big opportunity arose to automate a scientific directorate in the management management of its resources, manpower, travel, Research Technology Objectives and Plans (RTOPs), physical space, etc. Again, one would think that a scientific directorate would not only be receptive to using automation for administrative functions, but would insist on it. Surprisingly, although the scientific personnel were advanced in the development and use of hardware and software for scientific applications, resistance to the use of automation or purchase of terminals, software and services, specifically for administrative functions was widespread. There was skepticism that automation would lead to more information gathering, more paper, extra work, loss of control, and ultimately less productivity. The perception was that the Center had a Management Systems Office that was responsible for the Center administrative databases that would meet most requirements. Although there were numerous complaints about timeliness of reports, inability to interact with the system and admittedly, using manual calculations from several reports in order to provide analysis was an archaic process for these times; there were generally negative reactions toward efforts to improve the situation. The following saying by Nicolo Machiavelli really seemed appropriate.

> "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things, because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new."

What does an administrative manager do when faced with this situation, a shortage of personnel to proceed, and ever-increasing internal management, Center and Headquarters requirements for information? A clue from one of the more understanding scientists made sense, "you've got to show them it will work, and demonstrate mprovements, before you'll get scientific management support." This paper will highlight our approach to automating in this environment, some problems/constraints, acceptance and future plans in this area.

## APPROACH/PROBLEMS AND CONSTRAINTS

Realizing that automation would have to occur without full management commitment and using existing equipment and personnel where possible, we first tackled the areas that were the most labor intensive or that received the most complaints. A detailed review of the previous method of providing information was conducted and the problems associated with each were highlighted. The IBM 4341 is the host for administrative computing at Goddard and terminals,

printers and modems of various types were available around the Center. The existing software was and still is the RAMIS II Data Base Management System. The IBM Time Sharing Option (TSO) utility was also available to allow more efficient use of RAMIS.

One of the most important factors in accomplishing a job is to acquire the appropriately skilled and motivated personnel. With this in mind, some people changes and additions occurred resulting in a team of three who were not experts in ADP, but who had the ability to learn and possessed the right attitude. Training was identified and provided and contacts with ADP experts on the Center were established.

Although it was difficult to obtain priority from the Center's Management Systems Office to have them automate our priorities, the assistance provided on specific technical questions was outstanding. In retrospect, although it took a long time and much patience, it was probably better because there now exists a base of knowledge from which to expand.

Another problem was trying to find time with the heavy workload to take training and learn to develop programs and systems. The perception from the scientific side was that the administrative staff had increased and results were not immediate. Managers need to be aware that automation does take more resources initially, but the benefits in the long run far outweigh this initial investment. Efforts utilizing existing data as much as possible, developing programs that provide more valuable and useful analyses, and prompter reporting, have shown some skeptical managers that automation can improve management. The administrative staff was provided training and support and improvements have been made on initial attempts. As with any system, the bugs had to be found through use before they could be addressed and problems solved.

An additional problem was data input. Improved software, full screen editors, increased training, contractor support and priority assistance from MSO have helped alleviate this problem. As user-friendly full screen data entry systems are developed, clerical staff will be able to provide support in this area.

The increased use of CRT terminals is a significant change in the office environment. Based on our experience, it has become clear that ergonomic concerns must be addressed. Proper lighting and furniture designed to provide support for the worker who will spend extended periods sitting at a video terminal are imperative. This is part of the initial investment but will result in increased productivity and a healthier and more motivated staff.

## ACCEPTANCE

Over the past several years, most of the administrative function areas that fell under my auspices have been automated, i.e., RTOPs, manpower, travel, reimbursable agreements, physical space, various inventories, etc. A clue from one scientist --- to show the scientific managers through better analysis, manipulation of data to suit their own desires, better and more timely information, elimination of paperwork, -- proved correct. Although it took time to gain acceptance, scientific management encouraged us to present a Center Workshop on the Administrative databases developed for the Applications

Directorate that had Center-wide application. The Workshop was held on March 16, 1983, with approximately 100 attendees from virtually every directorate at the Center. Each staff member presented the portions with which he had been most involved, highlighting where the requirement originated, the old method of obtaining the information, the new automated method and the benefits derived. The need for sharing information, equipment and talent where similar requirements exist was stressed and the response was almost overwhelming. From that workshop, Center needs were identified and the results were presented to our management who arranged for us to present our findings to the Deputy Director of the Center and other top management who were in a position to take action. In addition to sharing information and expertise, the training of personnel on the use of existing systems was a problem across the Center.

