INFORMATION SYSTEMS MANAGEMENT THROUGH OFFICE AUTOMATION :

AN ORGANIZATIONAL AND SOCIAL PERSPECTIVE

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ABSTRACT

A number of concurrent technological and organizational developments
in the office automation area offer an excellent opportunity to greatly
improve information systems management. This paper will attempt to show
how information systems control could be taken over by managers through
office automation. The emphasis is first on showing how office automa-
tion can contribute in designing manageable and controllable information
systems from offices. Next, some organizational implications are dis-
cussed including possible structural changes and roles of the involved
actors. Finally, a research design approach is outlined. It provides
a practical framework to tackle implementation issues taking into ac-
count some critical constraints generated by office automation systems,
notably from an organizational and social perspective.

INTRODUCTION

Attention has recently been focused on office automation systems with most experts agreeing that the "data" processing world and the "text" processing world will ultimately converge.[1,3,8,20]

Office automation systems resulting from this evolution have the potential to profoundly effect organizations in different domains at various levels.

Because of the technological and organizational implications that office automation systems have in such areas as communications, database access, distributed processing, etc., the design of information systems within many organizations is going to be greatly affected. Recent technological developments made with more emphasis on ultimate end users - non EDP specialists - indicate that corporate management and office support staff will be faced with revolutionary changes accompanying office automation. However, they are going to be able to better understand and relate to those systems than in the past with the traditionnal EDP systems.

For example, it has often been stressed that, in order to keep the control of their information systems, managers have to be at least as attentive as they are with any manual system they supervise. In fact, it is astounding to note the frequency with which managers become apparently disinterested in their system and abdicate control to staff specialists.[2,7,15] Current research efforts in the office automation area - notably Xerox[18], Citybank[23], Wharton[5,16,17], etc. - make an effort to put technological capabilities in each office in such a form that secretaries and managers can use them. This approach of preserving "the culture of people" over "the computer culture", will enable a greater involvement of managers in their information system operations and policies.

The intention of this paper is to show how information systems control could be put back in managers' hands through office automation. The emphasis is on organizational and social issues that have been brought about by the relatively new concept of office automation. These issues will undoubtedly need the attention of managerial skills.

OFFICE AUTOMATION AND INFORMATION SYSTEMS

To date, within organizations, data processing and text processing
- the most developed side of office automation so far - operate to a
great degree independently of one another. However, an office can be
viewed as the center of what goes on in an organization as far as
information generation and communication.[14,25] Usually a great deal of
the information eventually stored and processed by the corporate EDP
department originates in an office or an other. For this reason a
number of information specialists and executives in several
organizations are thinking about eventually closing this loop.
Basically three technological and organizational developments permit
to argue that office automation systems present a reasonably feasible
route to the implementation of more meaningful information systems.
These concern the areas of data and text capture, data base
integration, and communication networks.

Data/Text capture.

Information specialists have recommended for some time that in order
to improve accuracy, the data entry function must move back to the
source level i.e.the corporate office where most data and documents
are generated. Therefore it is an excellent source date capture point.
An office automation system is a feasible solution because when some
text is typed, it is also digitized for storage on a magnetic medium.
Such a system makes possible the indexing and referencing of material
prepared in the office at the time of the original text entry. This
tends to improve accuracy, timeliness, completeness, etc..., all
essential criteria for building up sound information systems.

Data base integration.

Another use of office automation systems is the indexing and
referencing of documents prepared externally which enter the office
files. These systems will also assist in the maintenance of local
files as well as in the eventual integration of some stored material
in centrally controlled data base.[11] There already exist many
commercially available text editing terminals linked to a shared
processor for economies of scale which for instance have access to
common data bases containing customers' names and addresses and
standard letter paragraphs. Another growing area of information

storage and retrieval is the use of microforms by various
organizations such as insurance companies, banks and utilities where
special filing applications may require it. Microfilm and microfiche
systems can easily become part of office automation by allowing for
the entry and query of file index information from a terminal. The
microform is then displayed on a reader that can eventually deliver a
hard copy.

Communication networks.

