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International Development Research Centre
Centre de recherches pour le développement international

RAPPORT MANUSCRIT
MANUSCRIPT REPORT

Increase of Productivity in Public Administration: the Role of Information Technologies

Accroître la productivité de l'administration publique : le rôle des techniques de l'information

Proceedings of the international meeting held in Dakar, Senegal, 16–21 June 1986

Actes de la conférence internationale tenue à Dakar, Sénégal, du 16 au 21 juin 1986

June/juin 1987

CANADA

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This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

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Data for Development International Association

INCREASE OF PRODUCTIVITY IN PUBLIC ADMINISTRATION: THE ROLE OF INFORMATION TECHNOLOGIES

ACCROÎTRE LA PRODUCTIVITÉ DE L'ADMINISTRATION PUBLIQUE : LE RÔLE DES TECHNIQUES DE L'INFORMATION

Association internationale Données pour le Développement

Proceedings of the international meeting held in Dakar, Senegal, 16-21 June 1986

Actes de la conférence internationale tenue à Dakar, Sénégal, 16 au 21 juin 1986

Data for Development (DFD) is both a professional association and an organization for international co-operation. It is a non-governmental organization. It has no political, commercial or national affiliation, and it is non-profit making. Its general objectives are to create an awareness of data as a resource to be managed ; to study and evaluate the role of information in economic and social development ; and to promote international co-operation and exchange of experience in that field. Its members are of many disciplines and include managers, computer scientists, statisticians, planners, etc., all of whom are concerned with information for development. DFD has consultative status with the United Nations Economic and Social Council and with UNESCO, and has permanent relationships with the United Nations Development Programme and the United Nations Regional and Economic Commissions.

Données pour le Développement (DFD) est d'abord une association professionelle à caractère scientifique. C'est aussi une organisation non-gouvernementale de coopération internationale rigoureusement indépendante sans lien de caractère politique, commercial ou gouvernemental, et sans but lucratif. Elle a pour objectif premier de faire prendre conscience aux dirigants des gouvernements et des organisations internationales que les données sont un bien économique qui doit être géré tout comme les matières premières ou l'énergie ; elle a aussi pour but d'étudier et d'évaluer le rôle de l'information dans le développement économique-social et de promouvoir la coopération internationale et l'échange d'expériences dans ce domaine.

Données pour le Développement jouit de statut consultatif auprès du Conseil Social et Economique des Nations Unies, et auprès de l'UNESCO. L'association entretient également des relations permanantes avec le Progamme des Nations Unies pour le Développement et les commissions régionales économiques et sociales des Nations Unies.

International Meeting,
Dakar, Senegal 16–21 June 1986

I. Increase of productivity in public administration : the role of information technologies

II. The Government Information Plan of Senegal

Organized by Data for Development

With the co-sponsorship of the Government of Senegal
the Federal Government of the United States of America
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The DFD organizing committee would like to express their deepest thanks to all those who contributed in making this seminar a success.

Fistly, we would like to thank the Government of Senegal and UNDP for their gracious co-sponsorship of the meeting.

Next we give our thanks to IDRC for the funding of participants from developing countries as well as their precious aid on many issues.

The Government of the United States of America is to be thanked for their generous support without which the conference could not have been held.

We would also like to thank all the participants and especially those who contributed papers, chaired Working Groups, drafted and translated reports and those who took on extra responsibilities.

Because of the importance to developing countries of many of the issues concerning information technologies which were discussed during the international seminar, IDRC has published the proceedings to ensure their wide dissemination.

Translations of papers in French are available on request at DFD headquarters.

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FOREWORD

This collection of papers arises out of an international meeting which took place from 16-21 June 1986 in Dakar, Senegal. Its aim was to discuss under the general theme "Increase in productivity in Public Administration : the role of information technologies".

Participants invited to the conference are experts working in Public Administration and in the non-profit sector and concerned with the use of information technologies to increase productivity.

The total number of participants was 97, 47 of which were Senegalese and the 50 others being from 24 other countries.

The seminar sessions were of two sorts : plenary sessions of which papers of a general nature were presented and discussed in the mornings and parallel working group sessions in the afternoons. Each working group included between 10 to 15 participants guided by a chairman and aided by 2 rapporteurs. Each working group produced daily working papers during the course of the meeting, the outcome of their discussions being the final reports published in these proceedings.

The themes chosen were :

A. Methods for Strategic, Tactical and Operational Planning of Information Technologies in Public Administration

B. Methodologies and technologies to project total project costs, monitor and control projects and related expenses and evaluate increases in productivity

C. Social and behavioural approaches towards increasing productivity

D. Training and supporting the users of information technologies in public administration

E. Administrative regulations for introducing information technologies to increase productivity in public administration

Of course, it was not possible to exhaust all the important problems and issues nor to treat them in sufficient depth. With continuous support from the interested agencies and professionals in the world, DFD intends to organize similar meetings on a regular basis, in order to review and appraise progress with special attention paid to the needs and problems of developing countries.

INTRODUCTION TO THE CONFERENCE

INCREASE OF PRODUCTIVITY IN PUBLIC ADMINISTRATION : THE ROLE OF INFORMATION TECHNOLOGIES

JEAN SALMONA

Centre d'Etudes des Systèmes d'Information des Administrations
France

and

Data for Development International Association

Public administration is a harsh necessity for a nation. It is often efficient but within the economy, its presence is a burden. It is, one could say, the overheads of a nation.

Nowadays, all countries, whether they are industrialized or developing, have to meet up to ever-growing international economic competition. In this competition, each country has to be run like an enterprise which seeks the highest competitivity and, above all, lowering overheads.

The weight of an administration born onto a nation's economy cannot possibly increase without endangering the competitivity of the nation's economy. On the contrary, this weight must decrease. All countries have acknowledged this fact and are now looking for ways to cut down on public expenses and staff in public administration.

However, at the same time, the tasks of public administration are increasing, because of the development of the regulations which have become necessary, owing to the complex regulations in the economy and the social pressure requiring the redistribution of the expenditures and the incomes.

The urbanisation phenomenas, the need for public facilities and the demand for security to which they are linked continually increase the role of public administraton and non-commercial services financed by the taxpayers.

To face up to the inevitable development of the role of public administration and the non-commercial services and lessening their burden in the country at the same time implies that the productivity of this sector increases at a greater rate than the rest of the economy. This objective can be reached on the one hand because the productivity of public administration and public services are on the whole relatively low compared to the enterprises and because the administrative sector gathers, processes and disseminates information as its main tasks, which is a field in which the implementation of information technologies can increase productivity to a great extent.

But this increase of productivity can be achieved only if this implementation is properly planned and organized.

This major issue was chosen as the focal point of our international meeting, firstly because all countries are involved and also because for the past 20 years, the computerization of public administration, contrary to all predictions made, has not carried through with a noticeable increase in productivity. This had led to a certain scepticism among politicians and the decision makers in public administration, who are now even more wary as regards information technologies, as the pressure by hardware manufacturers is greater. The strategies of governments are now in a way torn between two tendancies : allowing the electronics revolution to penetrate all sectors of the economy and above all public administration, which represents an important market for the national electronics industry whenever it exists, and being cautious as concerns expenses for investment for concerning information technologies, expenses which can only be justified by measurable returns.

Our conference does not intend to exhaust all of the issues, far from it. The objective is to confront experiences and to help governments to ask themselves the right questions in this field.

Our work has been sorted into four general themes. The first one, which will take up our first half day, deals with the notion of productivity in public administration and the policies for increasing productivity through the use of information technologies. The Federal Administration of the United States is currently working on the issue under the "Reform 88" program. President Reagen used it as a platform during his re-election compaign. Messrs. Merck, Habermann and Reeder, who are members of the Executive Office of the President (Office of Management and Budget) will give us an overview of this policy now held by the U.S. Government. Beforehand, Mr. Andersen, a renowned specialist in the matter, will let us know the results of studies he led in the framework of the Economics and Business Administration School in Denmark.

The second issue now under much consideration by governments all over the world is the methodologies for implementing information technologies in public administration. Many books have been written on the methodologies. Few administrations use them on a regular basis. The second plenary session will be devoted to discussions on these methods. Mr. Yves Franchet, Controller at the InterAmerican Development Bank, will present a paper on the methods for strategic and operational planning used by the Bank as well as on the concept of information resource management.

Dr. Tora Bikson, of the Rand Corporation, will speak to us about the techniques used in establishing total project costs and in determining the control points in the development of these projects by the people running the projects. Then Mrs. Trish Fineran will introduce the "information center" methodology now being used with favourable results by the Federal Administration of the U.S.A. Finally Mr. Peter Bounpane will talk about the methods used by the Census Bureau in the U.S.A. to improve productivity in the population census.

In the past few years, information technologies have undergone great modifications. They have nothing to do with the electronic data processing and telecommunications of the 60's. One of the well-known causes for this failure of informatics to increase productivity in public administration in the 60's and 70's is the fact that the computerization has taken place without changes in organisational structures and procedures; data processing departments and centers were set up but they had little effect on the every-day running of the administration. By penetrating the day-to-day work of each civil servant, micro computers, office automation and new communication technologies can radically change its work productivity, on the condition that the organisation is modified, that attitudes change and that the basic procedures themselves are adapted in the best possible way to make these changes possible.

These changes will be the subject matter for the third and fourth plenary sessions. On the third day, we will study the new structures in information systems in public administration presented by Mr. Jean-Claude Cohen, Groupe de Recherche en Pedagogie de Soutien.

The Scribe project of the French Finance and Economy Ministry, which will be described by Mr. Paul-Henri Watine, officer in charge of this large ministry, is a very ambitious project likely to introduce major changes in the main and oldest French Ministry.

One of the most promising new technologies is the integrated services digital networks. Dr. Mathur of the Department of Electronics of India will give us his ideas on how administrations can make use of this technology to increase their productivity.

Several other new technologies which are likely to revolutionise public administration might be mentioned ; this is the case as far as the micro-processor card is involved. As a portable file, it may well have an important role in the social sector, in education and in defense. Furthermore, it may well become the unforgeable key for access to information systems and to administrative buildings. Not all issues could be delved into throughout our four morning sessions ; this topic has to be set aside along with many others for our next meeting.

On the last morning, socio-organisational, pedagogical and regulations issues will be raised, that is the non-technical aspects of implementing information technologies in public administration which are probably henceforth the major issues. Miss Evelyn Blennerhasset, from the Institute of Public Administration of the Republic of Ireland, will speak to us about the sociological, organisational and behavioural approaches. Dr. Bhatnagar, from the Indian Institute of Management, will go into the training problems. Lastly, Mr. Simon Corell will speak to us about internal and external administrative regulations linked to introducing information technologies based on the Swedish experience.

These papers will be discussed throughout the plenary sessions : in the afternoons, specialized working groups will meet for discussion 3 days in a row in order to analyse the problems, identify the major issues governments should be concerned with, and in some cases, attempt to find the answers. These working group reports, which will be added to the papers presented at the plenary sessions to make up the proceedings of the conference, will be presented on the last afternoon at the closure session of the meeting and will then give rise to a general discussion.

All of this information will then be disseminated to all governments. This final goal should be kept in mind.

This meeting is but the start of a long process. Data for Development has the intention of devoting its efforts for the following years on this topic, in association with UNDP and with the aid of all governments who feel that the modernization of public administration is one of their main concerns. With respect to this, I would like to express my deepest thanks to the Government of Senegal which was so kind as to welcome us here and to have been such a great help in organizing our conference, and to the Federal Government of the United States of America, whose generous support made it all possible.

Public administrations and organizations have the reputation of resisting to change, of being conservative, to sum up, of being for the economy a serious and competent sector but lacking dynamism. I am firmly convinced that this tendancy can change. It is up to us to prove throughout these four days that we are determined to make radical changes in this field within the next ten years.

DISCOURS D'OUVERTURE

M. JEAN COLLIN

Ministre d'Etat
République du Sénégal

C'est avec un réel plaisir que je préside la cérémonie d'ouverture de cette réunion internationale sur "l'amélioration de la productivité de l'administration publique : le rôle des techniques de l'information".

Je remercie le Président et les Gouverneurs de l'Association Données pour le Développement (D.P.D.) d'avoir choisi le Sénégal pour abriter cette manifestation scientifique dont les objectifs et les thèmes rencontrent parfaitement les préoccupations du Président de la République, Monsieur Abdou DIOUF, et de son Gouvernement.

En effet, thèmes ne peuvent être plus actuels que ceux qui vont faire l'objet de votre réflexion - comment accroître la productivité de l'administration publique grâce aux techniques de l'information, en particulier grâce à l'informatique?

On a pu parler d'une nouvelle révolution industrielle dans les années 1960 avec l'explosion et le développement des technologies de l'information.

Beaucoup d'espoirs ont été placés dans l'informatique notamment dans les pays en développement :

- "L'informatique est une des clés du développement et de la modernisation de l'économie";
- "Elle permettra de rattraper le retard de ces pays sur les pays développés".

Poussés par le coût du matériel et le souci de productivité, concepteurs, constructeurs et utilisateurs se sont lancés dans la course à la puissance et à la concentration du matériel informatique. Cette course à la productivité de l'informatique a conduit l'Administration Publique à une centralisation systématique des informations à traiter avec ses implications traditionnelles :

- la massification des travaux, regroupés pour obtenir une rentabilité maximale du traitement informatique

- la spécialisation des travaux, d'autant plus insidieuse qu'elle provient d'une séparation des tâches d'exécution de celles de conception et de préparation (responsables des ministères et spécialistes des centres informatiques)

- la supervision et le contrôle du travail exécuté qui sont la conséquence de la spécialisation.

C'est l'ère de la MICRO-INFORMATIQUE.

Cette approche a été celle adoptée par les pays développés de 1960 à 1970. Les pays en développement ont essayé de la suivre tant bien que mal, car n'ayant pas toujours les ressources financières nécessaires à des investissements aussi importants.

Les espoirs des pays en développement sont allés grandissants dans la nouvelle phase entamée à partir de 1974, avec l'apparition des mini-ordinateurs et des micro-ordinateurs. On a noté ainsi un engouement certain de l'Administration Publique pour cette nouvelle catégorie de matériel. Les investissements nécessaires en crédits, en formation, ont diminué de façon remarquable :

- un mini-ordinateur, possédant la même mémoire centrale que les grands ordinateurs d'il y a 15 ans, coûte 50 fois moins cher (une mémoire centrale de 100 millions d'octets qui coûtait il y a 10 ans 250 000$ revient actuellement à 50 000$).

- il faut actuellement quelques heures pour former une secrétaire à l'utilisation d'un logiciel de traitement de texte, ou un responsable de service à l'utilisation d'un tableur.

On est ainsi passé de la grande informatique centralisée à l'informatique légère décentralisée, ou encore, de l'informatique "distribuée" à l'informatique "répartie". Les petites et moyennes entreprises du secteur privé, les services autonomes et extérieurs de l'Administration Publique s'équipent à des coûts relativement bas.

Et l'on a pu penser que les pays en développement vont pouvoir sauter certaines étapes et rattraper leur retard en matière informatique sur les pays industrialisés. Or cette phase euphorique de "l'informatisation bon marché", voire facile, est pleine d'embûches et de dangers.

Paradoxalement, les dangers proviennent des coûts réduits des matériels et des logiciels, de leur facilité d'utilisation, qui peuvent entraîner, si l'on n'y prend garde :

- une prolifération anarchique des systèmes d'information dans tous les services et à tous les niveaux

- des redondances dans la gestion des données

- des incompatibilités entre les systèmes installés.

Le Sénégal a perçu très tôt ces embûches et dangers potentiels à éviter et a mis en place dans les années 1970, précisément en 1972, le Comité National Informatique (CNI), organe de définition, de coordination et de contrôle de la politique d'informatisation des services publics de l'Etat.

C'est ainsi, grâce au Comité National Informatique, notamment son secrétariat permanent, assuré par le Bureau Organisation et Méthodes (B.O.M.) qu'a été mis en place un schéma Directeur Informatique de l'Administration, outil essentiel qui fixe :

- les normes des données (définition, numéro d'identification des entrées de base, etc.) ;

- les normes techniques, notamment de réseaux, permettant à terme de connecter entre eux les systèmes installés de manière décentralisée par les divers services.

Je saisis cette occasion pour féliciter les responsables de l'Association Données pour le Développement qui a collaboré de manière très étroite avec le Comité National Informatique à la réalisation du schéma Directeur Informatique.

Le Sénégal entend poursuivre ses efforts dans ce sens pour aboutir à un plan plus global de développement de l'Informatique dans l'Administration.

C'est pourquoi, je me réjouis que vous ayez choisi comme thème du premier séminaire qui s'est tenu avant hier et hier, l'évaluation du schéma Directeur Informatique de l'Administration Sénégalaise. Car je suis certain qu'avec l'apport des expériences très riches des participants réunis ici, le Gouvernement du Sénégal exploitera de la manière la plus judicieuse les résultats de vos travaux sur cette question en particulier et sur les autres thèmes de votre réunion en général.

Je voudrais également remercier les organismes de coopération internationale représentés ici, le Programme des Nations Unies pour le Développement, et particulièrement le Fonds Européen du Développement qui a financé les études et la réalisation du schéma Directeur Informatique.

C'est également le lieu de souligner le rôle que le Sénégal et les pays en développement attendent généralement des organismes de coopération internationale :

- c'est qu'ils nous aident à prendre connaissance et exploiter les réalisations des autres pays et non à importer des modèles tous prêts qui ont peu de chance d'être adaptés aux besoins des pays bénéficiaires ;

- c'est qu'ils nous apportent un appui méthodologique qui permette de définir des solutions appropriées à nos problèmes.

Sur ce, je souhaite un plein succès à vos travaux et déclare ouverte la réunion internationale sur "l'amélioration de la productivité dans l'administration publique : le rôle des techniques de l'information".

THE CONSTRUCTION OF CHINA NATIONAL ECONOMIC INFORMATION SYSTEM

ZHANG SHOU

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Chairman, Ladies and Gentlemen,

I am glad to have the opportunity to attend this meeting in Dakar. First of all, I would like to express my sincere thanks to our host for offering us such good conditions so that we can all learn from one another and exchange experiences in the field of information systems. Please let me take advantage of this opportunity to make a brief introduction to the construction of the National Economic Information System of the People's Republic of China.

According to the decision of the State Council of the People's Republic of China, in February 1986, the State Economic Information Center will be set up in my country and the State Council entrusted the State Planning Commission to manage it. Then a governmental economic information network, namely, the National Economic Information System will be formed step by step. This decision adapts to the needs of the economic construction and the total reform of the economic system in the 7th Five-Year Plan. At the 4th Session of the 6th National People's Congress, Premier Zhao Ziyang pointed out that "Even more attention must be paid to strengthening the economic information and the consulting system for decision-making" while various reforms are being conducted. The National Economic Information System will be a vital measure and technical tool for the state-leading organization to analyse the situation of economic development and to conduct macroeconomic forecasts and consultations in policy-making.

In accordance with the primary plan, the National Economic Information System will be a computer-based information management network with four different levels (central, provincial, prefectural and city, and part of counties and key enterprises), providing central and local governments and main comprehensive economic departments with information services for macroeconomic analysis, forecast and decision-making. The network will be formed in the whole country in order to provide a better communication of information serving the macroeconomic management and a more complete technical system for data processing, economic analysis and forecasting.

One of the basic conditions for the computer-based information system is computer technology and the capabilty of automatic data processing. In this aspect, a base has been established after more than 10 years of work. The Planning Commissions (or/and Statistical Bureaus) in the central government and 28 provinces, autonomous regions and cities directly under the central government have been equipped with large or medium-sized computers. As to the volume of computing work for planning and statistics completed in 1985, just the amount of original data entered by keying exceeded 3 billion bytes. In the typical data processing, e.g. the data processing of the census in 1982, the data entry of about 1 billion people (that meant 40 billion bytes, 1.2 billion records) was finished in only 400 work-days. Now the data of about 400,000 enterprises from the industrial census, held at the beginning of 1986, is being processed.

The computers distributed all over the country have formed a data processing network which has been called "An integrated Data Processing System". In the system, a unified and standard data format and application programs can be run, the unified procedure of data flow and management methodology can be used, either centralized or decentralized processing mode can be adopted in each stage from data entry phase to editing and tabulating phase. The work organization is flexible with high efficiency. On the basis of data accumulated over meany years, various data bases, such as the data bases of population, agriculture, industry, etc. are being established to provide the information resource for economic policy analysis and national plan-making.

Up to now, the Planning Commissions (or/and the Statistical Bureaus) at the central and provincial level are already equipped with up to 51 sets of large and medium-sized computers. In more developed regions below provincial level, computers of medium and small-size are now being used, microcomputers have become popular and office automation has been put on the agenda.

Because of the specific conditions in China, for instance, the territory is vast while the communication facilities are not yet sufficient, a great quantity of information exchanges depends on the off-line diskette and magnetic tape modes. The data communication between computers can be carried out, but it has not been used on a large scale due to the quality of telecommunication and high cost. As you know, there are big differences between the Chinese and western languages. Therefore, developing the technique for Chinese character- processing is very important in the development of the computer-based information system. It is expected that the two basic technical conditions in data communication and the processing of Chinese characters will be better resolved in the National Economic Information System during the 7th Five-Year Plan (1986-1990).

Another important aim in establishing the National Economic Information System is to provide auxiliary tools apart from the data for decision-making. That means, in addition to determining targets and construction projects, stress in the planning process is made on the strategy and major policies of national economic and social development. While perfecting traditional planning methods, economic information and forecasting should be intensified with economic mathematical methods and computer technology, with a view to guiding the formulation and implementation of planning in short and long terms.

In this aspect, we have been establishing the models of econometrics, input-output, market-forecast, macroeconomic models, departmental and regional economic models and so on, and have had some tentative experience. In order to get this work done properly, a time series data base for macroeconomy analysis is being set up. During the 7th Five-Year Plan, the model library and mathematical method library will be added to progressively form a more precise system in functions and methodology from data collection and analysis to the utilization in the whole country. In this way, it is possible to change the plan-making for the state economy and social development from depending mainly on the traditional qualitative analysis (necessary and basic) to relying on the combination of qualitative analysis and quantitative analysis step by step.

As to the macroeconomic model, we sent representatives to attend the 4th Session of ESCAP's Regional Seminar on Interlinked Country Model System and the Meeting of Project "Link" in New York and exchanged experiences with the experts from other countries. It is feasible that we shall have more opportunities to discuss and study such problems with the professionals.

In the construction of the National Economic Information System, more attention has been paid to the design methodology of information systems. From the very beginning the information requirements of ministries, commissions and regional economic agencies (provinces) were investigated. the strategy of the management of information resources has been worked out based on the analysis of mastering the information resources, the orientation of information flow and the situation of information convergency at each level. At the same time the experts in each step (information technology) are organized to discuss, study and draft the information standards and norms including coding and classification of different kinds of information. By this method, a series of efforts are made to avoid the possibility of waste in investment, unnecessary repetition in labor and the difficulties of the interconnection of information system in the final phase. Among the problems of the system construction, a number of topics have been raised covering the classification and coding system of economic information, the processing of Chinese characters, the computer network, data storage, the strategy of software, the selection of computer system, and the problem of data security, etc. Many universities and research institutes are involved in the study of these topics. Of ocurse, informatics in China is still a new technical field. I believe that the construction of China National Economic Information System will be a good exploration for greeting the coming information era.

Most of the subjects discussed at this meeting of DFd are related to the construction of China's National Economic Information System and will greatly inspire us in our work.

Best wishes to the meeting.

Thank you.

POLICIES AND PRACTICAL MEASURES FOR INCREASING PRODUCTIVITY IN PUBLIC ADMINISTRATION THROUGH THE USE OF INFORMATION TECHNOLOGIES

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INTRODUCTION.

"Only fantasy sets the limits to what information technology can be used for" we are told in the trade press and in the colourful brochures from the vendors. We all know that it is not true. Human fantasy is not the limiting factor to the introduction of new information systems. As painful as it may be to realize, it is the more or less explicitly conducted cost-benefit evaluation ex ante or ex post which does not meet our productivity expectations/investment criteria/budgets, etc.

Many prophets offer cures for the lacking productivity achievements, e.g.

technological proposals

- make sure you are IBM compatible
- go for ETHERNET
- avoid the trap of 4th Generation Languages

structural proposals

- move toward end-user computing
- organize in chief programmer teams
- enforce application of structured techniques

actor-oriented proposals

- promote free exchange of information
- educate users
- create a high level of commitment.

However, no single proposal is likely to ensure productivity. Especially, it is important that a purely technological change strategy will not provide high productivity in itself. It has to be combined with other measures. This is my first basic assumption.

My second basic assumption is that the organizational costs are rising and playing an increasingly important role in any information systems project.

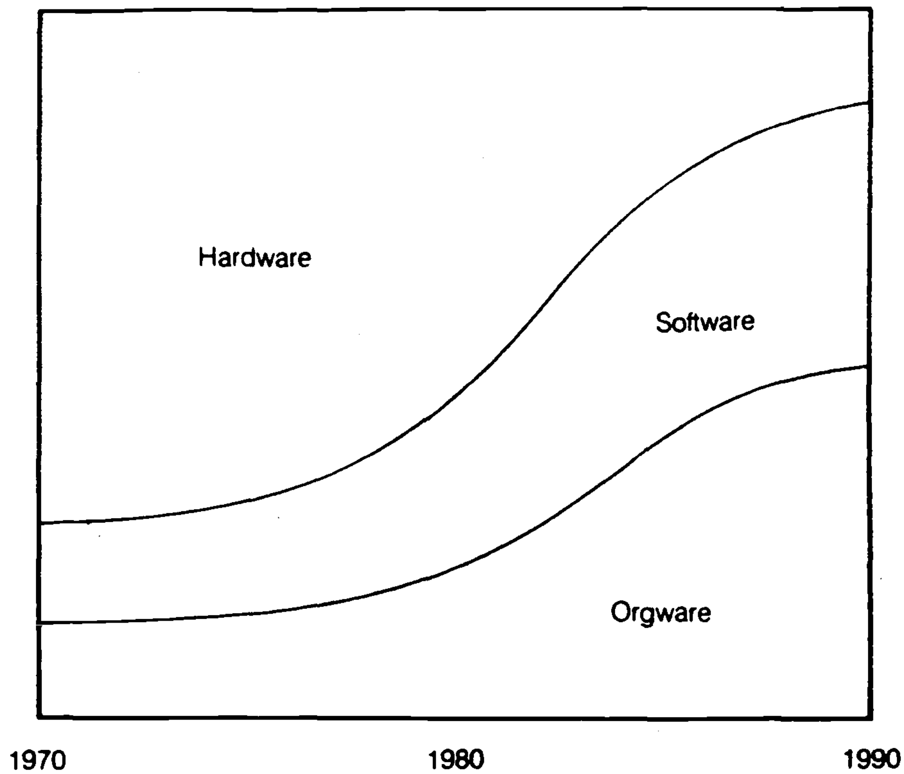

Figure 1: The Distribution of Total Costs of an Information Systems Project.

As shown in figure 1 which indicates the distribution of total costs of an information systems project, the hardware costs are gradually becoming smaller with the reduction in hardware prices. The software costs are increasing and will by 1990 presumably, be substantially larger than the hardware costs. However, as the diagram shows there is a third cost item which in the estimation here is going to be almost equally large as the hardware and software costs. The concept of "orgware" is suggested for all the activities involved in establishing requirement specification, training of users, changing work procedures, etc. I.e. all activities which are closely linked to the organizational implementation of an information system.

Space does not permit a lengthy argument about why the orgware costs are rising. Readers are referred to Bjørn-Andersen (1985), Hirscheim (1985), Markus (1984). But if this diagram is even partly reflecting the future situation, it is strikingly clear that it is necessary to be much more aware of the organizational aspects than we have been before.

This means that the most crucial point in achieving better productivity in the public use of information technologies is to monitor these organizational costs.

From this perspective I shall firstly give some evidence as to the costs/benefits of information systems in the public administration. Following that I shall proceed to propose policies and practical measures on how to improve productivity in public use of information systems in the three stages

- overall planning
- design
- implementation

and at all three levels provide theoretical evidence as well as practical examples.

2. COST-BENEFIT OF INFORMATION SYSTEMS.

It is a convincing argument that since the costs of human labour are rising and computer costs are being reduced, the more expensive production factor should be substituted with the cheaper one. This is true but in order to define the proper moment for substitution it is necessary to carry out some kind of cost-benefit evaluations. This is often done prior to the acquisition of a new system but very seldom are cost-benefit evaluations carried out after the event in order to validate the initial proposals.

In the situations where these ex post evaluations have been carried out, the general picture is that costs have been underestimated (more equipment had to be acquired, the main frame had to be upgraded, the development process took longer than expected, education took longer than expected and was not efficient so a conversion was very labour demanding, etc.) For a realistic estimate of the first year costs of establishing an electronic work station, see figure 2.

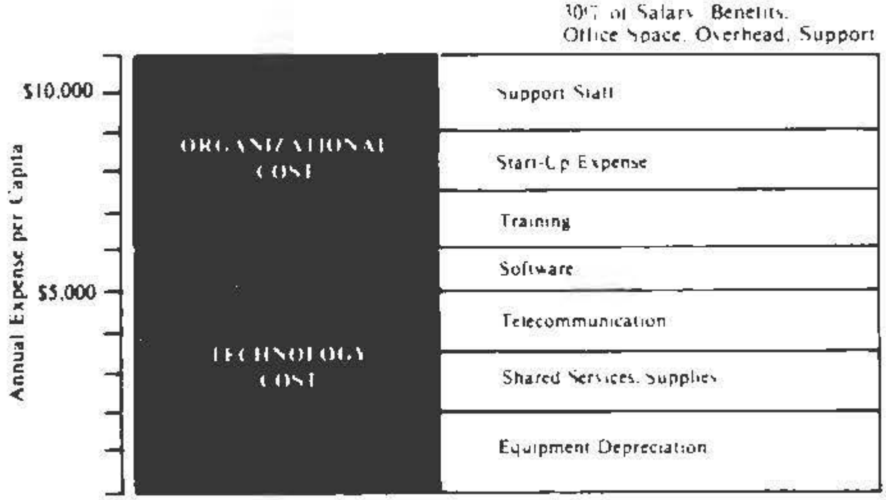

Figure 2: Costs of the First Year of an Electronic Workstation for Professional Use (Strassman, 1985)

At the same time benefits were to a large extent based too much on technological optimism and a belief in the miracles of information technology. And miracles are not that easy to come by.

A typical example of what often happens is described by Strassmann (1985):

> "A few years ago, a government agency built a model computer system to solve its severe administrative problems. As time passed, the people operating the system became mere appendages of the computer, because all available investments were absorbed by the drive to achieve maximum automation of even the most trivial clerical tasks.
>
> The technology's design dictated that operations personnel should perform increasingly narrow and mindless tasks. The cumulative investment in software and computer equipment was compounded over a long period of time. When external changes imposed new demands, they could be dealt with only by squeezing new requirements into old procedures.
>
> After a few years, obsolescent technology and rigid organization finally caught up with the system. Employee dissatisfaction rose. Failure and error rates reached scandalous levels.
>
> At this point, both the system and the people operating it lost all adaptability to evolutionary change because their energies were fully taxed just keeping the indispensable system from falling apart. Consultants recommended that a brand-new system be built at another site to replace the existing technology as well as the existing organization. Those running the current system had to be motivated, however, until the new replacements were ready.
>
> The cost of creating a duplicate environment was enormous - and the human costs associated with job displacement were astronomical. Needless to say, the entire project collapsed when those operating the old system found it easy to make the new system fail. The government agency in question has not yet recovered from the ravages of this experience.
>
> The lesson to be drawn from this story is simple: Do not let technological priorities get ahead of organizational consequences. In any information system, the value of the people operating it will always be worth much more than the accumulated hardware and software - unless a deliberate decision is made to reduce the people to mere appendages of the computer."

Two official investigations have been conducted recently in Scandinavia. In a study by the Swedish Internal Auditing Agency of cost-benefit in the Swedish public administration, they concluded that a meagre 14% of the installations of word processors were cost-beneficial (Administrationsdepartementet, 1986), and only 9% of the PC-installations were cost-beneficial.

In a second study conducted by the Danish Rationalization Office of the 10 biggest computer systems investments in the public sector over the years 1980-85, the conclusion was that

1) investments were not cost effective in the short run,

2) more data (information) was now available,

3) sometimes better service to clients,

4) better quality of printing,

5) increased dependency on technology (e.g. in case of breakdown),

6) employees have acquired skills to work with information systems which would benefit future computer implementations.

(Administrationsdepartementet, 1986)

What is wrong? This not very comforting result should even be seen on the background that the investigation was based on information acquired from those responsible for the information systems project and not an external, neutral institution.

Judging from these and similar assessments, information systems in the public administration are very seldom cost-efficient. At best, information systems can be cost-effective through their contribution to less quantifiable issues related to the kind of function or service that public agencies are performing.

E.g.

- provide better information for government policies,
- provide better possibility for a more correct/equal collection of payments from citizens,
- provide better possibility for a correct/equal allocation of financial and other contributions to citizens,
- faster service to citizens, other agencies and private enterprise in order to assist them in saving resources.

However, these benefits can only be achieved if information systems design is seen as part of the overall organizational strategic planning and that technological developments are closely linked to organizational and human developments as indicated in figure 3.

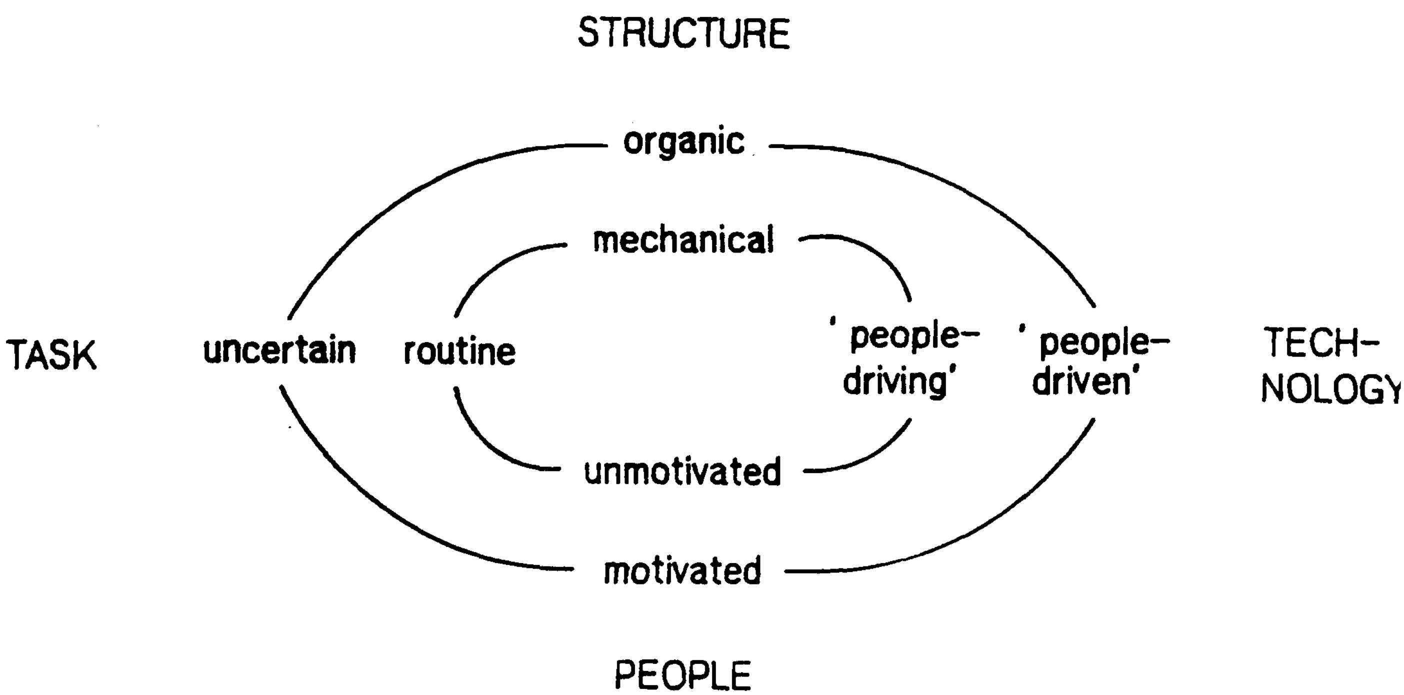

Figure 3: Mutual Dependency of Organizational Variables.

This figure shows the mutual dependency between the organization variables "task", "structure", "technology", and "people". The inner circle is characteristic of an organization with a large amount of routine tasks to be carried out, having a fairly mechanical organization structure, manned with fairly unmotivated people, and employing a people-driving technology. This would be characteristic of certain traditional government bureaucracies, large-scale volume manufacturing organizations, and the routine parts of many banks and insurance companies. The outer circle is characteristic of organizations with very uncertain tasks, an organic structure, highly motivated people, and a people-driven technology. This is typically seen in R&D departments, and scientific institutions, but many public administrations find that the growing societal complexity and turbulence are demanding a similar structure.

In the words of Flores and Bell (1984),

> "The largest single investment in an organization is in its employees working in particular ways, utilizing protocols to communicate, and forming a company culture .....

> software designers can be more effective if they acknowledge and take responsibility for their major part in this investment which accrues to them as the organizations's toolmakers."

In the following three sections, I shall suggest how such an integrated strategy may be carried out to achieve productivity in the public administration with modern information technology.

3. POLICIES.

Any introduction of information systems ought to be preceded by a strategic plan to coordinate the complex behavioral and technical aspects of information systems. But

> "without a strong pro-active direction from management there is a tendency for the process of change to be driven by technical considerations and an engineering view of information systems" (Keen, 1984).

This is supported in a recent study of values directing informations systems design (Kumar and Bjørn-Andersen, 1986). The main results are shown in the table below in figure 4

Table 4: OVERVIEW OF CANADIAN AND DANISH VALUE PROFILES

Average Behavioral Relevance Scores

	TECHNICAL	ECONOMIC	SOCIO-POLITICAL
CANADA	52.4	48.7	30.5
DENMARK	47.1	46.2	40.3
AVERAGE	50.6	47.8	33.9

which shows how technical considerations dominate over economic and especially social/organizational values. Interesting enough, there was a substantial difference between Canadian and Danish systems designers on the economic dimensions. While Canadian designers emphasize efficiency goals (project on time and on budget), Danish designers put significantly higher emphasis on effectiveness goals (long-range productivity of organization).

As a first step towards establishing an integrated plan, it is suggested to develop a vision (Keen, 1984). The tools for achieving this could be the so-called "Rich Picture" and the "Root Definition" for the organization. Space does not permit a description of these two tools, but interested readers are referred to Checkland (1981). An example of a vision could look as in figure 5 for the Danish Work Environment Agency.

The Vision of
the Work Environment Agency.

"We see ourselves as an agency with increasing importance in a world where technological developments to an increasing extent are putting pressure on the work environment. The relationships between technology and work environment get more complex and less transparent ....

The dual and partly conflicting functions of the agency as supervising laws, regulations and rules on the one hand and offering advice and service on the other must be recognized. However, it is foreseen that the service function and pro-active measures will dominate in the future .....

The agency will follow the general government modernization programme and will accordingly be more reliant on automation in all areas ....

Automation will only take place after thorough consultation with the relevant trade unions and employees on all levels. Nobody will be made redundant because of the introduction of new information technology".

Figure 5: Example of Part of a Vision for the Danish Work Environment Agency.

Based on such a vision it is possible to address the strategic plan for the organization by asking questions like

a) What should be the image of the organization 5-10 years from now?

b) What economic, societal, and political trends do we have to respond to?

c) What are to be the main priorities, opportunities, and problems?

d) What are the critical success factors?

e) What are the critical failure factors?

f) How can new information systems help us achieve our vision?

As an example, the Danish Work Environment Agency recently went through their policies and strategic plans. They developed in close cooperation with all interested groups

a) a vision for the role of the agency to the year 2000

b) proposals for the improvement of service to clients

c) a proposal for an organizational development programme for managers and staff

d) a long-range plan for the development of computer-based information systems.

Note especially how the development of the computer-based information system is part of the integrated strategy.

4. DESIGN

It is not possible within the frame of this paper to give a detailed account of all necessary design activities. Therefore I shall concentrate on those aspects of design which explicitly take the perspective of an integrated approach. One such approach is the "Functional Analysis of Office Requirements" (FAOR). This is a major research and development effort under the ESPRIT programme to define a generally applicable methodology and a set of instruments conducive to specification of requirements for computer based information. Figure 6 shows the main activity areas and the instruments for carrying out analysis from different perspectives.

a) Function analysis - defines the functions of an organization from its objectives.

b) Information analysis - defines information needs in functions through information modelling.

c) Communications analysis - defines information needs in functions from a communication perspective.

d) Needs analysis - defines information needs from an individual point of view depending on employee personal preferences.

These are then integrated and in the end a

e) Cost-benefit analysis which defines the value of the proposed system to the organization.