Several positive things happened from those presentations. A Center Administrative Information Processing Planning Committee (AIPPC) was established with a representative from each directorate, whose mission is: to provide a forum for directorate administrative users to keep abreast of current developments in office automation technologies and to exchange information on use of office automation in their areas; to identify specific areas within the Center where office automation application can lead to greater efficiencies and significant manpower and cost savings; to work toward implementation of automated techniques in these areas and to develop a set of recommendations for implementing technologies, including specific recommendation on hardware/software purchase and use.

A training sub-committee was established under the AIPPC whose primary responsibility was to identify specific training needs for the Center user community, to create an information exchange and to increase awareness of existing administrative programs and systems (hardware and software). Some achievements to date include publishing an ADP Assistance Directory for Business/Resources Applications which includes name of employee, extension, building and room number, type of equipment used, resource applications, and available software. These people volunteered to assist others and it included scientific as well as administrative personnel. The Committee also identified specific training needs and presented them to the training office which is resulting in additional funding for FY85. The AIPPC committee is on-going and is in the process of preparing a report on overall accomplishments to date.

In our own directorate, an Applications Advisory Group for Automation of Administrative Functions (AAGAAF) was formed in January 1983, with a representative from each division -- some scientists and some administrative personnel. The general goals of the group evolved as follows:

- To educate ourselves on current developments in office automation technologies, and to exchange information on their use.
- To identify specific areas within our area where automation of administrative functions can lead to greater efficiencies and significant manpower and cost savings, and to work towards the implementation of automated techniques in these areas.
- To develop a set of recommendations for implementing new technologies, including specific hardware and software purchases.

The group met approximately once a month and the first several meetings consisted of setting goals and gathering information, primarily by scheduling a series of speakers to report on developments in automation at Goddard Space Flight Center and NASA Headquarters. Subsequent meetings addressed specific problem areas where automated techniques would be useful.

1. A master list of problem areas was generated and individuals or groups are working on solutions.

2. An RTOP subcommittee was formed to investigate methods of reducing the effort spent on preparing the directorate response to the RTOP call. The goal was to have new procedures implemented in time for the FY85 RTOP cycle and the Full Screen Manager (FSM) capability is presently being used.

3. In order to overcome perceptions that clericals are not included in the decision making process, a clerical subcommittee was recommended to identify problems related to word processing, electronic mail and office equipment, and to provide guidance to the clerical staff. A major reorganization delayed establishment of this committee.

4. A contractor (General Software Corporation) was engaged to develop an inventory of directorate hardware and software and to make recommendations on the most cost effective way to automate and integrate our administrative systems (keeping in mind the Center and Agency plans). Initial thinking is that any system should include, at a minimum, integrated word processing, electronic mail and shared databases with local area networks as appropriate.

5. All members of the committee have implemented Telemail capabilities, and meeting announcements and minutes are now distributed by this method. We identified key personnel to use Telemail and arranged for training. Efforts in this area have led to the introduction of Telemail capability in the Directorate office. We are studying possible ways to implement electronic mail in many areas of intra-directorate communications.

The group has been on hold since January 1984, due to a major reorganization -- the merging of the two scientific directorates. This makes the need even greater to communicate through this forum and develop strategies for an overall direction for administrative automation and we anticipate starting up soon with additional members to represent the other directorate.

New management is already receptive and has added funds to include the second directorate in the Contractor's survey of equipment and software and an overall recommendation for a directorate strategy for administrative automation. Results will be presented this month.

## FUTURE DIRECTIONS ANTICIPATED IN ADMINISTRATIVE AUTOMATION IN THE NEW SCIENTIFIC ENVIRONMENT

Most future plans for administrative automation within the Space and Earth Sciences Directorate involve the use of personal computers and applications that will distribute the processing among these smaller, lower price processors. The introduction of microcomputers to administrative data processing has brought about several changes in the way work is carried out and the way information is accessed, manipulated, shared, and transferred.

The way microcomputers have become a part of the administrative office follows a logical progression. The first management applications are typically spreadsheet modeling and local database manipulation. This usually involves entering the data manually into a model or data base. This first step introduces the user to the computer, and the capabilities.

Manual data entry is not efficient use of an administrator's time. This is especially true when the data already resides in some form on a larger computer system. So, the initial use for manipulating data leads to the desire for access to the data stored in mainframe computer data bases.

The micro-mainframe link is the first integration of microcomputers into the larger data processing picture. This step is followed by two more logical and semi-independent changes. In the past, the mainframe systems provided a central location for data storage and access. Microcomputer users do not have a central location to store this data and if data is going to be on these small computers, a suitable method must be found to transfer it from place to place.

This is where networking fits into future plans. As more data is distributed among decentralized locations, the need to share and transfer the data will require that networks be integrated into the work place. This is true in both the scientific and the administrative communities. The types and placement of such networks will depend on the specific needs of different users and the technology available. Local Area Network technology is developing rapidly. Still, there are a number of questions not yet answered in this area.