Recent technological breakthroughs in telecommunication such as the
programmable switchboard PABX (Private Automatic Branch Exchange)
allows the linking together of various administrative functions for
the automated office.[4,12] A PABX may also provide communications
facility to link one office to another, to the corporate EDP department
or to outside computer service vendors. The programmable switchboard
may also be used in a variety of applications integrating both voice
and data communications in having models shared by office terminals.
It enables incoming messages from the outside to be stored in one
office system or another for later delivery ; it allows office
dictation to be recorded on voice store-and-forward equipments for
later transcription by the text processing center ; it optimizes
telephone line usages within offices ; it provides toll accounting as
well as traffic analysis to allocate phone budgets, etc. A typical
"Office of the future" may use an office automation system where
document generation, text editing, fascimile transmission, database
system, microforms, photocomposition and programmable switchboard are
used together.

Some technological implications.

The introduction of office automation systems in organizations is most
likely to bring about changes not only in the traditional office
structure, but also in the structure of the organization as a whole.

When EDP was introduced in organizations, its impact was initially
most felt in accounting applications, and it did not have the broad
effect on people that office automation systems, which reach almost
everyone, are expected to have. Though, there is a large consensus
among experts who feel that the user's level of technological
knowledge with office automation systems will not reach that of

today's data processing because it will not be needed.[1,21,24] Most
manufacturers are right now working for developing an easier-to-use
"friendly" technology for such "naive" users as managers and office
personnel. However, given today's state of technology, it is very
difficult ot produce an office automation system that simply can be
installed in an organization and be directly used by office staff
other than in relatively simple ways.[22] For that, and for some years
to come, new roles will have to be defined associated with people who
are able to take bits and pieces of the office automation technology
to put together reasonably good ad hoc solutions to get things
working. Presently, it is difficult to hand that role to someone who
does not understand in principle the editing language or the way
information is stored in the machine for example.

The problem as pointed out by a professional, is that "only a
handful of computer specialists have the remotest idea of the
information storage and retrieval problems in typical offices. The
problem is that computer people know how to think numbers, but they
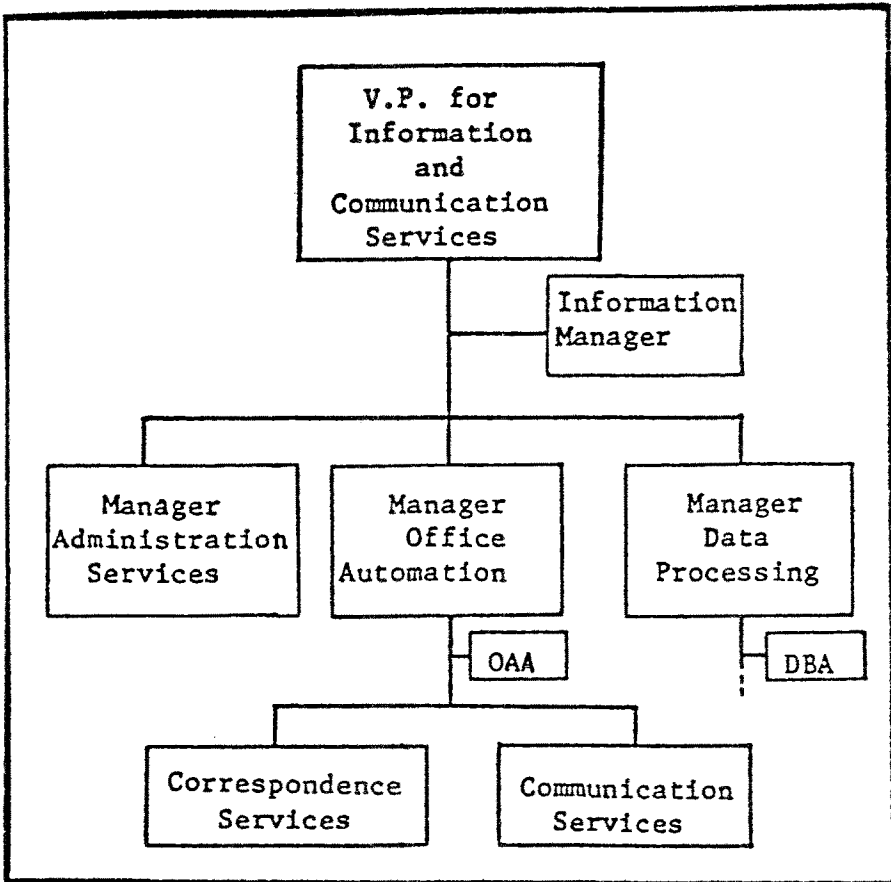don't know how to think words".[20]