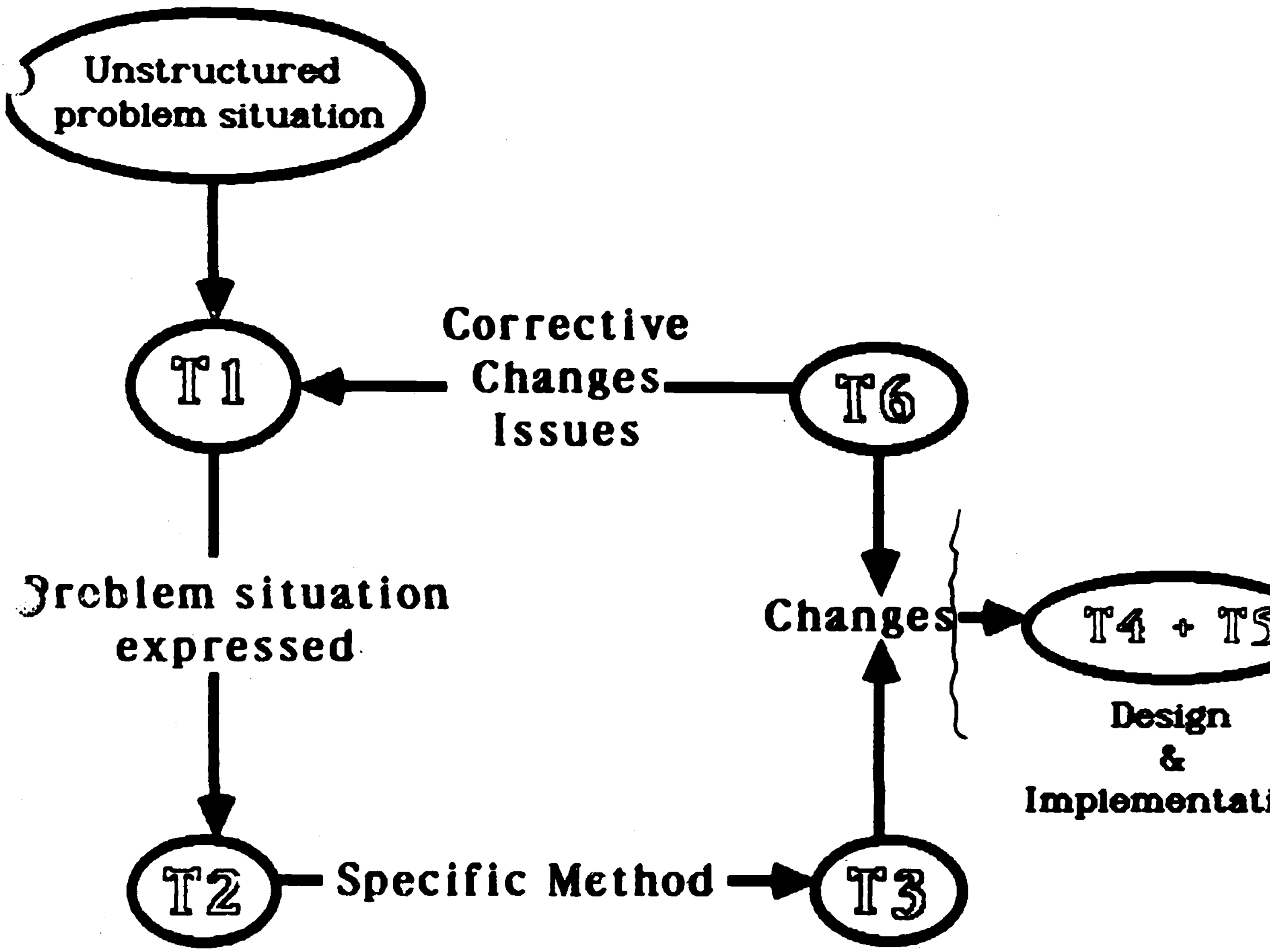

Figure 6: Main Phases of the Functional Analysis of Office Requirements Project (FAOR, 1986)

Even though the general FAOR methodology with all instruments will not be available until spring 1987, I should like to propose a couple of tools to be used in the instruments in order to safeguard especially the social/organizational dimensions of a computer-based information systems project.

Four tools are described here:

* a **three-day course** which has provided the participants with the educational background (Appendix 1),
* A **questionnaire** for analysing employee needs in relation to new office systems (Appendix 2),
* A framework for the **organizational needs** (Appendix 3),
* a method for a **task or function-oriented specification**, the so-called wall-graph method.

The Three-Day Course

To enable the participants to carry out analysis and specifications of requirements of a new information system in its organizational environment, it is necessary to provide training in tools and methodologies and their use. (See also Mumford and Henshall, 1979).

However, this will not work unless there is a certain level of consensus about values. Many employees, afraid of technological development, resist change. They are even suspicious that the socio-technical design strategy with a high degree of user participation is just another way of deceiving the employees. Accordingly, discussions on management goals and proposed changes must be undertaken.

Furthermore, we want the employees to critically evaluate proposals from vendors, something which demands self-confidence - the feeling that 'we are able to carry out the analysis ourselves'.

The objectives of the three-day course are best achieved if it is residential. This provides extra time for informal discussions and contributes towards making this course a type of organizational development exercise.

The content will not be further discussed here. The program is shown in Appendix 1, and the key tools and methodologies presented are dealt with below.

Questionnaire Analyzing Employee Needs

Integrated in the three-day course is an analysis of employee needs in the work situation. When the participants start on the course, they fill in a short questionnaire about their perception of their own job and expectations as to how it could be improved, especially in relation to new information systems.

In this questionnaire, we asked the following questions on a number of dimensions (e.g. job variety):

* How they perceived their job,

* How the present computer systems had changed their job, and

* How they would like their future job to be with new systems.

The questionnaires were then tabulated and results fed back to the participants for use in the workshops on the second day of the course.

Framework for Organizational Needs

One of the main difficulties in achieving a specification for the organizational part of a future system has been the lack of an adequate descriptive language.

The need was perceived by, among others, the Swedish Data delegation, which commissioned the outline of such a framework. The result was published recently (Arnberg & Bjørn-Andersen, 1983). The main idea is simple. Based on a very large survey of studies of the impact of information systems on organizations, we have identified the fourteen areas of a job which are potentially changed when a new information system is introduced (See Appendix 3 where the extremes of each dimension are shown as the ends of horizontal scales).

To give an example: One such dimension is 'degree of specialization'. A particular task like telephone sales may be handled by many employees, each taking care of only one sub-task (e.g. receive order, check whether goods are in stock, check solidity of customer, settle accounts, etc.) Alternatively, one employee may perform the full task from receiving the order to following up on the customer's payment.

The first system would represent one extreme of the 'degree of specialization' scale; the second would represent the opposite extreme.

When working on the specification or organizational requirements of a particular application, the design group is recommended to use the list shown in Appendix 3 as a check list and specify where, on each dimension, their future system ideally should be. Preferably, they should illustrate it by giving a concrete description, e.g. the degree of specialization which will be preferable.

Task-Oriented Specification

A prerequisite in any systems design project is to determine the existing work flow and - after the design of the information system has taken place - the future work flow.

The **wall-graph** method, which has been used extensively in the Scandinavian countries, has proved a suitable tool for this purpose.

The idea behind the method is that the employees working in a certain company section map their administrative routines and describe them by means of a handful of simple symbols (operation, delay, control, etc.). A circle represents an operation or activity; a square represents a control; a D-shape is temporary filing or delay; an inverted triangle is filing; and a cross represents discarding. Red is used for document flow and symbols; green for copying and data comparison; and blue for comments. Copies of original vouchers, forms or documents are glued on to the board with a type of glue which makes it possible to move documents around. In order to make it handy in size, all documents are reduced to half-size on a photocopier. Plastic coated boards about 120 x 50 cm and watersoluble ink are used so that drawings can be easily removed or altered.

The wall-graph is a very easy way of creating:

* A picture of the administrative work flow of the routine which is accurate and extremely easy to understand;

* A description suitable for evaluating the value of the routine and potential rationalizations;

* A possibility of showing and experimenting with changes in a simple and clear way; and

* A possibility of an active participation of all employees involved because everybody can see the full graph and can contribute suggestions. Furthermore, no 'high-priest' language or symbols are used.

Experience shows that the application of such tools in an integrated strategy for the design and implementation of information systems significantly contributes towards a higher overall productivity in organizations (Hirschheim, 1983).

5. IMPLEMENTATION

Implementation of information systems is suggested to follow the so-called PEP-model. This model consists of a list of implementation activities which have been found useful in the past in implementing office systems. These can be classified into three groups, the packaging of the information system, the environment in which the information system is implemented, and the actual process of implementation. It should be borne in mind, however, that the individual implementation activities should be selected in accordance with the overall strategy.

The specific suggestion for implementation activities is discussed below under the three headings: packaging, environment, and process.

5.1. Packaging

Traditionally, we do not see the external properties of an information system as part of the implementation procedure. However, we must realize that the packaging is extremely important to be the user, because it determines how mentally demanding it is to actually change one's procedures and work with the new system. It is therefore necessary that the hardware and software are presented to the user in such a form as to make it as easy as possible to understand how it could be incorporated into existing or new work procedures. E.g. the desk-top metaphor used in the Xerox Star and the Apple Macintosh, which allows for an easier or more user-friendly interface than traditional computer systems, makes these systems far easier to implement than traditional office systems.

The proposals for packaging the information system are the following:

- Personalized initial encounter. Several systems have the possibility of providing a personalized interface for the very first encounter with the user. This is not just a question of providing your name so that the system may respond, "Hi, Jack". It is a question of building into the system models of the type of tasks, the user has to deal with in his/her daily work.

- Reduction of early information load. Many systems assume a fairly high level of learning by heart of details which seem irrelevant to the user. Things like a long list of codes, instructions, special keys, switches, etc. that have to be known before the user can usefully get something out. This obviously makes the threshold very high, and efforts should be made for the user to get a very early success in the form of being able to execute certain tasks with a minimal amount of effort. This might mean a risk that the user believes that everything is dead easy but that risk is far less significant than the risk that the user gives up, because the initial encounters are too overwhelming and too mentally demanding.

- The user manuals should be based on a user-understanding and not on a technical/engineering understanding of the office. I am not arguing for large, complicated manuals as we used to have in the administrative data processing environment. I am arguing for problem-oriented, easy-to-follow descriptions of how to make the system perform more functions than originally assumed, how to carry out certain seldom used functions in the work processing program, how to perform certain functions in the spreadsheet, etc. It has proven very successful in practice to have users develop their own documentation of these necessary routines on top of the material already provided by the vendor of the system.

- Design information systems which allow for an upward adjustment to match an increase in user competence. If the initial entry price to the system is very low, e.g. with a menu-driven, easy-to-use system, the user will very soon reach a competence level where the menu-driven interaction form gets too slow and too annoying. The system ought to have the provision for a more efficient communication with the user. Furthermore, it is an advantage if the user can store certain information in the system and in this way build up his/her own information/knowledge base of factual information, routines, etc. which have been useful in the past.

- Evolutionary implementation of the system. No matter which overall strategy for implementation chosen, it is advisable to adopt a stepwise introduction of the system instead of introducing it in one big jump. E.g. the Danish Ministry of Industry is introducing its office of the future in the following five steps:

  - Independent word processors and terminals linked to the state government computer service bureau.

  - Local area network for electronic mail and a file server for sharing of data files and for administration of print files.

  - Professional work stations/PCs in the relevant sections of the Ministry linked up to each other and the state central computer service bureau through the network.

  - Super micro introduced for handling communication with external data bases like e.g. EUROnet DIANE, etc.

  - Micro and data bases for an integrated filing system in the Ministry.

This gradual or stepwise introduction of information systems seems a superior strategy to a solution where everything is introduced at one point in time.

5.2. Environment

In order to provide for a smooth implementation of information systems, it is necessary to have or create an environment which is conducive to change. This is obviously something which cannot be done in splendid isolation from what normally goes on in that particular organization/office. We all know of organizations which are very capable of handling change, and others where neither the management nor users have the slightest wish to change their behaviour and attitudes, e.g. to incorporate new information systems. This has a lot to do with establishing trust, consensus, common values in the organization. If these are absent it is very difficult to create any kind of change. In a hostile environment with little cooperation between employees/union and management, any move on the part of management would be viewed as a potential plot against the users.

Technology agreements is one of the ways of establishing a framework for a reasonable cooperation between employees-/unions and management on new technology. In the Scandinavian countries there are technology agreements in almost all medium to large organizations and similar agreements are in existence in individual industries in many other European countries. These agreements specify rules and obligations for management and change agents relating to provision of information for users, training, provisions, prior consultation with users and trade unions, etc.

Furthermore, technology agreements might necessitate a development or implementation organization with steering committees, user groups, etc., all of which have an influence on the implementation.

One very useful implementation feature has been the creation of the so-called local experts. These might be appointed formally or they might simply grow out of the user group as the individuals who are especially capable of trouble-shooting in relation to the systems, or who are especially knowledgeable about features which are seldom used. These local experts will thus have a function of assisting and training other users, will test out new facilities, and will often be entrusted to take care of simple routine checks of the work-stations, etc. Whether appointed formally or informally, it is important that this task is recognized at least to the extent that the individual is relieved of some of his/her other tasks in order to carry out this support function. Experience shows that one such local expert should be available for approximately every ten users, depending on the geographical layout of the office and the diversity of tasks.

5.3. Process of Implementation

The key element in the implementation process is to facilitate a learning process through which the users acquire the attitudes and the knowledge conducive to change and conducive to achieving a symbiosis between the system and the user. This learning process is not synonymous with the teaching exercises offered on a two day course by the vendor.

Even though an organization in general utilizes a piece of technology which is at a certain level in its saturation life-cycle, this might relate to individuals being at very different levels of their own personal learning level relating to that particular piece of technology. As we see in figure 7, it is necessary to make provisions for individuals being at different points in their own personal learning process vis-a-vis the new office system. (Pyburn and Curley, 1984).

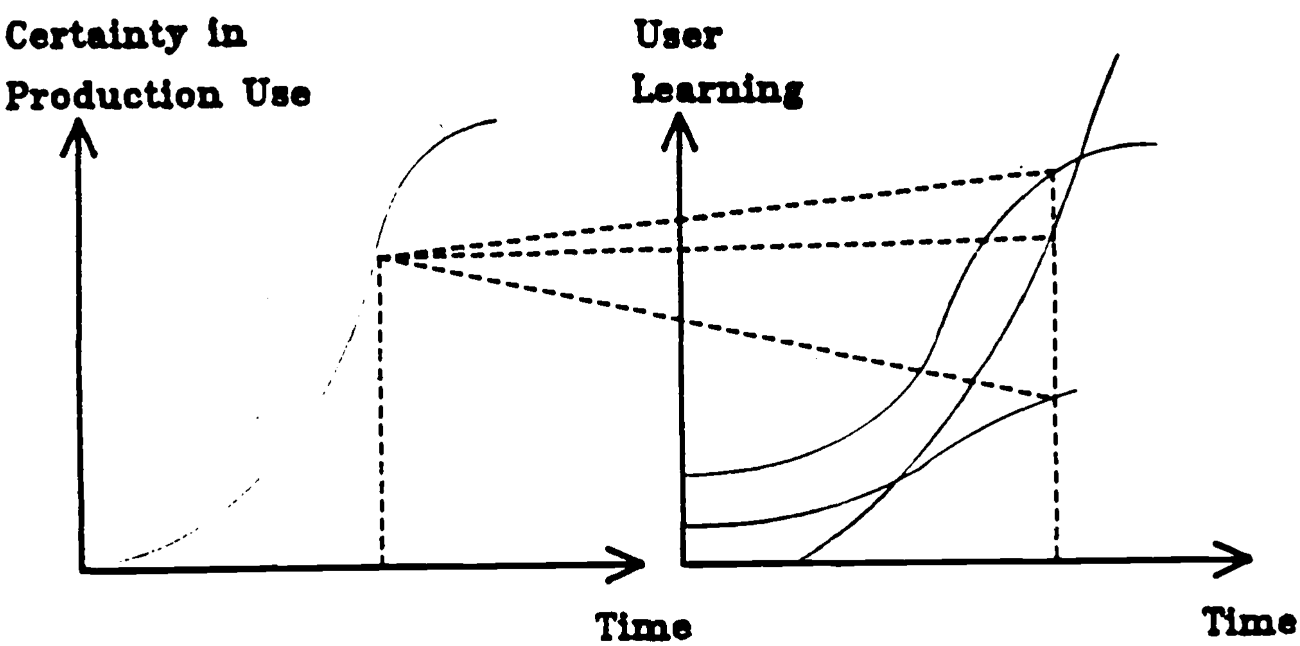

Figure 7: Intellectual Technology Life Cycle.

Secondly, it is important to realize the kind of change we want to accomplish with our implementation procedure. Four levels of change are shown in figure 8. This illustrates the fact that it is a lot easier to provide a training programme which will provide the attendees with a certain element of acquired knowledge, which might be tested in a computer aided instruction programme. However, if the objective of the training is to change the intended values or even more ambitious the individual and the group behaviour, a very extensive programme of change is asked for. But far too many existing training programmes on office systems are limited to concentrating on providing knowledge. It is often forgotten that the training programmes should translate into actual behaviour.

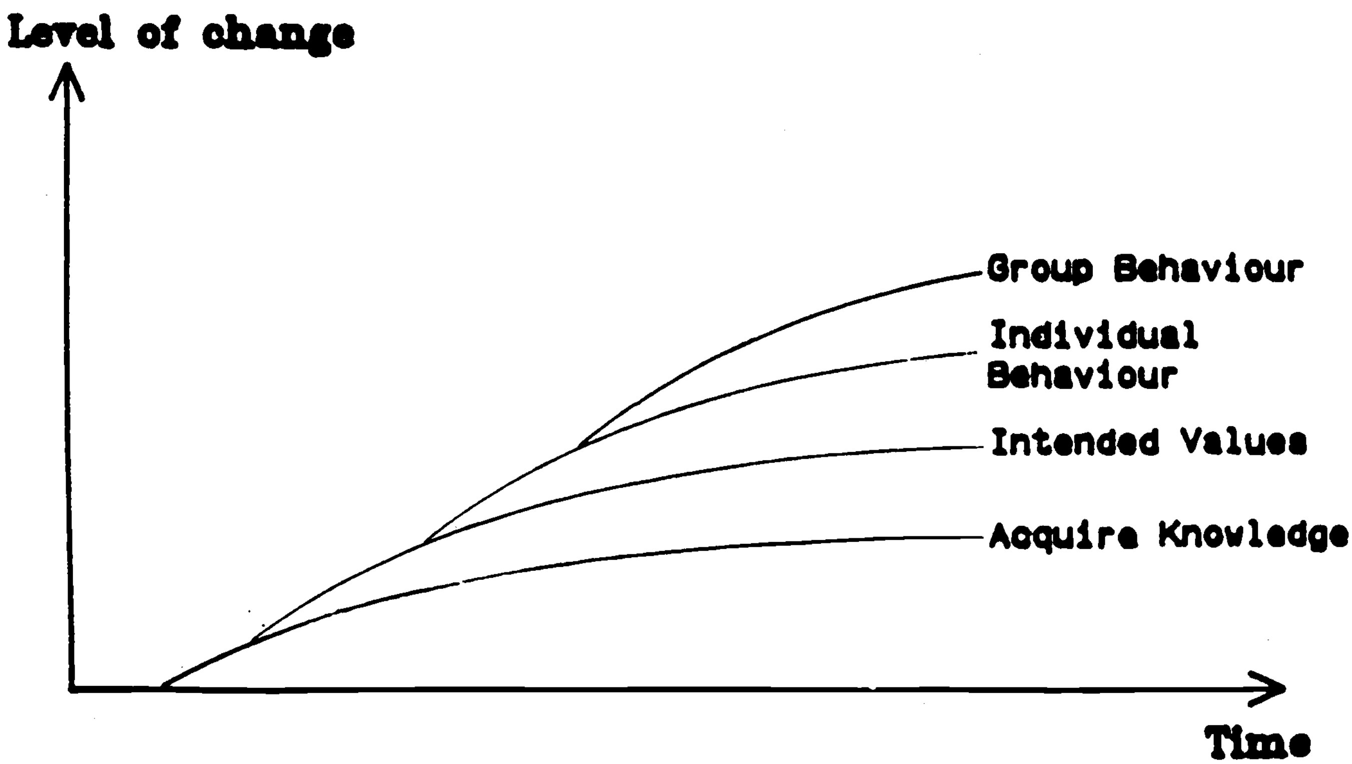

Figure 8: Level of Change Achieved with Training.

More specifically, it is proposed to follow the following guidelines:

- Process-oriented training. Some of the best programmes on implementation or introduction of end-users to office systems are organized in such a way as to address specific work processes from the user environment. The users are given the support either from the software or from the trainers available to address those tasks-

/problems that he/she is confronted with in the daily work. Experience shows that this kind of training provides for a learning process which is substantially superior to the training programme where the main emphasis is on structural characteristics of the system hardware and software.

- The training/learning should be seen as a continuous knowledge acquisition process. This is mandatory because of the unstructured and ever changing character of office work. At a time when most of the routine tasks have already been automated, the exceptions are becoming the rule. This means that users of office systems are not just "solving problems". They are going to utilize these systems to define problems and to define proper actions in order to initiate and monitor some kind of automatic process. In order to do that we must make sure that it is possible for users of systems to continuously learn more and upgrade the systems in that process.

- The objectives of the training/learning process must also be decided upon depending on the kind of system and the environment as shown in figure 3. In a study (Træsborg and Bjørn-Andersen, 1982) of the implementation of educational programmes provided when introducing new micro-electronics, it was revealed that a maximum of two days was provided. The study concluded that this was not providing the users with the possibility of evaluating and (re)designing the system, and therefore, this (lack of) training would be detrimental to organizational changes in the future.

- Create familiarity with the system. This can be done in many ways. One of the most successful ones is to let the users themselves or representatives of the users carry out site visits to other organizations which have similar systems. Other possibilities are the provision of possibility for testing out similar systems in secure environments, i.e. environments where nobody is laughing and where there are no pressure for producing a certain output. Other possibilities especially as a first introduction to work stations is the provision of different types of games. This could then be followed by a simple word processing system.

- Create real life demonstration projects or pilot installations of the first package implemented. This could be done in one user department or one part of a user department in order for this group to get acquainted with the tools, detect any malfunctions in the system and provide an easy means of evaluation of the potential consequences for the rest of the organization. This will take away a substantial part of the uncertainty that many users find with information systems.

6. CONCLUSION.

Modern public administration is getting increasingly complex and has to adjust to turbulent environments. Accordingly, planning, designing, and implementing information systems, utilizing an integrated strategy, is an important prerequisite for the improvement of productivity. In such a strategy, structural, technological, and actor-oriented strategies are combined.

Many systems designers have been reluctant to leave their traditional, technically dominated area for lack of tools and practical advice on how it might be done. This paper presents a number of tools and practical guidelines which should remove this excuse.

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APPENDIX 1 COURSE IN ADMINISTRATIVE PLANNING AND SYSTEMS DEVELOPMENT

Objective
The objective of the course is to provide the participants with an increased knowledge of planning and analysis techniques and the possibilities and constraints of the developments in information technology.

On termination of the course, the participants should be able to carry out specification on new information systems using experts as consultants.

PROGRAM
1st day

Introduction to the course
- presentation and discussion of the program

The development of information technology in general
- hardware and software developments
- functions of information technology
- facts and fiction of development

Typical systems relevant to the user situation
- systems development strategies within the public sector
- types of systems within municipal management

Municipal experience hitherto with minicomputers
- field of application
- consequences
- plans for further development
- strategies pursued by systems suppliers

Group work
- framing of questions to the Kommunedata regarding development plans etc.

The Kommunedata
(presented by a Kommunedata consultant.)
- strategies, products, service to municipalities

Plenary discussion
(of the Kommunedata's developments plans etc.)

PROGRAM
2nd day

The consequence of computer systems
- The impact of computer systems on jobs and organisations

Workshop
- Discussion of the consequences of existing computer systems on the participants' own jobs within the municipal administration based on a questionnaire (Appendix 2).

Plenum
- Discussion of consequences already perceived.

Job analysis — job design
- Methods of analysing the job situation (Appendix 3)

Workshop
- Analysis of present job situations
- Desirable characteristics of future job situations

Plenum
- Discussion of desirable job content characteristics

PROGRAM
3rd day

Systems work, requirements specifications
- phases, methods and tools

Project work in general
- principles
- practical approaches and empirical results
- user participation in systems work

Plans for future activities
- summary of municipal analyses and joint meetings so far
- types of tasks to be attacked
- the future roles of the consultants (only on call)

Workshop
- Proposals for plans of activities
  (objective, definition, organisation of work, methods plied, time and resource plan), defined by participants.

Plenum
- Discussion of plans of activities

APPENDIX 2 QUESTIONNAIRE

Introduction
This is a questionnaire about what you like and dislike in your present job and how you would like to change it.

The objective of this questionnaire is to get an overview of the user requirements to the existing and future systems. In this way we hope to contribute to a better working environment and, at the same time, achieve higher productivity and improved service to our clients.

Sample questions
To which extent do you feel that your skills are utilised in your present job?

Very high degree
Reasonably high degree
Acceptably
Only a little
Poorly

Would you prefer a job where there were better opportunities for utilising your skills?

Yes
No
It does not make a lot of difference to me

(Other dimensions treated in the same way were

- task variation
- routinisation of job
- stress
- responsibility
- involvement
- workload
- own determination of work pace
- variations in work load
- formalised procedures for the task)

What are the three best aspects of your job?

What are the three worst aspects of your job?

In which way do you feel that the use of electronic data and word processing will improve/deteriorate the work situation in your municipality?

APPENDIX 3 ORGANISATIONAL NEEDS

Respondents should indicate, on a scale as shown below (0-100%) the 'ideal' for each dimension of the new system. The result would provide a 'profile' of the system.

Job content

Strongly specialised job	Varied, enlarged job
Polarised division of work	No division of work
Structured preprogrammed work	Free choice of methods and sequence of subtask
Norm or rule-oriented behaviour	Consequence-oriented behaviour

Autonomy and control

Monitoring of work performance	No monitoring of performance
Much stress	No stress
No influence on own job	Total autonomy
No influence on company issues	Large influence on company issues

Social relations

No job security	Total job security
No possibility of self-actualisation	Great possibility of self-actualisation
Working alone all day	All work done in contact with others
Alienated	Well integrated

Personal development

No training demands	Many training demands
No personal development	High rate of personal development

TECHNIQUES DE L'INFORMATION ET CROISSANCE DE LA PRODUCTIVITE DANS L'ADMINISTRATION PUBLIQUE

YVES FRANCHET

Banque Interaméricaine de Développement

PLAN

RESUME

La Banque Interaméricaine de Développement, organisation financière publique internationale, a entrepris de moderniser sa gestion et d'accroître sa productivité grâce à un plan quinquennal d'informatisation. La stratégie suivie s'appuie sur les récents développements de la micro informatique qui permet la mise en place de systèmes de gestion et d'information décentralisés au maximum, où les utilisateurs sont fortement impliqués au niveau de la définition et de la gestion des systèmes. Les difficultés rencontrées sont plus d'ordre sociologique et organisationnel que technique. Bien que l'expérience de la BID soit loin d'être terminée, il est déjà possible d'en voir les effets sur la productivité, celle-ci étant définie, au sens le plus large, comme une mobilisation plus efficace et effective des ressources de cette institution.

INTRODUCTION

La Banque interaméricaine de Développement (BID) est une institution financière internationale publique crée initialement par les gouvernements des pays du continent américain. Une description de son origine et de ses fonctions est donnée en Annexe I.

En vue de rationaliser sa gestion et d'accroître sa productivité, la BID a entrepris de rationaliser et développer ses systèmes informatiques de gestion. La communication qui suit décrit cette expérience en cours ainsi que son incidence sur la productivité de l'institution.

I. PLAN QUINQUENNAL D'INFORMATISATION DE LA B.I.D. (1983 - 1987)

Comme la plupart des institutions semblables, la BID a modifié au cours des années 1970 son organisation informatique, passant rapidement de l'utilisation de services informatiques extérieurs à la création d'un service d' informatique interne chargé progressivement de la réalisation des travaux les plus importants. La croissance rapide des travaux informatiques réalisés dans l'institution n'a pas été accompagnée d'une coordination suffisante entre les différentes Directions, et a conduit à une situation caractérisée par la production d'informations redondantes, souvent incohérentes, due à l'absence d'une mise en commun des informations entre les différents départements, ainsi qu' à une insatisfaction croissante des utilisateurs de l'informatique, et de la frustration du personnel de la division informatique.

Face à cette situation, le Comité de Direction de la Banque crée en 1980 un Comité des Systèmes d'Information pour la Gestion au niveau directorial, 1/ présidé par le Directeur de l'Administration. Ce Comité décide d'entreprendre un diagnostic approfondi de la situation, et de préparer un plan quinquennal d'informatisation.

Les travaux d'analyse sont confiés à la société Arthur Andersen, qui remet ses travaux fin 1982. Au cours de la même année, le Bureau extérieur d'Evaluation et d'Analyse -- unité technique de contrôle du Conseil des Directeurs Exécutifs de la Banque -- prépare également un rapport sur la situation des systèmes informatiques de la Banque, et émet un certain nombre de recommandations concernant leur futur.

Ces deux documents sont transmis au Sous-Comité Technique du Comité de Systèmes d'Informations pour la Gestion, qui prépare un plan quinquennnal de développement de l'informatique à la BID pour la période 1983 - 1987. Ce plan est approuvé par le Conseil des Directeurs Exécutifs en 1983.

Les Grandes Lignes du Plan Informatique

Le plan informatique met l'accent sur deux aspects fondamentaux de la production et de la gestion de l'information:

- l'information représente pour une institution comme la Banque une ressource de même importance que ses ressources humaines et financières, et doit recevoir une attention semblable de la part de la Direction de la Banque.

1/ Ce terme est la traduction de la notion anglo-saxonne de Management Information System (MIS).

- les développements récents et les perspectives futures en matière d'équipement informatique permettent de donner un rôle plus important aux utilisateurs dans la conception et la gestion des systèmes d'information dont ils ont besoin.

A. L'information est une ressource essentielle de la Banque. Pour tenir compte de cet aspect fondamental, trois séries de mesures sont proposées:

- le niveau de représentation de la fonction informatique dans la Banque est élevé au rang de Directeur, au même titre que les fonctions financières, juridiques, administratives et opérationnelles. Le service informatique était auparavant une division de la Direction de l'Administration. A partir de 1983, le bureau du Controller, qui est l'équivalent d'une Direction, en prend la responsabilité, assisté d'un Controller adjoint, expert de très haut niveau en informatique. Un organigramme de cette nouvelle organisation est donné en Annexe II.

- la présidence du Comité des systèmes d'informations pour la gestion est élevée au niveau du Vice-Président Exécutif.

- Dans chaque grande Direction de la Banque est créée une Unité de Gestion des Informations (Information Resource Management Unit), chargée de l'élaboration, du développement et du suivi du Plan Informatique. Le coordinateur de cette unité est le conseiller du Directeur pour tous les problèmes liés aux systèmes d'information. Il est le représentant de la Direction dans le sous-comité technique du Comité des systèmes d'Information pour la Gestion.

B. Participation des utilisateurs à la conception et à la gestion des systèmes d'information.

La technologie des micro-ordinateurs, puissants et peu coûteux, permet désormais de mettre en place une architecture informatique décentralisée où les utilisateurs jouent un rôle plus important que par le passé.

Jusqu'en 1982, la structure de l'équipement informatique de la Banque consiste essentiellement en un ordinateur central Honeywell, géré par le Centre informatique de la Banque, qui se trouve à la Direction du Personnel. Les Directions soumettent leurs demandes de travaux informatiques à ce Centre. Elles ne possèdent aucune capacité technique qui leur permette de dialoguer efficacement avec le Centre. Les données sont transférées du Centre de traitement, soit en temps réel, via un terminal "on line", soit en "batch".

Le plan Informatique prévoit une mutation graduelle du système vers une structure beaucoup plus décentralisée et interactive.

Les Directions vont disposer d'une capacité technique leur permettant de participer à la définition de leurs systèmes d'information grâce à la création des Unités de Gestion des Informations, et de gérer leurs systèmes d'information de petite dimension sur des ordinateurs personnels et d'accéder à l'ordinateur central en mode conversationnel. Elles définissent chaque année leurs besoins et leurs priorités dans le cadre du Plan Informatique.

En liaison avec les coordinateurs de ces Unités, qui ont les représentants de leur Directions au sous comité technique du Comité des systèmes informatiques de gestion, le Bureau du Controller garde la responsabilité des choix en matière d' équipement, de logiciels, et de l'enveloppe budgétaire globale pour l'informatique.

La Division Informatique s'enrichit d'un Centre d'Information chargé des relations avec les utilisateurs, et, notamment, de maintenir ceux-ci informés des développements en cours, de tester et installer les nouveaux équipements et logiciels. Le Centre est également chargé de la conception et de la mise en place des bases de données à la B.I.D., ainsi que de leur gestion.

Le plan informatique prévoit initialement de développer quinze activités prioritaires, réparties en cinq phases. Elles comprennent:

Phase I - La révision et l'amélioration des systèmes existants

Phase II - La conception et l'installation de petits systèmes qui répondent aux besoins des différents Départements de la Banque.

Phase III - L'acquisition du nouvel ordinateur central, et la sélection du système de gestion des Bases de données (DBMS) qu'il devra utiliser.

Phase IV - Le développement de systèmes nouveaux dans le cadre de l'information pour la gestion (Management Information System-MIS) et du soutien à la décision (Decision Support System-DSS).

Phase V - Le développement de nouvelles versions des grands systèmes en place dans le cadre MIS et DSS.

L'annexe III décrit plus en détail la liste des activités prioritaires que recouvrent ces différents phases, ainsi que la chronologie de leur réalisation.

Moyens à la Disposition du Plan Informatique

Les Budgets de fonctionnement de la B.I.D. sont élaborés sur une base annuelle, et les Budgets d'équipement sur une base biannuelle. Depuis 1980, le Budget de fonctionnement est caractérisé par une croissance nulle en termes réels, qui s'accompagne d'un gel des effectifs en personnel permanent de l'institution.

Le plan informatique introduit, par conséquent, l'un des rares "budgets de programme" qui ait été élaboré, et le Conseil de Direction a décidé de lui allouer, pour la période 1984-1988, US$19 millions supplémentaires, dont $2,5 millions au titre du Budget d'équipement. Le Budget de fonctionnement du plan sert à couvrir essentiellement les frais de personnel supplémentaires, qui correspondent à un volume d'environ 233 hommes/an pour la période considérée. Le gel du nombre de postes permanents conduit la B.I.D. à ne recruter que du personnel temporaire -- consultants, et contrats à terme fixe -- pour exécuter son plan informatique.

Réalisation du Plan Informatique. Evaluation provisoire au début 1986.

Bien que la réalisation du plan informatique soit à peine à mi-parcours, l'effort entrepris par la B.I.D. pour moderniser ses systèmes informatiques apparaît déjà positif à maints égards.

Le démarrage a été plus lent que prévu. La prise en compte d'une opération "budget de programme" par une institution qui ne pratique pas cet exercice de façon courante, s'est traduite par des lenteurs administratives, notamment dans le recrutement du personnel temporaire hautement qualifié nécessaire.

D'autre part, la réalisation de la première phase -- révision et amélioration des systèmes existants -- a été plus longue que prévue, car l'importance des changements requis avait été largement sous-estimée dans la phase d'analyse. Cette phase a joué un rôle essentiel d'apprentissage pour les utilisateurs dans la définition et la planification de leurs besoins.

L'introduction des micro-ordinateurs chez les utilisateurs est, en effet, un facteur de changement important dans l'organisation du travail, la structure de la hiérarchie, et l'accès à l'information qui est liée à une certaine perception de la structure de pouvoir. Elle s'accompagne donc d'une forte résistance au changement des structures en place, phénomène bureaucratique classique. 2/ Le personnel d'encadrement, qui a souvent une assez grande ancienneté dans la maison, craint de voir son autorité remise en cause par l'introduction de techniques modernes que leurs collaborateurs plus jeunes, et, en particulier, leurs secrétaires, maîtrisent plus vite et plus facilement qu'eux. 3/

La création de la "visibilité" du plan informatique au niveau du Comité de Direction s'avère un facteur très positif pour la réalisation du plan informatique. Elle assure une pression constante au niveau des Directeurs pour résoudre les problèmes qui apparaissent. Le Controller joue le rôle de "Chief Information Officer" (CIO), fonction qui se développe rapidement dans les grandes entreprises américaines et internationales, et consacre le le fait que l'information est une des ressources vitales au bon fonctionnement d'une institution. Le Comité des systèmes d'Information pour la Gestion a adopté une attitude active et participative, après avoir traversé une période de formalisme peu productive de son existence. On discute maintenant au sein du Comité les questions importantes qui y sont présentées, et, notamment, les choix technologiques que doit effectuer la BID au cours des prochaines années dans les domaines de la bureautique, des

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2/ Le directeur de l'organisme informatique gouvernemental du Brésil -- SERPRO -- à qui je présentais le plan de la B.I.D., faisait le commentaire suivant: 20% de problèmes techniques, 80% de sociologie et psychologie.

3/ On pourra lire sur ce thème l'article de Peter Keen, de la Sloan School, M.I.T., "Information Systems and Organizational Change", Communications of the Association for Computing Machinery, Vol. 24, January, 1981.

nouveaux systèmes informatiques de grande dimension -- tels SWIFT pour les liaisons bancaires internationales de développement de réseaux locaux de micro-ordinateurs, de l'opportunité d'évoluer vers un système d'ordinateurs centraux produits par différents fabricants, du choix du système de gestion des Bases de données (DBMS).

La démarche suivie pour la mise en oeuvre du plan informatique a aussi joué un rôle important dans le bon déroulement des opérations. Le Bureau du Controller fait fonction de consultant interne auprès des utilisateurs, en leur fournissant des services qui leur permettent d'atteindre les objectifs fixés par le plan. Cette démarche implique de ne pas forcer une décision tant que la Direction utilisatrice qui doit la prendre n'est pas mûre pour la prendre, et, en particulier, n'a pas réglé les différences d'opinion ou les conflits ouverts qui sont apparus au sujet de cette décision. Elle implique aussi que le Bureau du Controller soit réellement au service du Département utilisateur, ce qui nécessite souvent un changement radical d'attitude de la part des experts informaticiens, lesquels doivent ainsi ajouter à leurs capacités techniques celles d'un expert en marketing et d'un spécialiste en relations publiques. Les lenteurs apparentes que cette démarche entraîne apparaissent plus que compensées par la qualité des relations qui se développent entre expert et utilisateur, et cette approche semble avoir évité, jusqu'à présent, la tendance au "rejet" systématique des décisions imposées de l'extérieur, problème désormais classique et bien connu dans les expériences d'informatisation d'entreprises et d'administrations.

La formation du personnel fait l'objet d'une attention particulière. Le Centre d'Information sert, en particulier, de lieu d'apprentissage, et la division formation du Département du Personnel développe une série de cycles courts de formation dont va bénéficier environ 20% du personnel de la B.I.D. en 1984/1985.

L'introduction des micro-ordinateurs dans les directions va de pair avec celle de machines de traitement de texte, et ces deux équipements représentent le début d'une introduction de l'automatisation dans le travail administratif. 4/ Cette automatisation reste, pour l'instant, peu développée, et, en particulier, la B.I.D. n'a pas encore mis en place les réseaux locaux d'ordinateurs, ni les systèmes de transmission de courrier électronique qui sont la condition nécessaire à cette automatisation. La seule exception consiste dans le développement rapide des relations micro à micro entre le Siège de la B.I.D. à Washington, et ses représentations dans les pays membres. Les 22 représentations de la B.I.D. sont chargées d'élaborer des rapports périodiques sur la réalisation des opérations financées par la Banque: résultats d'appels d'offres, montants des déboursements, état d'avancement des travaux, modifications dans les procédures d'exécution. Ces rapports sont dactylographiés dans les représentations, et expédiés par la poste au Siège où ils sont rentrés dans les systèmes d'information centraux de la Banque. La modification en cours consiste à rentrer ces informations directement sur les micro-ordinateurs de la Représentation, et à les transmettre, grâce à l'utilisation de "modems", et

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4/ Il est probable que dans un futur proche le traitement de texte se fera sur micro-ordinateurs définis comme "work stations".

via le réseau téléphonique international, à un micro-ordinateur compatible du Siège. Douze Représentations utilisent déjà pleinement ce type de communication.

Les opérations à réaliser au cours des deux prochaines années sont clairement définies et, en particulier, prévoient de résoudre les grandes questions suivantes:

a) Intégration du plan informatique dans la vie courante de l'Institution: il s'agit ici de dépasser l'horizon du plan quinquennal pour faire de la dynamique, introduite par ce plan dans l'organisation et les systèmes d'information, un élément de la vie courante de l'Institution. La rapide obsolescence de la technologie des systèmes d'information rend cette intégration essentielle.

b) Centralisation versus décentralisation des systèmes d'information. La décentralisation des décisions qui caractérise les premières phases du plan informatique risque de conduire à une situation de désintégration et d'incohérence des systèmes d'information de la BID si elle n'est pas périodiquement contrôlée. Avec la prolifération des ordinateurs personnels et des micro-ordinateurs, se présente le risque d'une multiplication des bases de données locales incohérentes, ou incompatibles entre elles. 5/ Le développement d'un dictionnaire de données devrait limiter ces incohérences. 6/

c) Prise en compte de la notion de coût informatique par les départements utilisateurs. La centralisation actuelle du Budget informatique dans le Bureau du Controller conduit les départements utilisateurs à accorder peu d'importance aux coûts informatiques liés aux opérations qu'ils entreprennent. L'introduction de la notion du coût permettra une meilleure discussion des priorités des départements, et une utilisation plus efficace des ressources du plan informatique.

5/ L'utilisation de nombreux modèles mathématiques, et la structure complexe du système de décision de la BID où le pouvoir politique peut être représenté comme une pyramide inversée audessus de la hiérarchie pyramidale de l'administration, rendent la solution de ce problème particulièrement délicate à la BID.

6/ Un dictionnaire de données contient la définition précise et exhaustive de toutes les données dans les systèmes informatiques, et permet ainsi d'éviter les incohérences possibles.

II. Informatisation et Croissance de la Productivité à la BID

Le plan informatique de la BID a comme double objectif, d'une part, l'amélioration des décisions grâce à l'utilisation de systèmes d'information cohérents, disponibles dans la forme et le temps, offrant un soutien apprécié à la prise de décision, et, d'autre part, un accroissement de sa productivité grâce à l'introduction de systèmes d'information plus performants. Il y aurait beaucoup à dire sur la relation entre systèmes de décision et systèmes d'information dans une administration, mais cet aspect n'est pas l'objet de cette communication. 7/ Il est bon de noter, cependant, que la BID étant une Banque, et, de ce fait, prenant ses décisions sur la base d'une analyse technique financière et économique des projets qu'elle finance, ses systèmes d'information sont plus utilisés dans le cadre de la prise de décisions que ce n'est le cas dans une administration centrale, nationale ou internationale.