One relative certainty is Ethernet. Ethernet will probably provide the link within small areas, and multiple Ethernet segments will be the links within single buildings. The links between Ethernet segments, linking buildings over longer distances, is not yet certain. This is the area where the largest number of changes are still to come. Much research and product development is occurring now to find the best way to tie Ethernet segments together over these longer distances.

The use of microcomputers and local area networks provide capabilities that will be utilized in a variety of ways. The ability to draft papers, letters, and memos on a scientific or managerial work station and transfer via network to a clerical workstation for editing, formatting and quality printing will be utilized. Electronic mail will also become a standard for communications. It will never completely replace written mail, but it will become an accepted means of inter office communications.

Another important area in which microcomputers are just beginning to assert their capabilites is as a method of distributing the processing loads. These small inexpensive processors will help take some of the processing load off mainframe systems. Several vendors have introduced mini-mainframe powered desktop systems. The IBM XT370 with RAMIS II software may at some point provide a low cost local system capable of mainframe processing and compatible with the IBM 4341 based RAMIS II.

The use of microcomputers for the FY85 manpower exercise is another example of

distributed processing. Using low cost off-the-shelf software, an application was developed to utilize IBM Personal Computers. The application was developed to allow users to work on their manpower spreadsheet on the microcomputer. The spreadsheets were then collected from the divisions on diskettes, and uploaded into RAMIS directly. The application broke down to approximately 80% PC based processing and 20% mainframe based. This reduced the load on the host system, and provided both host and local system users an increased response time. This method was used for the first time in our newly combined directorates which is comprised of 752 Civil Servants and approximately 800 Contractors. Although this method was new to all users, feedback to date has all been positive.

An important factor to recognize in planning for microcomputer integration in the workplace is training. These systems are a great deal easier to use than a mainframe system. The application software is developed with non-computer personnel in mind. This does not mean that we can simply put the machine on a users desk and walk away. Along with the commitment of funding to purchase the computer, we must recognize the commitment necessary to train the user and make this investment worthwhile.

There are a few factors to note in this particular commitment. The first is that the staff requires training in the use of micro systems. Also, they should have access to training materials, and experienced personnel to help them utilize the equipment. Another factor to recognize is that while these systems may cost only a few thousand dollars, they provide the capabilities of much more expensive systems. They will also be utilized on similar applications as the larger systems. For these reasons, we should be aware that application development is an important part of maximum utilization.

Systems analysts can be as important in utilizing microcomputer systems as they are in utilizing mainframe systems. A manager can spend a lot of valuable time learning to use a microcomputer, time that is better spent managing actual applications. The administrative staff should be developing applications to assist the manager, providing managers the data they require, or developing the capability to access this data without investing a great deal of time learning sophisticated, complicated software.

We have set up an Administrative Data Processing room in our local area. This room has two microcomputers, three computer data terminals, a small software library, and staff to assist users in learning how to use the computers and the software, and to help set up applications. The cost of providing this assistance to the users is more than made up for in the savings in start up time for the staff. It also encourages users to find applications, since they are aware assistance is available. It helps them get over the initial uncertainty and fear (computer phobia) that many people experience the first time they use microcomputers.

## SUMMARY

We've come a long way since 1981, but are really just beginning to scratch the surface. As automated systems improve, the layers of management between scientist and administrators will be reduced. Networking will create direct links between all levels of center personnel. Many improvements not forseen will come about as office systems develop.

Office automation will continue to change the way work is done for many years. Careful planning and commitment to integrating new systems with established methods will help facilitate these changes. The attitude that automation is done to improve a system, and not for the sake of automation is important. All levels of scientific and administrative staff will recognize improvements in a system and the success of each effort to automate will facilitate the next effort. Automation must be recognized as a process that occurs over time.

It will take full commitment from all levels of management for resources and funding, on-going training and continued group efforts, greater interaction with the scientific community and willingness to share resources and technology if we hope to come close to accomplishing major administrative achievements and productivity increases through automation that are taken for granted in the scientific and technical areas.

Finally, an assessment of administration automation in this scientific environment in 1984. We certainly have not obtained the "paperless office" as were the "buzz" words of 1980, and we're still striving for the "office of the future." However, the accomplishments during this period: reduction of paperwork and manual efforts; improved communications through telemail and committees; additional support staff; increased awareness at all levels on ergonomic concerns and the need for training; better equipment; improved ADP skills through experience; management commitment and an overall strategy for automating, gives us an excellent base to meet the upcoming challenges in managing resources in the largest directorate at Goddard.