Another question concerns the suggestion made earlier to key
data/text once at the text processing station, then storing it for
later retrieval or transmitting it. Such a procedure implies the
support of a digital technology. One may argue that "offices do not
work digitally ; they work with analog images on paper".[20] In fact,
most of the work going on in the office automation field and
commercially available concentrates on letting people produce paper
faster and in higher volume. Thus it appears that it will be a
disastrous solution in the long term. Hopefully, this tendency will
be reversed in order to concentrate more on ways for minimizing and
in many instances eliminating paper as a communication medium. Some
research initiated on graphics, image digitizing and holographs as
opposed to character representation may provide some satisfactory
answers.[21]

ORGANIZATIONAL IMPLICATIONS

Depending on an organization's primary activity, the principal incentive for implementing an office automation system may come from different areas : text processing, telecommunications (electronic mail, computerized conferencing, facsimile transmission, etc.), or even from the printing/publishing technologies. Initially, the responsibility for such services is likely to be given to an administrative manager, not to the data processing manager who will still be in charge of EDP and data communications. However, with the increasing development of functions associated with office automation systems, many believe that all these activities will be grouped under the responsibility of one executive, perhaps a V.P. for information and communication services.[8] Reporting to this executive - staffed with a manager for information administration - might be three different groups as shown in Figure 1. Each group is responsible for the following area :

1. In staff, the information manager is the data administrator responsible for the content of data bases, microform supports, etc., coordinating groups within the department and interacting with users in the whole organization to meet their information needs.

2. In line, the three departments are in charge of : a) administrative services : general office services utilizing non-electronic support ; b) office automation : correspondence services (text processing, graphics, printing, publishing, duplicating technologies), communication services (verbal electronics, voice and dictation equipments, PABX, etc.) ; and finally c) data processing : all data electronics related services, staffed with a "Data Base Administrator" responsible for the data base technology.

Although this type of organizational structure is apparently not going to be implemented within the near future, there is definitely a trend among experts to see the MIS or EDP function going under an executive for Administration, rather than the Controller.[6,26] At one point, it may well also happen that a great majority of people reporting to Administration will be DP professionals.

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                    ┌──────────────────┐
                    │    V.P. for      │
                    │   Information    │
                    │      and         │
                    │  Communication   │
                    │    Services      │
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                              │    ┌──────────────┐
                              ├────│  Information │
                              │    │  Manager     │
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         ┌────────────────────┼──────────────────────┐
┌─────────────────┐  ┌─────────────────┐  ┌─────────────────┐
│    Manager      │  │    Manager      │  │    Manager      │
│ Administration  │  │    Office       │  │     Data        │
│   Services      │  │  Automation     │  │  Processing     │
└─────────────────┘  └─────────────────┘  └─────────────────┘
                              │ ┌──────┐        │ ┌──────┐
                              ├─│ OAA  │        ├─│ DBA  │
                    ┌─────────┴─└──────┘        └──└──────┘
        ┌───────────┴──────┐  ┌───────────────────┐
        │  Correspondence  │  │   Communication   │
        │    Services      │  │    Services       │
        └──────────────────┘  └───────────────────┘
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OAA : Office Automation Expediter

DBA : Data Base Administrator

Figure 1 - Organizational structure for Information
          and Communication Services.

Role of the principal actors.

Before any discussion on these organizational issues, it seems
important to outline the roles of the principal actors involved in
offices and their interfaces. The manager is the point of interest
since s/he defines the "values" in the office. The secretary is also
important because s/he is one of the principal information processing
resources available to the manager because s/he can process relatively
unstructured information.[13] The hierarchy and its interactions at
different levels is also an important part of the office environment.
Finally, the system itself will have an additional impact on the
office.[6]

Interface between the actors.