Un accroissement de productivité sera défini dans la suite de cette communication comme une utilisation plus efficace et effective des ressources disponibles. Cet accroissement de productivité doit permettre d'atteindre de meilleurs objectifs avec les mêmes ressources, ou les mêmes objectifs avec moins de ressources.

Dans une entreprise commerciale, un gain de productivité peut se mesurer et se résumer aisement en termes de taux de profit. Dans une institution comme la BID, la mesure en est beaucoup plus difficile. Le volume de prêts de la BID et ses profits dépendent trop de conditions extérieures à l'institution (situation économique et financière des pays bénéficiaires, variation des taux sur le marché financier international, etc.) pour que leurs variations puissent être associés à une mesure du changement de productivité.

La BID traverse une période de restrictions budgétaires continues, et, en même temps, doit faire face à une plus grande complexité de ses opérations de prêt, en raison des difficultés que rencontrent ses pays emprunteurs. Une mesure possible de la croissance de sa productivité est donnée par sa capacité à accomplir des tâches plus complexes avec le même volume de moyens.

Les compte-rendus d'expériences d'informatisation dans les administrations qui ont eu lieu au cours des dernières années montrent clairement que ces expériences n'ont pas été systématiquement accompagnées par une croissance de la productivité. Il semble qu'informatisation et, a fortiori, automatisation ne sont des instruments utiles pour accroître le productivité que si un certain nombre d'éléments sont réunis, et, notamment: 8/

7/ Cf. note 5, page 9

8/ On pourra lire à ce sujet l'article de Ralph Klein, "Does Automation Necessarily Mean An Increase in Productivity?" Journal of Systems Management, May, 1985.

- une définition détaillée des besoins et des priorités en matière d'information avant qu'aucune opération ne soit entreprise,

- une participation active des utilisateurs à cette définition, et à la mise en place des moyens informatiques,
- une formation adéquate des futurs utilisateurs,

- la mise en place d'un système de contrôle de la réalisation des opérations entreprises, et de leur impact sur l'organisation du travail.

La stratégie suivie depuis trois ans par la BID réunit ses éléments, et explique pourquoi les utilisateurs sont unanimes à déclarer que l'expérience d'informatisation améliore leur productivité.

Au niveau des ressources humaines, on peut déjà constater que la tension qui existait entre informaticiens et utilisateurs a pratiquement disparu. La démarche suivie pour la mise en place du plan informatique, la formation d'un nombreux personnel sur micro-ordinateurs -- utilisant notamment des logiciels tels que Lotus 1-2-3 et D-Base III -- et leur participation à la définition de leurs besoins en matière d'informatiques, expliquent largement cette nouvelle situation, et permet de résoudre beaucoup plus rapidement et efficacement les problèmes rencontrés.

Répondant à une enquête effectuée, fin 1985, sur les gains de productivité engendrées par la mise en place du plan informatique, les départements sont unanimes à faire état d'une croissance de leur productivité. Ils sont moins nombreux, toutefois, à définir en détail l'expression concrète de ces gains.

Le département des Opérations souligne les gains de productivité qu'il obtient grâce à l'introduction des systèmes de communication micro-ordinateur à micro-ordinateur avec les Représentation de la BID dans les pays bénéficiaires. Ces liaisons de micro à micro permettent d'accélérer la transmission de rapports d'exécution des projets, de diminuer le volume de travail administratif lié à leur transmission, de simplifier ces rapports, de déléguer plus de responsabilités au personnel technique chargé de les élaborer.
Le département d'Analyse des Projets signale que la conversion des modèles d'analyse de projets sur micro-ordinateur permet à tous les professionnels du Département d'utiliser plus efficacement et plus fréquemment ces modèles. En outre, ces mêmes professionnels peuvent continuer leur analyse informatique lors de leur mission dans les pays emprunteurs en utilisant un micro-ordinateur portable, ou celui de la Représentation de la BID. Un nombre croissant d'entre eux revient au Siège de la B.I.D. avec un première version de leur rapport déjà disponible sur disquette. Enfin, le département des Projets a développé sur micro trois banques de donnés pour l'analyse des projets, amélioré son contrôle administratif des missions et du budget, et converti six positions de secrétaires en assistant-informatique. Ces actions ont permis au département d'évaluer et de suivre un nombre croissant de projets toujours plus complexes sans accroissement de personnel.

Quant au département financier, il est capable de faire face à une complexité et une gamme croissantes d'interventions sur les marchés financiers sans accroissement de personnel. La section du portefeuille qui a informatisé ses opérations de "SWAP" sur micro a calculé que cette informatisation avait permis de réaliser un gain d'environ US$1 million sur les premiers six mois de 1985, grâce à une plus grande diversité dans les choix d'opérations. Cette somme représente à elle seule environ un tiers du coût du plan informatique pour l'ensemble de l'année 1985.

Il reste beaucoup à faire pour connaître les sources de ces gains de productivité, les mesurer, et surtout les accroître dans le cadre de l'expérience menée à la BID. L'introduction de la bureautique ne fait que commencer. Mais les premiers des résultats obtenus grâce à l'introduction des micros et des communications micro à micro entre le Siège et les Représentations sont très prometteurs.

Plusieurs écueils sont à éviter; notamment l'avènement du micro comme symbole de statut professionnel, l'introduction trop hâtive et mal préparée de la bureautique, un manque d'attention aux transformations nécessaires de l'organisation du travail et de certains rapports hiérarchiques. D'un autre côté, la baisse du coût des micro-ordinateurs permet d'explorer, à un coût très réduit, de nouvelles utilisations pilotes. Alors que le coût d'évaluation d'un projet par les équipes techniques de la BID jusqu'au moment de son approbation par le Conseil d'Administration est de l'ordre de US$100,000, le coût du micro-ordinateur portable le plus récent qui soit compatible avec les systèmes de la Banque, s'élève début 1986 à US$1,500. Un gain de temps de 1,5% seulement, permis par l'utilisation d'un tel micro-ordinateur sur un seul projet justifie son achat.

ANNEXE I

La Banque interaméricaine de développement

Institution internationale de financement du développement, la Banque interaméricaine de développement, dont le Siège est à Washington, D. C., a été créée en 1959 pour contribuer à financer le développement économique et social de l'Amérique latine.

A l'origine, la Banque comprenait 20 pays membres, tous du continent américain. Depuis, avec l'entrée de 7 autres pays de ce continent, et de 16 pays extra-régionaux, elle en compte maintenant 43 au total.

Tout au long de ses 26 années d'activité, la Banque a joué un rôle majeur de catalyseur dans la mobilisation des ressources pour le développement de l'Amérique latine. Elle a aidé à mobiliser, garantir et organiser le financement de projets qui représentent un investissement cumulé d'environ 100 milliards de dollars, tout en stimulant une répartition plus équitable des avantages du développement. Cela, elle l'a fait en assumant un rôle d'avant-garde dans le financement de projets de développement destinés à améliorer la qualité de vie des secteurs à faible revenues de la région.

L'autorité suprême de la Banque est son Assemblée des gouverneurs où siègent tous les pays membres. L'Assemblée se réunit une fois par an pour examiner les opérations de l'institution et prendre des décisions sur les principales politiques à suivre. Elle se réunit aussi, le cas échéant, en session extraordinaire.

L'Assemblée des gouverneurs a délégué tous ses pouvoirs, sauf ceux qui lui sont exclusivement réservés dans l'Accord constitutif, au Conseil des directeurs exécutifs, lequel est responsable de l'exécution des opérations quotidiennes de la Banque. Les 12 membres du Conseil qui travaillent à plein temps au Siège de la Banque, sont élus ou nommés par les gouverneurs pour un mandat de trois ans. Chaque directeur nomme à son tour un suppléant.

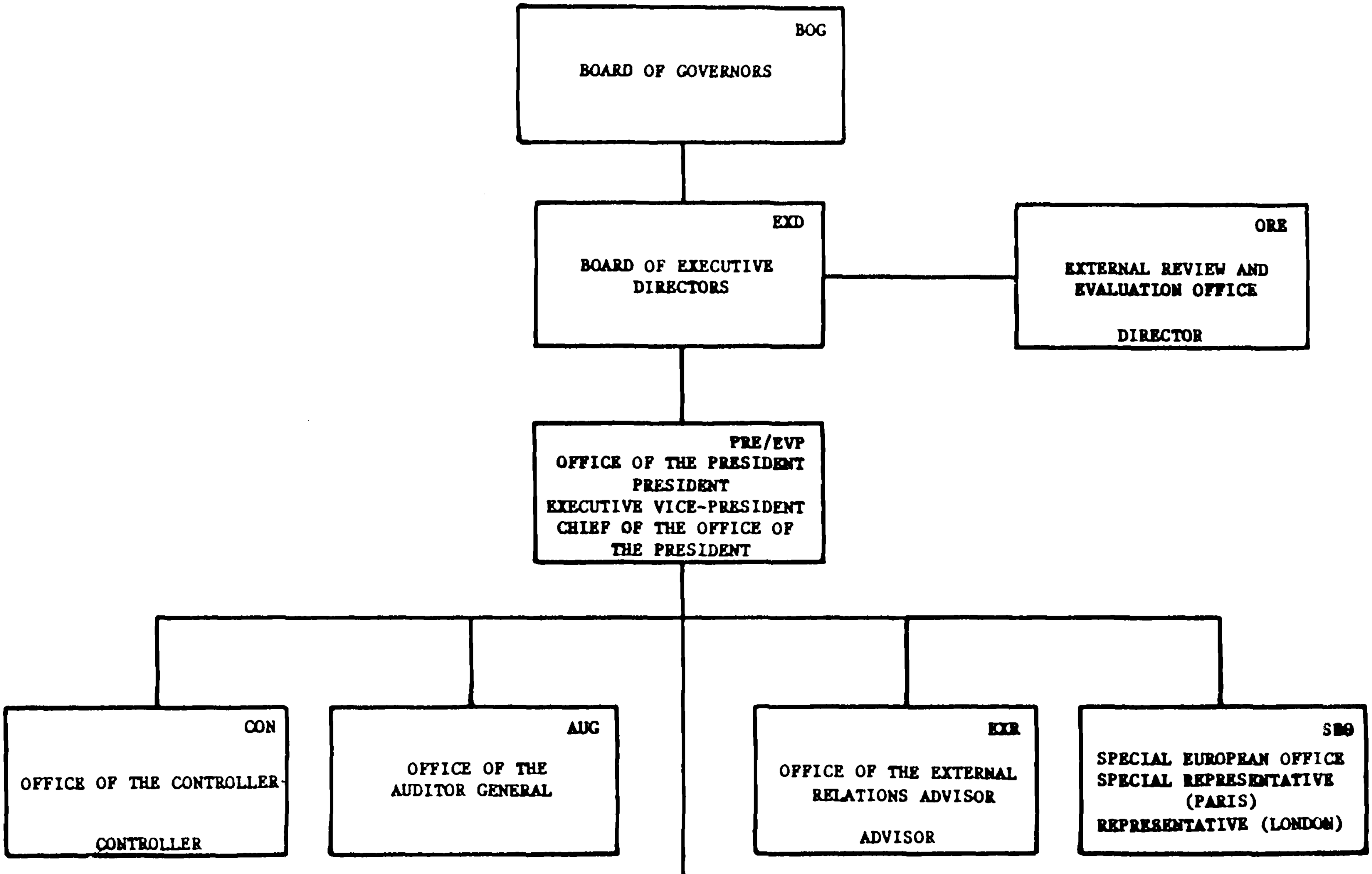
Elu par l'Assemblée des gouverneurs, le Président de la Banque a un mandat de cinq ans. Il préside le Conseil des directeurs exécutifs et soumet des propositions relatives à la politique générale de la Banque. Il est le fonctionnaire exécutif de rang le plus élevé de l'Institution, dont il est également le représentant juridique et le chef du personnel. Avec l'aide du Vice-Président exécutif qui est nommé par le Conseil des directeurs exécutifs, il dirige les dix départements et bureaux de la Banque.

La Banque a, dans ses pays membres régionaux, des bureaux qui la représentent dans ses négociations avec les autorités locales, et les emprunteurs, et qui supervisent l'exécution des projets que finance l'institution. Elle a également des bureaux à Paris et à Londres, pour faciliter les contacts avec les pays membres extra-régionaux et les marchés financiers.

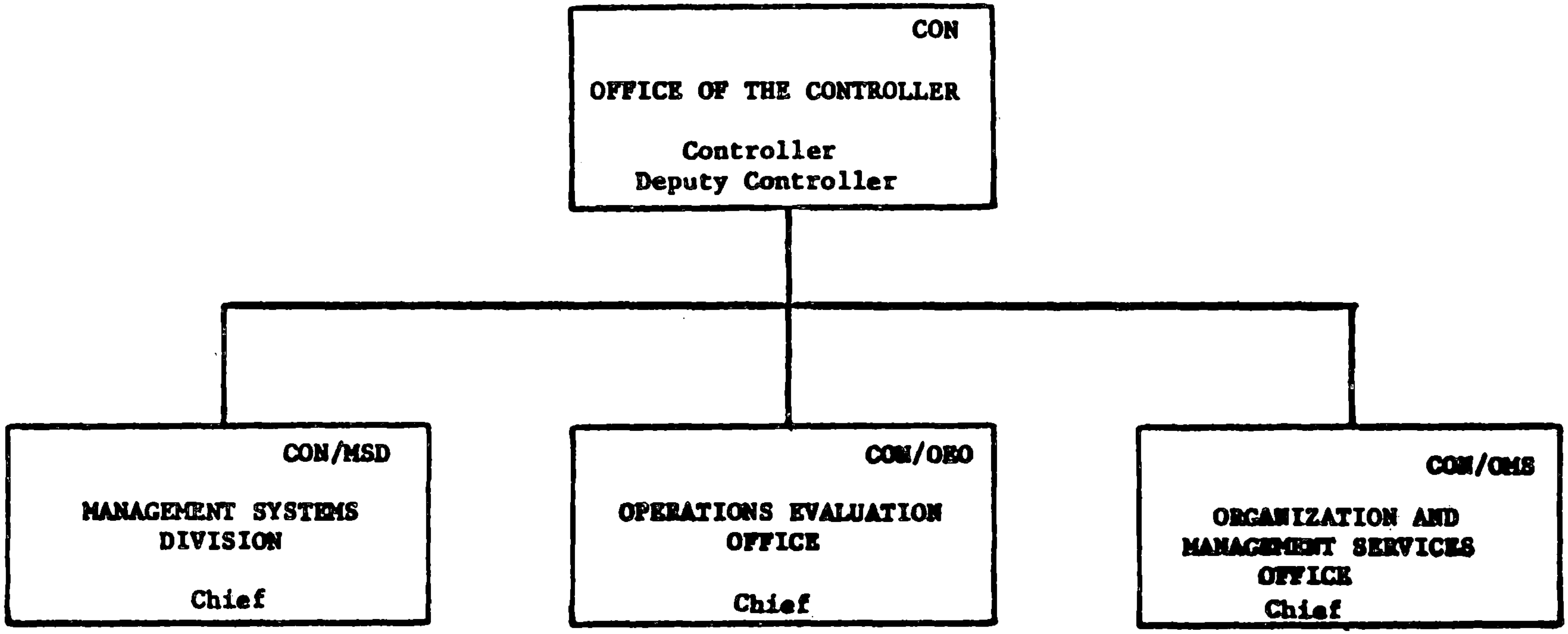
En 1984, la Banque employait 1900 personnes dont 493 dans ses bureaux en Amérique latine, et a utilisé 650 consultants. Son budget de fonctionnement était de US$145 millions. Elle a approuvé le financement de 58 nouveaux projets et 180 nouvelles opérations d'assistance technique, et géré un portefeuille de 472 projets et 614 opérations d'assistance technique en cours. Le montant de ses prêts s'est élevé à US$3,6 milliards et celui de ses emprunts sur les marchés internationaux des capitaux à US$1,8 milliards.

PAYS MEMBRES

Allemagne
Argentine
Autriche
Bahamas
Barbade
Belgique
Bolivie
Brésil
Canada
Chile
Colombie
Costa Rica
Danemark
El Salvador
Equateur
Espagne
Etats-Unis
Finlande
France
Guatemala
Guyane
Haïti
Honduras
Israël
Italie
Jamaïque
Japon
Mexique
Nicaragua
Pays-Bas
Paraguay
Pérou
Portugal
Royaume-Uni
République Dominicaine
Suisse
Suède
Suriname
Trinité-et-Tobago
Uruguay
Venezuela
Yougoslavie


BOG
BOARD OF GOVERNORS
EXD
BOARD OF EXECUTIVE DIRECTORS
ORE
EXTERNAL REVIEW AND EVALUATION OFFICE
DIRECTOR
PRE/EVP
OFFICE OF THE PRESIDENT
PRESIDENT
EXECUTIVE VICE-PRESIDENT
CHIEF OF THE OFFICE OF THE PRESIDENT
CON
OFFICE OF THE CONTROLLER
CONTROLLER
AUG
OFFICE OF THE AUDITOR GENERAL
EXR
OFFICE OF THE EXTERNAL RELATIONS ADVISOR
ADVISOR
SEO
SPECIAL EUROPEAN OFFICE
SPECIAL REPRESENTATIVE (PARIS)
REPRESENTATIVE (LONDON)

ANNEX II



Purpose: *Provides administrative support to all Bank Units in the areas of Management Information and Control Systems, Systems Analysis and Data Processing Services.
Performs socio-economic impact evaluations of the operations of the Bank.
Makes Organization and Manpower Studies of the Bank's Units; coordinates the preparation and maintenance of the Bank's system of Manuals.
Administers the Bank's Management Reporting System.

Office of the Controller

Functions

- Ensures, by means of independent, ongoing and selective examination, both *a priori* and *a posteriori*, of Bank operations and activities, the efficient and effective conduct thereof in accordance with the programs, plans, budgets and systems established to comply with the policies, resolutions, norms and procedures governing the Bank. Provides timely technical advisory services to the Office of the President, and the various departments and units of the Bank in areas relevant to their duties.
- Maintains a continuous program of analysis and evaluation of the organization, systems and effective use of the Bank's human resources for the purpose of suggesting and promoting any changes considered necessary for permanent improvement and updating of the Bank's management and the best use of its resources.

*- Provides administrative support to all Bank units in the areas of Management Information and Control Systems, Systems Analysis and Data Processing Services.

*- Executes through the Operations Evaluation Office, impact evaluation policy on completed projects for both loan and technical cooperation operations.

- Conducts, through the Organization and Management Services Office, studies on organizations, systems, procedures, and preparation of official reports, norms and provisions for the development, maintenance and updating of the Bank's system of manuals. Also conducts studies and carries out activities under the Bank's Human Resources Plan, providing advisory services to all units.
- Coordinates and monitors management response to, and follow-up that is necessary for the timely adoption of recommendations approved by the Board of Executive Directors.

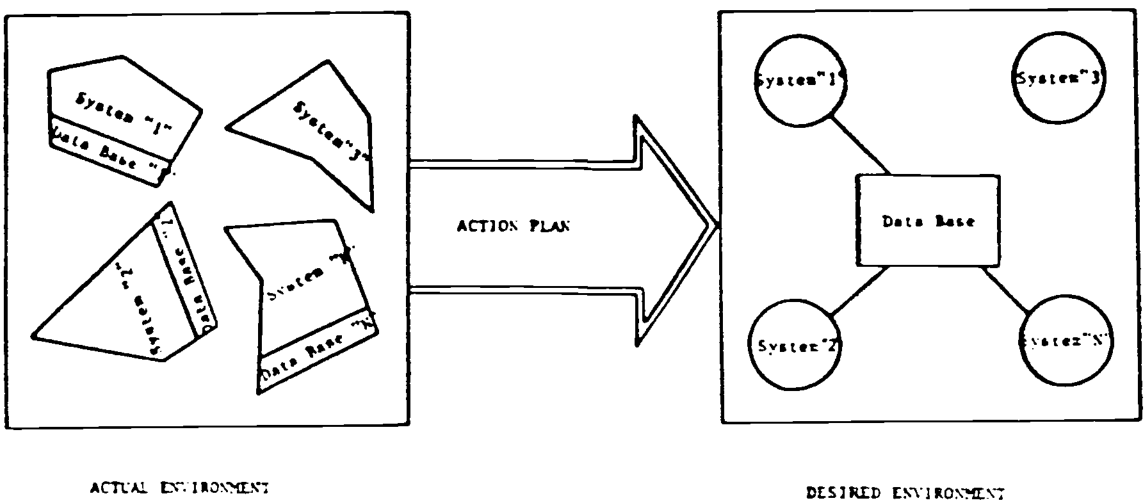
*- Monitors follow-up of the implementation of recommendations made in the studies and evaluation reports conducted by units within the Office of the Controller.

- Serves on all Management Committees to which its duties are relevant, both *a priori* and *a posteriori*.

COMPLIMENTARY INFORMATION ABOUT THE ACTION PLAN

I. OBJECTIVES OF THE ACTION PLAN

To change from a traditional data processing system to a Management Information System/Decision Support Systems (MIS/DSS) based environment.



II. STRATEGY TO BE FOLLOWED

Phase I - Correct, improve and implement the "on going" systems, without MIS/DSS approach.

Phase II - Develop simple and small systems to fulfill new demands from departments.

Phase III - Decide upon the purchase of a new computer and the Data Base Management System (DBMS) to be used with it.

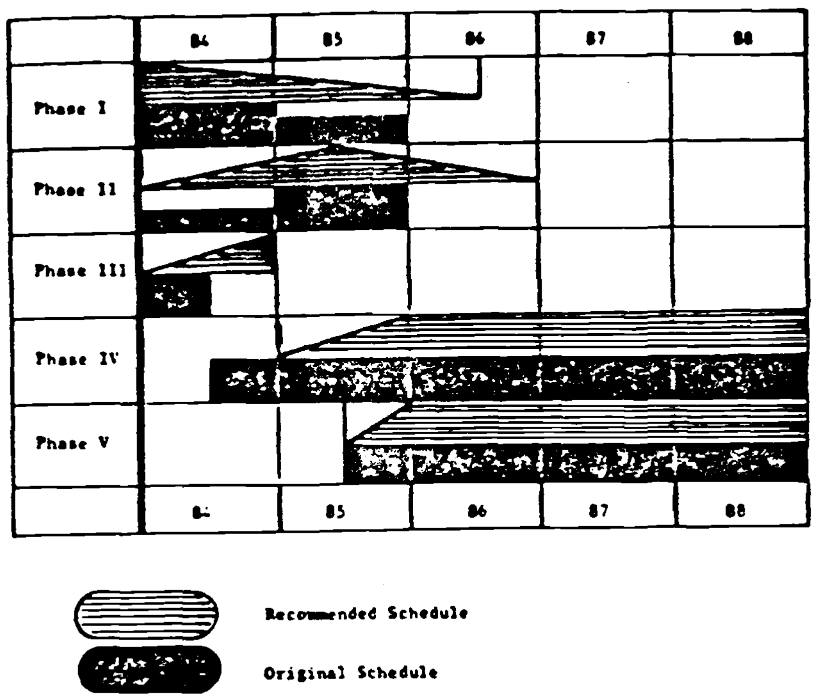
Phase IV - Develop new important systems (ex. FALS, etc.) under MIS/DSS approach.

Phase V - Develop new versions of "on going" systems, under MIS/DSS approach.

LEXIQUE:

DBMS: Data Base Management System
DSS: Decision Support System
FALS: GEN V: logiciels de la BID
MIS: Management Information System
MSD: Management Systems Division
MISC: Management Informations Systems Committee

III. SCHEDULE



Comments on this item:

A. It is necessary first to analyze the effects caused by the introduction of PCs in the Bank. They will change the profile of the demand.

B. The delay caused by the analysis referred to in item A leads to postpone the selection and purchase of the new IBM computer.

C. By postponing the referred purchase, it will be possible to consider new alternatives which will certainly be announced by IBM during 1984.

IV. GUIDELINES

A. Improve the relationship between users and CON/MSD.

B. Emphasize the improvement of the "on going" systems.

C. Optimize the use of the technical resources already in existence.

D. Prepare and develop only small and well defined projects under good control of costs and objectives.

E. Follow up and analyze the effects caused by the use of PCs in the Bank before taking a decision about new computers.

F. Train and up-date CON/MSD personnel.

V. MAIN ACTIVITIES

A. Start the implementation of Information Resources Management Units (IRMU) in the departments.

B. Create the information center in MSD starting with people supporting PCs and the GEN V software.

C. Correct and improve the "on going" systems used by FIN and DPA.

D. Develop small and simple systems to fulfill new demands from departments.

E. Prepare the inventory of Bank's files used by LIDAS, SIP, TCAS, TCPI, etc. and develop better updating procedures.

F. Define the guidelines to be considered in the Bank's MIS project.

G. Prepare changes in MSD's structure.

H. Start the study about Field Offices.

I. Implement telecommunications in the Bank.

J. Start the development of the MIS/DSS project.

K. Re-evaluate FALS and decide about its development.

L. Define standards for PCs use and reinforce support to PC's users.

M. Re-study the MISC and Systems Analysis Sub-Committee's (SASC) role.

N. Prepare the inventory of all data processing activities which are being developed by the departments.

O. Define, develop and implement a cost accounting system for data processing activities.

VI. STAFFING AND BUDGETING

The data presented in the "Systems Analysis Sub-Committee" paper (Table II) can be better understood through the following graphic.

PRODUCTIVITY AND INFORMATION TECHNOLOGY IN PUBLIC ADMINISTRATION

HERMANN HABERMANN
and
FRANKLIN S. REEDER

Office of Management and Budget
Executive Office of the President
United States of America

This article will explore the implications of information technology for public administration first by describing current strategies being used by the United States Federal government to manage investments in information technology and then by examining approaches for evaluating the impact of information technology on governmental information processes.

At the outset, it is central to understanding the importance that the U.S. Federal government attaches to the management of its information resources to note that the U.S. government is, in large measure, an information enterprise. The United States government is probably the largest single collector, disseminator, and user of information in the world. In Fiscal Year 1986, the U.S. government will spend in excess of $15

1. Portions of this article are drawn from "Federal Information Resources Management" by Franklin S. Reeder, Bulletin of the American Society for Information Science, Volume 12, Number 5 (June/July 1986)

billion for information technology.[2] The annual burden on the American public of Federal information collection activities is expected to be on the order of 1.9 billion hours or the equivalent of almost one million work years.[3] Many government activities, like the Bureau of the Census and the National Library of Medicine, exist solely to collect and disseminate information. Others, like the Internal Revenue Service, the Social Security Administration, the Weather Service, the Patent and Trademark Office, and the Defense Logistics Agency are critically dependent on information resources - both information and the technology used to process it - to perform their missions and deliver needed services to the public.

The information intensive nature of Federal programs coupled with the explosive growth in the size and complexity of those programs beginning in the 1930's forced the federal government to look to technology to address its information management needs. By the late 1970's, as the government was becoming increasingly dependent on information technology, its information technology infrastructure was showing signs of age and becoming less respon-

2. Five Year Plan for Automatic Data Processing and Telecommunications, June 1985, U.S. Government Printing Office, Washington D.C. Fiscal Year 1986 is the twleve month period ending September 30, 1986.

3. Information Collection Budget of the United States Government, Fiscal Year 1986, U.S. Government Printing Office, Washington D.C.

sive.[4] The Federal government, historically a leader in the development and use of information technology, was falling behind. One response to those expressions of concern was the enactment of the Paperwork Reduction Act of 1980,[5] which expanded and revitalized the Federal structure for information resources management (IRM). That statute required the head of each cabinet department or independent agency to designate a senior official for IRM - essentially a "chief information officer."

Principles of information resources management

An examination of other resource management disciplines (human, financial, or material) is helpful in understanding the importance of information resources management. Rules and policies that prescribe how the acquisition, processing and disposition of information affect virtually every Federal manager. Meeting the challenge of providing information resources for Federal managers in the 1980's and 90's requires a strategy based on a set of widely understood and accepted principles. The development of a functional, cohesive set of principles in this changing environment is a non-trivial problem. The basic principles upon which current Federal IRM policy are based include the following:

4. See, in particular, the reports of the Commission on Federal Paperwork, the President's Reorganization Project on Automatic Data Processing and various of the reports of the President's Private Sector Survey on Cost Control.

5. Public Law 96-511.

- that information is an economic resource, like other resources, with value and costs of production, and that it must be managed like other economic resources;[6]

- that information, like those other resources, has a definable life cycle, from initial acquisition (or collection) through processing to disposition, and that decisions about each phase of that life cycle have implications for the other segments of the life cycle;

- that the size and diversity of Federal operations mean that accountability for and management of information resources must be decentralized;

- that the role of central management and oversight agencies should be limited to examining major or precedent-setting initiatives and investment decisions; addressing common, government-wide problems; and creating positive incentives for effective management of information resources by Federal agencies;

- that it is generally in the government's interest to exploit the economies and efficiencies available through the

6. A more complete discussion of the concept of information as an economic resource is found in "The Functioning of Information Markets" by Yale M. Braunstein in Issues in Information Policy, National Telecommunications and Information Administration, U.S. Department of Commerce, 1981, U.S. Government Printing Office, Washington D.C.

use of commercially available, modern technology to process information; and

- that managing information in the public sector imposes special responsibilities with respect to confidentiality, privacy, preservation of historic records and public access.

Strategies for information resources management

Having identified a set of basic principles, one is faced with the challenge of developing a strategy for improving and modernizing the Federal information resources management structure. While merely articulating principles is not sufficient, an extensive, prescriptive regulatory regime would be inconsistent with the principles outlined above. Thus, the Federal strategy for IRM has three components:

- A limited set of policies and procedures. The cornerstone of that set of policies is OMB Circular No. A-130, issued in December of 1985. OMB will from time to time issue additional policies on matters of government-wide concern, such as computer-to-computer communications standards, planning, and electronic information collection.

- A planning process that will serve agency managers. Over the past three years, we have developed a planning process that is designed to encourage agency officials to focus on major strategic issues. That process is also designed to encourage private sector involvement in planning and to identify and provide data on areas of common concern (e.g., software modernization) where central policy direction may be required.

- A review process that will allow limited oversight resources to focus on key initiatives. We initially designated eight major systems, which by virtue of their size, complexity, sensitivity, or precedent-setting nature, warranted review.[7]

Having set forth a set of principles and strategies for Federal information resources management, the balance of this paper describes some methods and concepts that are helpful in assuring that information technology initiatives are consistent with these principles.

Information architectures

Central to the improvement of productivity through information technology is the concept of information architecture. In this section, we will discuss our concept of information architecture, examine some of the problems that we see, and discuss our activities to solve some of these problems.

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7. Reports on Management of the United States Government, Fiscal Years 1986 and 1987, U.S. Government Printing Office, Washington D.C.

It has been our experience that information technology architectures that differ dramatically from the architecture of the organization are almost invariably doomed to failure. Therefore, because an information architecture should be a reflection of the organization, central to development of an architecture is an understanding of the organization. The first step in constructing an architecture then is examination of the organization architecture. In a manner similar to a building, an organization has an architecture or a topography. For example, what is the physical nature of the organization? Are all of its components propinquitous, or are they physically distributed? What is the logical relationship among components? Even if components are located together, central management may be weak or strong. Similarly, physical distribution need not imply decentralization of authority. In what stage is the development of the organization? Is the organization in a growth state, or has it reached a state of maturity? What are the expectations of the organization for the near and long term?

An examination of these kinds of questions lead to the development of an information architecture. In general, we must determine the extent to which information will be a managed resource and how technology can be used as a tool both to support the decision making process and to reinforce the decision. More specifically, an information architecture answers the following kinds of questions: What are the information flows in the organization? Is there a set of "corporate" information and who defines it? Who "owns" different sets of information and who generates it? Is information technology of strategic or tactical importance to the organization? What are the quality requirements for information and how are they ensured? An analysis of these questions leads, for example, to decisions on centralization or decentralization of data bases and technology and creation of data dictionaries. In the Federal Government, we expect each of our major "Departments", such as State, Agriculture, etc., to determine the answers to these questions for themselves. An examination of our success in dealing with these questions has led us to the conclusion that the Federal Government needs to develop more specific information policies.

The introduction of the microcomputer has increased the urgency to focus on these questions. It has been our observation that perhaps the main influence of the microcomputer has been the reinforcement of the concept of private information which is controlled by each individual as opposed to the concept of corporate information which is managed and controlled by the organization. In the past, mainframes made it easy for organizations to control the content of and access to corporate data bases and the available analysis tools and access to the mainframe to use the tools. The microcomputer has made it possible for each user to develop his or her own data base with a wealth of tools to use. This collection of personal data bases can easily become a chaotic collection with no joint quality standards or ability of the organization to use the information in the personal data base. While we feel it is important that individuals have their own work spaces -- physical and electronic -- information is an organizational resource and must be managed as such.

We recognize that this is an area where we have a great deal to learn. Therefore, the OMB has decided to pursue a major initiative to determine what policy, if any, is needed to improve the management of information by the Federal Government. OMB will sponsor one or more seminars on the concept of information sharing. Six areas to be explored include: (1) who does and who should set the rules for sharing; (2) what should the rules be; (3) how does one evaluate the integrity of privately held information; (4) what is the relationship between private and corporate information; (5) what are the industry trends in providing technology to manage, store, retrieve, and share information; and (6) how can technology be used to reinforce the concept of organizational ownership of information. The development of a sound information architecture is the first step to improving productivity through information technology. In the next section, we discuss the concept of return-on-investment and how we are using it.

Return On Investment

In an era of constrained financial resources, it has become increasingly important to assure that the limited resources available to invest in information technology are invested in those projects that provide the greatest potential payoff. Therefore, to encourage wise expenditures for information technology, the Federal Government has implemented a return-on-investment policy to assure that commensurate benefits are obtained from expenditures in the information technology area. The policy requires that, in general, a 10% return be realized for investments in information technology. We have defined an initiative to have a ten percent return-on-investment if the net present value of the initiative is at least zero. We will first discuss the types of benefits that are acceptable for the analysis, then consider how the anlaysis is to be carried out and discuss some possible areas where these benefits can be realized.

We have instructed our Federal agencies that it is always acceptable to pursue an information technology initiative to meet a statutory requirement. Even for this situation, the statutory requirement that is being met must be clearly explicated and an analysis including alternative approaches to meet the requirement must be completed. This analysis must include a benefit/cost analysis for each of the alternatives.

The first and most desirable benefit is in the form of real savings. These savings can be increases in collections, reductions in recurring costs such as maintenance and telecommunications costs for existing automation efforts, reductions in the number of employees, or demonstrable and quantifiable increases in higher valued activity levels of employees. (We will consider this concept in more detail below.) We make a careful distinction between savings and cost avoidances. Cost avoidances may be listed in the benefit/cost analysis, but they are not to be used in the net present value analysis. The common characteristic of each of the above items is that they are quantifiable and should result in trackable reductions in budget outlays.

A second justification that can be offered is quantifiable, noneconomic benefits. These are impacts on administrative or program delivery that can be measured and tracked. For example, let us assume that the mission of a Federal agency is to intercept narcotics traffic. If the agency can submit an analysis that demonstrates an acceptable increase in the amount of narcotics intercepted, then their funding request may be approved. The analysis that must be submitted must describe how the metric was determined, what the basis is for assuming the predicted increases in the metric, and how the increases are to be tracked. As in the previous cases, a benefit cost analysis must be contructed for each alternative.

The United States Government has developed and published a guideline for performing the benefit cost analysis.[8] One of the issues that must be addressed in conducting the benefit cost analysis is the concept of systems life and what are reasonable guidelines for expectations of systems life. The Office of Management and Budget has provided guidance to the Federal agencies that it expects the systems life of most initiatives to be between three to six years. It has been OMB's observation that most information technology initiatives do not have a systems life much beyond six years and that at the end of this period, new initiatives are usually begun. The recurring and nonrecurring costs and benefits must be determined for each alternative and the net present value of the costs and benefits calculated over the systems life. The discount rate to be used in the calculations is ten percent. The net present value of the alternative is the net present value of the benefits less the net present value of the costs. Except as noted above, the selected alternative should be the one with the highest positive net present value.

Agencies may assume some savings to be cumulative over the life of the initiative. For example, suppose an agency is able to reduce its full-time employment by 100 people in the second year of the systems life and 50 more each year thereafter for the remainder of a four-year project? In that case, an agency would

8. Guidelines for Documentation of the Computer Programs and Automated Date Systems for the Initiation Phase, Federal Information Processing Standard Publication 64.

get a discounted benefit for the cost of 100 staff years in the second year, 150 in the third year, and 200 in the fourth year.

Initiatives which meet the ten percent return-on-investment criteria will recieve the most favorable consideration. It is possible, however, to have an approved information technology initiative which does not meet the ten percent return-on-investment criteria. That is, one for which the net present value of the initiative is less than zero. In such a case, one of two situations must hold. Either the initiative is the least costly way to meet a mandatory requirement (e.g., a statute), or it has been decided that the importance of attaining the explicitly defined quantifiable noneconomic benefits warrants the cost.

Information technology initiatives can generally be separated into two classes. In the first class, technology is applied to an area where it has not been used before. An example of this is office automation where there has been no previous experience with automation. In office automation, it is particularly important in constructing the benefit cost analysis to consider not only improvements in productivity of the production staff but also how the functions of work are to be changed. This is the concept of higher valued functions that we mentioned above.

All employees spend their time in different roles. For example, part of the time a manager performs a clerical function, part of the time a supervisory one, and it is hoped, most of the time a managerial one. Similar considerations hold for all employees. One of the important benefits to be gained from office automation is the increase in time that an employee spends in higher valued activities. For example, if a manager is able to spend say 20 percent more time in managerial functions, then there is a real economic value to the information technology initiative that allowed for this.

In the other class, an initiative is proposed at the end of the life of an existing system (see discussion above on systems life). One of the questions that must be answered is whether the original reason for the automation still exists. Often, some of the most important benefits in an information technology initiative in this class are reductions in maintenance costs. If the automation initiative can be determined to be essential to the mission of the agency, then in addition to reduced maintenance cost, the reliability of existing hardware/software/communications, for example, can be considered as well.

Evaluating investment proposals

Ultimately no single tool for evaluating automation projects is universally appropriate. Rather, the Office of Management and Budget has devised a series of questions that need to examined in evaluating proposals for automated informations systems:

- First, what is the problem that the agency is trying to solve? Systems should not exist for their own sakes or in a vacuum; the organization proposing to make an investment needs to have real, preferably measurable purposes that it expects automation will serve.

- Given the answer to the first question, what is the expected return on investment? The preceding section of this paper elaborates on that question.

- Has anyone ever done this before? While technologists tend to pride themselves on being current with the "state of the art", it is prudent not to be first. Proposals to apply untested technology or tools not before used on the scale or in the environment being proposed should be examined especially carefully. To the extent that a proposal requires the use of untested or experimental technology, the burden of proof is on the agency to show that the attendant risk has been reviewed and is essential to the purposes that the system is intended to serve.

- Does the organization have the organizational capacity to bring off the project? This is, to a degree a corollary of the preceeding point. The U.S. Federal government is not a single, monolithic, homogeneous body. Rather, it consists of agencies with widely varying missions, histories, and organizational cultures. For purposes of analyzing automation projects, agencies vary widely in the current state of automation as well as in the skill of agency staff to exploit new technology. What is a well understood undertaking in one agency may be a great leap for another.

- Does the agency have a "system concept" based on a realistic assessment of the nature of the activity being automated? All too often automation proposals consist of a series of process steps - buy equipment, develop software - based on no system concept or, worse yet, on an implicit assumption that the new system will be just a linear extrapolation of the existing system. That may be appropriate in a few cases but usually is not. For example, the design of the United States tax processing system for the 1990's needs to take account of changes in the technology being used by American taxpayers, employers and financial institutions. If most individuals and institutions who will interact with the tax system are likely to be using computers, we should not build a system to process growing volumes of paper.

- Is the approach to building the system incremental and realistic? This seems to contradict the previous principle but, in actuality, does not. While the proposal must be based on a concept or vision, the proposal must also show that there is an approach that will allow the long term goal to be accomplished in achievable phases with plenty of opportunities along the way to reexamine assumptions and change direction if assumptions prove not to be valid.

Assuring that technology is productively applied in the public sector is a challenging task given the absence of the measure of profitability used in the private sector. There are, however, tools available to the government decision-maker to permit him or her to make the best possible use of the limited resources available to improve the productivity and reduce the cost of government.

UNDERSTANDING SUCCESSFUL IMPLEMENTATION : CRITICAL VARIABLES IN MANAGING TECHNOLOGICAL INNOVATION

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The 1980s have witnessed the widespread introduction of computer-based tools into white collar work, and the forecast is that this "rain of new technologies" will continue for the remainder of the century (Nussbaum, 1985). For this reason we undertook a field research project aimed at exploring how computerized procedures are incorporated in information intensive environments. The study was supported by the National Science Foundation (see Bikson, Gutek and Mankin, 1986) as part of its general interest in technology transfer--how are innovations successfully transferred from contexts of development to contexts of application?

We approached the understanding of innovative office technology from this standpoint, treating implementation as a proper instance of "the translation of any tool or technique, process or method of doing, from knowledge to practice" (Tornatzky, et al., 1983; cf. Bikson, et al., 1984). Given that organizations will be deluged with electronic information tools in the years to come, it would be very helpful to find out whether there is something generalizable to be learned about the transfer and utilization of these new work-transforming technologies.

CONCEPTUAL FRAMEWORK

For this purpose, we relied on a conceptual framework which has proved relatively robust in recent research on the implementation of organizational innovations across varied domains (see Bikson, 1980; Eveland and Rogers, 1980; Tornatzky et al., 1980; Berman and McLaughlin, 1978; Yin et al., 1978; and the detailed review in Bikson et al., 1981). A review of that literature led us to three classes of hypothesized influences on the successful implementation of office technology.