Consideration of the purely human interfaces -- manager/secretary,
manager/hierarchy, and secretary/hierarchy -- is a difficult task
because humans are complex actors. In this context, we are more
interested in the discussion of interfaces between an office
automation system and the human actors who are going to use it.
Nevertheless, the system will obviously impact their behavior and
some human observations can be made :

- the manager/system interface may be considered the most important.
  As the one responsible for the office, the manager establishes
  values and rules reflecting his/her style and personality. The
  system should in turn be able to reflect this style and personality
  if it is to be accepted. Personalization here is an important
  characteristic that must be part of the system, thus contributing to
  a more "human" computer system. In OASIS, an office automation
  system being developped at CESA[9], personalization is built in with
  such features as flexible report or schedule formats at different
  levels of details or times. A notion of "history of use" is being
  built in OASIS to remember the manager's useage familiarity with
  the system as part of the personalization effort. Therefore the
  system will "learn" and adapt to the user's degree of sophistication.
  So far, very few systems have been designed and actually run by
  managers themselves, with various degrees of success depending most
  of the time on the resistance to change and cooperation of managers
  involved in those experiments.[2,18,23]

- The secretary/system interface is very dependent on the scope of
  responsibility given to the secretary. It is assumed that
  secretaries will be primarily responsible for operating the system.
  Consequently, the interface should be simple, requiring as little
  abstraction and learning as possible. Here again, some office
  automation systems - as the one under development at the Wharton
  School (W.O.A.P.)[17] - provide some kind of results personalization.
  By setting parameters, the W.O.A.P.* system is able to recognize who
  it is "used by", and who it is "used for". But perhaps the key
  problem here concerns who will get the job done. Most managers lack
  typing skills and since we deal with an interactive system using
  terminals with typewriter keyboards, there are physical and
  psychological constraints for them. Of course, the primary data
  input necessary to drive the system will center on the secretary.
  It is conceivable that budget, schedule or planning supports
  modules for example will typically be run by the manager
  him/herself. This is important in maintaining the feeling that the
  systems are built in such a manner that only a "clerical"
  intermediary is required to use it.

- In the hierarchy/system interface, one of the most important
  considerations is privacy of information, the protection of it
  and the control of access to it. The answer is neither provided in
  granting complete access nor in preventing it completely, but in
  defining some level of access in between. Depending on the
  hierarchy, some people may have access to detailed financial
  information for example, while others may be restricted to some
  summary data. In other words, an office automation system must be
  able to provide some control mechanism allowing intermediate access
  stages. Another advantage here is the communication facility that a
  system may offer by cutting out several levels of hierarchy. For
  instance, if a manager wants to call a meeting of his subordinates
  with OASIS, he can review their schedules and set a date and time
  without having to go through the whole hierarchy of managers and
  their secretaries. A manager can also leave a message to a high-
  ranking officer of an organization through electronic mail. Such
  systems offer a definite advantage in situations where time is a
  vital constraint.

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* WOAP stands for Wharton Office Automation Project. The author who
  participated in this project named it also OASYS in a previous pa-
  per[17]. It is not to be confounded with OASIS, another project de-
  scribed later which is conducted in CESA by B. Savonet and the author.

Impact of interactive computing systems on people.

To date office automation systems have had some definite impact on the people who have used them. Following in an outline if the principal areas of observation.

- the interactive nature of most office automation systems has an important impact on people's motivation. For example, to provide information through a system "asking questions" is a better accepted activity than filling out pre-printed forms. A system waiting for an answer appears to be more likely to get one. The "conviviality" of the system may be a good means of coping with the resistance to change by users whose jobs may be affected.

- an interactive terminal also provides a sort of "impersonality" which is likely to assist communications throughout the organization because of the non-censorship feeling it offers to users.

- finally, since it is possible for non-trained users to have a working system within an hour, they immediately feel rewarded for their invested time. Therefore the system is appealing to them and they are more willing to learn about it and continue to use it.

A RESEARCH DESIGN APPROACH

At CESA, we have been setting up a research design approach to organizational and social implications of office automation, and we are currently implementing it.