- Characteristics of the organizational setting--of offices, in this instance--were expected to influence the results. Here we defined 'offices' as organized behavior settings comprising at least four persons, at two or more occupational levels, jointly involved with some information-based process or product. This definition is congruent with conceptions of work groups or primary work subsystems employed in traditional organizational research.

- Features of the information technology were likewise expected to affect implementation success. For research purposes we specified the technology of interest as multifunction interactive computer systems deployed to support white collar work in offices as defined above. We did not target specific hardware configurations, system architectures or software applications.

- Third, we explored implementation strategies--the sequence of activities undertaken in the effort to embed new technologies in extant organizational settings. Ranging from initial planning and decisionmaking to postinstallation modification and training, properties of the implementation process itself were expected to exert the strongest influence.

These potential sources of effect were regarded as closely interrelated and situation dependent. While they can be separately considered for heuristic purposes, they are likely to be reciprocally influential in fact.

The last element required for the conceptual framework--a viable idea of implementation success--was the most problematic. No consensual criteria were available either in research studies of organizational innovation or in more specific literature on office performance. The difficulty was compounded by the fact that we needed criteria applicable across quite varied office settings. We therefore adopted a broad approach to the construct of successful implementation, representing it in a number of ways.

We treated system use, first of all, as at least a necessary condition for success; thus we examined, for example, the ratio of actual to potential users as well as the proportion of potential users who expected to be interacting with the computer system in the near future. We also took user satisfaction (e.g., perceived "friendliness" of the computer system, overall satisfaction with the new technology, and general job satisfaction) as a face valid indicator of success. Finally we considered a set of performance effects, including user assessments of productivity as well as manager-rated productivity improvements and value-added gains. Together these variables provided a multifaceted representation of implementation success.

PARTICIPANTS AND RESEARCH PROCEDURES

Private sector organizations that had introduced multifunction interactive computer systems as work tools in white collar departments at least six months prior to the start of the research were sought for participation. Table 1

Table 1. RESEARCH SAMPLE

- 26 Organizations
  - 50% manufacturing
  - 50% service
- 55 Work Groups
  - range: 4 to 40 employees per group
  - mean size: 10 employees per group
- 530 Employees

describes the sample we recruited (see also Bikson and Gutek, 1983). It should be noted that in most organizations, advanced office technology is not evenly distributed; rather, some departments have come to think of it as a way of life while others have only just heard of it. The departments participating in this study are early adopters of information technology; thus they do not necessarily represent all white collar work groups. However, because the sample is otherwise extremely varied (e.g., in mission, hierarchical status, industrial sector), we believe the implementation lessons it presents may be generally instructive.

Because we sought comprehensive information in a number of domains, we used multiple instruments and data sources. Information gathering methods included standardized surveys to all members of participating work groups and structured interviews with the department heads; in addition, we collected archival information about the computer systems in use and related budgeting and staffing patterns. A year later we made follow-up research visits to a balanced subsample of about half the participating sites (see Bikson et al., 1986, for a complete description of the procedures). The discussion that follows is based on the first round of research visits to the full sample, although in many instances what we learned during the follow-up stage of the study assisted us in interpreting the findings.

The definition of "office" above requires that work group members be organized in relation to information-related processes or products. After data collection we first attempted an a priori categorization of work groups according to their organizational missions. We found that, while the groups varied broadly in respect to task domains, they seemed to be classifiable into four work group types based on the information-related function they performed. Table 2 shows the distribution of participating

Table 2. WORK GROUP TYPES

- **24% management, administration**
- **29% professional (text orientation)**
- **20% professional (technical orientation)**
- 27% secretarial, clerical, technical support

work groups among the four categories (these are roughly comparable with Chamat's (1985) three groups, except we have split professional offices into two categories).

The upper management and administration groups in this classification are typically fairly high in organizational hierarchies and have decisionmaking, planning, and oversight responsibilities. They include, for example, corporate strategic planning offices and fiscal comptrollers' offices. We distinguished two types of groups that carry out professional functions. The "text-oriented" professional offices were so designated because their major products tend to be text-bearing documents (either print or electronic). Examples are legal offices and public relations offices. In contrast, the "technical" professionals tend to have products that take the form of specifications, designs, formulas, and the like. In this category, for instance, are electronic design departments and internal R&D departments. The fourth group type comprises offices that provide support services and tend to be located nearer the bottom of the organizational hierarchy. Reservations and bookings offices, inventory control, and accounting offices are examples in this category.

We underscore the importance of the work group level of analysis for attempting to understand the transition to computer-based information tools. First, organizations are actually structured this way, allocating functions to subunits; work group membership (as the examples above suggest) has at least as much influence as occupational level on tasks performed (Bikson and Gutek, 1983). Second, sound decisions about what hardware and software tools are needed cannot be made apart from understanding the type of work unit in which they will be used (Bair, 1985). Finally it is at the work group level that implementation processes are typically carried out--it provides an appropriate way of chunking the transition.

REPRESENTING IMPLEMENTATION SUCCESS

The theme of good tools for information work broadly expresses the implementation goal for organizations taking part in this study, although they differed in many specific respects. For example, interview responses established that in half the groups new computer technology was viewed primarily as a tool for upper management and professionals; in another third, its usefulness to managers, professionals and support staff equally was emphasized; and in 17 percent of groups it was regarded chiefly as a support staff tool. Given the diversity of technology aims and work group missions represented in the research, we explored many general indicators of implementation success along the dimensions of use, satisfaction and performance.

Members of participating work groups were all surveyed, whether or not they were computer users. We took as a prima facie index of implementation success the proportion of employees in each who interacted directly with a computer system in some way during their work. Those not currently using a computer were asked whether they expected to within the next year or so. Table 3 presents the proportion of current users,

Table 3.

EMPLOYEES WHO USE OR WILL USE COMPUTERS AT WORK

	Currently use a computer	Expect to use a computer	Do not expect to use a computer
Executive	36%	46%	18%
Managerial	71%	26%	3%
Professional	79%	18%	3%
Technical	81%	18%	1%
Secretarial	64%	23%	13%
Clerical	73%	21%	6%

future users, and committed nonusers within occupational level. While the dependent measure used for analysis purposes is proportion of computer users within a work group, their breakdown within job category is instructive. It appears there is not much support for the view that managers will not keyboard, and the majority of executives in this sample expect to be using a computer in the near future. On the other hand, it is executives and secretaries who are disproportionately represented among the committed nonusers.

In addition to percent of users in a group, we constructed two more use-related variables. System acceptance is an ordinal variable with a value of 0 for subjects who say they will never use a computer and a value of 3 for current users; those who expected to learn within the next few months or years received intermediate values. System incorporation, another ordinal variable, is based on users' answers to a question about the extent to which computer-based tasks had become a regular part of their work repertoires; their responses ranged from 1-3, while nonusers were assigned a value of 0. Work group means served as dependent measures in subsequent analyses involving these variables.

Besides employee use measures, we also explored employee satisfaction measures. Both popular media and trade journals had advanced the view that technology interfaces are so ungraceful and cumbersome (if not frightening) as to seriously impede casual users (Bikson and Eveland, 1986). To explore potential negative effects of interactive tools on users' task experiences, we asked work group members to rate their level of satisfaction with the "friendliness" of their computer system in particular and with the new office technology in general. Table 4

TABLE 4. SATISFACTION REPORTS

	Percent of Respondents			
	Very Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Very Dissatisfied
Computer System Friendliness	40%	47%	11%	2%
New Office Technology	38%	49%	7%	6%

presents their responses. (Job satisfaction data, not tabled here, were obtained by summing responses to two standardized survey items from the University of Michigan's organizational assessment package. Outcomes were similar but more positively skewed and exhibited less variance.)

Examining the data in Table 4 suggests that employees in our sample, on the whole, find the electronic information tools introduced into their work settings relatively satisfactory. While we observed little in the way of differences between work group types on these and other satisfaction measures we explored (Bikson and Gutek, 1983), there are two exceptions. First, technical professionals--those with greatest expertise--are least satisfied with the "friendliness" of their computer systems. Second, text-oriented professionals are happier with the new office technology than are other types of groups.

Work group performance effects constituted the third sort of success indicator we investigated. In Table 5 a set of productivity-related outcomes are summarized, based on data obtained from heads of participating work groups. When productivity is defined in terms of increased output by the work group, substantial improvements are cited. On the other hand, in terms of decreased labor costs, over half the groups report no change.

TABLE 5. REPORTED WORK GROUP PERFORMANCE EFFECTS

Output:	Percent of Groups
No increase	13%
Some increase	47%
Substantial increase	40%

Labor Cost:	Percent of Groups
No decrease	51%
Some decrease	34%
Substantial decrease	15%

Staffing Impacts By Job Level:	Percent of Groups Less	No Change	More
Secretarial/clerical staff	36%	60%	4%
Professional staff	7%	73%	20%
Managerial staff	6%	81%	13%

Examining the staffing impacts of computerization by job level helps explain why. It is only at the secretarial/clerical level that sizeable staff reductions have occurred, but these positions are least costly to retain. In contrast, managerial positions have remained relatively stable and professional staffs have grown. In general, outcome measures suggest some changes in work performance but do not provide evidence of dramatic overall improvements (see also Bikson et al., 1986).

Effects of computer-based tools on office costs and outputs are displayed here because they represent the most frequently-cited objectives for introducing the new technology. To create a dependent variable representing successful implementation across work groups, we combined cost and output reports from managers. The resulting three-level productivity improvement indicator receives a value of 1 for groups who report no positive change relative to their objective (either cost reduction or output increase) and a value of 3 to those who report substantial positive change; intermediate gains receive the intermediate value. Managerial interviews also probed potential value-added effects not captured by productivity indicators (such as improved accuracy in planning or forecasting, more timely completion of information intensive projects, and the like). To explore such outcomes, we created a 3-level dependent variable representing managers' assessments of value-added benefits achieved. Finally, from users' self reports of the impact of the computer on the quantity, speed, type and quality of their work plus the quality of their work experience we constructed a summary index of individual performance effects; a continuous variable, its values were generated by factor scoring procedures. (See Bikson et al., 1986, for more information about dependent measure construction.)

EXPLORING INFLUENCES ON IMPLEMENTATION OUTCOMES

Within the three broad outcome categories--use, satisfaction, and performance--we explored a number of ways of representing implementation success. As the preceeding section describes, we devised three variables within each category or a total of nine dependent outcome measures. Adhering to the proposed conceptual framework, we next explored each of the hypothesized sources of influence (characteristics of the organizational context, the computer system, and the implementation process itself) to see how they might be related to implementation success.

For this purpose we carried out a number of univariate analyses, looking at relationships between outcome measures and each of the many potential explanatory variables suggested by the conceptual framework. Our aim was to find subsets of variables in each hypothesized component of the framework that (1) have a conceptual basis in previous innovation research; (2) are not confounded with group type; and (3) have predictive relationships to multiple measures of implementation success. Variables that met these criteria within each hypothetical component of the implementation framework were combined and treated as predictors in multiple regression analyses, with each implementation success measure serving as a dependent variable.

All these analyses were carried out at the work group level (number of cases = 55), with individual survey responses aggregated and linked to interview and archival data. Results are reported as significant if the probability value associated with the statistical test employed is .05 or less; obtained probabilities of about .10 or less are termed marginally significant. Findings from these analyses are summarized below (for a more complete account, see Bikson et al., 1986).

All three classes of theoretical influence evidenced some significant relationships to the success measures we studied. For brevity the discussion below focuses on the predictors within each class of influence that had greatest statistical effect across the dependent measures. Findings should be interpreted as indicating systematic associations which are not necessarily causal in nature.

ORGANIZATIONAL CONTEXTS AND IMPLEMENTATION SUCCESS

In order both to learn what kinds of activities characterize characterize information-intensive settings and whether they are differentiated by group type, we asked survey respondents whether or not they performed each of 18 different tasks as a regular part of their work. The task list represents activities that occur frequently in white collar work and that can be done with or without a computer. Using a factor analysis (see Bikson and Gutek, 1983, for a more complete description of this procedure) we identified four sets of co-occurring tasks that account for about 60 percent of the variation in activities performed. The boxes in Table 6 show obtained task sets (i.e., tasks that, on a statistical

Table 6.

INFORMATION HANDLING ACTIVITIES:
CO-OCCURRING TASK SETS

FACTOR II
Edit and rewrite
Proofread and correct
Write original material

FACTOR I
Maintain files
Process records
Fill in forms
Handle messages
Keep activity logs
Maintain inventory
Keyboard text or data

FACTOR III
Fiscal operations
Statistical computation
Distribute information
Maintain a database
Develop forms
Communication
Administrative support

FACTOR IV
Programming
Maintain a database
Statistical computation
NO communication

basis, are likely to co-occur). We then assigned scores to individual employees representing the extent of their involvement with the activities in each set.

Task sets strongly differentiated individuals employed in the four different types of work groups. Analyses of variance treating group type as the independent variable and factor scores as dependent measures (Bikson and Gutek, 1983) yielded the following results. Activities in the first box, primarily involving the management of information, are distinctive of individuals employed in support groups. In contrast, individuals in text-oriented professional groups more often perform the writing, editing and proofing activities in Box II while technical professionals are distinguished by their engagement with the more computational, statistical and numeric tasks in Box IV. Finally, higher level management and administration employees are differentiated by the information-handling activities in Box III. Interestingly, verbal communication was strongly and positively associated with management tasks but strongly and negatively associated with technical tasks.

We regard these findings as corroboration of our original classification of offices into group types based on organizational function. While we were not surprised to learn that different types of groups tend to do different sets of activities, we were surprised to learn

Table 7. INFORMATION HANDLING ACTIVITIES

Most Common Tasks	Percent who do each
Communicate verbally	96%
Write original material	66%
Proofread and correct	63%
Edit and rewrite	57%
Maintain files	57%
Handle messages	49%
Fill in forms	48%
Distribute information	47%

how many activities are performed in common by white collar employees, regardless of the type of office. Table 7 shows the most widespread information-handling tasks along with the percent of survey respondents who do each in the course of their regular work. Other recent research (Bair, 1985; Bjorn-Anderson, 1985; Chamat, 1985) suggests some of the reasons for this finding--support staff are performing more professional functions and professional people are handling more of their own support needs. Almost everyone has to communicate either verbally or by text, and most people have some sort of information files to maintain. Looking only at the sum of tasks performed, we found that management and administration employees engage in the greatest number of different activities and support staff, the least. It would seem that work groups differ more in the variety than in the specific type of information-handling function performed.

Moreover, all the work groups appeared to be engaged in tasks that could be assisted by interactive information tools. We then explored a variety of organizational variables as potential predictors of successful technological innovation, including context measures (e.g., size, group type, industrial sector) along with organizational structure and job design characteristics (e.g., centralization, autonomy, comfort, advancement opportunity, and the like) for which standardized assessments have been developed by Quinn, Cammann and their colleagues at the University of Michigan. A full description of these variables and a more detailed presentation of analyses is available in Bikson et al. (1986).

The most promising of the organizational variables studied--eleven in all--were then examined in a series of regression analyses treating each of the nine implementation success indicators in turn as dependent measures. Obtained F values ranged from 0.73 ($r2 = .16$, n.s.) to 8.33 ($r2 = .68$, $p < .0001$), yielding three significant and three marginally significant findings. Organizational predictors showed weak associations with performance outcomes and somewhat stronger relationships to use measures. They evidenced generally strong relationships to satisfaction variables, being highly significant predictors of satisfaction with the technology ($r2 = .44$, $p < .001$) and with the job ($r2 = .68$, $p < .0001$).

Having looked at the regression analyses separately, we next looked at them collectively for patterns among the predictor variables. That is, we wanted to find out which (if any) of these organizational characteristics made systematic contributions to dependent measures across outcome categories. Among them, it is job design characteristics that seem to be most clearly implicated in implementation success. Specifically, variety and challenge in work along with adequacy of resources for task performance emerge as relatively important positive predictors for at least some measures of computer use, user satisfaction, and performance improvements. It is not surprising to find resource adequacy associated with implementation success. Findings for variety and challenge are more noteworthy: they would seem to suggest that the "rationalization" of work and deskilling of jobs can act against the best interests of both employees and employers.

In general, however, the organizational variables studied here do not account for a great deal of variation in implementation success in comparison to the other classes of influence studied. We do not think this means that user context characteristics are unimportant but rather that better dependent measures are needed. We explored most of the standardized survey scales used to represent characteristics of organizations. While we invariably found high scale reliability (alpha coefficients in the .80s), we are uncertain of scale validity for office work. Most measures of organizational characteristics in the research literature were developed and validated with blue collar samples and their extension to information workers is problematic. (For instance, an item on the autonomy scale is "I can take breaks when I want," which we suspect has a quite different meaning for office employees than for employees in manufacturing plants.) Traditional archival measures of organizational variables (e.g., frequency of tardiness, absence from work without an illness excuse, or grievances as indices of job satisfaction) are also difficult to obtain in white collar settings, especially for higher level employees. Further, problems of response bias (generalized positive or negative response set) should be mentioned with self-report variables, although we found our respondents to be fairly discriminating. Finally, it is possible that some of the most important context characteristics for promoting innovation are the most difficult to operationalize and lack standardized measures. For example, encouragement of initiative, experimentation, independency and other organizational culture values (see Bikson, Stasz and Mankin, 1985 for an example) may well have strong impacts; but these are not captured in the existing store of organizational variables for use in empirical research.

COMPUTER SYSTEMS AND IMPLEMENTATION SUCCESS

Characteristics of the computer systems introduced into the office settings studied were also expected to have an influence on implementation success. New installations characterized nearly a third of the participating groups, who acquired them in 1982; this equipment had been in use for less than a year prior to data collection. In contrast, some groups had used used interactive computers for several years, as Table 8 shows. The

Table 8.

WHEN WORK GROUPS FIRST ACQUIRED ADVANCED TECHNOLOGY

1977-79	**15%**
1980	**21%**
1981	**33%**
1982	**31%**

equipment represented a number of manufacturers. The vendors most commonly found include Apple, Digital, Hewlett-Packard, IBM, Wang and Xerox, with equipment from many other makers less frequently observed. We were surprised at the small proportion of single-vendor sites--most groups

Table 9.

NUMBER OF DIFFERENT VENDORS REPRESENTED IN WORK GROUPS

1	**24%**
2	**26%**
3	**19%**
4	**22%**
5	**8%**
6	**2%**

have equipment from two or more (see Table 9).

The distribution of processing power among work groups is likewise diverse. Archival data revealed the following sorts of computing arrangements.

TABLE 10. SOURCE OF PROCESSING POWER FOR WORK GROUPS

Computing Support	Percent of Groups
microcomputers	31%
mid-size computers	52%
mainframe computers	50%

The percent of groups in each arrangement in Table 10 sums to more than 100 because the alternatives are not mutually exclusive. Most of the work groups have multiple sources of computing support, reflecting the entrance of personal computers into settings already served by some kind of central processing unit.

Our exploration of technology characteristics as influences on successful innovation followed the analytic strategy we pursued in studying organizational characteristics (see prior section). But because there is not a long tradition of behavioral research involving computer system characteristics, we had to develop independent variables for this component of the conceptual framework as a part of the research project. We approached this task from two directions, using both survey data and archival information supplemented by interview responses. In both instances we followed Bair's work (1980, 1984) by starting with detailed feature lists and constructing more generic variables from them. Our aim was to construct variables that met the criteria specified above, as well as two others; they needed to (1) be independent of particular vendors and specific applications, and (2) represent properties of computer systems that have a relatively direct impact on users.

Work group members, as part of the survey, were asked to rate the satisfactoriness of specific properties of their computer systems. To learn whether these properties could be combined to form more generic variables we again carried out a factor analysis (see Bikson and Gutek, 1983). The four resulting factors and the features that define them are presented in Table 11; together the factors account for more than 60 percent

Table 11.
USER-GENERATED DIMENSIONS OF INFORMATION TECHNOLOGY

Factor I:

Text or data alteration capability
Text or data entry capability
Organization of stored information
Information retrieval capability
Appropriateness for your specific job functions
Error detection and correction
Back-up to prevent file loss
Keyboard layout

Factor II:

Promptness of maintenance
Quality of maintenance
Quality of printout
Quality of the video display
Back-up to prevent file loss

Factor III:

Quality of the operating manual
Type of dialog with the computer
Response time of the computer

Factor IV:

Convenience and comfort of office furniture
Arrangement of equipment, furniture and space

of the variance in user responses to computer system characteristics. We construe the first factor chiefly in terms of functionality, or goodness of fit between software design and job functions. The second factor, in contrast, emphasizes equipment performance. We interpret the third factor as standing for interaction support--whether users have what they need to take advantage of interactive tools. The user environment is represented by the fourth factor. We regarded these factors as major dimensions of multifunction interactive systems from the user perspective. Accordingly we converted them into predictor variables for further exploration (using a standard factor scoring procedure and averaging the scores within work groups).

Next we attempted similar procedures with objective (vs. perceived) properties of computer systems. While these properties are "objective" in the sense that they are independent of users' experiences of them, associated variables and measures reflect researcher choices. For example, number of different vendors represented in a work group's equipment could be summed and treated as a continuous variable (a proxy for tool diversity with the advantages and disadantages that entails). We also wanted to represent system complexity in terms of software functions. However we found we could not simply count and sum the number of different applications without making very arbitrary assumptions. We decided therefore to treat system complexity as a three-level variable (low, medium, high) rated by researchers on the basis of number and type of functions implemented.

Examination of archival data, in contrast to survey data, did not yield a limited but comprehensive set of computer system dimensions (higher-order or summary characterizations.

We therefore examined separately a number of hardware and software features that fulfilled the criteria suggested above and seemed potentially capable of affecting implementation success, adopting an exploration strategy very much like that employed with organizational characteristics (see above). These investigations and trial analyses with many computer system characteristics variously represented yielded eight archivally-based variables for further study: shared workstations, electronic mail, system complexity, customized software, user modifiability, number of different vendors, use of microcomputers, and use of minicomputers.

Survey and archival variables--twelve in all--were then treated as predictors in regression analyses; as before, the implementation success indicators served as dependent measures. Obtained values of F ranged from 1.14 ($r2 = .26$, n.s.) to 5.26 ($r2 = .62$, $p < .0001$), producing six significant and 1 marginally significant results among the nine regression analyses. Again satisfaction outcomes were easiest to account for, overall; however, in contrast to organizational characteristics, system variables were more strongly related to perceived system friendliness ($r2 = .56$, $p < .01$) and satisfaction with the technology ($r2 = .55$, $p < .001$) than to job satisfaction ($r2 = .41$, $p < .05$). In the use category, system properties were marginally associated with percent of users ($r2 = .34$, $p = .10$) and strongly associated with incorporation of system use into task processes ($r2 = .62$, $p < .0001$). With respect to performance, the system characteristics studied.accounted for 47 percent of the variance in user-assessed work impacts ($p < .01$) and 42 percent of the variance in managers' ratings of value-added benefits ($p < .05$).

Next we looked for patterns within the set of predictor variables, attempting to see whether any of them was systematically related to implementation success across dependent measures. The strongest single predictor variable in the regression equations is whether or not a workstation is shared; exclusive use makes a highly significant contribution

Table 12.

TECHNOLOGY CHARACTERISTICS THAT AFFECT SUCCESS

User-generated properties:

- Functionality
- Interaction support

Archivally-based properties:

- Unshared workstations
- Communication
- Customized software
- User modifiability

to extent of incorporation of interactive tools into task processes, satisfaction with the new technology, and user-rated productivity improvements. Other important variables derived from archival data are having electronic mail (the system property most strongly associated with proportion of group members that are system users), customized software, and user modifiability. Interestingly, user modifiability makes a marginally negative contribution to perceived system friendliness; however it makes a significant positive contribution to overall satisfaction with the technology and to user-assessed performance benefits. (Table 12 summarizes the computer system variables most closely related to implementation success.)

Among survey-based variables, two of the four factorially-generated dimensions emerged as consistent positive predictors: functionality (first factor) and interaction (third factor). As might be expected, functionality is strongly related to the extent of incorporation of computer-based tools into day-to-day tasks; it is also a strong predictor of system-related satisfaction measures. The interaction factor makes substantial individual contributions to all three work group performance outcomes; it is also a significant contributor to system-related satisfaction.

In general, except for having enough workstations to go around, hardware properties seem less important than software properties for predicting implementation success. It is probably inapppropriate to compare the relative importance of perceived and objective system properties (since the former are summary variables but there are twice as many of the latter). In our data, however, the factorially-generated functionality dimension seems very much like the user's view of customized software (less than 20 percent of participating work groups had wholly off-the-shelf software). The interaction dimension also appears like a user-based counterpart of user modifiability (an archival variable). That is, we think there is some convergence between the subjective and objective measures. This is not to imply that there is an unambiguous set of system properties that predict implementation success. As noted above, there is not a straightforward relationship between the functionality and interaction factors. The same seems to hold true of important objective properties--systems that are customized are not typically easy to modify. These exploratory findings suggest that the implementation process involves implicit or explicit choices between success criteria (e.g., "friendliness" versus longer-term satisfaction with interactive tools). Nonetheless, for the outcome measures used here, computer system variables outweighed the collection of organizational characteristics we studied in trying to account for variation in implementation success.

IMPLEMENTATION PROCESSES AND SUCCESSFUL OUTCOMES

The organizations participating in this research introduced computer systems into their offices because employees at all levels of the hierarchy were engaged in a great many information tasks; they aimed at improving work group performance in varied ways by providing advanced information tools (see above). On the basis of previous innovation studies, we believed that characteristics of the processes by which new technologies were introduced into extant work settings would have a great deal to do with the success of these efforts.

While there is a long history of innovation research, the major concepts it has investigated were not readily translated into variables for this study. Again we began the exploration by developing measures of implementation process characteristics that are importantly linked to innovation success in existing literature, investigating their relationship to success indicators in a variety of univariate analyses. Implementation process data were drawn primarily from managerial interviews, supplemented by survey responses, researcher ratings, and archival information (see Bikson et al., 1986, for a more detailed representation of implementation variable development).

Available innovation research gives considerable importance to stage in the implementation process (Bikson et al., 1981) as an explanatory variable. Initially any technological innovation in a work setting is thought to disrupt regular work repertoires and stimulate a great deal of change as the organization adapts to new capabilities. Gradually the turbulence is expected to give way to smoother transition processes until finally a new stasis is reached. While this thesis accords with common sense, it is not clear how to operationalize 'stage'. Often 'stage' is equated with 'age' of an innovation, or length of time since first access to the new tool; however the passage of time can signal delays and errors as readily as progress. Similarly, amount of turbulence (or degree of system change since initial implementation) can be treated as a stage measure; however stasis may be a sign of too early routinization rather than full deployment of system capabilities. And former theories fail to take into account that if the state of the art is rapidly advancing--as with computer-based tools--continuous system evolution rather than stasis in user settings should be expected. Consequently we also included a three-level researcher-rated stage variable, refering to whether computer system use was just beginning, well under way, or fully incorporated into work group behavior within a setting.

A second key characteristic identified in prior innovation research is user participation in the decision process. Several study instruments included items that tapped this issue. The best was a survey item asking users whether or not they took part in decisions about organizing work in relation to the system; proportion of positive responses per work group is significantly associated with implementation success across dependent measures. (Managers' judgments about the extent of user participation in decisionmaking are correlated with but systematically higher than users' own judgments.)

Varied other implementation strategy characteristics were also examined, such as focus of efforts (technology focus, group focus, sociotechnical balance), status of the work group with respect to technology diffusion in the organization, voluntary vs. mandatory transition to new tools for employees, and user satisfaction with the level of learning support (see Bikson and Gutek, 1983a, for an extended discussion of training in computer-mediated work settings). In all, a total of twelve implementation variables representing either stage or process characteristics were selected on the basis of preliminary explorations for further study in regression analyses using success indicators in the three outcome categories as dependent measures.

These analyses yielded values of F ranging from 0.98 ($r2 = .26$, n.s.) to 4.41 ($r2 = .61$, $p < .001$); the set of implementation process characteristics explained a significant amount of variation in eight of nine dependent measures, leaving only manager-assessed productivity improvements out of account. Once more, all three satisfaction outcomes were readily predicted; the strongest finding was for satisfaction with the new technology ($r2 = .61$, $p < .001$). Implementation process variables were also significantly associated with use measures; in this outcome domain the strongest regression equation had proportion of users within a work group as the dependent measure ($r2 = .57$, $p < .001$). Within the area of performance outcomes, implementation process characteristics evidenced significant relationships to users' assessments of performance improvements ($r2 = .54$, $p < .01$) and to managerial judgments about value-added benefits ($r2 = .57$, $p < .001$).

As a last step in the exploration, we investigated the regression analyses for systematically influential predictor variables. Consistent with earlier innovation findings, stage of implementation as rated by researchers makes strong individual contributions to system use and work group performance measures. Age of system (from archival data) shows a very similar but less strong pattern of influence. On the other hand, amount of system change since initial implementation (from managerial interviews) is a distinctly negative predictor. Not surprisingly, the age of a system shows moderate positive correlations with both the stage of its implementation and the degree of change it has undergone in the process (Table 13 summarizes implementation process variables most consistently associated with successful outcomes).

Table 13.

IMPLEMENTATION CHARACTERISTICS THAT AFFECT SUCCESS

Implementation stage

Implementation strategy:

Sociotechnical approach

Learning support

Positive change orientation

User participation

Diffusion status

Among implementation process features, a balanced social-and-technical approach is a strong predictor, contributing particularly to tool acceptance and percent of users as well as to managers' assessments of bot productivity and value-added gains. Another important predictor variable is user satisfaction with learning support, associated with incorporation of computer-based tools into task processes and user ratings of performance benefits; it also contributes to satisfaction with the technology. Other implementation strategy elements that make consistent but less strong contributions to outcome measures include the organization's positive orientation toward change (a standardized survey measure from Cammann et al., 1978) and user participation in the decision process. Finally, the work group's diffusion status--its potential role in technology transfer--emerged as a positive predictor. Groups that were official pilot projects were very successful, perhaps because they received a great deal of organizational hand-holding and encouragement. But groups who regarded themselves as leading examples, as innovators in their milieux, were also quite effective. At the other extreme were groups who believed they would have no impact or might even be seen as a negative example. Conversely, the total proportion of work groups in the same site who were also implementing interactive technology yielded a similar but weaker and negative pattern of influence.

Exploring implementation characteristics suggests that in the transition to advanced information technology--like other organizational innovations--the nature of the process can importantly affect the nature of the outcomes. This conclusion merits emphasis in view of the fact that a sizeable proportion of organizations focus their innovation efforts on the technology itself, paying little attention to the change process. For example, most of the organizations taking part in this study did not have a budget earmarked for implementation and could not estimate the cost of meetings, planning procedures, and other hands-on activities associated with the conversion to computer-based tools. Further, while our findings are coherent with prior research in highlighting the influence of implementation process characeristics, they diverge in suggesting that a successful transition to computer technology will be indicated by organizational stasis; in contrast, we suspect the mark of successful implementation with a rapidly advancing technology may be an organization's learning to manage change rather than attempting to minimize it (Bikson and Eveland, 1986; Bikson, Stasz and Mankin, 1985).

DISCUSSION

In reviewing what we learned from studying how organizations introduced computer-based procedures into white-collar work, we believe some of the nonfindings are as important as the findings. Among the widely touted problems that we did not observe in our sample, first of all, was resistance to computer use. Many sources (see literature review in Bikson, et al., 1981) had predicted that employees would not be willing to interact directly with information systems--some targeting sex (men will not use a keyboard), others citing age (older employees cannot make the transition), and still others basing their expectations on job status (managers won't work at machines). As Table 3 above shows, none of these predictions was borne out by the data we collected. In fact, rather than finding equipment going unused, we found that limited computing resources was by far the more common problem--work groups reported they needed more workstations and more processing power.

Second, we did not observe software "unfriendliness" to be a major problem. In the main, employees are relatively satisfied with the applications they use (see Table 4). This is not to say they have access to the best of interfaces, but only that functionality seems to outweigh friendliness in the work groups we studied. Employees appear to be highly motivated to use good tools, and there is some evidence that "friendliness" (or, ease of use by untrained individuals) may stand in the way of functionality in the long run (see Bikson and Gutek, 1983). On the other hand, effective use of a complex interactive tool requires better learning support for employees than many organizations are prepared to provide (see Bikson and Gutek, 1983a).

There are, however, a number of issues raised and not resolved in this research. These issues concern how organizations can make multifunction interactive systems into effective work tools, given that employees are willing and able to use them. For instance, we have observed that while organizations are fairly successful at getting applications to support highly specific functions they have not been notably successsful at supporting generic functions. Table 4 above provides evidence that there are many white-collar activities performed in common by a sizeable proportion of employees in an organization, regardless of their departmental affiliation or occupational status (e.g., communication, file organization and management). Future research needs to address the question of how to enhance the generic information and communication environments in which more narrow, task-specific applications are embedded.

Next, subsequent research needs to investigate system functionality for upper level employees. While over three-fourths of the organizations in our sample aimed at providing support for higher management and professionals, they were most successful at supporting lower level employees (clerical, secretarial, and technical). Major efficiency gains are observed at that level (see Table 5), but they have little impact on overall costs or value-added improvements. Further, we suppose this issue is related to improved support for generic activities--since it is higher level groups who perform the most varied but general information and communication functions. While the question of managerial and professional support has not gone unrecognized, the research reported here suggests two reasons why it has not been adequately resolved.

- o Developing "the professional workstation" or "the managerial workstation" is probably not a fruitful direction. As we have underscored, the functions performed in common by higher level employees are currently most lacking in support. Second, research at the work group level has made it evident that these employees do not in the main work as individuals--rather they act as members of teams that include other managers or professionals as well as support staff. Facilitation of shared work by teams of employees, many of whom perform information-related functions in common, is likely to prove more productive (cf. Bair, 1985).

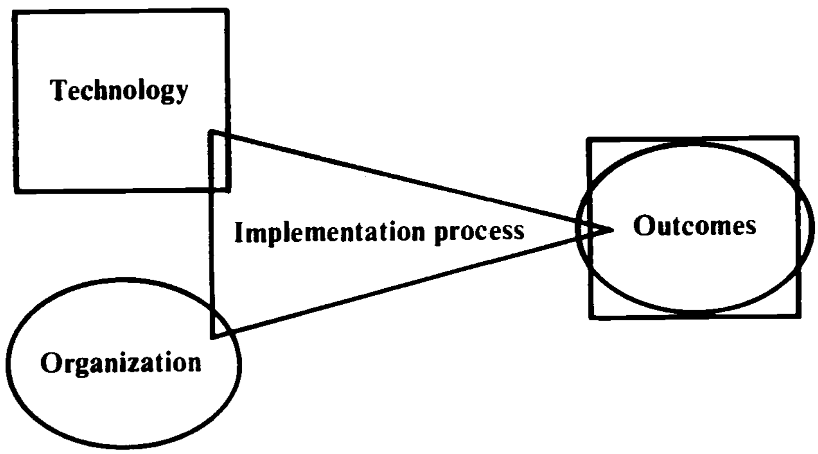
- o Developing interfaces to systems that can be used without risk of error by almost anyone, with little training or effort, is also not likely to be effective. We have not found evidence that having to learn how to use a system is aversive to higher level employees (even though quality training is difficult to deliver). Moreover, systems that are "idiot-proof" are also probably competency-proof, preventing well-educated employees from manipulating interactive tools in ways that take advantage of their established skills in task domains. Thus questions of how to increase the power rather than the simplicity of user interfaces merit more attention (cf. Bikson and Gutek, 1983a; Bikson, Stasz and Mankin, 1985).

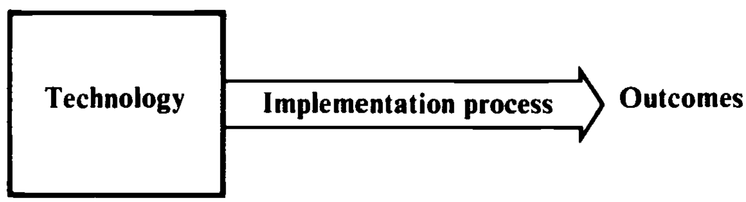
Further, there is need for research that explores the links between multifunction interactive systems and organizational performance. Our explorations suggest that where outcomes are readily measureable (in increased output units or decreased input units) they do not represent major organizational impacts. Information and communication--critical elements in an organization's products as well as processes--are not readily assumed under the manufacturing productivity paradigm. Further, we have observed that even when we rely on such measures they are the least readily linked in systematic ways to the characteristics of organizational contexts, computer systems and implementation processes reported here. It is not yet clear how interactive tools affect basic missions and task processes in white collar work groups, and how these in turn can affect organizational performance. While examples of dramatic technology-related benefits have surfaced in the literature (e.g., Hammer, 1984; Bikson, Stasz and Mankin, 1985), we are still unable to define the relationship between the capabilities of flexible, powerful computer systems and the performance of organizations in the information economy.

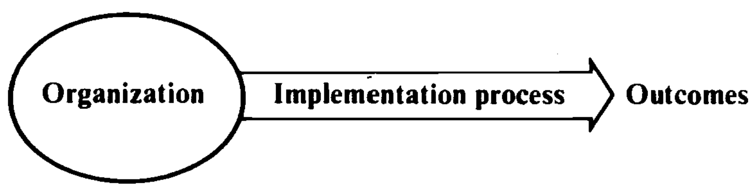
Finally, there remains a substantial amount of work to be done in developing a research paradigm that will enable cumulative contributions to knowledge about advanced technology in information intensive work. The study reported here is exploratory and suggestive. While we believe the conceptual framework on which it is based has a great deal of utility for research on technology transfer and utilization, methodological efforts are needed to develop and validate key variables and their measures. In particular, multiple measures of the same variables will help in distinguishing patterns of relationship among the phenomena studied from method artifacts such as response bias in self reports. More importantly, experimental and longitudinal research is needed to identify causal relationships among variables. As the state of the technical art continues to advance, learning what can be generalized from previous implementation experiences will contribute both to innovation research and to innovation processes in organizations.

Appendix

Understanding Technological Innovation







HOW INCREASED AUTOMATION WILL IMPROVE THE 1990 CENSUS OF POPULATION AND HOUSING

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Introduction

The U.S. Census Bureau began planning the 1990 Census of Population and Housing -- the Bicentennial Census of the United States -- several years ago. Even though April 1, 1990, is still four years away, an early start to planning was necessary because of the complexity of the issues we face and the long lead times needed to implement decisions. Our goals for 1990 are to produce data products in a more timely manner and to make the whole census process more cost-effective, while at the same time maintaining a high level of accuracy. Another way of saying this is that we are attempting to make the census process more productive. We hope to achieve this by automating outmoded clerical operations and by entirely rethinking the relationship between the data collection and data processing phases of the census.

Over the last century, the census has played an important role in the history of automated data processing in the United States. By 1890, the U.S. census had become an encyclopedic enumeration of the American people: there was a great increase over previous censuses both in the number of inquiries and the volume of data tabulated and published. Census officials, realizing that something had to be done to speed up the processing and tabulation for the 1890 census, gave a young engineer named Herman Hollerith the assignment of constructing a quicker tabulating device. The electromechanical tabulating machine Hollerith developed for the 1890 census -- which read punched cards by electrical pulses -- revolutionized both census-taking and statistical tabulating. Hollerith's machine was soon being used worldwide in business and census applications.

Hollerith's invention allowed greater volumes of data to be processed, in more sophisticated cross-classifications, in a shorter time and at less cost. His punch-card system was modified and improved by the Census machine shop for each successive census over the next 60 years.

Eventually, computers replaced the tabulating machine for processing data, and the census was again at the forefront of the technological revolution. UNIVAC-1, the first major computer system for civilian use, was installed at the Census Bureau in 1951 and was used to process part of the 1950 census. Though large, cumbersome, and slow by today's standards, UNIVAC-1 was a major advance from the Hollerith tabulating system. Computers were used to process all of the 1960 census, and, of course, the 1970 and 1980 censuses.

Another new device came with the 1960 census when FOSDIC was introduced for entering data into computer as a replacement for keying. FOSDIC stands for <u>f</u>ilm <u>o</u>ptical <u>s</u>ensing <u>d</u>evice for <u>i</u>nput to <u>c</u>omputer. Questionnaires were microfilmed by special page-turning cameras, and FOSDIC read the data from microfilm into computer. This advance, which was developed to meet the specialized needs of the decennial census, eliminated the need for key-punchers, saved time, and improved quality. FOSDIC has been used in the last three censuses.

The point of this brief history lesson is that the decennial census, because of its massive workload and unique character, has called forth new technologies, new tabulating, computing, and automated equipment to speed up the processing of census data. For much of the last century, the U.S. Census Bureau was in the forefront of the automation revolution.

As we examined our 1980 census experience, we found that while the census was generally a success there was a great deal of room for improvement. We determined that much of the improvement in timeliness, accuracy, and cost-efficiency could come from taking a fresh look at automation and increasing automation in the census.

While the automation advances we plan for the 1990 census will not involve the development of new technologies such as Hollerith's tabulating machine and UNIVAC-1, they will be based on innovative applications and refinements of existing technologies. This challenge of appropriately using existing technologies is no less a challenge than that faced by previous census-takers in inventing new technologies. And that is why the Census Bureau has embarked on a vigorous program to examine alternative automation possibilities in test censuses before making choices for the 1990 census.

Since we are contemplating significant changes in automation for 1990, I will first describe how the 1980 census was taken so the departures will be more easily understood.