First established in early 1976 under the name OASIS[9] it was an initial research program aimed at developing operational tools to be used in an office environment. A number of office tasks were selected in cooperation with secretaries involved in this process and a number of software modules were implemented accordingly. So far, they have delt with :

1 - text processing (documents creation and preparation, personalized repetitive letters, automatic bibliography maintenance, etc..)

2 - scheduling of events (planning for certain dates and times, coordination of schedules, agenda maintenance, etc..)

3 - filing (preparation and maintenance of some office files such as resumes, publications, names and addresses files, document flows, etc..)

4 - communications (electronic mail and message system).

The OASIS system as shown in Figure 2 is in constant improvement. Modules are being modified, suppressed or added according to the needs and comments expressed by the various actors involved in its design and operations. For the most part, the system is being developed in the BASIC language and run on a PRIME computer from various terminals (visual displays and printers, all meeting office quality requirements).
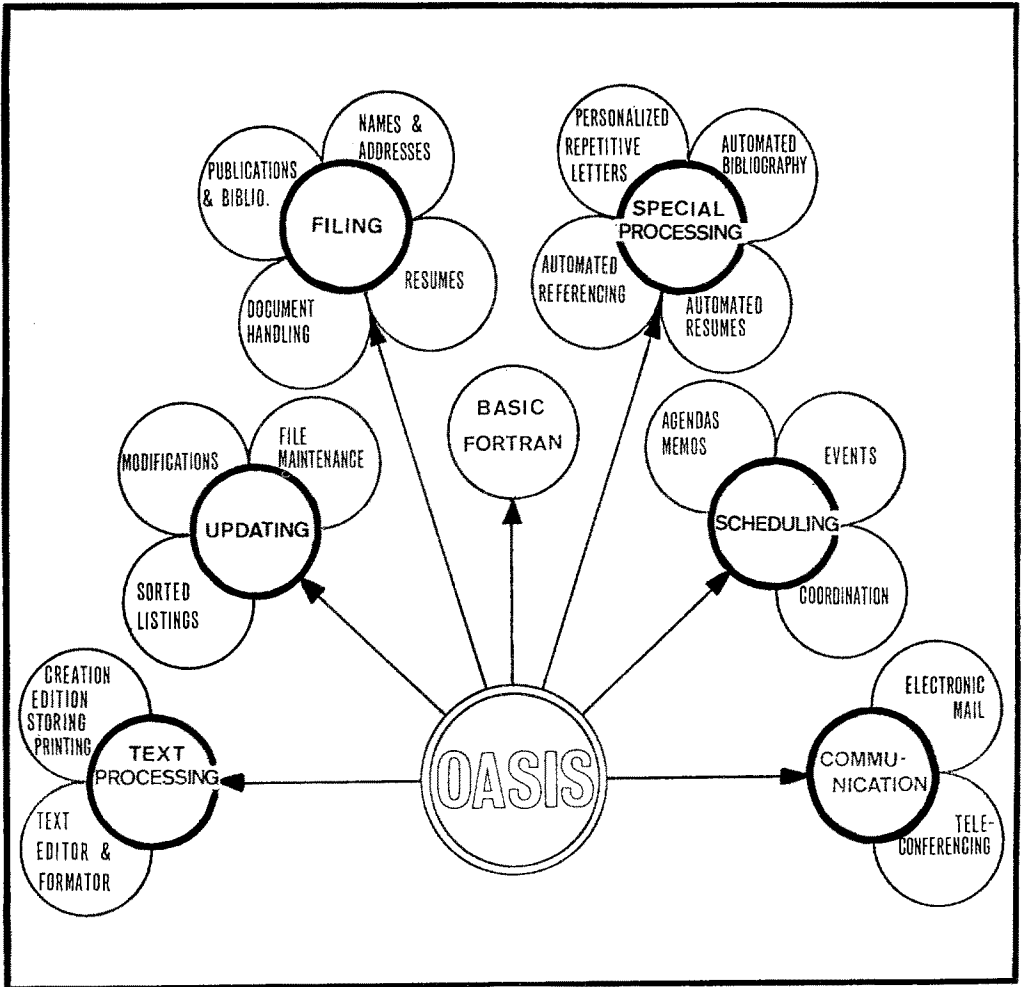
Figure 2 : Modules in CESA's Office
Automation System.