1980 Census

The 1980 census was taken using the mail-out/mail-back procedure in areas of the country containing 95 percent of the population. We purchased address lists for some of these areas and listed addresses ourselves elsewhere; in all cases, the address lists were then checked and updated by the U.S. Postal Service and our own field personnel. The USPS delivered questionnaires to each housing unit a few days before Census Day and householders were asked to fill them out and mail them back to a temporary census district office on April 1. The aim of this approach was to complete as much of the census as possible by the less costly mail method and then to do the costly and time-consuming followup of those housing units for which no questionnaire was returned. We had received questionnaires for about 83 percent of the occupied households within 2 weeks of the mail-out. A large work force (270,000 at peak) personally visited nonresponding housing units and vacant units. In sparsely populated parts of the country where mail-census procedures were not suitable, census enumerators went door-to-door to take the census.

We set up 409 temporary district offices to carry out data collection. The majority of the operations were done manually. For each office, a large number of clerks were hired to make changes (additions, deletions, corrections) to the address lists, check in mail returned questionnaires and edit the questionnaires for completeness and consistency, assign housing units for followup, monitor the enumeration of the nonresponding units, and tally preliminary counts. Many of these operations can be considered "processing," but processing did not begin in earnest until the collection offices completed their work, closed, and shipped their questionnaires to one of three processing centers. The offices generally closed from 5-7 months after Census Day.

At the processing centers, the questionnaires were microfilmed and the data read into computer by FOSDIC. Though processing center operations were largely automated, written entries for many questionnaire items (e.g., ancestry and occupation) were given numeric codes manually prior to computer processing. These coding operations required a large clerical workforce.

This system worked very well considering the amount of manual work involved and the sharp division between data collection and data processing. The Census Bureau met its legal deadlines for the release of apportionment and redistricting counts;[1] many of the small-area data were issued earlier than for the previous census; and many more data, especially for race and Spanish-origin groups, were published. Still, we did not release some of the data products, particularly those based on the sample questions, as quickly as planned. (This delay was due in part to budget problems that forced us to cut staff and temporarily suspend sample coding operations.)

For the 1990 census, we want again to meet our legal deadlines and we want to release other data products more quickly than ever, as well as keeping costs reasonable and making the counts as accurate as possible.

Automation Plans for 1990

We have identified a number of areas that are candidates for automation, and have already begun to test some of them.

One of these areas is geography. Geographic materials are essential to a successful census for two reasons: First, having correct and legible maps helps our enumerators find every housing unit so that we have a complete count; and second, having correct boundaries and geographic information helps us assign each housing unit and the people who live there to the appropriate land area. One of our problems in the 1980 census was that our geographic materials, including the maps, were produced in separate operations involving a great deal of clerical work. This process was slow and error-prone, leading to delays in production and errors and inconsistencies in some of the products.

1/ Apportionment is the process whereby a State is awarded a share of the 435 seats in the House of Representatives based on its population; redistricting refers to the process of redrawing the boundaries of legislative districts within States based on the principle of "one person/one vote."

For 1990 we are automating our geographic support system, which we are calling TIGER (Topologically Integrated Geographic Encoding and Referencing system). TIGER will integrate into one file all the geographic information that was produced in separate operations in 1980. This will allow us to produce the geographic products and services for 1990 from one consistent data base, and will help us avoid some of the 1980 census delays and inaccuracies. Having the computer generate maps that match the geographic areas in our tabulations will be a big improvement over the clerical operations of the 1980 and earlier censuses.

Another improvement planned for the 1990 census is the development of an automated address control file. Since we will again use the mail-out/mail-back census methodology, an accurate and up-to-date address control file is essential. In 1980, although the initial control list of addresses was computerized, changes to the address file during the census were made manually. For 1990, we will have continuous access to the automated address control file so that we can keep the list current.

With an automated address file, it will be much easier to determine whether or not we included a specific address in the file. It also will be possible to update the file where we missed an address in earlier operations. We can use bar-code technology for computer check-in of the questionnaires, instead of doing check-in manually as we did in 1980. As a result, it will be easier for our enumeration staff to identify the addresses for which questionnaires have not been returned, and we could send reminder notices to those addresses, thus reducing further the number of nonresponding housing units where we need to send enumerators.

Finally, with an automated address list, we can update the list and use it in future Census Bureau operations. In our 1985 test censuses, we successfully implemented an automated address control file, automated check-in, and the use of reminder cards.

One of the most promising ways to take advantage of automation in the census, and our biggest challenge, is to convert the data on the questionnaires into a computer-readable format earlier in the census process than in past censuses. This approach is essential if we are going to take full advantage of automation and release data products quicker. For 1980, the data conversion did not begin until after the temporary census offices closed and shipped their questionnaires to one of three automated processing centers. For the 1990 census, we want to begin converting data concurrently with the collection phase, an early start that would move us 5-7 months ahead of the 1980 schedule.

We know that we want to do concurrent processing in 1990, but making that decision has raised a number of very complex issues. Because of the logistical problems of communicating between collection and processing offices, concurrent processing will require that we have many more processing centers than we had in the past (one in 1970 and three in 1980). Should we have separate processing and collection offices or combined processing/collection offices? A related issue is the type of equipment we would use to accomplish processing. We cannot build or maintain enough FOSDIC machines to support numerous offices. Should we use FOSDIC in some offices and return to keying (which we abandoned in 1960) for other offices? We tested a third type of equipment in our 1985 test censuses -- optical mark recognition. An optical mark reader eliminates the microfilming step required for FOSDIC and reads the data from the questionnaires directly onto computer. While this technology offers real possibilities for the future, it has limitations and risks and we have decided not to consider it further for use in 1990.

One reason is that we simply do not have time to test it further. In order to allow ourselves sufficient lead time for the procurement of the needed equipment, we must make all key decisions about automation by September 1986. At a major decision conference last Fall, we narrowed our focus considerably by reaching some decisions on office structure. We decided that for large urban areas, we would set up separate processing offices to support a number of collection offices. For more rural areas, we would have combined processing/collection offices. We still must decide how many of each type of office we will have, what type of equipment to use, and work out other details; however, this is the direction in which we are headed.

Concurrent processing involves both potential benefits and potential risks. On the one hand, it will speed up census data processing and allow us to release data earlier. It will allow more time for review and correction of the data and will enable the computer to replace certain census operations done clerically in 1980, such as the questionnaire edit. It will contribute to tighter control of field followup assignments and allow early identification of enumeration problems. Also, computer records of questionnaires could serve as backups to the originals in case they are accidentally destroyed. And, in general, it would reduce the amount of paper in the collection office.

On the other hand, concurrent processing will be more expensive, will require more automated equipment for a shorter period of time, and could involve control and coordination problems. We will need a higher quality of temporary staff to manage and support the offices and we will need to have extra equipment in reserve.

So far I have discussed our plans with regard to automating geographic materials and the address control file and beginning data conversion earlier. We will increase or improve automation in other areas to help speed up the census and make it more accurate, and I will discuss briefly a few of these areas.

One area is questionnaire edit. Edit is a repetitive and monotonous job better suited to computers than people. Entering data from the questionnaires into the computer earlier in the census process will allow computer editing of the questionnaire data earlier than ever before. These edits will check the completeness and consistency of the data. In 1980, the questionnaires were manually edited in the district offices, basically to check that they had been answered completely; then, once the questionnaires went through the FOSDIC machines, the computer edited them for completeness and consistency. For 1990, most of the manual editing would be eliminated, resulting in speedier, more consistent, and more accurate editing. Decentralizing the computer edit operation would also allow us to recontact the respondent, if necessary, which was not possible in the 1980 census.

Another promising automation technique relates to the coding of handwritten entries on the questionnaire. In 1980, manually coding the handwritten entries on questionnaires involved a large, time-consuming, and costly clerical operation. For 1990, we might be able to key handwritten responses into the computer and specially developed software would assign the appropriate computer-readable codes. We cannot eliminate all clerical involvement in coding, because some handwritten responses will be incomplete or uncodable and will have to be handled by our referral units. We will, however, be able to significantly reduce the amount of manual work and, thus, save time and money and improve the quality of the data. We are planning to test some aspects of automated coding in our 1986 test censuses.

We will also use automation to help us plan and monitor the census. The Census Bureau is developing an elaborate automation management information data base to see that we meet key dates in making decisions about the shape of the 1990 census. The management information system was in place to help us keep track of operations for our 1985 test censuses and in helping us plan our 1986 test censuses. In addition to serving as an aid in planning the 1990 census, the management information system will give us up-to-the-minute cost and progress data so that we can monitor actual 1990 census operations. In 1980, cost and progress reports were not integrated with other management reports, and some of the cost and progress information was several days old by the time managers received it.

Automation will help us control and monitor many other administrative functions. We will have an automated payroll system, as in 1980. And for 1990, we will also have, on a microcomputer, a new automated employee file that will help us organize needed information about our large temporary work force. (We did this in our 1985 test census.) For instance, we will know whether we are meeting our hiring goals in each enumeration area and we can use the file to help us make enumerator assignments. We will also have a new automated inventory control system to manage the procurement and distribution of the large volume of specialized supplies needed to take the census.

Finally, we are looking at automation of our tabulation and publication operations for the 1990 census. Our tabulation system was fully computerized for the 1980 census, but for 1990 we expect to take advantage of advances in data base software to make improvements in the system. We also want to use the computer in our analytical review of the tabulated data, which was conducted manually in 1980. This review, which looks for errors and anomalies in the data, is essential to maintaining the quality of our data products. Using the computer will speed up and improve this analysis.

New automation techniques will also play a part in the dissemination of our data products for the 1990 census. While the Census Bureau will continue to produce paper reports and large summary computer tape files, we must also address the needs of small computer users who will want products on floppy disks. Another new development we will consider for 1990 will be an online data base in which users can access summary data from their office computers using a telephone hookup. The Census Bureau has already implemented such a system, called CENDATA, on a limited basis. There may be other developments in the next few years--such as improvements in laser disks--that we will be able to take advantage of for the 1990 census. Fortunately, our final decisions on tabulations and data products can be made later in the decade, so we can take advantage of new technologies.

There is a sense of excitement at the Census Bureau about these automation possibilities, but some words of caution should be added. Whatever systems are developed must be simple, because they will be operated by a temporary work force with minimal training. The systems must be fully tested, proven to be reliable, and essentially "fail safe" to avoid crippling breakdowns. The equipment must not be unreasonably expensive and should either continue to have value to the Census Bureau or be marketable to someone else upon completion of the census.

Most of all, as we look to increasing automation in the census, we must take care to ensure that the confidentiality of the data we collect is maintained both in fact and in appearance. Only by maintaining the confidentiality of the census process can be ensure a high level of public trust and cooperation. The Census Bureau is proud of its record of protecting confidentiality and is constantly looking for ways to maintain and improve that protection.

The Census Bureau does not release data about individuals to anyone, including other Federal government agencies. But the sometimes menacing implications of technology require that we increase our efforts to convince individuals that they cannot be harmed by answering the census and that the information they provide is strictly confidential by law.

Closing

Automation is one of the key areas we are examining as we plan the 1990 U.S. Census of Population and Housing. There are many other issues, of course, that go into making a successful census: the basic procedures we will use to collect the data, the content of the questionnaires, hiring good temporary staff, and promotion and outreach. But, automating many of the census tasks performed clerically in 1980 and previous censuses can help us to take the census more quickly, allowing us to meet our legal mandates for releasing apportionment and redistricting counts and to release other data products in a timely manner. Automation could also help us introduce cost-efficiencies into many areas, improve accuracy, and also allow for better control of the census process.

Traditionally, U.S. census data collection and much of the census data processing (e.g., questionnaire check-in against the address control list, edit of questionnaires for completeness, and coding of handwritten responses) have been paper- and people-intensive tasks. The use of automated equipment can help to deal with the mountains of paper and the thousands of clerical tasks in a much more efficient and controlled way. Hiring, training, and finding space for all the people who have been needed to perform the numerous operations in past censuses have taken a lot of time and cost a lot of money. While the 1990 census will also likely require a large number of temporary workers, we are looking at ways to cut down on the number of labor-intensive activities and to use automated systems to control the census process.

We have been working on our automation plans for some time now. We tested some new approaches in our test censuses last year in Tampa, Florida, and in Jersey City, New Jersey, and will conduct further tests of automation this year in part of Los Angeles County, California, and in several counties in east central Mississippi. These tests are very important as laboratories where we can try out optional approaches. There will be further testing in 1987 and a dress rehearsal in 1988.

While there are many decisions yet to be made and problems to be worked out, we have progressed far enough in our automation planning to say this: there will be significantly more automation in the 1990 census than in any previous census. We will make innovative use of automation techniques to perform data-entry earlier than ever before. We will have an automated geographic support system. We will edit questionnaires by computer. And we have already implemented an automated address control file, automated questionnaire check-in, and an automated management information system in our test censuses, and plan to have these features in 1990.

Thus, we are optimistic that we are on the verge of another historic breakthrough in applying automation to census-taking. And that is fitting since 1990 will mark the 200th anniversary of the first U.S. census in 1790.

MAJOR TRENDS IN GOVERNMENT INFORMATION SYSTEMS ARCHITECTURE

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Introduction

One major difficulty faced by this new category of architects dealing with information systems -and particularly in government- stems from the dramatic evolution –or revolution- of technology, which makes any architecture obsolete as soon as it is being implemented.
When considering the period 1950-1985, this phenomenon has been significantly accelerated in the past ten years, following a period of relative stability. This does not mean that there were no changes between the early fifties and 1975, but these were merely an increase in capacity and complexity of systems, actually not in their overall architecture.
In the following pages, we focus on the major significant trends in this government information systems architecture, according to western european experience (mostly in french government). This implies that some changes have been deliberately omitted , even when they had noticeable consequences in the design and analysis phase of information systems: for instance, the development of data models and related software have made it easier to design and set up data bases, but the overall structure of the information system did not undergo a real transformation. On the other hand, development of microcomputers and communications have actually given a turn to the architecture of systems, by offering a wide range of choices of feasible and tempting solutions, along with a selective proportioning of centralization, decentralization, autonomy, communication, etc
In this short analysis, we identify three eras:
-the first age (the stone age), from 1950 to the early seventies, focused on management information systems, mostly isolated (one task, one system)
-then came the era of data banks (with the concept of sharing the data) and even of cooperative systems (with the concept of distributing the tasks and the data), which began in the early seventies, and, in some respects, is not quite yet completed
-now under way is the era of distributed, decentralized and communicating systems, with micros, networks, etc, and also the development of "end user computing", that is a wide dissemination of computer use within non computer professionals.

For each stage, some examples of systems will be given, as well as main characteristics, problems raised, and new issues.

1-The management era

Historically, the first fields of application of computers in government administration were mostly directed towards
-the internal management of government, on one hand, and
-the handling of wide range of administrative routines, on the other hand

In the first category, are the usual payroll system, (which is usually the very first computer application in any country), and the budget or accounting system.
In the second category are the tax collection systems, and in some countries the pensions or social security, welfare or health care systems.

One has to add to these systems the statistical system, with the early processing of censuses and statistical surveys.

The main characteristics of these systems were as follows:
-each system was dedicated to one task (or a group of tasks)
-there was no relation between systems, either in terms of computer communications, (tape or networks) or in terms of content (communication of concepts and data)
-the usual design and analysis methodologies did not really lay stress on a global (systemic) approach of the overall system.

2-Data banks and cooperative systems era

2.1-Data banks
The advent of data banks came about with the raising of consciousness of redundancies between separate information systems, and inconsistencies between data processed in different agencies. Another, though less stimulating, reason for the advent of data banks was the growing concern for horizontal planning, involving data from different sectors and/or agencies.

The main characteristics of data banks were as follows:
-data coming from various sources were gathered, processed and organized in a unique information system
-data banks were mainly centralized in large computers, though the concept of "distributed" data banks appeared in the late seventies
-access to data was possible through different procedures: either

through batch processing, or direct access through a terminal.

Examples of such data banks are: industrial data banks, agricultural data banks, employment data banks;
One specific kind of common data banks was the basic entities registers, mainly used to provide unique identification of basic units as individuals, enterprises, buildings, real estate, vehicles, etc.

2.2-Cooperative systems
While data banks did not go through any great modifications of the internal administrative procedures of the source agencies or services participating in the bank, cooperative systems imply a deep reorganization of the overall procedures and routines. One main cause of arrival of such systems has been the growing concern for reduction of administrative burden, and overall need for simplifying the administrative processes for individuals and even more for business enterprises.

Examples of such systems were, in France for instance, the customs system SOFI, the social statements and surveys system, and the business enterprises procedures centres.

2.3-Critical issues in data banks and cooperative systems
Data banks as well as cooperative systems gave rise to various issues:
-technical issues, of course, related to the capacity of software and hardware to handle large volumes of data, with satisfactory performances for the user; related to the "user friendliness" of the query languages software, and the complexity of the data models they could handle. Another set of technical issues is related to the content of the systems, and the problems raised by simultaneous use of data coming from various sources: thus appear the fundamental questions of basic concepts, definitions, and classifications, the identification problems, etc
-political issues, related to capability of different agencies to cooperate, exchange data, and, in some cases (cooperative systems), modify their own procedures
-financial issues, mainly relating to the "who will pay for what" question
-social issues, related to privacy and confidentiality versus sharing of information.

On the other hand, this trend toward sharing of data and cooperation in procedures created new needs altogether
-in coordination structures between agencies, in terms of data definitions, concepts and classifications, as well in identification and registering, and

-in analysis and design methodologies, with the advent of systemic -or global- approach.

3-The era of decentralization and communication

Along with the development of professional microcomputers and communications facilities, government administrations had to live through the thrust of administrative and political decentralization or deconcentration.
Whatever might have been the actual degree of effective decentralization, which could significantly vary from one country to the other,and from one agency to another, this has resulted in the following questions:
"why shouldn't we take this opportunity of using microcomputers and new means of communications to provide local and regional levels with limited but sufficient processing capabilities, with communications facilities (i.e. networks) to convey the necessary flows of information to the central level?"
Of course, and as usual, there has been a first significant trend towards "total" decentralization, along with total autonomy in choices of microcomputers hardware and software. This soon led, in some agencies, to the same kind of situation which could have been observed at the end of "first era" in §1: no possibilities of communication between regions, difficulties in gathering and aggregating data at central level, etc. Quite soon, local and regional levels felt the need for communication and sharing of common resources.
Now, most agencies and large corporate enterprises have reached a quite satifactory compromise between centralization and decentralization, with mixed architectures combining:
-centralized processing, communication and storage capabilities
-local and/or regional processing, communication facilities and equipment
-a set of standards defining what is to be centralized or decentralized, and how common sets of data and concepts are to be used all over the system, and, finally some software and communication standards

Sample architecture may comprise:
-a central computing unit, holding major central databases and reference files, but also electronic mail capabilities
-local microcomputer units, able to communicate with the central unit, and to extract some parts of common data in order to process them locally, or able to request tasks requiring large processing capabilities
-an overall network (mostly public networks) for interregional

communication (along with the central unit)
-local areas networks, for local communication (within a building)

In this architecture, the central processing unit is altogether a centralization unit for data which has to be processed at the central level, but also a resource unit for local and regional users, offering data resources as well as processing (software, memory, etc) resource.

Of course this kind of architecture has given rise to new issues:
-technical issues:
how to ensure communication and data transfer between local and central units? this has for instance led to a new generation of software, able to handle "micro-mainframe" connection.
how to ensure common data protection, while any use can access to central processing resources? This has led to the infocentre concept, where the two functions of
a) production and processing of data at the central level
b) providing information resources to the users at local level through communication network
are strictly apart.

-organizational issues:
which functions/data have to be centralized/decentralized?
which standards have to be set up to ensure minimum consistency and communication?

4-Towards a new approach of information systems architecture

In this area, assessment of hypothesis of future development could be hasardous. Major trends concern technological developments:
-artificial intelligence, experts systems, and the fifth generation computer gives way to new applications of information systems, mainly in the field of Decision Support. First experiences are still dedicated to limited domains, (as in era 1), or require such processing capabilities that they have to be kept centralized.
-man-machine interfaces are developing in quite a few significant directions, comprising voice, mouse, tactile screens, natural language etc.
-type of data processed and stored will integrate more and more image, text and voice in future systems, requiring larger communication flow capacity. A significant axis of future convergence will be communication compatibility between local area networks and the PABX. Another axis will be connection between electronic mail and telex or teletex networks
-the typical workstation will be more and more multi-function,

combining some of the above mentioned developments

This leads to new kinds of information systems architecture, where users will be able to design, with "toolboxes", tailored decision systems using fully centralized data and local information, communication and office work handling systems integrating image, sound and text or data. There, the focal point would be the individual workstation, and not the overall system. This means there is a change in the viewpoint; and also in the scale of such systems.

This goes along with a new consciousness of the importance of training and day to day assistance of final users, and their participating to choice and design of systems and architecture, and their evaluation.

UN PROJET MAJEUR D'UNE GRANDE ADMINISTRATION : LE PROJET SCRIBE DU MINISTERE FRANCAIS DES FINANCES

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A l'occasion du projet de transfert de ses services centraux (6 500 agents sur un total de 10 000) dans de nouveaux bâtiments, décidé en 1981, le ministère français de l'Economie et des Finances a engagé une réflexion de grande envergure sur la modernisation de ses méthodes et de ses outils de travail.

Cette réflexion a notamment montré que les outils bureautiques allaient radicalement transformer le fonctionnement des services de conception et que cette évolution devait faire l'objet d'une stratégie globale prenant en compte l'ensemble des aspects :

- organisationnels (réforme de structures),
- humains (formation),
- matériels (outils individuels et collectifs),
- de communication,
- immobiliers.

Pour la commodité de l'exposé, on regroupera ces divers aspects sous deux têtes de chapitre, concernant :

- d'une part la politique de bureautisation,
- d'autre part les fonctions collectives et le réseau.

I. LA BUREAUTISATION DE L'ADMINISTRATION CENTRALE

Bien que très proche sur le plan technique de l'informatique traditionnelle, la bureautique pose en réalité des problèmes de nature très différente qu'il a fallu résoudre.

A la différence de l'informatique dont le mode de fonctionnement est centralisé et régi par les spécialistes, la bureautique redonne à l'utilisateur une autonomie totale qui jointe à la baisse des coûts, au foisonnement des matériels et à la vulgarisation par les médias peut si on n'y prend garde conduire à l'anarchie, à la balkanisation et au gaspillage.

La stratégie du ministère a été de tenter de concilier cette exigence de liberté retrouvée avec le souci de cohérence des choix et la création d'infrastructures et de services communs qui offrent plutôt qu'ils n'imposent leurs services.

. **Volonté de déconcentration**.

- Attribution d'enveloppes financières aux services, grande liberté de choix des matériels, des logiciels et des configurations mais dans un cadre défini (liste de matériels et de logiciels agréés et par conséquent "soutenus" (maintenance, formation, conseils).

- Mise en place au sein de chaque service et de chaque unité de responsables particulièrement formés pour assurer la logistique et le conseil rapproché.

  . Mais parallèlement création de services communs musclés capables de conseiller, de former et d'assister les services.

- Lancement d'un ambitieux programme de formation par des moyens internes.

- Etude socio-organisationnelle menée par des spécialistes sur les sites d'expérience.

- Création d'équipes de conseil et d'assistance et formation des spécialistes.

- Animation des échanges : bourse des programmes, démonstration de matériels et de logiciels, clubs, groupes de progrès, bulletin spécialisé, etc ...

1° Bilan : . La mutation se passe bien. Excellent accueil. Mais sous utilisation passagère des possibilités des matériels (goulot d'étranglement de la formation).

. Peu d'accrocs au cadre fixé : grâce à la dimension communication donnée par le projet SCRIBE.

II. LE RESEAU LOCAL ET LES SERVICES COLLECTIFS

A la différence de l'informatique, où les postes de travail (terminaux) sont dépendants d'équipements centraux, la bureautique est parcellaire et éclatée : si on n'y prend garde, chacun, individuellement gagnera en efficacité, mais ces gains risquent d'être annulés si les possibilités d'intercommunication ne sont pas ménagées.

Le coeur même du projet consistait donc à créer physiquement et logiquement un réseau local capable :

- faire communiquer entre eux la totalité des postes de travail bureautiques et des serveurs bureautiques et informatiques, qu'ils soient spécialisés ou polyvalents, et quelles que soient leurs marques respectives,

- de véhiculer en tous points et vers l'extérieur toutes les informations de quelque forme que ce soit (textes, tableaux, images, données produites par les matériels connectés au réseau ou stockées chez eux).

C'est dire que la notion de réseau local recouvre deux aspects essentiels :

- la fonction communication elle-même,

- divers services collectifs offerts aux utilisateurs du réseau.

A. La fonction communication

1. Sur le plan physique :

Un système de cablage à trois niveaux :

- réseau fin précablé qui innerve la totalité des bureaux, les lignes étant regroupées par zones sur un tableau de connexion permettant la constitution et l'évolution des grappes ainsi que la liaison au réseau local lui-même (points d'accès réseau),

- un réseau local par bâtiment, à très haut débit (10 méga bits, cable coaxial, Ethernet) qui dessert tous les locaux informatiques et les points d'accès du réseau secondaire,

- une boucle (fibre optique) reliant entre eux les 4 bâtiments.

2. Sur le plan logique :

Il s'agit d'un réseau normalisé selon le système ISO à 7 couches.

Lorsque les normes ne sont pas figées ou établies (cas de la 6° couche) un choix provisoire a été fait : celui des normes internes du constructeur maître d'oeuvre, BULL (DSA 101 et 155).

Le respect de ces normes par les différents fournisseurs de matériels permet le dialogue entre machines de fabricants et de fonctionnalité différents. Deux exemples :

- un micro-ordinateur de marque A peut envoyer, à travers le serveur de courrier I, un texte à un poste de travail électronique de marque B qui le renvoie pour avis, après l'avoir retraité à un micro C à travers un autre serveur de courrier II.

- De même le micro A peut-il accéder, comme n'importe quel terminal à tel ou tel serveur informatique pour faire réaliser un traitement ou recueillir des données.

Cette polyvalence qui résulte du choix d'une normalisation et de l'architecture non hiérarchisée qui caractérise un réseau local, permet de grandes économies:

- dans les investissements

Inutile de multiplier les postes spécialisés : un micro-ordinateur dans une pièce est à la fois un matériel bureautique et un terminal capable d'accéder à des serveurs informatiques de marques différentes.

Inutile aussi de juxtaposer comme dans le passé des cables du réseau A, du réseau B etc., plus besoin de tirer une "ligne" chaque fois que l'on installe un terminal ou que l'on dispose d'un nouvel ordinateur.

- Productivité accrue grâce à l'absence de "ruptures de charge" dans le circuit de l'information : possibilité de transmettre sous forme électronique et retraitable la totalité des textes, données ou tableaux chiffrés produits sur les postes de travail connectés au réseau.

B. Des services collectifs

Le réseau local n'aurait qu'un intérêt limité sans l'adjonction de services collectifs.

1. Services bureautiques

- Pour assurer la communication bureautique entre les postes, des "serveurs de courrier" comportant des logiciels de messagerie normalisés sont indispensables. Le premier serveur expérimenté est celui de BULL (DOAS 6, logiciel Starpost").

- Un deuxième serveur bureautique a été mis en service qui a une fonction de classement collectif des documents.

- Dans un stade ultérieur seront installés des serveurs collectifs d'impression, capables d'assurer les gros tirages.

Parallèlement, une expérience de mise en service d'un serveur d'archivage sur disque optique numérique connecté au réseau est prévue, en liaison avec les travaux engagés au niveau de la CEE dans le cadre du projet ESPRIT.

2. Services informatiques

Parce qu'il accueille les serveurs informatiques classiques qui y sont connectés au même titre que les plus petits micro-ordinateurs, le réseau local permet l'accès aux diverses banques de données du ministère.

3. "L'accès au monde extérieur"

Mais pour importante que soit la communication interne, un réseau local qui ne serait pas ouvert vers l'extérieur n'aurait que peu de succès.

Le réseau local est ou sera donc connecté

- au réseau Transpac, à travers des passerelles. Tout poste connecté au réseau peut donc ipso facto, s'il y a droit, avoir accès aux serveurs informatiques des services extérieurs du ministère ou appartenant à d'autres organismes (accès aux banques de données extérieures notamment),

- au réseau de messagerie public Teletel, dès que les problèmes d'interface avec les normes retenues par les PTT seront réglés,

- aux systèmes videotex internes ou externes grâce à l'interface avec le PABX.

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Le projet SCRIBE met donc en jeu, au moyen d'une démarche synthétique, des techniques ou des savoir-faire dont peu sont nouveaux.

Son originalité réside toutefois dans :

- le caractère synthétique de cette approche dans laquelle la politique d'équipement des services en matériel bureautique a été conçue en intégrant dès le départ les aspects fondamentaux de la communication,

- la place privilégiée donnée au respect de la normalisation pour pouvoir concilier l'unité et la diversité. SCRIBE est le premier réseau local normalisé. Seuls Boeing et Général Motors ont pour l'instant un projet similaire,

- le caractère original et sans doute exemplaire, de la collaboration engagée avec un grand constructeur (BULL) pour sa mise en oeuvre.

Estimant que le Cahier des Charges élaboré par le ministère des Finances pour consulter les différentes entreprises, résumait parfaitement les exigences futures du marché, le groupe BULL décidait de construire son offre bureautique globale sur ces hypothèses. En souscrivant parfaitement au souci d'ouverture vers les autres constructeurs, à travers la normalisation, qui était celui du ministère, BULL s'est donc offert a être le maître d'oeuvre global de l'opération dans le but de développer les différents produits de son catalogue sous le contrôle vigilant d'un grand client motivé, sans facturer à celui-ci aucun coût de développement.

De la rencontre parfois tendue mais toujours fructueuse de ces deux ambitions est né un système qui transformera le fonctionnement d'un grand ministère et aura en même temps des retombées importantes pour d'autres organismes.

INTEGRATED DATA NETWORKS

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This paper reviews the impact of Networking on Information Technology and the trend of developments in the establishment of Networks with the objective of realising "Integrated Services Digital Network" (ISDN). The concepts of digitalisation,its advantages and impact on the emerging networks and services have been brought out. The important factors to be kept in view during the stage of transition to meet the demands of voice and non-voice services, have been touched upon. The concept of ISDN, the nature of services and connections supported have been briefly indicated. The experience of the Indian Administration in establishing a "National Informatics Centre" (NIC) and its impact on public administration and productivity have been commented briefly.

1. Introduction

The last three decades have witnessed phenomenal developments in Information Technology (IT) and a host of new developments are round the corner even as we prepare for the twenty first century. Data networks and telecommunication technology form an important dimension in the IT revolution. Data networks provide for transmission of data in digital bit stream for communication between computers to computers, terminals to computers and terminals to terminals. They carry raw data or processed information over distances ranging from less than a kilometer to tens of thousands of kilometers instantaneously and economically. From simple data links supporting data rates of 300 to 1200 bits per second via point-to-point telephone links, data networking has evolved rapidly to encompass today packet switching and circuit switching networks, public and private networks and interconnect a wide range of computers and terminals of different speeds, codes and protocols. The desire of being able to communicate with others at any time, anywhere and access any kind of information in any desired form is rapidly becoming a reality. With the rapid digitalisation of public telephone networks, the distinction between voice and non voice signals such as data, image, text etc., are diminishing in terms of the ability of the network to support them. Marriage of computer and communication has resulted in Information Technology to emerge. Integrated Digitgal Networks (IDN) are reshaping the architecture of telephone networks so as to lead to "Integrated Services Digitgal Network (ISDN).

The Telematic Services, the means to realise an Information Society, are being tailored appropriately and not necessarily in a similar manner by different administrations to meet the demands and aspirations of the people for expeditious information flow.

It is worth recalling that government (public administration) was one of the main early users of the telephone network in most of the developing countries and is so even today in most of the rural and semi-urban areas, whether it is law and order or local administration or health-care or education or rural development programmes. In most cases, it is difficult to quantify the benefits of telecommunications and hence justify the capital investments to be made in relation to other competing demands like health, education, irrigation, power, transportation etc. Even so, one can boldly state that there is widespread appreciation today of the importance of investments in telecommunication infrastructure and the benefits to be realised from these investments in terms of increased productivity, reduced travel, better coordination, more optimum utilization of scarce resources, timely availability of information for decision-making, provision of help in the case of emergency and natural calamity and better quality of life. These have been clearly brought out in the report of the Independent Commission for Worldwide Telecommunications Development set up by the ITU - "The Missing Link" - in December 1984. The benefits of Data Networks in terms of productivity gains are even more explicit compared to telephony, though its potentials and benefits are yet to be fully appreciated by many developing countries.

It is essential that public administrations, particularly in developing countries, now realise the potential of data networks. As it happened in the case of telephony, government and public administrations would do well to take a lead in the growth and utilization of such networks and related non voice services which can augur well to the rapid digitalization of telephone networks and to their ultimate transformation as "Information Networks". Only such an initiative will help government and public administrations in developing countries to profit fully from the emerging Information Technology tools.

2. Information Technology - impact of Networking

Data networks have undergone significant architectural changes during the last decade. A lot more developments are expected in the coming decade and a half and it is indeed difficult to predict precisely the shape of information networks in terms of technology, architecture,applications and services as we enter the twenty first century.

Computers entered most of the industrial and service sectors, as also in public administration, as stand alone data processing centres. Leased lines over public telephone networks provided point-to-point data communication links to remote dumb terminals for entry of data from user locations. Batch processing, prevalent even now, gave way to interactive terminals. Data rates supported by telephone lines also increased steadily from 300 to 600, 1200, 2400, 4800 and 9600 bits per second thereby increasing the throughput and response time.

Access through dial-up lines of Public Switched Telephone Network (PSTN) and via Public Data Networks (PDN) was also realised. While the former enabled economic access for low traffic batch loads,the latter provided increased throughput and high efficiency for interactive traffic. For the computer industry packet switched network signalled a major step in the direction of standards. While different computer vendors introduced their own proprietory network architectures to support distributed processing and networking, the international efforts in evolving standards for public data networks marked a major new trend from the user point of view. The successful effort of CCITT in evolving x.25 and its wide acceptance since then, both by the Telecom administrations and computer vendors, have played a pivotal role in the evolution of computer network architecture. The concepts, evolution and widespread acceptance of ISO seven layer architectural model for open systems interconnection,have further streamlined the design of networks and paved the way for integration of various computing and communication devices into networks. Protocol standards are emerging steadily for communication between machines. It is becoming increasingly possible today to introduce variety of computing elements starting from dumb terminals and micro/personal computers to minis, mainframes and super computers, often from different computer vendors, and yet integrate them into a homogeneous information network providing integrity of data, data transparency to end users, and flow of processed information to different decision making levels of an organization.

As a result, the trends in data networks today are towards greater flexibility, higher throughput, wider range of services and more user friendliness. The explosion in personal computers and micro computers sets a new trend in locating processing power and intelligence right at the user location. The effect is greater user participation and possible delegation and autonomy to the user through timely availability of information and decision support systems, while still maintaining the benefits of centralised coordination and control. The result of this architectural flexibility in information networks is the availability of an information technolgy tool capable of supporting a wide range of administrative/managerial structures appropriate to meet local needs.

The emerging new network architectures however, are not without a price. While technology has emerged rapidly, various architectural issues are yet to be fully addressed. Distributed processing brings in a new level of complexity and while, in most cases, hardware is readily forthcoming, software tasks have to be carefully managed and new levels of security and privacy issues have to adequately addressed. Standards take time to emerge and given the pace of technology developments, run the risk of obsolescence before they are evolved fully and accepted widely by the user community and industry. Also, standards,by their very nature, can mean stifling of innovation and are frequently threatened. Fortunately the industry, administrations and user community at large is alive to these challenges and process of evolving standards has assumed a new trend involving larger participation by industry and users. Efforts in the direction of ISDN is an example of standardization process, keeping a step ahead of demand or markets,in paving the way for orderly progress towards emergence of information society.

Progress in the telecommunications field also need a notable mention. Telecommunication technology has added a store of major addition to the information technology tools. Decreasing chnnel costs, increasing end-to-end digitalization (IDN), order of magnitude increase in channel capacity (fiber optics), break through in distance and locational barriers (satellite communication), increasing intelligence of the network to store, process and handle a wide and diverse variety of information sources and media, promise new potentials to be exploited by the information industry. Telecommunication networks and services themselves have moved increasingly towards support of the information processing and handling machines as against exclusive and simple interface to human beings through voice or text, thus placing at the disposal of information industry the benefits of a widespread (if not universal) economical network.

3. INTEGRATED DATA NETWORKS

Architectural evolution in computer networking has been aided significantly by the trend and the steps already taken towards standardisation. Open Systems Interconnection (OSI) and its wide spread acceptance is enabling interconnection of computers and terminals from various vendors. From predominantly terminal oriented networks, as typically used in air-line reservation systems, that emerged in the late sixties and early seventies, we today have local, national, regional and International information networks interconnecting diverse computers supporting applications ranging from scientific and research groups, banks, air-lines, data bases, corporate information systems, governmental information systems etc.

Developments in telecommunications technology (networks and services) have been equally breathtaking and have contributed in a very major way to the emergence of above trends. The Public Switched Telephone Networks are supporting increasingly wider range of other services such as videotex, Teletex, Fax, data to name a few. While it is difficult to review all factors that have led to these new developments in the service repertory of Telephone networks, it would suffice to say that the telecommunications technology trends - SPC concepts, digital switching, satellite communication, fibre optics are leading to realising an end to end digital connectivity accompanied with widening in scope of services by emergence of information networks through technology advances.

The third dimension playing a pivotal role is the microelectronics. Trends in VLSI have led to microcomputers of today providing the power of main-frames of yester years. It is thus possible to locate computing power and storage capability at the source. Distributed processing, distributed data bases etc have thus become very relevant and extensively important in today's context.

4. Data Networks in Public Administration

As computerisation is introduced in public administration, the development trends in computer field have also to be kept in view. Data networking, which is consistently getting refined, has to be an integral part of any computerisation plan being evolved for public administration or governmental informatics. Data Networking to aid productivity in public administration can be introduced in a variety of ways. Some of the options include phased implementation of a strategic plan involving either downward migration of computerisation from the nodal centre or upward migration from the lower administrative level (such as districts).

In the case of the former, a large computer is initially set up providing access to other nodal governmental agencies, be it in the Centre or in the States, through remote terminals. These terminals are then upgraded to micro or mini or main frame computers progressively and linked to the main centre through appropriate terminal emulation or file transfer protocols.

In the latter case, computerisation is introduced at the district (field) level through micro/mini computers which are progressively networked to the central computer. This has the merit of preparing the lower levels or segments of governmental agencies to build up adequate experience in computerisation before the benefits of networking are exposed. The problems of incompatibility in the computers at the field level with the central computer, from the networking point of view, or disparity in standards in codes or formats of data however do arise in the process.

It is also possible to introduce networking by interconnecting various computer centres supporting different applications. Problems of incompatibility causing difficulties in networking of various computers have to be resolved needing careful planning. Soon after the first stage of implementation, wherein a terminal oriented network connects to a central computer and a star network of terminals/minis/micros connect to a central computer, it is advantageous to plan a separate communication sub-net for nationwide networking of government computers to provide flexibility and economy. This can be done through adoption of proprietory network architecture of the computer vendors in the case of homogenous computers or a separate governmental network also making use of public data networks with suitable higher level protocols. The trend today is increasingly towards the latter though probably the most prevalent method in operation uptill now is the first option because of its inherent simplicity to the user. Flexibility to introduce computers from different vendors and the increasing acceptance of standards by computer vendors are however expected to shift this trend.

It is however difficult if not impractical to adopt the latter strategy of networking in the early stages of computerisation, particularly in the context of developing countries. It is however necessary to plan and adopt a well defined approach for introduction of data networking right from the initial stages.

In planning and evolution of the data networks, an integrated plan aims at optimum utilization of communication and computer resources to support a set of services to the end user in administration at various levels with maximum user friendliness and minimum cost. Such a plan interalia would need to consider the following stratgic issues:

a) Location and distribution of computing resources in government

b) Identification of applications which require networking capabilities

c) Selection of communication sub-net alternatives

d) Choice of protocols (layers 1-3) and design of communication sub-net

e) Choice of higher level protocols for various applications and systems

The networks, now getting evolved are such that there would be a smooth transition to "Integrated Services Digital Network" which would support variety of voice and non voice services and take care of disparities in speeds, codes and protocols through adoption of ISO 7 layer architecture. To realise ISDN the existing networks have to go through a transition phase involving digitalisation of the Network which is inescapable and provides a series of advantages as outlined below.

5. Advantages of digitalisation

Digtalisation results in improved transmission quality in addition to enabling a unified technology for transmission and switching. Interconnection of switching and transmission systems based on digital concepts have inherent advantages in terms of eliminating the need of A/D converters thereby avoiding impairment in quality. Problems in speech transmission such as echo cancellation etc have been resolved in an economical manner with the introduction of digital technology. Fibre optic technology (light wave transmission) being used extensively adapts better to binary signals and accordingly permits high capacity digital connections. The equivalence of a conventional telephone channel to a 64 K bits/Sec digital channel results in data services to be derived more economically. In addition translation of voice and non voice signals into digital streams enable composite carriage in one stream providing an increased flexibility. The digital systems are also economical for short and medium distances. With the demand for provisioning of non voice services being on the increase and considering the distinct advantages of digitalisation, there is a steep thrust towards realising digitgal environment with the objective of establishing "Integrated services Digital Network".

6. Transition from analog to ISDN environment

The basic objective is to meet the present and future demands for various types of services in an optimal manner keeping in view the aspects of economy and the operational and maintenance requirements.

In several countries, particularly the developing ones, the existing environment is analog providing primarily telephone services through autonomous exchanges. Long distance links deploy open wire, radio (including microwave), coaxial cable or satellite as the media. The analog telephone networks are also being exploited for certain non voice services but these networks have severe limitations in terms of either being uneconomical or unable to provide all the new emerging services or enhancements in existing services. These networks also have limited capability in terms of routing options, analysing dialled digits etc. In spite of these limitations, the analog networks have been and are still being used fairly extensively for provisioning of data services. This is essential to utilise the large investments in the assets and the long life yet to be lived by these equipments. Switch over to digital era is however inescapable in view of its distinct superiority and advantages associated particularly with regard to its ability to provide the emerging services and to meet the challenge of services integration economically.

"Integrated Digital Network" is an interim phase to lay the foundation for ISDN. The three basic components that constitute an IDN environment involve digitalisation of the switching and transmission systems and of the subscribers link. It is virtually impossible to attain transition from analog networks to integrated digitgal environment in a single stage. A series of interworking problems in addition to operational aspects such as numbering, charging, routing etc, arise, apart from technical considerations. Synchronisation, signalling, bit rates, bit formats are some of the other aspects that need detailed consideration. The "Integrated Digital Networks" that are emerging are primarily structured around the objective of realising the availability of a switched path at 64 K bits/Sec in the IDN environment. Initially, the digitalisation concept is not being extended to the subscribers premises. The switching nodes and transmission links of the network are however being converted into digital keeping in view the services needed, the traffic, the location where such services are needed and aspects of economy and status of existing equipment. Establishment of IDN thus requires a very careful and detailed planning not only to take care of immediate requirements but also of the future.

7. Integrated Services Digital Networks

The "Integrated Services Digital Network" is a network, in general evolving from a telephony IDN, that provides end to end digital connectivity to support a wide range of services, including voice and non-voice services, to which users have access by a limited set of standard multi purpose user -network interfaces. It would support a wide range of voice and non-voice applications in the same network. In addition it would support a variety of applications including both switched and non-switched connections.

In the evolution towards an ISDN, digital end-to-end connectivity will be obtained via plant and equipment used in existing networks. ISDN switch is to evolve by progressively incorporating additional functions and network features including those of any other dedicated networks such as circuit switching and Packet switching for data so as to provide for existing and new services. It is virtually impossible to plan integration from services point of view particularly because of the inability to determine the services that will have to be provided in future.

Every administration has to consider a series of factors to ensure smooth transition to ISDN. It is essential to formulate steps for transition and each step has to be economically viable and at the same time should be able to merge with the long term needs in a smooth manner. It seems advantageous to develop on the concept of identifing network connection types which are most likely to support future needs. Accordingly the network could be relatively open ended and architecture could be such so as to be adaptable to cater to the future needs or even for unforeseen growth.

During the stage of transition it is necessary to assess, to the maximum possible extent, the growth and improvements in the existing services and the demand for new services. In respect of equipment it is essential to consider the type, state, age, quality and reusability of the exisiting equipment, apart from the rate of procurement and installation of new equipment. While assessing demands,it would be advantageous to determine it on a country-wide basis as also for isolated areas. This would help in deciding about the location of switching centres and transmission links and would also have an impact on numbering, routing, charging aspects apart from the economics associated with the revenue potential.

While planning transition from analog to digital environment two widely separated concepts are in vogue to meet the demands of new services or enhance the existing telephony services.

To provide non-voice services between major centres or to separate selected subscribers or for providing enhanced telephony services to selected subscribers in separate cities or to provide basic or enhanced telephony services to rural areas, a digital overlay network spread fairly thinly is useful. The overlay network, if appropriately engineered, would meet fairly well low digital traffic requirements over a wide area. The initial cost per subscriber would, however, be high and service reliability would be limited due to absence of alternate routing and all subscribers would not have access to the services of overlay network. However, subscribers scattered in different parts of the country would be able to access the overlay network. Staffing, documentation, training, maintenance etc. would pose certain difficulties owing to the presence of two separate networks, the overlay and existing. The concept could be attempted in a metropolitan area, particularly with large number of business subscribers desirous of having non-voice services and enhanced telephony services. The overlay network would gradually grow and in the final integration phase merge into the analog network.

Environment, needing new services or enhanced telephony services in a localised area could in the transition phase adopt concept of an Island growth wherein complete digitilisation is attempted in the localised area by replacing the existing equipment and installing new equipment. The concept will also be useful in an environment where communication centres are located widely apart and digital long distance links prove to be uneconomical from cost considerations. The network which will be localised will have good flexibility and reap full benefits associated with the concept of digitalisation but it will not be able to cater to a nation wide coverage initially.

These concepts individually may not be able to provide an ideal solution in all cases and a judicious mix of the two concepts, in terms of realising a pragmatic approach, is needed. It is expected that broad band services at rates greater than 64k bits/s would not be needed immediately. However, small terminal clusters up to 64k bits/sec or nx64 k bits/sec. with digital access capability would surface in initial stages of ISDN needing support for both circuit and packet switching connections.

The user network interfaces for the ISDN as specified by CCITT include access by single and multiple ISDN terminals, multi services PBX LAN, private networks and specialised storage and information processing centres. In addition, access to existing telephony network, other dedicated networks such as packet, telex etc. and also to another ISDN and service providers outside ISDN will need to be incorporated. ISDN for rates less than 64 k bit/sec are being studied and would have a major impact on the architectural scenario, particularly for the developing world. The concept of low bit rate voice would play a significant role in this direction as it would enable voice and non-voice services to be derived off a single 64k bits/sec channel.

8. National Informatics Centre

The "National Informatics Centre" (NIC), a concept conceived by Dr. N. Seshagiri, Additional Secretary to Government of India in the Department of Electronics, was set up in mid seventies to inculcate informatics approach to increase productivity and assist decision making process in the government. Since then, it has been playing a catalytic role in ushering computer consciousness and promoting systems approach in data collection, organisation, processing and its acccessability.

Right from the inception, NIC has incorporated networking approach in its plan. A CYBER 170/730 system located at New Delhi has at present 40 interactive local terminals, 33 remote terminals and 11 mini computers connected to it. The remote terminals and mini-computers are also located in New Delhi and are connected to the CYBER through point-to-point data circuits leased from Department of Telecommunications (DOT) in a star configuration. Two concentrators are also used to support remote terminals. The mini-computer and multiplexer links work at 4800/2400 bps speed and the remote terminal links at 300 to 1200 bps. In addition, some radio links are also used to connect mini-computers to the CYBER at 4800 bps. A varity of modes (asynchronous and synchronous) have been used in the network.

On communication software front, UT-200 emulator has been implementd on LSI 2/10 and HP-1000 mini computers. HP21MX system has been linked with CYBER using HASP protocol. CYBER based electronic mail system has also been developed for NIC users.

The entire hardware and software maintenance of the network is done in-house by the Network Communication Group (NCG). The systems software Group provides the system upgradation and software support facility for integration of various devices in the network and introduction of new facilites to the remote users.

The benefits of NIC network (NICNET) were visible right from the early stages, which inter-alia have enabled NIC to:

a) accelerate the process of computerization in various government departments by providing access to sophisticated computing resources, trained manpower support, planning data and tools for decision making

b) reduce the time taken to collect and process data and thus improve the speed and effectiveness of decision making.

c) enable various government agencies to share experiences and data from the common data-bases, thus enabling correlation of data bases of different segments.

d) greater user participation as the computerization through networking provides for gradual upgradation from simple terminals to increasingly sophisticated local computing capability, while still retaining benefits of access to central computing resources and data-bases through the network.

The early experiences in networking also enabled NIC to undertake prestigious projects like development of an on-line information system for conducting the Asian Games to provide up to date information on various aspects of the game. The system was supported by 33 terminals spread over a 25 km radius in Delhi and demonstrated NIC's expertise in implementing on-line interactive networks.

With the new thrust in computerzation for increasing productivity and effectiveness of decision-making in the country, NICNET is in the process of expansion on a nation wide basis and its implementation is in progress. The NIC network is being expanded as a dedicated network as no public data network exists in the country and there is a rapid growing awareness to computerization in different sectors of government. The telecommunication infra-structure in the country is also in the process of upgradation in terms of achieving quality and reliability.

The above considerations have led to an ambitious NICNET expansion plan to cover 22 state capitals and 400 districts through a dedicated satellite data network utilising INSAT. The NIC set up already deploys around 800 people and is growing rapidly.

The NICNET also supports a hierarchy of computing resources, from super computers at central and regional level to mini/super-mini at state headquarters and microcomputers at district level.

NICNET experiences have re-inforced the relevence of integrating data networking in the governmental informatics programme. While technology developments make it possible for many developing countries to leap-frog the techniques of 70's, certain amount of evolution and learning from experiences would appear unavoidable. New architectural models and standards emerging today provide for much greater flexibility to adopt multi-vendor approach to computing and communication segments. It is thus possible to start with a data network solution appropriate to the existing local conditions of a developed or developing country and evolve as the communication infrastructure gets upgraded with IDN and ISDN capabilities. It would be possible to integrate new additions in computing resources in various tiers of administration through suitable network architectures and protocols.

In many developing countries, governmental informatics itself would do well to take initiative in the development and utilization of non-voice communication services and thus provide the thrust to the evolution of information networks and march towards establishment of ISDN.

IMPLEMENTATION OF INFORMATION TECHNOLOGIES IN PUBLIC ADMINISTRATION : SOCIAL , ORGANISATIONAL AND BEHAVIOURAL ISSUES

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Introduction

In October 1983, the European Foundation for the Improvement of Living and Working Conditions initiated a study on technological developments and the public service as part of its overall research programme into social changes associated with the use of electronic technology in the public and private sectors. Eight countries participated in the research; Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands and the United Kingdom.

The objectives of the research were to examine the effects of the introduction of technology on:

(a) the public service organisations themselves e.g. impact on work organisation, work environment and quality of work life of employees;

and

(b) the quality of service rendered to the public e.g. speed, equitability, reliability and effectiveness;

Each country undertook a small number of in-depth case studies of technological change. These are reported in detail in the various national reports. This paper is based on the consolidated report which summarises and discusses the major findings and issues identified in the individual nation studies.*

Before outlining some of the main findings, it is necessary to point to two limitations of the research. The first limitation is one which faces all case study-type research, namely, that only a small part of the total public service in each country could be studied. The case studies focus primarily on three areas of public sector activity: social security, employment services and population registration. Other major areas of the public service (e.g. health, education, public utilities) were not covered. The research findings should, therefore, be viewed as indicative rather than conclusive.

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* A list of the case studies undertaken in each participating country is appended. Copies of the individual nation reports (in either the original language or English) are available from the European Foundation, Loughlinstown House, Shankill, Co. Dublin, Ireland. The consolidated report is available in all languages of the European Community.

The second limitation relates to the research topic itself - technological change. Developments in information technology (IT) are proceeding at such a rapid pace and public service organisations are adopting these technologies at such a rate, that yesterday's experience (and even today's) can only provide a partial guide to tomorrow's efforts. The technological picture is dynamic, not static. Consequently, research studies become out-of-date quickly. In this regard, we are conscious of the fact that the prime emphasis in our research is on traditional data processing applications, that is, on the processing of large volumes of routine data. These types of applications are currenty the most important in the public service computerisation portfolios of all countries. In future years, however, other types of applications are likely to be of more interest e.g. office automation, decision support for managers and policy-makers, new IT-based services to the public. These types of computer applications are already being implemented in many public service organisations. One important characteristic of these newer applications is that they tend to make greater use of advanced technologies than traditional record-keeping or transaction-based systems e.g. interactive on-line systems, database, high-level user language, computer models, telecommunications networking. They also affect the work of more people (especially more senior people), and require more active and greater user management involvement than routine data processing systems. Consequently, the social, organisational and behavioural issues raised by their implementation are likely to be greater in number and more significant than those experienced to date.

Although the problems and opportunities posed by tomorrow's systems are likely to be somewhat different to today's, they are not likely to be completely different. We can learn something from past experience, both our own and other people's. In this context, the case studies are of practical interest and relevance. They detail the experience of a number of public service organisations in different countries in implementing technological change in important social service areas. There has been remarkably little empirical research into technological change in the public service - in spite of the fact that the public service is probably the single largest user of information technology in most countries. The case studies provide useful insights into the difficulties and challenges encountered in implementing technological change in the special context of public administration and add to our understanding of the factors which must be taken into account if we are to manage this change process more effectively.

Technology and the General Public: Impact on Client Service

In almost all of the case studies, computerisation had only marginal effects on the quality and kind of service provided to the client population. However, this statement masks the fact that some significant changes did take place, particularly in the field of social security. It must also be borne in mind that some of these so-called marginal changes may have long-term consequences, the character of which are only beginning to emerge. Basically, two kinds of changes accompanied the process of computerisation:

(a) the obvious: viz. changes which were immediately visible and apparent to both employees and clients of the public service;

and

(b) the subtle: viz. changes which were not immediately apparent to individual clients who had only intermittent contact with the particular public service, but which were apparent to staff who work constantly with the system.

Obvious Changes

The most frequently encountered "obvious" changes in client service were:

* Changes in methods of payment

* Changes in speed of payment or service

* Changes in frequency of personal attendance at public offices.

It is interesting to note that most of these obvious changes relate to social security payments rather than to personal social services (e.g. employment or population registration services). The changes brought about by computerisation in these latter areas tended to be more subtle and less immediately observeable.

1. Changes in methods of payment:

In most of the case studies involving financial compensation, there was a distinct trend for computerisation of the administrative process to be accompanied by a change in payment method. Cash payments were being phased out and replaced by electronic funds transfer (EFT) and/or computerised cheque payment. This development was welcomed by the majority of social security claimants. However, it created some difficulties in some situations. For example, in Luxembourg, the withdrawal of the cash payment option in relation to reimbursement of medical expenses has increased the average waiting period for insured persons from 8 to 15 days (over 21 days, if the person fails to give the correct registration number in the first place). To the extent that this longer waiting period creates cash flow problems for individuals (particularly those in the weaker sections of society), computerisation could be said to have disimproved the quality of service. In some countries, the proportion of unemployed persons without personal bank accounts is quite high. These people often experience difficulties in cashing cheques with third parties. Consequently, they preferred the old method of cash payment.

2. Changes in speed of payment or service:

Where payments were regular and unvarying in amount, computerisation generally resulted in faster payment. However, where payments were once-off, or fluctuated from payment period to payment period, there was generally no improvement in speed of payment. At best there was no deterioration, at worst a substantial disimprovement. Differences in the mode of data processing accounted in large part for the differences in speed of payment, batch processing (run once or twice monthly) was the usual method for processing once-off claims or monthly claims; on-line data processing being used for processing regular weekly payments.

Speedier service was also apparent in the non-financial area. For example, most of the case studies on population registration showed a significant improvement in speed of service. In the Netherlands, a passport can be issued by a computerised local authority in 15 minutes. Yet another good example of improved speed of service was given in the British study of employment services, where a high speed national network enables job vacancies notified to one local office to be on public display in another local office on the regional network within 15-30 minutes (an improvement of 15 minutes on the previous norm) and in non-local offices nationally within one hour (previously up to 2 days by post).

3. Changes in frequency of personal attendance at public offices:

There was a definite trend for computerisation in the social security area to be associated with less frequent personal contact between public service organisations and their clients. In some instances, personal contact had been reduced to one initial meeting to establish eligibility; thereafter, contact tended to be by letter or telephone. The changeover to non-cash methods of payment was a significant factor in this regard. For example, in Ireland and France, the introduction of non-cash payments to the unemployed had been accompanied by less frequent personal attendance at social security offices. This change was welcomed by the majority of unemployed persons, many of whom found the weekly or fortnightly ritual of signing on and queueing in overcrowded public offices personally humiliating and inconvenient. They preferred the anonymity of postal or electronic payment.

Although face-to-face contact tended to be lower, the frequency of telephone and written contact tended to be higher following computerisation, due mainly to claimants' queries and requests for clarification. Forms designed more for data input purposes than easy understanding, the complexity of the rules and regulations governing most social security payments and inadequate explanatory leaflets all contributed to clients' lack of understanding and confusion. Only in a minority of instances could the increase in personal queries be traced directly to inadequacies in the computer system itself e.g. in relation to the UK housing benefits case study, where lack of integration of accounting systems resulted in clients receiving different amounts of money each week or month or being notified that they owed money when in fact the amount owing would be taken up by the next month's benefit. Slowness in payment (whether perceived or actual) also gave rise to a substantial number of written and, especially, telephone enquiries, creating what the Belgian report called a "vicious circle" viz. delays in payment producing enquiries which take up staff's time, thereby delaying payments further.

Subtle Changes

Unlike the obvious effects, which were felt most keenly in the social security field, the subtle effects of technology were experienced in both the financial and personal social services areas. Among the most frequently mentioned of these less apparent but none-the-less real effects were:

* Faster information/enquiry service for the majority of clients
* Poorer quality service to "non-routine" clients
* More formalised, business-like service
* Greater equitability of treatment
* Difficulty in tracing and correcting errors in records
* Difficulty in understanding forms.

1. <u>Faster information/enquiry service for the majority of clients:</u>

Where the computer system was on-line, introduction of technology always resulted in a faster information service to clients. Although the volume of queries usually increased substantially following computerisation, in most cases so had the organisation's ability to cope. The case studies indicate, however, that few individual clients are aware of the improvements in information services. In some instances, the only visible evidence of computerisation to the general public was a change in the type of form they received or had to complete. Even then, they were scarcely aware that the service had been computerised. The extent to which the existence of computer systems are made public varied from country to country. In Ireland, for example, enquiry screens and other pieces of computer equipment were not placed in full public view. In Denmark, which has more of a "computer culture", the public is accustomed to computer systems and employment service counsellors are in the habit of showing job-seekers, willingly and often without being asked, the information that they encode about them.

Awareness and use of computerised enquiry systems and easily accessible databases was highest amongst non-clients. For example, in Belgium, organisations (both public and private) access the National Register with the permission of the local council. In the Netherlands, too, local population registers are used to facilitate the work of other municipal bodies, e.g. to generate lists of individuals for medical screening purposes.

2. <u>Poorer quality service to "non-routine" clients:</u>

In all case studies, the majority of clients were relatively satisfied with the quality of service, although few had noticed any visible improvement following the introduction of technology. Where a deterioration in quality of service was detected, it was generally in relation to non-routine cases or applicants. Compartmentalisation of the work and job fragmentation (whereby employees are familiar with only aspects of the administrative procedure or regulations governing the particular public service) rather than technological factors, were the main reasons for staff's inability to handle non-routine enquiries or give full explanations to clients. The Danish case study on employment services illustrates how computer systems can, inadvertently, disadvantage some types of client. In this study, the person-job matching system requires a precise description of the type of job sought by the job-seeker. Thus it was not enough for a person to say that he was "interested in any kind of job"; areas of interest had to be defined exactly in accordance with a pre-coded reference system. This preciseness worried some job-seekers, who felt that their chances of employment were affected adversely by being "pidgeon-holed in a certain occupational category".

3. <u>More formalised, business-like service:</u>

In many cases computerisation reduced the frequency of face-to-face contact between employees and clients. This less frequent contact, combined with an increase in the speed of service, affected the quality of service in that contacts became "briefer and more business-like although not unfriendly" (Dutch report). This greater efficiency was usually appreciated by the public. There was no indication in the reports that staff were less personally helpful following computerisation. In many instances they shielded clients from the vagaries of the computer system e.g. by preparing cheques manually during systems breakdown and helping clients complete computer-coded forms.

4. <u>Greater equitability of treatment:</u>

Computerisation did not affect equitability of treatment in the social security field, where eligibility is governed by statutory rules and regulations. In the personal social services area, the evidence from the national reports is conflicting. In the Danish employment services, as noted previously, there was some indication that computerisation had disadvantaged certain categories of job-seekers. However, in the UK study of employment services, the opposite was the case. Computerisation had improved equity of treatment in that job vacancies were now displayed almost simultaneously in all offices in a district or region, thereby giving each job-seeker "an equal bite of the cherry". This development was particularly welcome by those advising disabled job-seekers; they felt that their clients had a better change of getting a job the quicker they heard about the job vacancy. Jobs which were filled were also cancelled more quickly, thus lessening the frustration of unsuccessful job-seekers.

A further example of computerisation facilitating equity of treatment is given in the Irish study of public housing allocation. Under the manual system, all staff had unrestricted access to housing applicants' records making it possible to effect unauthorised changes. The more stringent controls introduced following computerisation (viz. limiting data entry work to only a few selected staff) were said to have improved the security and integrity of the data, thereby improving equitability of treatment of housing applicants.

5. Difficulty in tracing and correcting errors in records:

As long as information is input correctly, computerised records are generally accepted as being more reliable than manually-kept files. Difficulties arise, however, when data is input incorrectly. For example in the German case study on population registration, one employee stated: "If you mis-spell a name, you might never find it again in the system; when we had paper files and microfiche, you leafed through and found it eventually". In the Netherlands case study on social assistance, more than 50% of clients interviewed claimed that they had come across mistakes in their dealings with the social services. Of these, about a quarter said they had experienced difficulty in having the errors corrected - a timelag of up to several months was not exceptional A similar picture emerged in the Netherlands case study on population registration. Although such precise data were not given in any of the other national reports, these findings indicate that errors in coding and data input may be more frequent than realised or admitted.

6. Difficulty in understanding forms

Regarding forms, the German study echoes the sentiment implied in many other reports: "The whole notion of forms has always been a lamentable chapter in the public service". With computerisation, the situation seems to have deteriorated - especially in the social security area where clients have difficulty completing very comprehensive forms or understanding the details given on payment slips (Netherlands, Denmark, Ireland, UK, Germany). In the German rent allowance case study, the comment is made that the wealth of detail contained in forms is really for the benefit of the administration: it shows staff in the local office exactly how the amount to be paid was derived.

The important role played by public service employees in determining the extent and nature of "computer impact" on client service was identified clearly in the Danish report:

> "It is not possible to isolate the relationship between the EDP system and clients without taking the staff into consideration as a kind of intermediate variable.... We are in no doubt that it is the employees and their behaviour who determine primarily the nature of the service given to the general public and, therefore, the public's attitude towards the EDP system".

Employees are seen as an important buffer between the technology and the client system, e.g. shielding clients from the effects of a system breakdown by writing out cheques manually, helping individuals understand and complete forms etc.

Broader Social Issues

In addition to the client service changes, both positive and negative, that arose in relation to particular public services, three issues of broader social concern are highlighted by the research:

* Data protection and privacy

* Technology as a mechanism of social control

  and

* Low priority being given currently to client service issues in computerisation of the public service.

Data Protection and Privacy

The importance of placing information technology in its proper political and social context was very evident in the treatment of data protection and privacy issues in the various national reports. The problem is seen with different degrees of urgency in different countries. The most stringent laws exist in Germany and Denmark. In Belgium, rules have been drawn up in relation to the use of the National Register and a general law on individual privacy is anticipated. In the Netherlands, the situation is less advanced - at best municipalities had created (or were in the process of creating) privacy statutes. Rules of one sort or another also exist in the UK, France, Luxembourg and Ireland.

Public Servants' Lack of Knowledge and Awareness of Data Protection

It is clear from the various reports that data protection laws alone are not sufficient to safeguard individual rights. Strict organisational controls and administrative measures as well as statutory regulations will be needed, given the relatively low level of awareness among public servants dealing with the public of data protection legislation and the importance of privacy and confidentiality of individual data. The general impression was that there was a certain degree of complacancy, borne largely out of ignorance, among both public servants and the general public. As stated in the German report: "There is an underdeveloped sensitivity towards data protection on the part of public service organisations". A concrete example of this insensitivity is given in the Dutch case study of a computerised social assistance system where information on individual claimants may be given over the telephone without any call-back or other security precaution. Again, the computer supplier has direct access to this computer system via a telephone line and a modem, thereby increasing the danger of unlawful access to social security records. To many public service employees, data security means nothing more than having to use a password to access a computer terminal. Even this elementary security precaution becomes trivialised with constant use. Although mentioned explicitly in only one report, the informal use of other colleagues' passwords when one has forgotten one's own probably occurs in most countries. The case studies indicate that the majority of public servants have little knowledge or interest in the uses to which public data banks are put. As stated by the German researchers, "Knowledge about existing data protection laws and sensitivity to data protection was frighteningly minimal in the offices examined". This lack of knowledge means that employees are not in a position to advise citizens of their rights. Nor are these rights explicitly set out in the various forms members of the public have to complete. For example, in the German population registration office studied, the only reference to a person's rights in the data protection field was contained in a short note on the back of the form which stated: "These data are collected in accordance with articles 13, 16 and 18 of the Bavarian registration law. The citizen is informed of his/her right to veto" - a cryptic message which was not readily understood by either the public or employees of the office.

The only example of a spontaneous concern and interest in data protection and privacy on the part of public servants was given in the Belgian report. A local authority which had not linked its population register to the National Register when participation was optional now found itself in a position where it was being forced to computerise. Staff in this office were extremely wary of the introduction of information technology. As stated by one respondent: "Who knows where technology will stop?" Among their concerns were: (a) What information will appear on the new identity card? Would it be possible to have a secret code showing an individual's political tendencies? (b) Would not the 9 items of information currently demanded grow to 15 or 20 tomorrow? (c) Was it in the national interest to have details of the whole population available in a readily accessible form? There would have been no need for informers if a National Register had existed during the Second World War.

Technology as a Mechanism for Social Control

Concern about the linking up of social, regional and national databases was mentioned in several reports (Belgium, Denmark, Germany, Luxembourg, Netherlands). The most serious reservations were expressed in the German report. The researchers express concern about (a) possible violation and abuse of individuals' democratic rights inherent in the trend towards the creation and amalgamation of personal databases containing a vast amount of information on individuals; and (b) the use of technology as a social control mechanism e.g. to disclose abuses of the social security system by cross-checking taxation records with social security records. The Danish report indicates that the use of technology to detect social crime in this way is not permitted.

The German researchers are particularly skeptical about the adequacy of data protection laws in controlling the use of advanced technologies in the public service - especially in a climate where public bodies are being forced to rationalise and reduce expenditures. Current data processing arrangements are also cited as a factor contributing towards the "erosion of presently valid data protection law". In a situation where data are processed centrally but stored locally, responsibility is "blurred and deferred". Whether the increased use of advanced information technologies in the public sector will or will not lead to greater state control of the individual citizen is a matter for speculation. The Luxembourg report strikes an optimistic note: "Security and protection of computer data does not appear to constitute a problem: there is a law guaranteeing protection and there appears to be no doubt that it is strictly applied". By way of contrast, the German report expresses a pessimistic view, indicating cause for concern.

Impact on Client Service: A Secondary Consideration?

An issue of social concern arising from the research is the relatively low priority being given currently to client service aspects of computerisation in the public service, both at the level of service to the individual and at a more macro, national level. This is not to say that improvements in speed and quality of service to the citizen have not taken place. They have. In most cases, however, these improvements have been relatively slight and not very obvious to the public. It is clear from the case studies that computerisation is viewed in all countries primarily as a means of cutting costs and increasing administrative efficiency. The main objective is to reduce administrative costs (usually labour costs) associated with providing existing services rather than to create new services or improve current services in any fundamental way. Social and client service considerations seem, at best, to be of secondary importance in the decision to computerise. Priority setting as between cost efficiency and client service objectives in computerisation inevitably poses difficulties for decision-makers. Advantages for the citizen may be seen as disproportionate to the running cost of the service. As stated by one German public service manager: "We have to reflect whether we can continue to spend thousands of marks just to save five minutes of the citizen's time".

The financial pressures being experienced by public service organisations everywhere, combined with a rising demand for public services (especially in the social security and health areas), are undoubtedly important factors explaining the current emphasis on computerisation as a tool for rationalising and optimising internal administrative procedures. The financial resources are simply not there to enable public service organisations expand or improve services to the citizen in any major way.

However, lack of finance only partially explains the relatively low level of attention paid to client service aspects in computerisation projects generally. It is not the total explanation of why client outcomes (both positive and negative) often seem more like by-products of the computerisation process than one of the primary products. Nor does lack of finance adequately explain why changes in client outcomes are as likely to be accidental and unexpected, as they are to be planned and deliberate. To some extent at least, these indicators of a lack of sensitivity to and awareness of the importance of client service issues reflect more general structural characteristics of public service organisations, namely, their tendency to be more internally-oriented than externally-oriented.

This concern with the internal workings of the organisation is a characteristic feature of that form of organisation we call 'bureaucratic'. It existed before the advent of computer technology and, in spite of predictions to the contrary, shows little sign as yet of being replaced by alternative ways of organising. To many ears, the following description of the pattern of civil service administration in the U.K., made 27 years ago in 1959 by Arnold Toynbee, still has a ring to truth about it today:

> "In the world of civil service, plunging into action is the arch crime. When you sight an objective you must not head straight for it. You must consult a thousand colleagues who have the right to file objections in the names of a hundred other government departments who are great powers, and you must not feel frustrated or guilty when you find yourself bogged down. The civil servant's duty is not to achieve desirable results; it is to follow the correct procedure".

Toynbee's description encapsulates both the spirit and content of what people mean when they complain of public service "bureaucracy" or "red-tape". Complaints about "bureaucracy" are made not only by citizens and those outside the administrative apparatus, but also by public servants themselves. The victim in Toynbee's scenario above is not a member of the public; it is a well-intentioned, motivated official trying his best to get things despite the odds against him.

Many of the negative effects on client service reported in the various studies can be traced to the bureaucratic form of organisation rather than to faults in computer systems or bad work attitudes of officials.

Indeed, the willingness of public service employees to go out of their way to protect the public from the more negative aspects of bureaucracy, and/or overcome problems associated with computer systems, is stressed in many of the national reports. Although there is an understandable tendency on the part of members of the general public to blame individual public servants for any red-tape, "buck-passing" or impersonal treatment they encounter (whether computer-related or not), it is important to remember that the bureaucratic mode of operation is an organisational attribute and not an individual personality trait. Bureaucracy has survived (some might say flourished) for decades, despite major changes in the social, economic and political environment. Its demise will not be caused by technology, which cannot of itself, force public service organisations to abandon long-established ways of relating to their environment. Technology has not, and cannot, force the public service to become more responsive to client needs. This will only happen when the ideology or set of beliefs underlying the bureaucratic model of organisation is replaced by a different ideology - one which places a greater emphasis and value on innovation, change, results and individual initiative and creativity.

Technology and the Public Service: Internal Effects

Given that the prime focus of technology is on rationalising internal administrative procedures, one would expect its internal effects to be greater in number and more significant than its external effects - which, as we have seen, were not very significant. This, indeed, was the case in the public service organisations examined. In all cases, numerous aspects of the work environment - some large, some small - were affected by the introduction of computer technology. In a short paper, it is not possible to discuss all the changes that took place. We will, therefore, concentrate on the main empirical findings and common organisational and behavioural issues identified in the research.

Changes at the Macro-Organisational Level

These were basically of three kinds:

* Changes in policy/function
* Changes in structure
* Changes in employment.

1. Changes in policy/function:

   In only one case was the process of computerisation accompanied by a change in basic function or policy. In the UK employment services, a major policy decision was taken to move from individual job counselling and guidance towards a self-service approach to the notification and filling of job vacancies. However, technology did not appear to be a significant factor in this decision; other factors such as a need to control costs while still coping with increased numbers of unemployed persons looking for work were more important determinants. Technology was used to support and facilitate this change in policy direction. However, the report states that had the opposite decision been taken, "a range of acceptable advanced information technologies could have been introduced as aids to job matching and guidance". Such was the case in Denmark where computerisation was introduced primarily as an aid to person-job matching and individual counselling by professional staff.

2. Changes in structure:

Although there was evidence of a certain amount of re-grouping of functions and re-distribution of staff and, in some instances, the creation of new sections, in general, the introduction of computerisation did not lead to major structural change in the organisations studied. The opportunity to use technology as a means of effecting significant, radical organisational re-design was not considered. In many cases, the objective seemed to be the opposite, that is, to ensure that computer systems would change existing structures as little as possible. Even in those cases where minor re-organisation took place, it was clear that most of the changes could not be attributed only, or even primarily, to computerisation. The changes took place before computerisation and could be traced back to a specific re-organisation plan e.g. in the Netherlands where autonomous work teams had been introduced independently of automation.

3. Changes in employment:

Guaranteed job security is a feature of public service employment policies generally. Consequently, no staff in any of the case studies were made compulsorily redundant. This is not to say that there were no staff savings. Automation "saved" staff costs in that increasing volumes of work (especially in the social security area) could be handled without the expense of recruiting extra staff. Substantial cost savings were also achieved through the reduction or elimination of overtime working. Computerisation was seen as an important means of bringing about a reduction in staff numbers and costs in the public service generally - an important governmental objective in most countries. In many countries, there was a feeling that significant reductions in public service employment would occur in the medium to long term - most probably at clerical or "production" level, where the need for large numbers of data collectors and inputters will diminish as more advanced technologies are introduced.

Changes at the Individual Employee Level

The extent to which the introduction of technology affected employees' jobs and work situation depended very much on their position in the organisational hierarchy. In all cases, staff at the lower end of the organisational scale experienced much more change than staff at middle and higher levels. This is undoubtedly a reflection of the type of computer applications examined, almost all of which were "bread-and-butter" systems of the routine data processing type. Although many of the systems generated aggregated statistics and control data, in general, they did not impact much on the work of professional and management staff.

The main changes experienced by lower level staff were in the areas of:

* Job content and scope
* Control and supervision
* Work pressures and demands
* Skills and qualifications

  and

* Social relationships.

1. Changes in job content and scope:

In some cases, computerisation resulted in less "pen-pushing", greater variety, an expansion of duties and a reduction in tedious, repetitive work. In most instances, however, increased monotony, less variety and greater rigidity were reported. The most adverse effects were felt by data-entry operators. Their work was repetitive, short-cycle and VDU-intensive, involving little discretion or responsibility. In most cases, the disadvantages (in terms of job satisfactioon, health and work productivity) were recognised by management and ways were devised of distributing data entry work equitably among all staff. In other cases, however, centralised data entry pools had been created and staff allocated full-time (or nearly full-time) to such work. Job satisfaction, health and other quality of work life aspects were not considered in the drive for greater efficiency. As stated in relation to one of the Dutch case studies:

> "That these aspects should be taken into account was, for some respondents, a totally new idea".

With the exception of Denmark where professional employment service counsellors enter information directly, there was a distinct trend in all other countries to confine data entry work of any kind to the lowest clerical grades. Professional and managerial staff and senior clerical grades tended to access the computer system for enquiry purposes only. Job status was a major consideration here - especially in the UK and Ireland where strict demarcations between various grades of staff are commonly encountered. Higher level staff, almost without exception, felt that computerisation had improved the quality of their jobs by eliminating time-consuming routine tasks and enabling them focus on the more interesting aspects of their work - specifically dealing with individual clients.

2. Control and supervision

Although not stated explicitly in all case studies, it would appear that computerisation resulted in one signifiant change in supervisory and control practices viz. a shift in emphasis from controlling people to controlling and planning the process of work. An example of this type of work process is given in the Belgian case study on occupational diseases where the computer system enables management "to locate the department in which files stay for a long time" and there are plans to develop this "quality control" aspect further.

The potential of technology to control and monitor the work of individuals was rarely used although statistics relating to individual output (e.g. number of cases processed) were readily available. Only in Denmark, however, did this aspect of computerisation appear to be discussed in a formal way with staff. An agreement had been reached between trade union representatives and management in the employment services that these computer-generated statistics would not be used in employee appraisal: these were considered a poor measure of individual performance and workload. In no case study, did employees express concern about surreptitious electronic monitoring of their work performance by management. This issue appears to receive more attention in the U.S. and Canada where the level of unionisation is low generally and formal technology agreements rare in comparison with most European countries.

3. Work pressures and demands:

Computerisation of the work process was associated with increased pressure and tension in many instances. The Luxembourg report, in a comprehensive survey of staff attitudes and opinions, details a number of contributory sources - many of which were also mentioned in other national reports: decrease in amount of free time available; increased work load; having to adjust work pace to rate of the computer; fear of making mistakes; sense of being rushed or hurried by the computer system; more difficult and concentrated work. This last factor - the intensity of concentration needed for VDU work - was highlighted in many case studies. Activities with a physical content (e.g. searching a filing cabinet) had been replaced by abstract tasks. In consequence, some employees felt mentally pressurised and fatigued.

In most instances, these types of work pressures and demands were experienced only or primarily by lower-level clerical staff. However, an interesting example of increased stress at higher levels is given in the Irish study of public housing allocation. The "points system" used to allocate houses to applicants is very complex and relatively subjective. Prior to computerisation, applicants were given a verbal explanation of how the system operated when being interviewed by housing officers. Following computerisation, however, applicants had access to detailed computer print-outs. The availability of this extra, written information had resulted in lengthier, more stressful interviews, as housing officers attempted to explain (and justify) how an applicant's total points were derived. The opposite case - too little as opposed to too much information - is reported in one of the UK housing benefits case studies. In this instance, organisational changes introduced with computerisation resulted in staff being unable to answer questions about some aspects of the client's account - leading to feelings of loss of control.

4. Skills and qualifications:

In general, little attention was paid by management to the possible impact of computerisation on skills and qualification levels. No instances of up-grading were recorded. Training, where given, was usually confined to keyboard skills and functional knowledge of the computer system needed for the particular job. In some cases de-qualification occurred through job compartmentalisation and fragmentation of tasks. Employees lost their specialist knowledge of the administrative process as a whole and the rules and regulations governing the particular public service. In general, although the work was often more difficult and concentrated following computerisation, it was rarely more skilled. At best, no conceptual skills were lost and interpersonal skills received a new emphasis in that personal interaction between employees and the public increased following computerisation in some cases.

5. Social relationships

A decrease in work contacts between employees was reported in many studies. Employees were tied to a work station and the amount of screen help (menus, prompts, codes etc.) available lessened the need for advice and feedback from colleagues. Personal contacts with supervisors sometimes increased - especially during the early stages of implementation or when knowledge of the total computer system had been restricted deliberately to higher-level staff. Where work contacts decreased, there was a tendency to compensate by increasing informal (i.e. non-work related) interaction.

Organisational Issues

The research raises a number of issues relating to the design and implementation of computer systems in a public service environment, two of the most important of which are:

* The need for improved planning of information systems

  and

* The need for more active employee involvement in the process of introduction.

Need for Better Planning of Information Systems

It is clear from the research findings that organisational and human factors received much less attention than technical factors in the design and implementation of the computer systems examined. Possible implications of the use of technology for organisational re-design, job content and employee job satisfaction were rarely thought through in any systematic way. Even the adequacy of the technical or systems planning process was suspect in many cases. Manual systems were on the verge of breaking down under the pressure of increased workloads. Consequently, the planning and user testing phases of projects often had to be rushed, resulting in organisational and technical problems which might otherwise have been anticipated. Even in projects where there was a more relaxed planning phase, non-technical aspects of computerisation were not generally given full consideration.

The reasons for this situation are many, some of which are environmental and largely outside the control of public service managers; others are more organisational and capable of being controlled by management to some degree. Firstly, there is the difficulty (some would say impossibility) of planning in an unstable, changing and pressurised environment, such as that being experienced in the public service as a whole. Severe financial pressures, major increases in unemployment and related social problems, changes in legislation, shifts in political attitudes, the pace of technological development and advances in information technology are some of the major environmental constraints facing planners in the public service. They provide at least a partial explanation of why planning for information systems in the public service, at both strategic and project level, has encountered so many problems.

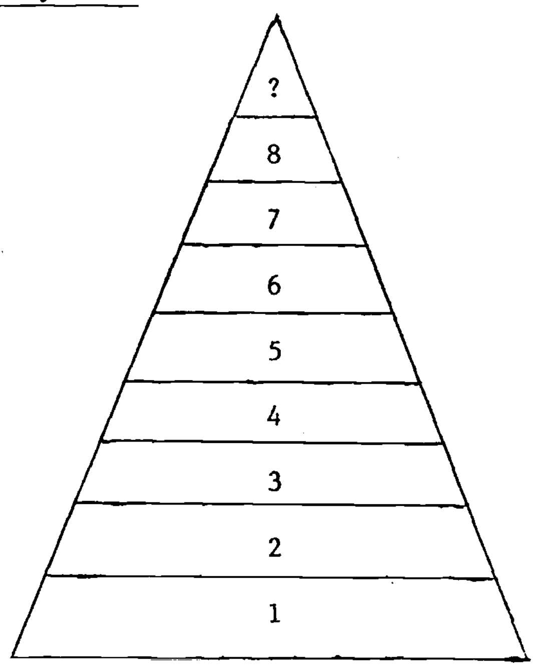
Secondly, there is a lack of knowledge and awareness on the part of many public service managers of the problems and opportunities posed by computerised information systems. To a great extent, the planning and development of computer services has been left in the hands of computer specialists - often drawn from outside the organisation (e.g. from a central data processing agency). These technical specialists often do not have an in-depth knowledge of the organisation nor a background in organisational analysis and development. It is, therefore, not surprising that, in the absence of any active user management input, technical issues tend to dominate the planning process.

Lack of knowledge, however, is not the only factor explaining the low level of user management involvement in the development of computer systems. Bureaucratic organisational structures also have a role to play in this regard. Public service organisations rarely respond to new activities or events by absorbing them into the existing organisational structure. Instead, they tend to create new sections or committees to deal with them. They also operate on the principle of clearly defined roles and responsibilities. In the case of computerisation, the lead role is almost invariably given to technical specialists. While the user manager may play a consultative role, organisational structures and systems of responsibility allow him (indeed, may encourage him) to see computerisation as something lying outside his normal area of responsibility. The extent to which he will make an active, positive contribution to the design and development process depends then, not only on his level of knowledge, but also on his level of personal interest and commitment.

Need for More Active Employee Involvement

Given the low level of user management involvement generally in planning for computer systems, it is not surprising to report that employee participation was also low. Although there was general agreement on the importance and need for active user involvement in systems introduction and implementation, this principle was more preached than practised in most instances. The NEDO pyramidal model of employee involvement illustrated hereunder summarises the general situation.*

Degrees of Employee Involvement in the Introduction of Information Systems



8. seconded a range of users to work on the project at different stages

7. selected the project manager from a user department

6. involved users in writing user manuals

5. seconded systems specialists to work with users

4. involved users in design of screen layout

* National Economic Development Office, The Impact of Advanced Information Systems: The Effect on Job Content and Job Boundaries. London: NEDO, 1983.

3. discussed user requirements with staff at different levels

2. discussed user requirements with managers

1. kept employees informed of the system's progress.