Objective of the research design.

The main objective of the research team working on office automation
at CESA is not software tool development although modules in OASIS·
are constantly improved. Actually, the objective is to evaluate the
effect that our office automation system has in technical, human,
economical and organizational areas by means of a pluri-disciplinary
approach. This is what the MATHIAS[10] project is about. Some well-
identified office functions have been selected in actual offices
within CESA and other external organizations to insure that results
obtained in one environment are general enough to be transferable in
other environments.

Working hypotheses.

Our research team is currently investigating the following hypotheses :

1 - Office automation systems seem to offer a number of advantages
    over traditional manual office systems : what kind of experimental
    measures could we use to scientifically confirm those expected
    advantages ? For example, what criteria in terms of volumes
    processed, time spent, number of people, cost and economic
    consequences, etc. may impact the "productivity" related to the
    various categories of work processed in an office environment
    such as text processing, scheduling, communications, etc. ? Is it
    also possible to measure inconveniences in the same way ?

2 - Because of the automation of an increasingly large number of
    office tasks, functions of the social actors concerned, i.e.
    secretaries, managers, hierarchy, organization, are going to
    evolve toward a larger decentralization of responsibilities while
    the tendency is to increase the centralization of processing. Is
    it really so, and by what criteria may this be appreciated ?

3 - The eventual redefinition of some functions is going to affect
    the equilibrium of the social cell represented by an office in its
    organizational environment. By what evidence may one evaluate this
    lack of balance ? What consequences will this have from a human
    standpoint ? Is it possible to avoid them by using an appropriate
    implementation program ?

4 - Education needs of the office staff to recent computerized
technologies and to new working conditions and procedures is
going to be an important element affecting the success of the
office automation effort. Are there some satisfactory strategies
to tackle this education problem ? How to organize it ? What
about the other actors ?

5 - The technological changes introduced in an office environment
are not neutral, i.e. they are going to generate negative
reactions. In fact, the automation process is just starting in
some offices. So far, traditional tools in use in most offices
are writing tools (typewriters and copiers), simple and
monofunction that contrast with some integrated, multifunctions
of today's office automation system (writing - transmitting -
storing - accessing, etc.). This distinction seems important
because widely accepted individual technologies such as the
telephone or the writing tool must be differentiated from a
"system" tool. An office automation "system" is able to handle
several administrative functions and therefore is in a position
of modifying many working habits and many traditional
organizational frameworks. On what technical criteria should those
systems be built in order that they be least "disturbing" ?

6 - When dealing with the problem of justifying office automation
systems, most of the time one is faced with issues relative to
the improvement of the office work productivity. We all know
that the productivity concept carries a lot of emotional
reactions. Is it possible to conceive the organization of
administrative work with production as the only objective ? Are
we attempting to transpose in the office the spirit of scientific
organization which is reflected in most working conditions in
the industry ?

7 - A distinction is possible between offices according to major
tasks they perform :

a) the production offices which handle very structured tasks
such as heavy typing jobs in banks or insurance companies.

b) the support offices which handle unstructured and very
diversified duties - mostly administrative - such as scheduling,
telephone answering, filing, light-typing, etc.

The assistance brought by office automation systems to those two office environments may be very different. However, it is not radically different from one office to another or from an activity sector to another so long as those offices belong to the same category. How to experimentally demonstrate this assertion ?

RESEARCH METHODOLOGY

The problem with conducting this kind of empiric research is in making
sure that results are pertinent and transferable to other environments.
For this reason, it is necessary to take the prototype office
automation system away from the experimental setup and to transfer it
to real "operational" offices choosen for pilot studies. Besides
testing the transferability of results, this allows for an
appreciation of practical difficulties in installing the system. A
number of observations may be made with regards to the acceptance of
the system by the office staff, the degree of information/education
needed, the organizational constraints, etc. In particular, the pilot
study should try to determine quantitative measures of "productivity"
and to evaluate qualitative factors affecting the impact of this
technology on office environments under investigation.

A typical pilot study may be organized according to the four following
steps :

Step 1 : Systems analysis of the office cell and comparison with the
         traditional organization.