Employee involvement in the case studies was generally passive rather than active - a distinction characterised in the French report as the difference between (a) employee consultation to gain acceptance of a system selected by management and (b) employee participation to "get the system right". The difficulty of achieving genuine participation in bureaucratic organisations was again a factor. As stated in the German report: "It seems that this demand collides with the hierarchical thinking in the public service organisations." There is some evidence, however, that public service unions in many countries are becoming more demanding in relation to the use of technology - not only in relation to employment but also in relation to job content, career patterns and quality of the work environment. According to the French researchers: "The direction and terms of reference of participation are changing: the trend is away from psychological models of satisfaction towards games theory models of negotiation".

The trend towards decentralisation of technology (not necessarily accompanied by decentralisation of power and decision-making) may also encourage greater user involvement in computer systems generally. Local management is becoming more aware of how critically dependent the organisation is on computer systems for its day-to-day functioning. They are also becoming aware that fewer problems are encountered when employees and their representatives are involved in planning and implementation. From a practical cost point of view, therefore, it is in everyone's interest to promote as wide a range of involvement and discussion as possible. As stated aptly by one public service manager: "You can never spend too much time explaining and negotiating. If you don't take the time, things will not go according to plan - which is expensive."

Concluding Remarks

Information technology is clearly a double-edged sword. It has both liberating and controlling potential, depending on how and for what purpose it is implemented. It may be used to reinforce existing policies and organisational arrangements or it may be used as a vehicle for promoting change, either internal organisational change or external, client service change. While there are some signs of innovation in public service provision (e.g. the movement towards 'self-service' in certain public service areas), in general, public service policy makers and decision-makers have adopted a conservative and fairly narrow view of the use of information technology. This view is also reflected internally - in the planning process for computer systems and in the relative lack of impact of such systems on administrative structures and processes.

Technology is seen primarily as a means of maintaining the status quo, of doing an existing job cheaper or faster. It is not often realised that its introduction also offers the opportunity to assess the strengths and weaknesses of existing policies and procedures, to discuss whether the whole area of information processing could or should be approached in quite a different way. Plans and strategies tend to focus on operational technical matters, to the detriment, sometimes exclusion, of policy, organisational and client service aspects.

Lack of finance, lack of awareness and knowledge of information technology, and social and political pressures are undoubtedly important factors explaining the relatively low impact of computer systems on the public service to date in most countries. The bureaucratic structure of public service organisations is, however, an equally important factor. It emphasises stability, conformity and impersonality and focuses on the "how" aspects of doing something rather than the "what", "why", or "whether at all" aspects. As such, it does not marry easily with the concepts of innovation and change implied by the new information technologies.

Whether the public service can continue indefinitely to adapt technology to suit existing practices and procedures is open to question. Most commentators think it unlikely in the long-term. As computerisation becomes more pervasive and public service managers become more skilled and knowledgeable in managing the process of technologically-stimulated organisational change, significant change can be expected in the nature and number of public service jobs, in organisational structures and processes, and in the type and quality of services offered to the public.

APPENDIX

(a) List of case studies undertaken in each participating country

(b) Some details of computer systems used in the case studies

Belgium:

(a) Population registration:

(i) at national level via a study of the National register;

(ii) a before-after comparison at the local level of two local authority population registers - one computerised and linked to the National Register; the other a manual system not linked to the National Register.

(b) Occupational Diseases Fund: a national organisation with responsibility for the prevention of occupational diseases and for the payment of industrial compensation to workers with specific occupationally-contracted illnesses.

Research undertaken by the Institute for the Improvement of Working Conditions (Institut pour l'Amelioration des Conditions de Travail).

Denmark:

(a) Employment Services: computer system for supporting the filling of job vacancies in two local employment offices;

(b) Sickness benefit administration in a large municipality;

(c) Pensions administration in a large municipality.

Research undertaken by the Institute for Informatics and Management Accounting, Copenhagen School of Business (Institut for Informatik og Okonomistyring, Handelshojskolen i Kobenhavn).

France:

Unemployment benefits and employment services:

The GIDE project: computerisation as an aid to cooperation between agencies in the unemployment/employment field.

Research undertaken by the National Agency for the Improvement of Working Conditions (Agence Nationale pour l'Amelioration des Conditions de Travail).

Germany:

(a) Rent allowances administration in a local office;

(b) Social assistance administration in a local office;

(c) Population registration in a large town.

Research undertaken by the Social Sciences Project Group Munich (Sozialwissenschaftliche Projektgruppe Munchen).

Ireland:

(a) Unemployment assistance administration in a local office of a central government department;

(b) Disability/sickness benefit administration in a central government department;

(c) Allocation of public housing in a large local authority.

Research undertaken by the Institute of Public Administration Dublin.

Luxembourg:

Social security administration at national level:

(a) Administration of family allowances;

(b) Administration of sickness benefits.

Research undertaken by the Centre for the Study of Population, Poverty and Socio-Economic Policies (Centre d'Etudes de Populations, de Pauvrete et de Politiques Socio-economiques).

Netherlands:

(a) Population registrations; comparison of two local population registers: one manual, the other computerised;

(b) Social assistance administration in two municipal offices.

Research undertaken by Delft University of Technology (Technische Hogeschool Delft, Vakgroep Techniek, Arbeid en Organisatie).

United Kingdom

(a) Employment services: computerised vacancy circulation system in two local employment offices: experienced user v inexperienced user;

(b) Housing benefits administration in two local authorities: contrast of two different computer systems in use.

Research undertaken by the Social Policy Research Unit, University of Sussex and the Innovation Research Group, Brighton Polytechnic.

Country	System Description	Application Area	Technical Comments	System Comments
Belgium	National Register Local population registers	Population registration	Centralised data base. On line access and update via local terminals. Local printers available.	530 local authorities linked to National Register out of possible 589. Linkage compulsory.
Belgium	Computerisat-ion of Occupational Diseases Fund	Social security	Telecommunications network including mainframe and minicomputers.	Wide variety of applications - mixture of batch and on-line. Plans to create data banks.
Denmark	AF-Match EDP system	Employment service	On-line access to central data-base via public data network on dedicated lines. Hard copy available locally.	Centralised file maintenance. Currently only records of job seekers. Plans to include job vacancies also.
Denmark	Pensions system	Social security	Centralised batch system.	These systems replaced existing batch systems. Some improvement in data entry. Otherwise no new facilities.
Denmark	Sickness benefit system	Social security	Centralised batch system.	

Country	System Description	Application Area	Technical Comments	System Comments
France	"GIDE" project: computer management of job applications	Employment service	Network covering regional and local levels. Wide distribution of VDUs and printers. Multiple suppliers.	Joint file provided for two related but distinct organisations, one recently computerised, the other a long time computerised. General policy of continued decentralisation applies.
Germany	Rent allowances system	Housing benefits	Central batch processing system	Decentralisation and use of on-line system under consideration.
Germany	Citizen registration system	Population registration	Partly decentralised: on-line and batch.	Further automatic facilities planned in third stage of development.
Germany	Social security system	Social security	On-line system connected to in-house computer - 30 terminals.	Plans for integration into communal data bank. Screen dialogue to be introduced
Ireland	Unemployment assistance system	Employment service	On-line system linked to supermini.	System being extended to major employment exchanges will eventually be linked to other major systems in social security area.
Ireland	Disability benefits system	Social security	On-line daily transaction with batch nighly update.	Redesign of current system at advanced stage.

Country	System Description	Application Area	Technical Comments	System Comments
Ireland	Housing points allocation system	Public housing	Mixture of on-line and batch linked to in-house mainframe.	This is a stand-alone system not currently linked to other systems.
Luxembourg	Social security computer systems including * Central computerised registration and collection of contributions *Health care system *Family allowances *Pensions	Social security Social security	On-line and batch systems. Data entry terminals in user organisations.	Uses single data bank for social security. Developed and maintained by Common Technology Centre. Continued penetration of computerisation planned.

Country	System Description	Application Area	Technical Comments	System Comments
Netherlands	Municipal social security systems	Social security	CASE 1: STEUNHOVEN: In-house, on-line system with 8 terminals and 7 local printers. CASE 2: ZORGDAM In-house, on-line system based on two mini-computers. Printers available locally.	Decisions taken to move from using regional computer centre to own facility having considered (a) cost, (b) user-friendliness and (c) possibilities of both stand-alone and centralised options. Further reflection suggested that a mainframe solution would have been more appropriate.
Netherlands	Municipal population registry system	Population registration	CASE 1: DATAHAGEN On-line system with daily updates. CASE 2: HANDBERGEN Punched metal plates and appropriate processing equipment	There are approx. 30 population register systems available from 16 computer centres. Personal data can be displayed on VDU at public centre. Data can also be printed on standard forms for issue to public. Liklihood that municipality will link into regional computer centre soon.

COMPUTERISATION IN PUBLIC ADMINISTRATION: MANPOWER AND TRAINING NEEDS

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Public Administration in Developing Economies

The role of public administrators has been changing in most developing countries from that of a regulatory function to one of development administration. Regulatory functions are concerned primarily with law and order, administration of justice, revenue and tax connection. In developing economies where shortages of essential commodities, such as building materials, fertilizers, food, fuel are a common occurrence, the state has to intervene to supply such commodities at controlled prices. Therefore in recent years public administrators have also performed the role of managing the distribution system in addition to the regulatory function of price control.

The development function is of a recent origin. In India the development function includes the implementation of the following types of programmes:

1. Provision of basic infrastructure facilities in the rural areas. This covers the creation of new schools, health facilities, rural roads, drinking water supply, electrification.

2. Provision of adequate social services like health and education through increased outlays on personnel and equipment to be pressed into service in the areas

3. Scheme aimed at promoting rural industry, increasing agricultural productivity, providing rural employment.

4. Assistance to individual families below the poverty line to provide productive resources which can bring about an increase in family income.

The main actors in the tasks of governance are the council of ministers, state level bureaucrats, and district officials at various rungs. At the central and state level, policies are laid down, and resources are allocated. The district level officials are the main instruments of implementation. On the other hand, legislators, political activists, elected representatives at the district level and the general public are the beneficiaries and also focal points for creating demands on the administrative system.

This paper highlights the role that computers can play in providing information support for improving productivity/effectiveness in the above areas. There are several factors that inhibit the use of computers, and perhaps inadequate training of administrators on computers is the most important amongst them. The training needs are analyzed and some proposals are made to bridge the gap, in qualitative and quantitative terms.

Status of Computer Use in Government

In India the use of computers in public administration has been very limited. At the centre, the National Informatics Centre (NIC) provides information support to various ministries. Some of the departments for which data bases have been created are the central electricity agency, customs and excise, the central water commission and the Ministry of Finance (1). The central statistical organisation and planning commission have been using inhouse computers primarily for census operation and econometric models.

At the state level computers have been used for processing data from a variety of census, and in the police department. At the district level, there is hardly any use except by the treasury to capture all payment and receipt transactions.

Impact of Use of Computers

With the number of computeruse in the Government sector, at around 1000 (including micro computers) the impact has been low. However the main reason for a lack of impact is the type of computer applications. These have mostly been of routine processing of statistical data which in any case is not accessible to decision makers at the field level. Such data is often out of date for any operational use and its quality is suspect. An expert group from Asian developing countries noted (2).

Information Technology for this group, as far as country experience goes, means faster data processing rather than providing support to decision makers.

Productivity Oriented Applications

It has been recognized that convention definition of productivity as applied to manufacturing system could be not applied to public administration (3). In this paper productivity is taken in its broader sense as the degree to which goals/objectives of a particular project/department/mission are achieved. Illustrations of computer applications covering the three major public administration functions which could improve productivity are described in this section.

Maintenance of law and order is perhaps the most important area within the regulatory function. To improve the performance of this function, the efficiency and effectiveness of the police force would have to be enhanced. Information can play a vital role in improving these two factors. Computer applications that can be built in this area are management of personnel; data bases on crimes, criminals and modus operandi; and operational planning including inventory, vehicle maintenance, patrolling routes etc. India has an extensive programme of computerization for supporting crime investigation and most of the above uses have been planned (4). Police Computer centres have been set up in most of the state capitals. However actual use and impact has been low because of factors mentioned later.

In administrative functions concerned with distribution of scarce commodities and provision of services, computers could be used for performance monitoring of various field units. Such monitoring could focus on inputs, efficiency indicators converting inputs into activities. Unlike the computer applications in police, where large data bases have to be built and an access has to be provided to such data bases from far flung terminals, such applications could be built on small micro computers which need to be located in the field headquarters from where such services are controlled and managed. In a study of MIS needs for health-related activities in rural and urban areas, computer applications were identified for monitoring of hospitals performance, for creating a personnel data bank of doctors, and paramedics and for maintaining stocks in the central agency supplying drugs (5). However these applications could not be implemented because of non-availability of trained manpower.

The greatest advantages from computerization can accrue in the development planning function. Each district (population of about one million) spends approximately 100 million rupees in a year on various development programmes listed earlier. Computers could be used effectively for deciding optimal location of the new infrastructure facilities being created through such investments. Computers could also be used to monitor the progress of implementing such projects to cut down delays and over expenditure. Again micro computers based in district headquarters could be used to create data bases on villages in sectors such as health, education, water supply, roads, etc. Such use can lead to minimized cost of development inputs; improved quality of data; data integration across departments; and flexible and model based analysis of data. At the Indian Institute of Management, Ahmedabad, decision support systems have been built to enable the decision-makers to use their judgement in combination with models and data bases in several areas of district planning (6). Examples of ongoing use of such software, however, are very few.

The above areas have touched upon the use of computers as a managerial tool. The bureaucracy also deals with masses of information on files which generally move from one functionary to the other in the process of making specific decisions. The entire process of originating of files, movement of such files, their storage and classification could perhaps be automated by using micro computers operating in a local network. However, such kinds of users of computers are not being envisaged in the immediate future because the lack of resources required to replace typewriters with word processing terminals and an inability to carry out a reorganisation of the way in which offices are functioning today. If productivity increases through office automation it would also mean a reduction in manpower, which may not be acceptable to the strong unions of government workers.

Factors inhibiting significant use of computers

A few years back, the major problem was of investment in hardware and software. However, with decreasing prices of computers and widespread indigenous availability it is now possible to justify a computer purchase for almost any government department. Availability of electricity constitutes a constraint particularly when computer usage is envisaged in small towns. However, there are many large towns with several government departments which still do not use computers. The infrastructure for maintenance of computer systems is quite adequate. Perhaps the primary reason for the lack of a spread of computer uses in Government and the routine nature of its use is the lack of awareness about computers at all rungs of the bureaucracy. Computers continue to be treated as a tool for the specialist. Their potential in supporting day-to-day and long term planning and monitoring problems is not recognized. Where a few enlightened senior bureaucrats have pioneered such uses of computers, manpower problems have plagued the implementation.

Professionals who can identify appropri ate uses of computers, design and implement systems, and users who are adequately aware of capabilities of computers to use them in their decision making and planning tasks are very few. This is the major bottleneck in the use of computers for improving productivity in Public Administration.

Although the trained manpower availability is restricted even in the private and public enterprise sector, the problem is specially acute for the government sector. Government salaries in general are much lower as compared to the enterprise sector and therefore in a growing field like computers, the security of a government job is not enough to compensate for the salary gap.

Training and Manpower Needs for Computerization in Government

Training and manpower needs have been assessed on the basis of a premise, that a large number of applications to increase productivity will be developed on microcomputers installed in the field. Manpower would be required to identify, develop and implement computer based systems. Training would need to be imparted to update computer professionals, and to make public and policy makers aware, so that large scale use of computers is acceptable to the society. Since the administrators would be using computers as an integral part of their planning and monitoring tasks, their knowledge of computers, decision making styles and attitudes about political masters would have to be changed through appropriate inputs in training courses. All these aspects are discussed in the following sections.

For any significant use of computers in public administration, the following kinds of computer professionals will be needed:

Information Analysts:

Those who can study public systems and identify such areas of applications which will improve productivity or make a planning or a monitoring process more effective. Such professionals would have to be equipped with a good understanding of the working of government system knowledge of computers and skills in developing models. Unfortunately the importance of this role is not fully recognized.

Systems Analysts (Main frame):

Systems Analysts who would be able to design computer systems, once applications have been identified. Some of these systems analysts would be working on large machines, with sophisticated software tools, and would require a state-of-the-art knowledge of computing, and tools of systems analysis and design.

Systems Analysts (micro computers)

These analysts will work with software toosl like B base III, LOTUS 1-2-3, FOCUS and other application generators which may be developed specifically for the government systems. These analysts will need to be familiar with such software and possess some understanding of the working of the government.

Programmers:

Those who will develop and maintain programmes on large central computer systems.

Data Entry Operators:

Those who will key in data captured from documents for creating and updating data bases.

Clerical Staff with Keyboard skills:

In many applications, the existing staff will have to be trained to input limited data on a keyboard. The data entry on a keyboard will form only a small percentage of the total activity of those functionaries. Examples of such functionaries would be reservation clerks, bank clerks, etc. However, poor keyboard skills of such people could decrease the effectiveness (slow response in transaction processing) of the entire application.

In terms of numbers, an estimate of various types of manpower required for government applications is given in table I below:

Table I
Estimated Manpower Requirement (85-90)

	Total Projected requirement (all sectors) (1985-90)	Requirement for Govt. sector (1985-90)	Output at current level (1985-90)
Information Analyst	8 250	1 200	500
Systems Analysts (large)	15 000	3 000	3 500
Systems Analyst (Micro)	40 000	8 000	27 500
Programmers	50 000	8 500	

The above projections have been worked out on the basis of a Department of Electronics projections, which puts the total number of computer systems that will be installed in India by 1990 as 200,000 (7). The breakup of different types of systems is shown below:

Table II
Estimate of Computers expected to be installed
between 1985 and 1990

Category of computers	Total		Government sector	
	N°	Value	N°	Value
Large and Super computers	105	50	50	975
Midi computers	800	3100	120	465
Mini computers	5000	3700	1000	740
Micro computers	200000	9250	40000	1850
		18000		4240

In an environment of such acute shortage, one of the problems faced by the Government sector is its inability to attract good computer professionals, and its inability to retain these professionals. The problem is compounded by the fact that most educational programs do not orient students for working in a government system.

As a solution, many government organizations like the Police, the Railways, etc. have created their own cadre of computer specialists. These are officers drawn from the operational wing who have been trained for a 2-3 months period. This experiment, however, has not been successful because within some services there are just not enough people who have the requisite aptitude and background to become computer specialists. Secondly such jobs are always away from the main stream of activity and do not attract officers of good calibre. There usually is a stagnation of officers who choose to opt for such a specialist role because of few promotional avenues. If such officers are rotated from specialists to operational roles, then an absence of four to five years can reduce the effectivenss of the officers when they return to the operational role.

Proposal for a New Cadre

Since the Government of India is embarking on a major computerization programme it would be feasible to think of a cadre of computer specialists specifically trained for developing computer systems in government organizations. Such a cadre of specialists already exists in professions like Audit, Finance and Accounting. Young men and women in the 23-25 years age group could be recruited for an all India service. They could be provided a one year training in information analysis and system design at the government academy. Such officers could be deputed to various organizations. They could also man the specialist positions in the state/central level organizations which are charged with responsibilities of providing centralized computer support to Ministries. The advantage of such a cadre would be in its abilility to attract bright men and women as there would be good career prospects and upward mobility.

Such a cadre at the centre is being proposed for the role of Information Analyst/Systems Analysts (main frame).

For programmers/Systems Analyst (micro) such a cadre could be proposed at the State level. In fact the existing cadre of statistical services at the state level should be reoriented to become a cadre of computer professionals.

Updating Existing Professionals

Training programs to update the existing computer professionals need to be mounted urgently. These people may be occupying senior portions in government computer centres and have the capacity of influencing the future of computerization in their departments. Many of them are concerned with important decisions like buying of new equipment for a state government computer centre. Such training programs should be of 2-3 months duration and should include a module on computer architecture, systems software, MIS framework, file design, systems analysis, DBMS, and an exposure to microcomputers. Such programs should be run by institutions which have a track record of working with government systems.

Training of Administrators

Fortunately inservice training is being emphasized strongly. For training a large number of administrators at various levels, a computer module has to be built into the inservices training programme that are being designed for such officers. However, the objective of such a module should be to provide an appreciation of the capability of the computers through illustrative cases and examples rather than intricate details of hardware and software. Far too often when such programs have been designed and offered by institutes of engineering/technology these turn out to be half-baked courses in a programming language. It is strongly recommended that some hands-on experience on micro computers would go a long way in removing a fear of computers amongst such officers. With the availability of spreadsheet software and data base managers which are extremely user friendly such hands-on experience could be provided easily.

It must be recognized that in-services training is an expensive proposition and there are many aspects on which an officer needs to be trained. It should not be treated as a substitute for providing basic exposure at the entry level. The best place to provide a significant exposure to Government officers is at the time when they undergo training as probationers after their selection into an All India Service. For example, recruits to the Indian Administrative Service, the Indian Accounts Service, the Indian Engineering Service, the Indian Economic Service and Bank Officers, Officers in Central Excise and Customs, etc., are all required to go through one or two years training.There is no reason why a significant (30 to 40 session module) cannot be built on computers in such training programmes. Of course availability of faculty and micro computers on campus in the academy where such training is conducted would be necessary for this exposure to be meaningful.

Proposals for Strengthening Educational Infrastructure

It is proposed that such an infrastructure be created at all state level institutes of public administration. Since the task of training is very huge, the computer centres at state level should also create a training and consultancy wing to handle part of the training load.

For creating awareness amongst public and policy makers (ministers, legislators) the medium of TV should be used. Awareness programs for such a public could be conducted by professional bodies like the computer societies.

A new institute can be set up centrally to serve as the academy for training the officers of the proposed all India cadre of computer specialists. Such an institute could be charged with the following responsibilities.

1. To train information analyst/systems analyst required for the government sector.

2. To conduct awareness programmes on computers for senior administrators.

3. To serve as a centre for development of teaching software suitable for training administrators at various levels.

4. To develop decision support systems for tasks of development administration.

5. To train faculty from state level institutes.

Some other recommendations which would help in solving the manpower problems are made below.

1. Familiarity with a keyboard and knowledge of word processing software should become an integral part of all clerical training after their recruitment in government jobs.

2. Microcomputers should be provided to large numbers of educational institutions particularly at college and university level. Graduates, most of whom get into clerical professions, will have an opportunity to become computer literate.

3. Entrance tests for all government jobs (at all levels) should include a section on computers on the basis of a prescribed text. Development of introductory text books for different levels should be given top priority.

The current inputs into manpower development are very meagre. The emphasis is on building hardware and software resources and not on their appropriate use. Perhaps a 10% diversion of budgets meant for installing new equipment, into schemes for developing computer manpower and training, would enable proper utilization of the vast computing resources that are being created.

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INTERNAL AND EXTERNAL REGULATIONS

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Laws and regulations are very much associated with protection and preservation of society. They often have to do with keeping the well-situated - just well-situated. But at their best, laws and regulations can be moderators and good tools to create balance between the weak and the strong. As a lawyer who step by step has come closer and closer to the EDP-production - I must say - these kinds of regulations are more important than ever.

Talking in terms of "agriculture society" and "industrial society" it is easy to talk about an era, strongly affected by new technology, as the "information society" or "the System Society". Changing from one society to another means great stress on mankind. For the industrial world it seems more and more shocking that the legislation, rules and old agreements don't play the same part as the stabilizing skeleton of the social body as it did before. This loss of legal stability has not yet been fully recognized - but it will.

Rather early, however, legislators paid attention to human rights and the need to examine the protection of privacy in a computerized society. Today we can find that special privacy protection Acts have been passed in Austria, Canada, Denmark, the Federal Republic of Germany, France, Hungary, Iceland, Luxemburg, Norway, Sweden and the United Kingdom.

In some federal countries such as the United States of America, there is special legislation aside from the rudimentary federal rules, which control the federal authorities information processing. As early as 1970, however, the United States introduced the Fair Credit Reporting Act, providing control on a branch of business which already at that time was rather extensively computerized. In Switzerland, where legislation exists at Canton-level, national legislation is expected very soon. There is a number of nations standing on the threshold of legislation, for example Belgium, Italy and Portugal. The legislation for protection of individuals has been believed acceptable enough to enable the state of Spain to ratify the Council of Europe Convention for Protection of Individuals with regards to Automatic Processing of Personal Data.

Even if most countries that have already passed data protection legislation - or are in the process of doing so - have followed the two recommendations from the Council of Europe (one concerning the private sector and one the public sector), the different laws do not and will not look alike. The three Scandinavian countries, for example, have different solutions. The Danish legislation is close to the recommendations, with separate laws for the public and the private sectors. In Norway there is just one law, which covers the credit information business as well, while Sweden has a Data Act concerning both the private and the public sector and a separate Credit Information Act.

Even some developing countries have special legislation concerning data processing. Brazil is one example, but the Brazilian law focuses on other concerns than privacy. It protects national development, the labour market, know-how, sovereignty etc. The need for privacy legislation is however now being investigated. Another example is the People's Republic of China. They have an operating Data Inspection Board, but its task is for the moment concentrating on data security matters. Representatives have visited the Swedish Data Inspection Board several times and looked at the work with great interest.

Some existing laws seem more far-reaching than others. It is always dangerous to compare legislation of one country to a specific law of another country. You cannot make any comparisons between countries without a deep dive into other kinds of legislation. Of great importance to the privacy protection standard is for instance the influence of constitutional rules, secrecy legislation, procedural laws, penal codes, administrative rules etc.- which together make up the legal environment of information. Without looking at the total situation, it is difficult to have an opinion of how strong protection a single law can give the individual.

Some people in Sweden like to state the fact that Sweden was the first country that passed a data protection law on national basis. Maybe I was a little proud myself when I started my work for the Data Inspection Board. But nowadays I am sorry to say that there are not many countries I know which are in such a bad need of a protection legislation - than Sweden. I base this statement on three conditions.

1. The Freedom of Press Act (a part of the constitutional rules) has rules since 1766 and can be described as a "Habeas-Data-principle": the right of access to public documents. When this right was established a document was rarely anything else but a sheet. Today a document has become identical with "every kind of constellation of data that gives you information from media for data processing". The exceptions must be defined in the Secrecy Act.

2. The social system of Sweden and its bureaucracy need a lot of information about the inhabitants. I dare say that there is no other country with so many personal files on the total population.

3. A personal number follows every Swede from the cradle to the grave, and a long time after that as well. Because the personal number is so practical when keeping personal files (less risk of mixing individuals) the use of it is nearly total.

In short, it is very easy to get a lot of information about any individual in Sweden. And thanks to the personal number it is easy to combine personal data files. This phenomenon has been called "to create a data-shadow" of an individual. It is not allowed according to the Data Act.

Even if the privacy legislation has come to an early point of focus, computer technology in a more general way, has not yet been reflected to an acceptable extent in other parts of national legislation. In some countries the Penal Code has been amended in order to protect privacy and to face other new problems. In Denmark the Penal Code was amended 8 years before the Data Protection Act was passed. In Sweden some sections of the Data Act also cover non-personal data. Section 21, for example, deals with "data trespassing", which means that hackers, crackers and other trespassers can be sentanced for unauthorized use of computerized information. This section is subsidiary to the rules in the Penal Code. The peculiarity of computer crime, or usually more accurately - computer aided or computer related crime - must be investigated. I am sure the Penal Code in many countries need to be amended adequately to deal with the crime of today and tomorrow.

If someone, one dark night,blows your safe, he may not necessarily want your money. He might very well prefer your tapes or diskettes. Often they are of much more value. Computer crime is usually a more sophisticated phenomenon. Jay Bloom-Becker has described the situation of today and has put it in the following way:

"In a nutshell, there are several good reasons why you might consider a career in computer crime. First of all, no one will ever know if you commit one. Second, no one will ever tell if you do. Third, no one will every punish you. Fourth, you really don't have to know an awful lot about computers to commit this crime. Fifth, the opportunities for advancement are phenomenal. And finally, there is no time like the present".

One example of these new problems is that it is hard to prove a theft of computerized information. The owner usually still has the information in his possession. It has merely been copied. Another example is the case of a programmer who takes part in the development of new software and is suddenly offered a new job. If he - or she - starts to help the new employer with programs similar to those at the old job, to what extent is the knowledge that he or she brings, stolen from the former employer and what is part of the programmer's mind, which he or she certainly is entitled to keep and use.

You can patent computers - both how they work and methods of processing - and production processes. It is also possible to protect programs by patents or other intellectual property rights such as copyright. It is, however, impractical and in any case not an easy task to do so or to maintain the protection. And the lifetime of a program is not long. By the way, we passed our first sentence on pirate-copying two weeks ago in Sweden.

WIPO (the World Intellectual Property Organization) and UNESCO have been fairly active in the attempt to establish an international convention on the legal protection of programs, but so far without success. It is partly because of discrepancies in the views on these matters in developed and developing countries. It is no secret that one reason for the enormous progress in EDP-development is that it has been so easy to copy the competitors progress. Why take this mainspring away now?

But it is easy to understand the frustration of the manufacturers. Among other things it's a question of money. The turnover just on programs for small computers (those in a price range under US$10,000), was more than two billion dollars in the USA alone in 1983. Intellectual property rights border on rules in the labour market and working conditions, for example both the employee's and the employer's right to "know-how". The problem in this sector is made still more complicated by the extensive use of consultants. A consultant in this field is usually involved in all steps of computerization - from the investigation, programming, pilot study, test of a complete system and even running the system. The consultant's rights and responsibility must be described precisely in the contract. It will not solve the problems of intellectual property rights but you will be better off if dispute rises.

The discussion in circles close to WIPO shows a will to keep these rather modern rights in their traditional forms - in the future as well. It amazes me a little. Already the Xerox machine and the tape recorder have partly maimed the intellectual property rights and the computer may very well finish them off. Copyright is no doubt the first intellectual property right to be in the danger zone, but patent rights, design rights are also threatened.

Also contract law is sometimes in trouble, as we are not used to all the changes computerization brings. Too much has become unforeseeable. Disputes between contracting parties are becoming more and more common, concerning both sales and services and both in court and in arbitrary procedures.

The world is growing more and more cash-less. Bank and postal systems started the cash-less trend. This development has opened new areas where you change documents not touched by a human hand. Does this mean that the world is becoming signatureless as well? Until recently, when you wanted to withdraw money from your bank in Sweden, two clerks signed this "agreement" between you and the bank. Nowadays you agree on your withdrawal with a banking-machine in the street and get a printed receipt. There is little practical evidence if - which happens - a technical failure or someone's abuse has affected your statement of account.

Still central banks and political decision-makers believe that they have a grasp of international money-transfer through their national rules. When you look at all those electronic fund systems of different kinds which day and night move money all over the globe - even outside the central banks office hours, it looks to me a bit optimistic. SWIFT (the Society for Worldwide International Financial Telecommunications) is one of the biggest international money transfer systems. It coordinates transfers between 1 500 bank-companies in about 40 countries amounting to half a million international and domestic transactions a day. To be precise, what is happening is not the transfer of money but the registration of data. Data that gives information for a worldwide clearing.

The international electronic fund transfer systems are probably typical examples of an activity that will demand international conventions in the near future.

Banking is just one sector, transport is another sector exposed to great changes. Unsigned documents and the problems that rise from this are not new. They are the same when we agree by word of mouth, but the dimensions of "unsigned documents" today make it into another kind of problem. Our attitude to legal documents is obviously changing. That's why I think no area of legislation will be unaffected.

Another kind of legal problem entails the services offered by owners of textconference systems, Newsmedia or postal services like Teletex. They all create huge new databases. They will no longer just border on more traditional media such as newspapers and radio and television broadcasting which have their own regulations. They will also take over many of the traditional media functions and therefore require special attention.

In the 60s and early 70s some people warned against computers making the human being transparent. This problem has extended also to companies. There are two reasons. One is the increasing integration between the public and private sector. More and more information about private companies is collected by public authorities. This transfer is usually regulated but not in order to protect the company. The other reason is that traditional official secrecy acts protecting information of this kind, as well as information concerning national security do not work very well in a computerized environment. This may lead to an increasing understanding among businessmen that their companies have privacy protection problem of the same kind as individuals.

Many multinational and other big companies have moved their internal correspondence from the traditional post or telephone channels to electronic mail systems. Many of these systems are accumulating huge data bases, which also are used as "knowledge-banks" and even as bases for negotiations. This is the case also among insurance and banking companies which usually have obligations to observe secrecy based on special national legislations. Using this kind of huge systems makes a company in many ways very vulnerable. Somebody said that the only secrecy or security worth mentioning that exists in many electronic-mail systems is depending on a very loyal and happy staff. I am sorry to say that it is still just half of the problem. You still have your communication security prolem to solve. And the answer to that is enchryption and key-administration.

Aside from imperfect legislation, the legal authorities suffer from inadequate knoweldge. There is today at least one multinational company manufacturing computers, which no longer brings action against a pirate manufacturer unless it knows that at least one of the judges involved in the case is a user of a personal computer of its brand, so that he might be able to understand what the case is all about. The lack of competence on the part of the legal authorities is a serious question is most countries that are entering the information society.

Another serious question is the legislators' belief in how the laws they write are used. Laws are still made in traditional ways and legislators still think that new rules are taken care of by skilled lawyers who carefully practise the rules in one case after another. What will actually happen is that programmers will take the rules and transform them into technical terms. You can say there are two versions of the regulation. One in normal language. One in programme language. And on this electronic scheme maybe several hundred thousand decisions a year will be made. The politicians have to consider this new technique very carefully. We also need few forms for appealing against such a decision.

Computer technology together with telecommunications are not affected by national borders. Therefore it is rather natural that so many international organizations are involved in the legal discussions, e.g. the United Nations (UNCITRAL), the Council of Europe, the European Community, the European Parliament as well as the OECD, the Intergovernmental Bureau for Informatics and indeed Data for Development.

National legislation procedures are in themselves slow. In the international field the process is still slower. The Council of Europe started the discussion about privacy and computers as early as the end of the 1960s. In the OECD the subject was discussed for the first time a few years later. Not until September 1980 was a Council of Europe Convention drawn up. At the same time the OECD passed its Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data. These two international legal documents have in many ways the same content.

The main principles in both documents are: Quality of data - "data must be stored for specified and legitimate purposes and not used in a way incompatible with those purposes", individual's right to access to his own personal data and basic data security. These principles are fundamental and I do hope they will be included in internal laws all over the world.

The Council of Europe Convention has been signed by about fifteen countries. The Convention came into force on 1 October 1985. It happened when it was ratified by the fifth nation. The OECD Guidelines have been accepted by the member-countries. However, these two international agreements have been a step forward but there are many problems unsolved, for example the question of conflict of law.

We all live on a globe that shrinks. The new communication technology demands new treatment. If legislation relating to transborder matters could be developed by an international organization and adapted domestically, we would gain much in efficiency. This seems, however, to be impossible in a world with 170 sovereign states. But it should not be. We all have so much in common, especially one. We are all heading towards the new "Information Society". Maybe this could be the kick to cooperate transborders in new ways. It is both a challenge and an opportunity. Why not be more constructive and set up an international legal forecast institution, which can make recommendations and advise. Maybe UNCITRAL can play that part. Or must there be a new organisation without bindings to earlier tasks. But one thing is sure. We have no time to lose. This new computerized tool has one serious disadvantage. Wherever it is used - in a company, in an authority, in transborder data flow situations - it can easily increase the unevenness between the party who runs the computer and those who are subjects to registration or are buyers of database information.

The Council of Europe Convention and the OECD Guidelines were not born without resistance from the business community. They saw these rules as new international bureaucracy (and therefore something very negative). But the critics are wrong. If they were right, the consequence should be a demand for abolition of all "traffic rules" governing international transport at sea, by road or in the air. I guess this would result in great difficulties in getting an aircraft off the ground.

Internal and external regulations are meant to be a help! Administration should provide service. I would like to end where I started. Rules and regulations at their best are a good tool to create balance between weak and strong and facilitate the communication between people. And that's what I call "fair bureaucracy".

ADDITIONAL CONTRIBUTIONS

The following papers were prepared as additional contributions to the conference

IMPACT OF TECHNOLOGY ON FACILITIES

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Much attention has been paid to recent advances in office automation; little attention has been paid the effects these advances, both in quality and quantity, will have on the buildings that must supply a place for and power to this equipment.

This paper explores an analysis of these effects performed by the Facility Management Institute (a division of Herman Miller Research Corporation) at the request of a major financial organization. The study looked at several areas of impact. Particularly, the study resulted in architectural and workstation criteria that would have to be met should the organization reach a ratio of one terminal to each employee--a ratio rapidly becoming the norm in many businesses. The study poses two questions that must precede any treatment for the effects of technology: What will be the severest plausible demand for electronic devices? When will that demand be reached?

The paper outlines architectural criteria imposed on buildings by a high degree of automation. It also briefly discusses some other effects of automation, especially the effects on individual offices.

The two appendixes contain a more detailed listing of architectural criteria and a sample lay-out for a heavily automated office.

This report was prepared by:

Word Processing: Diane Saunders
Graphics: Kathy Staley
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Office electronics do not exist in a vacuum. No personal computer, video display unit, mainframe computer, or automated information management system is independent of the building or individual office that houses it. Unfortunately, many plans for implementing large-scale electronic information systems fail to recognize this inescapable reality.

In current American jargon, buildings designed for large-scale use of electronics are being dubbed "smart" buildings. As with most jargon, this term is misleading, since the "smart" elements in buildings are the electronic systems incorporated there. However, the term does focus attention on structures, interior walls, utility systems, and furnishings. These parts of a facility must allow the "smart" equipment to work most effectively and efficiently while integrating it comfortably into the working environment. "Smart" equipment, therefore, can and <u>should</u> have enormous effects on buildings.

To help illustrate the variety and extent of these effects, let me discuss a consulting project the Facility Management Institute (a division of the Herman Miller Research Corporation) conducted from 1983 through 1985. The organization involved was a major financial institution with six thousand employees housed in a complex of eight buildings. These buildings ranged in age from one to 33 years. The overall consulting program consisted of a number of elements all aimed at helping this organization formulate a long-range facility strategy for renewing older buildings, guiding the construction of new buildings, and managing internal facility changes. (See Figure 1.)

The project consisted of two major phases. The first related to architectural criteria that might be affected by office automation. The second phase developed new office planning and

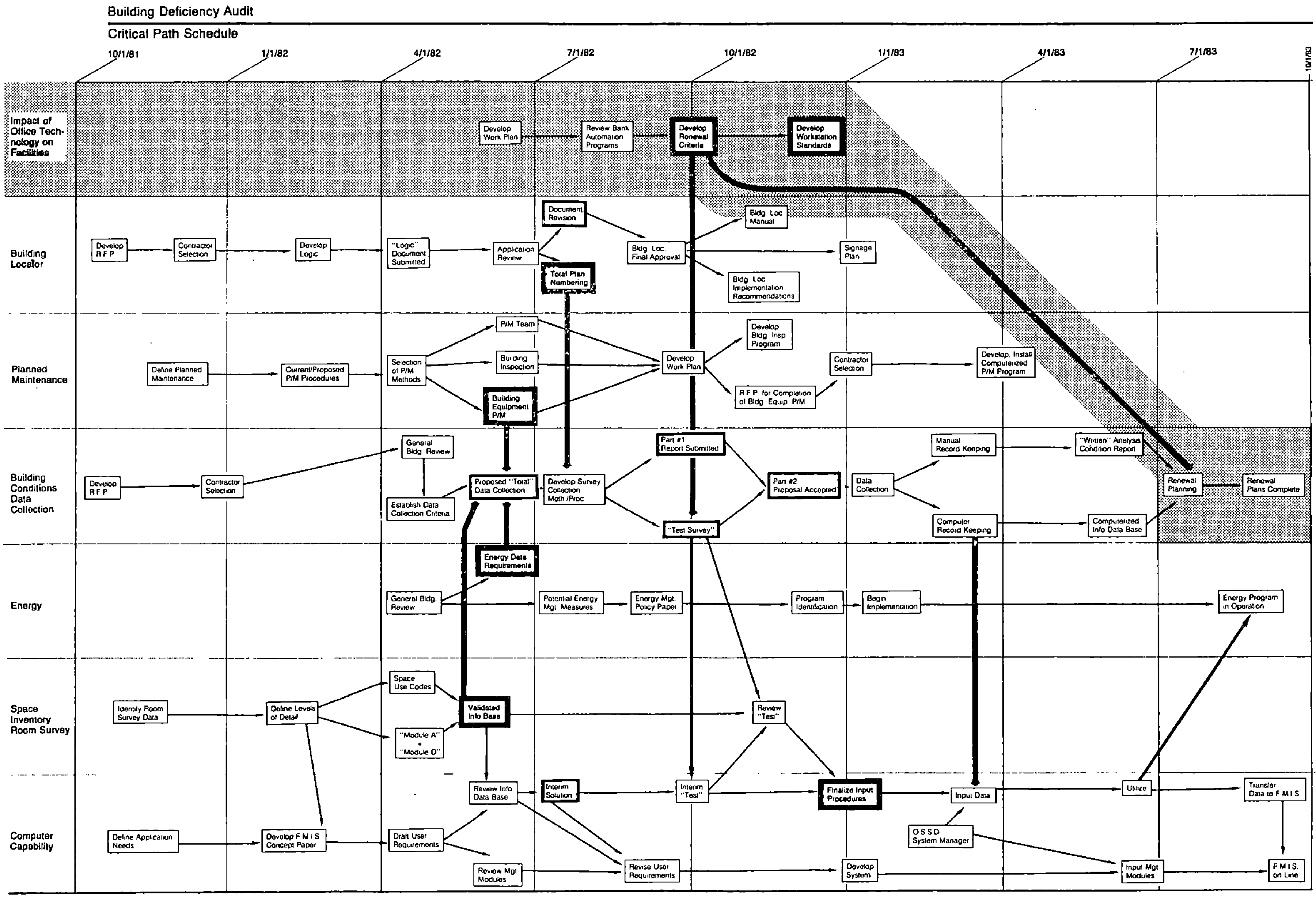


FIGURE 1. A Plan for Analyzing the Effects of Office Automation on Facilities

furnishing standards. Because it developed a variety of new standards directly related to the impact of implementing new office technologies, the "office of the future" part of this project was the most influential portion of the study. Together, the results of these two phases constituted a major collection of findings that, we believe, have broad implications for many similar situations.