         - study of the office in terms of systems approach : its
           environment, structure, functions, actors involved,
           "culture", management style and personality, etc. The
           objective of this initial phase is an attempt to construct
           a system model of the office in order to better appreciate
           the various parameters that may affect its behavior -
           notably from a pluri-disciplinary approach.

         - this systems analysis phase should be conducted along with
           a detailed study of the various office functions in its
           traditional, non-automated functioning. During this study
           a number of measures should be made on the office tasks as
           far as volumes, delays, complexity, processing, frequencies,
           etc. according to the categories of office functions
           previously defined. This will allow for the establishment
           of a comparison basis with automated functions introduced
           in the next phases.

Step 2 : Introduction of the office automation technology.

This phase provides for the installation, test and
implementation in the office of a technology suited for the
automation of some selected office functions. It may be
initiated concurrently with the first step provided that
information/formation has been given to the office staff
prior to any installation so that "negative" reactions may be
avoided as much as possible.

Step 3 : Automation of some office functions and measures.

- during this phase some office functions and/or tasks are
  selected for automation according to results of the previous
  phases. Criteria for selection may include feasibility from
  a technical standpoint, opportunity from a processing
  standpoint, cost constraints, human impact, etc.

- from that juncture commences a period for quantitative and
  qualitative evaluations of the selected activities.

- then comparisons are made between measures taken during the
  traditional manual operations and those taken in the
  automated mode. Here the major difficulty is to evaluate
  precisely the qualitative aspects from one mode of
  operation to the other.

Step 4 : Validation of the results transferability into other
environments.

This phase is concerned with the validation of results
obtained and recommendations made as a result of the transfer
of the experimental conditions in another office environment.
An analysis of the same tasks performed in step 1 is
necessary to allow for comparison and validation of the
results. The same variables should be measured and then
compared. Significant differences and gaps should be
analyzed and conclusions made with regards to the working
hypothesis 7.

A final report should present results of the pilot study
with the following emphases : the implication of a
technological introduction on the evolution of office
functions and tasks, on human reactions due to new working
conditions, on psycholosociological constraints due to
changing working habits of office staff, and on economical
and organizational consequences. Particular attention should
be given to technical specifications that the office
automation tools should meet in this kind of office
environment.

CONCLUSION

A number of concurrent facts lead us to argue that an opportunity to greatly improve information systems management is offered by recent office automation developments.

Organizations have just discovered the enormity of office automation problems by looking at their increasing costs. The ballooning clerical costs of the office are being given more attention in the budgeting and planning cycles that every company undergoes on a formal or informal basis, thus generating an important market of potential customers for equipments and services.[22] It is believed that organizations are willing to make the necessary investments that can increase productivity and significantly reduce the time from idea to printed or recorded material ready for communication and distribution.

From another standpoint, organizations are increasingly recognizing that information may be compared with a resource that needs to be managed.[19] They also realize that the flow of corporate information is going to be considerably affected with the arrival of office automation technologies.[16]

Also, the declining hardware costs are going to assist in the wide dissemination and use of technological tools in offices, and "all kinds of applications which seem exotic today are going to become feasible and attractive".[12]

In the long run, office automation and data processing are going to move along together as their technologies gain in similarity, and it was argued that this may provide a basis for more meaningful information systems. However, any success in that area presupposes that managers of the traditional DP functions will become involved in office automation problems.

A first step in the design of an automated office is provided by OASIS and similar office automation systems under development. However, they usually are developed in somewhat idealized environments because users are relatively familiar with the technology involved, and costs are not yet well controlled. Therefore, it is not clear whether such systems working in some environments will work when transfered in other environments. Because of the tremendous potential for change

brought by such office automation systems, the organizational implications cover a wide range of areas. The traditional office structures and the various actors involved are first to be affected, and this is a very sensitive issue in most organizations.

The MATHIAS project previously described provides a research methodology which constitutes a reasonable framework to tackle office automation implementation problems. The pilot study approach such as discussed may proved to be essential in taking in account the technological, human, social, organizational and economic constraints for a successful implementation and that in itself is really a challenge for managers.

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