RATES OF AUTOMATION

Our experience suggests two key issues shape the requirements of automated offices. To begin to delineate changes in conventional wisdom about facilities, these two issues must be dealt with first.

1. What will the severest plausible demand for electronic devices be?

Severest plausible demand in the United States is turning out to be one personal computer or video display unit per worker. In our consulting project, this was not readily apparent. Extensive interviewing in various departments finally revealed that this would be the ultimate stage of automation in this institution. From a ratio of 1:1, additional pieces of equipment can also be projected. Based on typical classifications for workers, such items as printers, processors, plotters, and alternative input devices like a mouse or digitizer can be added to the VDU or personal computer (PC) to define a typical equipment package. (See Figure 2 and Table 1.)

From these projections of equipment packages, we calculated that 14,000 new electronic components would be obtained by our client if the 1:1 ratio was accomplished.

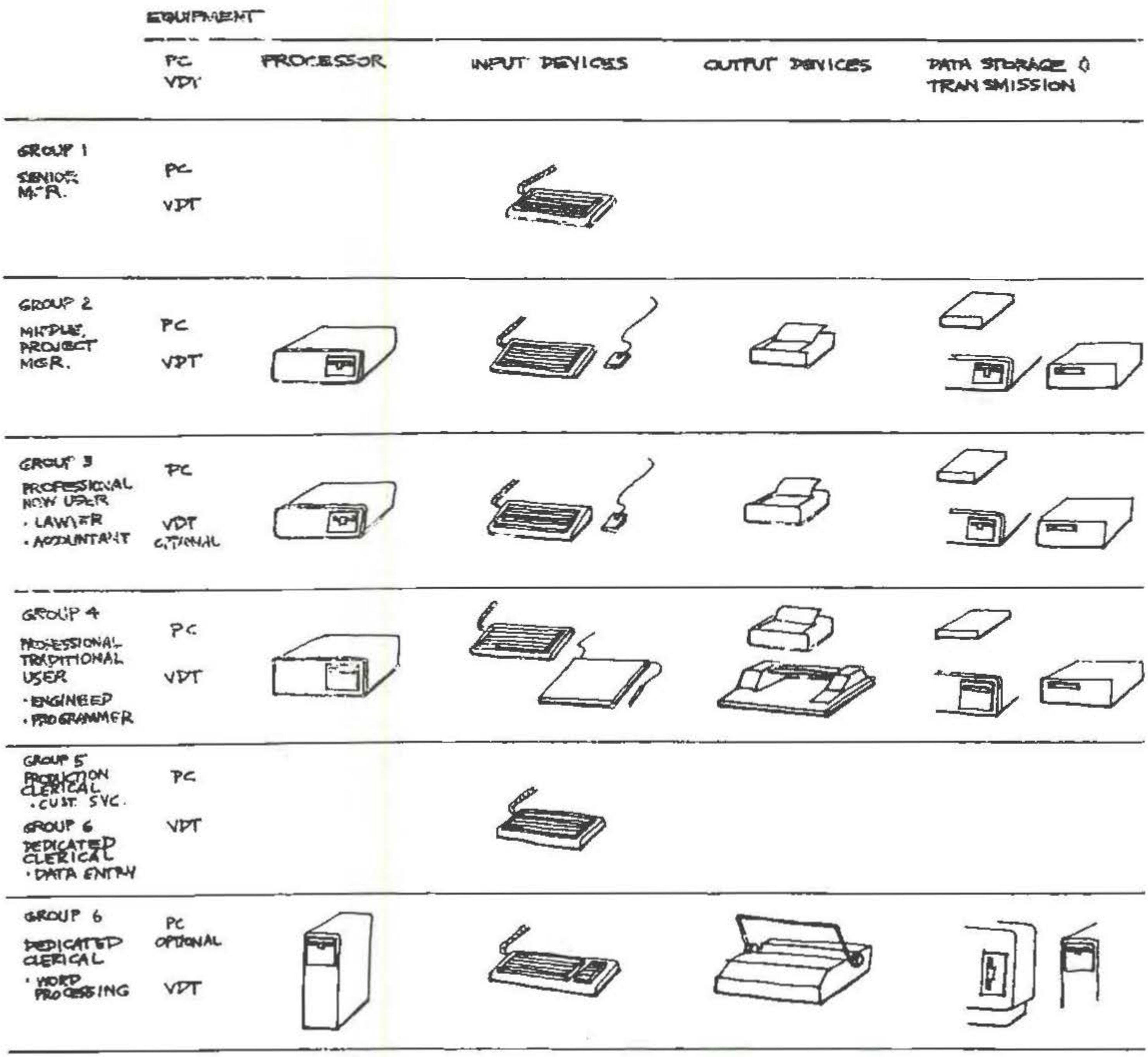


FIGURE 2. Electronic Equipment Required in Addition to the CRT

TABLE 1. Calculation of Total Pieces of Electronic Equipment

Technology Units	Ratio in FY 83 Based on Staff of 5,864	Interim Demand	Severest Plausible Demand	Totals Based on 1988 Staff of 6,317
Staff/Terminal	3.5:1	2.5:1	1:1.1	6948 VDT
Letter Quality Printers/Terminals	1:5	1:8	1:20	350
Draft Quality Printers/Terminals	1:10	1:6	1:4	1740
Controllers/Terminals	1:200	1:200	1:300	23
Telephone Modems/Terminals	1:10	1:3	1:15	463
Local Area Network Modems/Terminals	0	1:2.5	1:1.8	3821
Distributed Small Processors/Terminals	1:40	1:30	1:20	350
Plotters/Terminals	1:500	1:200	1:36	190
Laser Printers/Terminals	0	1:300	1:50	140
Large Floor Model Copiers/Terminals	1:23	1:37	1:125	58
Desk Top & Small Console Copiers	1:41		1:36	190

Projected Total Technology Units at Severest Plausible Demand - 14,278

Ratio of Staff to Technology Units at Severest Plausible Demand - 1:2.3

Estimated Total Technology Units FY 1982/83 - 2,166

Current Ratio of Staff to Technology Units - 1:0.42

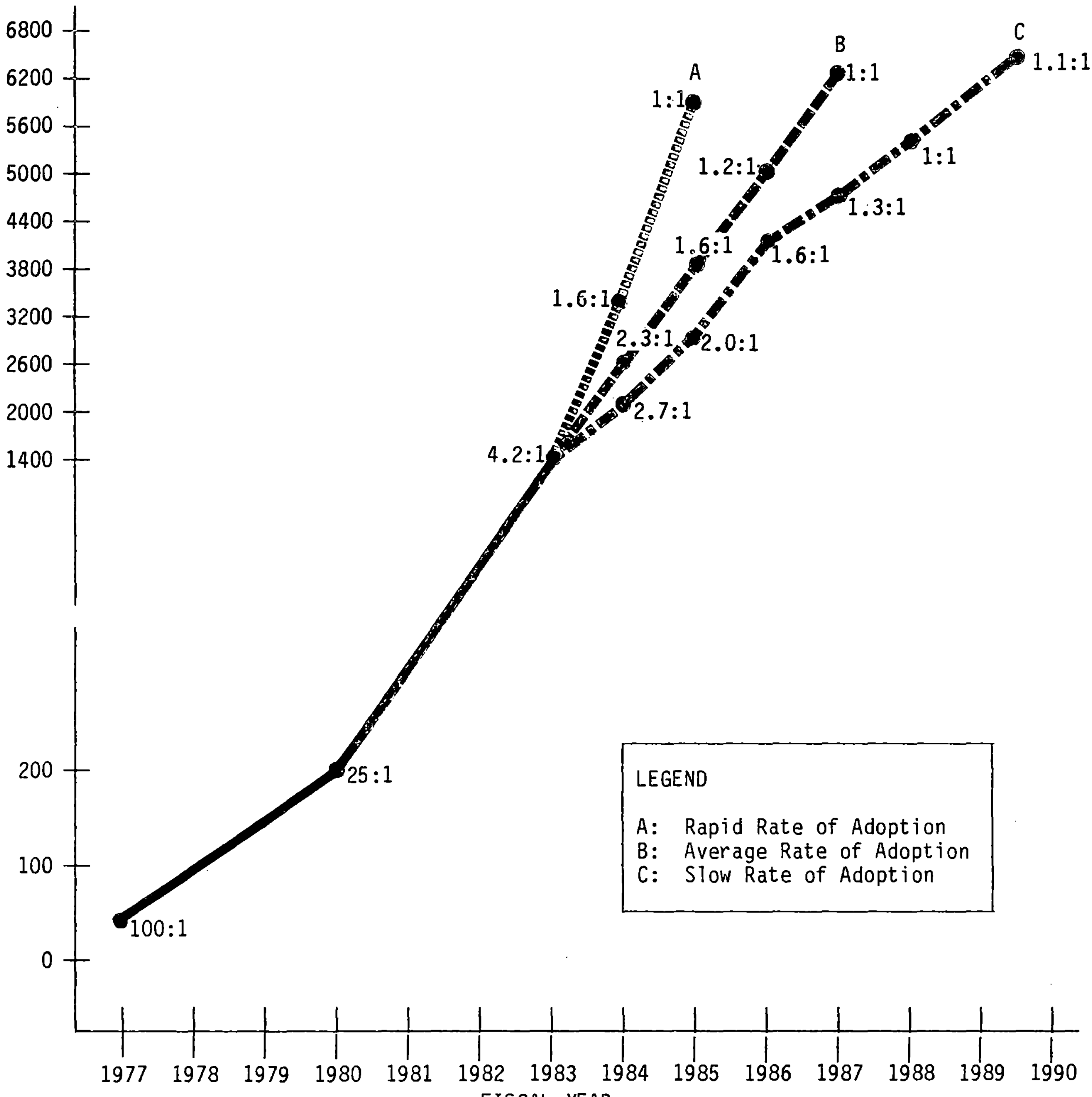
2. When will severest plausible demand come to pass?

Our experience here shows that you will get at least three kinds of answers based on the technological bias of those you ask. The people most committed to technology will give you the earliest date; the people most afraid of technology will give the latest date. Others will fall in between. (See Figure 3.)

A planning committee representing a cross section of the organization's departments has proved to be an effective way of reconciling different projections. These committees are not easy to organize and run, but overall they have two beneficial effects: They bring out more elements of the problems to be solved for each department as part of a larger whole; and they create advocates in each department for the plans, schedules, and decisions that are made.

Answering these two questions may take many months, but it is crucial. Once you determine how much equipment will arrive and when it may be installed, the direct facility impact can begin to be defined.

About three-quarters of the way through our consulting program, our client formalized a program for managing office automation. The objective was to ensure a reasonable implementation of the unstated but implicit movement toward the 1:1 ratio. The formal program team comprised a number of people from our original guidance committee who had helped uncover the original movement toward the 1:1 ratio and had been exposed to many of the emerging facility recommendations. This made the formalization process reflect the interactions between decisions about technology and possible impacts on the facility.



(Ratios noted above indicate the number of staff per terminals.)

FIGURE 3. Variation in Projected Rates of Automation

DEALING WITH UNCERTAINTY

Unfortunately, at this point, the question of the uncertainty of these projections must be brought up. As we all know, the rate of change in the field of electronics is phenomenal, while buildings are slow to construct and often difficult to change. The answer to this uncertainty is to think in terms of flexibility: the ability to rearrange, expand, contract, and move the facility elements likely to be affected by electronic work tools.

As a result of this project and others, we know that the facility elements most typically affected by office electronics are: utility systems, space delineation, furnishings, and space planning.

We developed a set of guidelines for our client to consider in evaluating the impact of office technology on the flexibility of facility design and planning. These guidelines are helping to emphasize where time and money can do the most good.

THE DISTRIBUTION SHIFT

Besides the flexibility required by uncertain projections, another major requirement bears on the implications for facilities. Considering that most technology programs are implemented in increments, the facility must be ready for a shift from technology concentrated in pockets throughout a building and shared by many, to an evenly distributed and decentralized arrangement where most workers have their own personal package of hardware. This shift usually begins with "satellite" and "regional" computer centers in various buildings where each center serves ten to fifty people at a time. The later stages of automation consist primarily of "clusters" of three and four people who share a terminal and individuals using a terminal exclusively. The discovery of this shift was very significant because it helped to define when various facility elements became critical. In our report to the client, over twenty new architectural criteria were proposed. The most critical guidelines are included here, the rest are found in Appendix A.

ARCHITECTURAL EFFECTS OF AUTOMATION

The first systems to be considered, both because of growth in numbers of appliances and the distribution shift, are the utility systems. The early phases of technology implementation required localized delivery of the key utilities--electricity, data wiring, and possibly additional air conditioning. We recommended that the client begin by planning the utility systems, data, electrical, telecommunications wiring, and ventilation around the severest plausible demand--not present or near-future needs. This sounds obvious, but apparently not all organizations realize it.

What we found, and continue to find, is that current design standards don't account for additional equipment. The additional volume of chase space, distribution capacity, etc., required to handle the severest plausible demand does not have to be outfitted immediately with cable or with equipment. The cubic meters needed to expand utility distribution or the square meters needed to accommodate additional technology are relatively inexpensive today, compared with adding it later. To build for the severest plausible demand rather than for the norms of today is to buy the flexibility for future utility expansion and access.

We also proposed plans for easier access to utilities. We design a city's utility systems to be far more accessible than the ones in most of our buildings. Yet getting into a building's systems, adjusting them, modifying them, upgrading them, repairing them, are perpetually critical problems exacerbated by the expense of lost time when computer equipment is idle. I would argue very strongly that today's uncertainty about technological change demands quick and easy ways to add and delete electrical service, cables, and ventilation ducts.

Random wire distribution and more utility outlets were also included in the new criteria. This is another one of those things driven by office automation. To give a quick example: Imagine a utility system on some sort of regular grid and laying space out so that each desk lands somehow neatly on that grid. What happens with this nice grid when someone comes in and adds functions or equipment in an irregular way to handle, say, a printer station that was not part of the original design standard? Yes, you can put a terminal in every one of the rooms on the grid, but don't forget the terminal requires other equipment--a small central processing unit (CPU), printing equipment, etc. What about an automatic copier? Where is that going to go? This changes everything. A rigid grid supply for wiring can't respond.

Organizations intent on automation have to provide utility sources at relatively random spaces in addition to fixed grids. We like to see people choose utility systems as unfixed as possible, right down to the lighting. In the case of electrical and data wires, random capacity and placement ability also furnish the opportunity to make subtle adjustments in location and service capacity. Some workstations, we're finding, require as many as ten electrical receptacles, while others may need only two or three. This variation in demand should be accounted for.

New criteria for expandable heating, ventilating, and air conditioning (HVAC) systems are another major issue. As you approach a 1:1 ratio of people to terminals, you can expect an additional one to two pieces of other equipment for every terminal. By the time you add all this equipment together, you are generating a good deal of additional heat. Terminals right now produce about as much heat as one and a half people sitting and doing office work. If everybody in the organization gets a terminal, the "occupancy" of your building doubles, increasing the heat produced and requiring changes in cooling capacity.

To summarize, with a ratio of 1:1 people to terminals projected as the severest plausible demand, the new utility system criteria included the following:

Upgraded wattage for information processing hardware. (An additional 15 to 20 watts per square meter.)

Upgraded air conditioning. (Add an additional 600 to 700 BTUs to the sensible heat load per person.)

New accessibility requirements. (Increases in access to these wiring systems--electrical, data, and telephone, at each work location or potential work location by using state-of-the-art distribution or raised floors.)

New cost elements. (Based on 1985 costs in the United States, there is the potential of an additional $45 to $190 per square meter to accommodate these upgrades.)

OTHER EFFECTS OF AUTOMATION

The second phase of our project related to planning and furnishings. This phase produced criteria that crossed the bridge between direct architectural issues and those related to space planning and work process support.

Space Utilization Implications

Early decentralized phases of automation consume space that must be found in addition to individual offices, workstations, and meeting rooms. In localized areas this can account for a 12 to 15 percent increase in space needs, but overall these spaces only add about 2 to 5 percent to space requirements. However, mature decentralized distribution of technology usually requires more space within individual work areas. This happens, our studies showed, because significant reductions in paper do not occur and because the equipment takes up more space than the paper it replaces.

Adding office technology at the 1:1 ratio can push individual space requirements up 12 to 15 percent. To accommodate this shift in space utilization the following guidelines were applied.

1. Create space that allows for what we call "two-dimensional planning," large spaces available at 600 to 1000 square meters per block--with nothing dividing it up permanently. If you intend to divide it later, that suggests you need something like 15 to 25 meters between any fixed walls--a lot more than typically occurs in a building with a central core.

   With the normal narrow space in most center-core buildings our client owned, they could only plan around the circumference of the core. In most buildings with a central core, they could only plan for two 4.5-meter-deep offices and a corridor for secretaries outside. They couldn't readily re-cluster workstations or offices on anything but a line parallel to the core. It's virtually impossible, with the typical dimensions and the need to align offices with the window mullions, to get options in density and arrangement in most buildings with a central core.

2. Build in "breathing" space on the front end. Breathing space is really allowing for flexibility. It is space not immediately necessary for a specific function. Over a monthly or yearly basis this space--used in the interim for other things--is easy to add back into the organization as you add more people, terminals, or functions.

   To gain breathing space without radical increases in net usable space, we proposed reducing the size of individual offices. (See Table 2.) Areas such as regional terminal rooms, shared satellite terminals in a department, printer and processor stations all add space unless a new balance between personal office space and organization or group space is considered.

Workstation Implications

The fact that working with computers is physically so different from working with pencil, pen, and paper is well documented. New performance characteristics for furniture as well as new long-range planning for purchasing were required to handle the influx of computer hardware. The recommendation of new furnishings and guidelines was the result of our studies relating computerized work to the client's long-range automation plans. The new guidelines focus on relating furnishings, and space allotted, to the function and work of an individual regardless of salary and rank. This is not easy to do, but it can make for more effective use of the equipment in an overall plan.

Some thirteen new workstation variations were developed based on four primary packages of furniture. These packages accounted for use in both shared and dedicated situations. They also described basic ergonomic needs, shifts and growth in the use of computer equipment, and the need to control light and acoustics around and within the office where the furnishings would be used. (See Appendix B.)

TABLE 2. Workstation Standards for Automated Work

	Existing Sq. Ft.	Alternative Three/B 20% reduction (Sq. Ft.)
Vice President	450	360
Directors	400	320
O Level	300	240
N Level	225	180
Division Chief	225	180
J-M Level	150	120
Assistant Level	125	100
Secretarial	100	80
"Other" Cons/YP & Temp. RA	125	100

3. Plan for space changes caused by the automation distribution shift. People forget often that the increase of electronic equipment, combined with the distribution shift, create many space changes. As more and more people work on their own terminals, which require peripheral equipment, their offices need to change, sometimes drastically. At the same time, the number of shared regional and satellite centers declines and most should be dismantled. This growth and shift all can lead to substantial redesign of large blocks of space. Modular furniture and wall systems best accomplish both large and small changes. This kind of furniture is often 15 to 20 percent more expensive than conventional furniture. (See Figure 4.)

BUDGET IMPLICATIONS

As in anything, postulates have corollaries. Guidelines in planning for office technology have qualifications. Some of the flexibility proposed, which must be bought and put in place before the computers arrive, will cost money and may be rendered less useful by future developments in office electronics. However, it boils down to paying now or paying later. Dealing with the facility elements I have talked about added 15 to 17 percent to the total cost of a new building or major renovation for our client. Adding piece by piece over time, however, pushes these costs as high as 35 to 60 percent of original construction, assuming the facility our client had could be modified effectively. Surprisingly, the older buildings in their complex appeared to be easier to modify than the newer ones.

Unfortunately, these new costs were not originally included in the budgets for implementing office automation. Still, the organization must pay one way or another. These costs clearly must be seen in any projection.

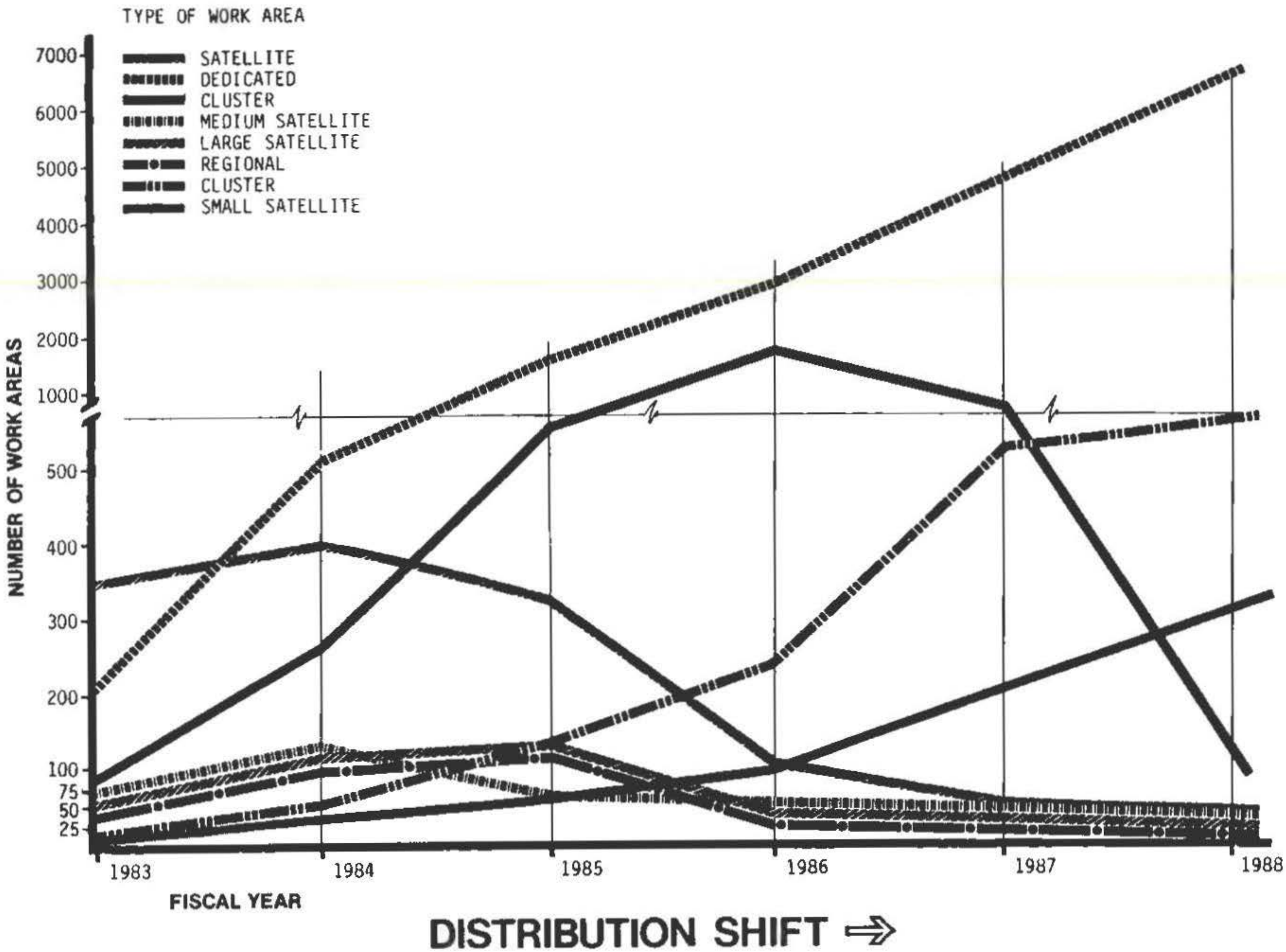


FIGURE 4. Shift in Ways Terminals Are Used

CONCLUSION

If these guidelines appear to be the last word, don't believe it. When dealing with the concept of facility flexibility and office automation, the last word is: there is no last word. These recommendations are tested and have worked. They represent a good deal of thought, research, and experience. But it would be foolish of me to pretend that they are all you need to know. With the question of automation, since that industry is changing so fast and so often, we still don't know everything. The best advice I can end with is a paradoxical pronouncement about flexibility and office automation: Try whenever you can to plan for the unplannable.

APPENDIX A The following table presents the architectural criteria for any facility that will be housing office automation technology.

TABLE A1. Architectural Criteria for Impact of Office Technology

Building Element	New Load Factor	General Result	Design Criteria
EXTERIOR ENVELOPE			
Exterior Shell	a. More technology units creating an increase in HVAC requirements	Localized reinforcement of building structure to hold up additional large cooling equipment	1. To be determined from final HVAC system design and electrical system design
Interior Shell	a. More noises from equipment, especially printers	Improvement in acoustical absorption and isolation to achieve noise reduction	1. Ceiling finish materials to be .70 NRC in enclosed rooms with printing equipment
	b. Increased volume and variety of service systems running through interior shell	Increased access through walls, ceilings, and floors to service and change service system locations and densities and connection points	2. Ceiling finish materials to be .95 NRC in open-plan space with printing equipment 3. Make access for service and change as flexible as possible
SERVICE SYSTEMS			
Plumbing	a. Potential need for direct water cooling of equipment	More cold water capacity and piping connections on each floor	1. Two dedicated 1/2" cold water lines and a drain capacity easily located anywhere on a floor

Building Element	New Load Factor	General Result	Design Criteria
SERVICE SYSTEMS (continued)			
HVAC	b. Overall ratio of 2.3 technology units per bank staff member c. 3 technology units per person per HVAC zone d. Max technology units per one 400 sq. ft. location is 14	More cooling capacity overall More capacity to deliver cold air to specific locations More capacity to exhaust warm air	1. 50% of staff on typical working floor @ 3 watts per sq. ft. for technology units; 14% of staff on typical working floor @ 5.5 watts per sq. ft. for technology units; 36% of staff on typical working floor @ 6.9 watts per sq. ft. for technology units 2. Max. density per one HVAC zone is 8 watts per sq. ft. for technology units 3. Max. load at any one location is 15 watts per sq. ft. for a 500 sq. ft. enclosed space 4. For some support equipment environments (SEE) a load of 20 watts per sq. ft. in a 150 sq. ft. space must be accommodated in both open plan or closed rooms
Wiring & Distribution Systems			5. All controllers will require individual clean circuits 120V 6. All laser printers will require clean circuits determined from clean circuits requirements, receptacle capacity requirements, and change rates

Building Element	New Load Factor	General Result	Design Criteria
SERVICE SYSTEMS (continued)			
Lighting	a. Need to control glare on VDT b. Need to vary lighting levels c. Need to provide more at the desk task lighting	A greater variety of ceiling lights and diffusers More task lamps at individual desks More localized switching lights on and off	1. Min. foot candles of 50 to 70 at the desk with all lights on 2. One portable light fixture per desk 3. Additional dimming, switching, and diffuser criteria
Telephone	a. Increase in data dedicated lines 2.5 terminals per dedicated line	Increase in phone line and switching capacity Larger vertical distribution risers between floors Larger telephone control rooms	1. 2.5 terminals for every dedicated line at mid-point of technology adoption cycle 2. Decreased to 15 terminals per dedicated line at full adoption due to increased use of local area network (LAN)
Communications/ Data Systems	a. Use of local area networks	Cable trays, conduit, and coaxial connectors must be added as LAN becomes available	1. 1.5 coaxial connectors for each terminal
		More wiring and cabling and TV cameras to be installed	1. Per needs of system specified by security consultants

Building Element	New Load Factor	General Result	Design Criteria
SPACE DELINEATION			
Fixed Walls	a. More telephone lines b. More data line (LAN) c. Larger and more complex electrical circuitry d. Larger and more complex ventilating systems	Larger telephone closet space Additions of data controller rooms Expansion of electrical closet sizes Larger duct shafts or addition of duct shafts	1. Additions to size for all fixed-wall enclosed spaces to be based on capacity requirements for each service system
Moveable Walls	a. Support additional number of receptacle assembly for electricity on full-height walls b. Support receptacles for LAN coaxial cable connections on full-height walls c. Upwards of 75dB noises from printers	More electrical plugs to be installed in private offices and in conference spaces New coaxial cable connectors for attaching terminals to LAN installed in walls Higher performance standards for walls surrounding printers	1. Add in appropriate numbers based on specifications from electrical power section 2. Add in appropriate numbers based on specifications from communications/data systems section 3. Full-height walls enclosing printers must have S.T.C. 45 Moveable open plan screens enclosing printers must have S.T.C. 29, N.R.C. .80; they must be 60" or more high

APPENDIX B

The following three pages are examples of one of fourteen new workstation standards. Each variation contained four descriptive diagrams which covered:

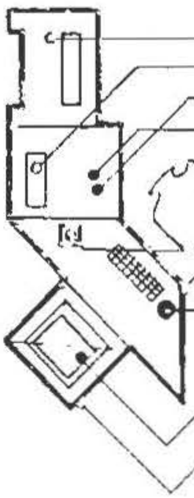
1. General layout to support a particular work process.

2. A listing of the components required.

3. Planning and environmental conditions to take into account when designing the workstation for use in an enclosed office.

4. Planning and environmental conditions to take into account when designing the workstation for use in an open plan office.

WORKSTATION TYPE COMPONENTS | 1-B



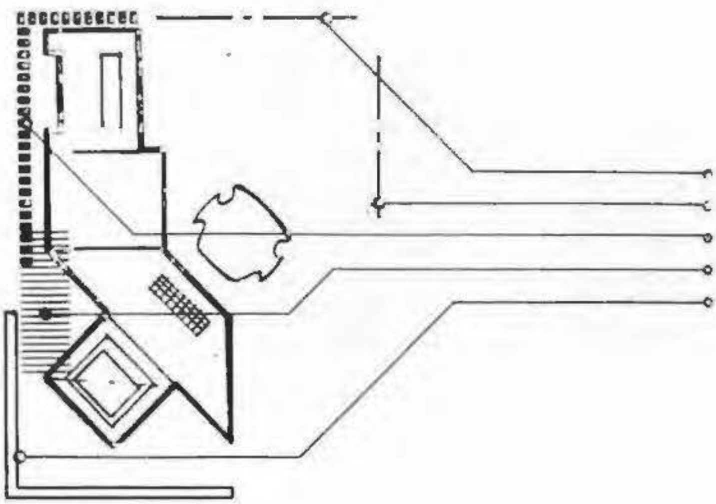
7,B(2)	Production Printer Table
3,C	Secondary Work Surfaces
6,B(1)	Drawer
1,C	Small Work Surface
4,B	Terminal Use Chair
2,B	Keyboard Support
8,A	Task Illumination
5,A(2)	Document Caddy
5,D	VDT Screen/Tilt Swivel
2,F	Screen Support

Detailed specifications for components and planning considerations can be found on pages 66-104; they are listed in numerical order by the component's code.

Notes: 3,C Secondary Work Surfaces should be installed in the flat position.

WORKSTATION TYPE PLANNING/OPEN PLAN

I 1-B



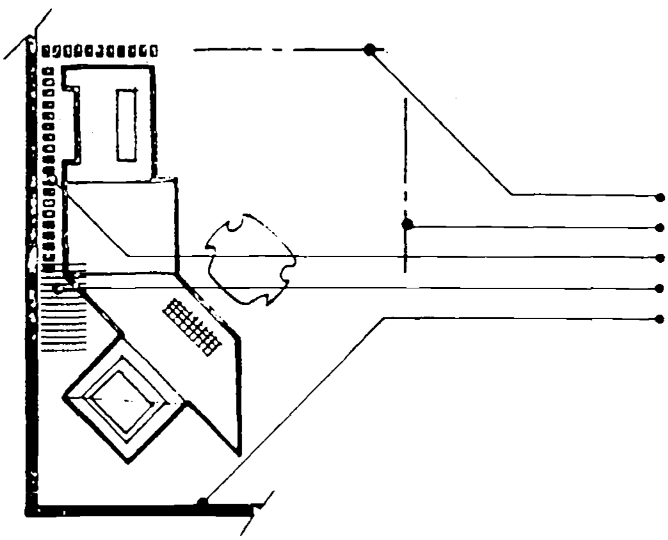
Detailed specifications for components and planning considerations can be found on pages 66-104; they are listed in numerical order by the component's code.

	Ceiling Treatment	Wall/Screen Performance	Local Absorption	Background Sound
Acoustics	NRC .95 9,A(3)	NRC .75/STC 28 9,C	NRC .95 9,E optional	

	Zone 1	Zone 3	Luminair Treatment	Wall Reflectance	Window Treatment
Illumination	50 f.c. 10,A(1b)		Lenses 10,B(1)	40%-50% max. 10,C(2b)	Blinds 10,B(3) as necessary

	Convenience Electrical		Data Electrical		Telephone	Data Telephone	Data Coax
	120 V	220 V	120 V	220 V			
Number of Receptacles	4		1		1 as necessary	1 as necessary	1 as necessary

WORKSTATION TYPE PLANNING/ENCLOSED PLAN 1-B



10,C	Window/VDT Relationship
10,B(3)	Blinds
9,B(2)	Wall Mounted Absorption
11,A(2)	Receptacle Zone Location
10,C(2b)	Contrast Control at Walls

Detailed specifications for components and planning considerations can be found on pages 66-104; they are listed in numerical order by the component's code.

	Ceiling Treatment	Wall/Screen Performance	Local Absorption	Background Sound
Acoustics	NRC .70/STC 20 9,A(2)	40-45 dBA 9,B(2)	NRC .95 9,E	

	Zone 1	Zone 3	Luminair Treatment	Wall Reflectance	Window Treatment
Illumination	50 f.c. 10,A(1b)		Lenses 10,B(1)	60% max. 10,C(2a)	Blinds 10,B(3) as necessary

	Convenience Electrical		Data Electrical		Telephone	Data Telephone	Data Coax
	120 V	220 V	120 V	220 V			
Number of Receptacles	4		1		1 optional	1 as necessary	1 as necessary

RAISING PRODUCTIVITY IN PUBLIC ADMINISTRATION
THROUGH INFORMATION DEVELOPMENT

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1. Productivity in Public Administration

Increase in productivity in public administration (P.A.) is crucial in a country's development with its growing role in all walks of life, especially in a developing country. Productivity in P.A. is determined by several tangible and intangible factors, some quantifiable, others being qualitative. They include : capital investment in set-up, personnel, leadership, relationship between leadership and staff, nature of rules and regulations, delegation of authority, accountabiity to public, overall socio-political system, etc. The role of information development is indeed recognised in raising productivity in P.A. particularly recently with development of new information technologies. Increasingly, governments are engaged in developing information, within the country and across borders, and adopting new technologies.

2. Information development

Information has to be understood in its broad sense defined as "data structured by way of modelling, organising or converting data so as to increase the insight on level of knowlege" (Nijkamp, 1982). Development has also to be taken in its comprehensive sense: expanding base, widening coverage, standardising the classifications and concepts, maximizing utility, exercising cost effectiveness, as also increasing adaptability to the emerging needs.

The logical basis of information development can be seen in the needs of informed decision-making; monitoring and review of development schemes; intelligence for developing mitigation strategies for the observed problems; better coordination within the Government as also between Government and business and industry; increasing feedback from public about government performance; and maintaining appropriate relations with different countries.

The process of information development would have various components including :

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i) Modernising information organisation;
ii) Reducing time-lag;
iii) Increase in consistency;
iv) Standardisation of concepts and classifications;
v) Setting-out priorities
vi) Expanding the data bases in line with the socio-economic objectives;
vii) Simultaneous development of hardware and software in line with technological development; and
viii) Maximizing benefits of the United Nations and other international frameworks of information in the various fields.

3. Recent Initiatives

The question of developing information has received wide attention, in recent years, not only at national but at regional and international (the U.N. and Group of 77) level also, certain initiatives have been taken.

In India, the recent history of information development goes back to the period when national planning began in 1951. The information base has grown considerably over the plans and the Indian system can be considered as one of the highly organised and expanded ones as obtained in the developing countries. Conceptually also, the system has developed in more ways than one. Since then several groups have deliberated on this aspect, organisations have grown and multiplied, coverage has increased dramatically and usage has grown significantly. (Roy Choudhury and Mukherjee, 1984). There exists a Central Statistical Organisation (CSO) at the Centre. There are similar set-ups in the States. To develop hardware and software, National Informatics Centre (NIC), set up recently, has made several advances (Annual Report). There are, however, several gaps in coverage and lag in speed of collection and dissemination which provide room for improvement. (ESCAP 1975, Ministry of Commerce, 1979, IDA 1983, and Chakravarty and Raghavan 1985). The moderate long-term growth of the economy, albeit off-trend growth during 1980-85, and lower overall productivity (compared to the industrialised and some of the newly industrialising countries) of factors also firm up this point. There are standing working groups in the Planning Commission to focus on the issues of improvement. The other government Ministries/-Departments have their own system of developing information and are fully conscious of the need. Recently, aside from the need for development of information in its common usage, the need for developing 'intelligence' system and early warning signals for policy-making has been emphasised. Efforts for cooperation with international organisations in different areas of information development have been expanded.

4. Indicators of Productivity in P.A. - Recent Trends

Development of indicators and measurement of productivity in P.A. is important but a complex problem. There are no readily available data and agreed indices on the subject. The indicators have to be based on surrogates such as growth of government revenue, savings and investment rate in government departments, growth of gross domestic product (GDP) in P.A., value added per employee in government departments, increase in popularity with public (judged through public opinion surveys), and overall productivity of the economy especially given a mixed economy. It is likely to be hazardous, without some indicators, to draw any conclusion regarding quantitative dimension of rise in productivity in government; much more so if we want to specify the information as one of the sources of growth in productivity.

4a. Two Variants

Ideally, such a study of trends should be made keeping in view two variants:

i) Without information development; and
ii) With information development.

It would, therefore, be necessary that certain indicators of information development are also developed, considering specific project outputs and/or changes in operational and practical aspects of P.A. Indicators like expenditure on information technologies, stock of experts, training and research, etc. point only to inputs. The indicators should reflect on inputs (stock and flow) and output, as also on impact on productivity. The indicators have also to be structured in the context of the development stage of the country and system pattern of P.A. and objectives being achieved.

In the context of India, while some information on indicators of productivity could be identified, it has been found difficult to do so with respect to information development, as this has been going on as a continuous process since development plans were launched in 1951. In fact, this task is usefully performed if some case studies are undertaken covering specific instances of information development in a particular area/department.

4b. Trends Since the Sixties

Two major indicators of productivity in P.A. we have considered are :

(i) Growth of rate of savings and gross domestic capital formation (GDCF) in Government administrative departments (GADs) compared with the economy-wide rates ; and

(ii) change in Incremental Capital-Output Ratio (ICOR) for administrative departments vis-à-vis economy-wide.

Considering the period since 1960, savings and GDCF rates are found to be higher in the GADs, compared to the economy. The long-term trends, however, show that the rates have declined in the GADs. The performance of GADs has improved in the recent period in so far as the rates increased, but grew at slower pace compared to the economy (Table 1). The ICOR works out to be lower (Table 2) in GADs compared to the economy, and the trends show that it declined in the recent period (Table 3). When compared to the public sector, the ICOR in GADs works out to be substantially lower and the gap increased in the recent period. Considering these two indicators, we thus find that the productivity in GADs, in recent period, has been going up. A close observer may relate this rise in productivity to several factors including improved quality of personnel, better equipment, higher average returns to employees compared to the rest of the economy, increased opportunities for growth in productivity, and last but not least, information development reflected in considerable expansion of data base as well as data networks.

5. Mitigation Strategies and Suggestions

For continuously developing the information system (including intelligence and signalling system) and fill the felt gaps in terms of coverage, time lag and speed, the mitigation strategies have to be worked out for which the professionals and the persons working in the field must join hands. They call for frequent interchange of views and increased opportunities for them at national and regional international level. The seminar being conducted by DFD has an important role to play in this context, in providing a forum for interchange of ideas across the countries.

The various international organisations are indeed providing support to the lagging countries to come up to the standards of the growing countries. There is large scope for cooperation at regional and international level. The present initiatives are not adequate. There is a case for a "distributed information and research system" (DIRS) at the global level, as against the present UN centralised system (Raipuria, 1984).

There is large scope to increase productivity in government, albeit lack of precise indices, through information development with present S&T development. In India also, while the information base and coverage has developed since planning began and there is a definite conciousness for further improvement, there is wide scope to develop further with an objective of raising productivity in government. Our suggestions include articulation of needs of the process and formulation of the mitigation strategies to overcome the conceptual, strategic and operational problems.

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TABLE 1

Savings and GDCF Rates* of Government-Administrative Departments (GAD) Compared to the Economy, 1960-61 to 1982-83 (averages)

Year	Savings (%)		G.D.C.F. (%)	
	GAD	Economy-wide	GAD	Economy-wide
1	2	3	4	5
Three-Year Averages				
1960-63	43.0	13.8	38.9	16.4
1970-73	27.1	16.8	28.7	17.7
1980-83	30.8	22.8	34.9	24.5
% Variation				
1980-83/ 1960-1963	(-) 3.7	21.7	(-) 26.2	47.6
1980-83 1970-73	13.7	35.7	21.6	38.4

*Gross domestic cpaital formation; rate defined as percentage of product.

Source of Information: Central Statistical Organisation:

1) Transactions of the Public Sector, 1960-61 to 1979-80, New Delhi, September 1983.

2) National Accounts Statistics, 1970-71/1983-84, New Delhi, January 1986.

TABLE 2

**Incremental Capital-Ouput Ratio (ICOR) :
Economy-wide and for Public Administration**

Year	ICOR*	
	Economy-wide	Public Administration
1973-74	6.5	4.0
1974-75	6.2	4.2
1975-76	6.7	5.1
1976-77	5.2	4.9
1977-78	4.5	4.4
1978-79	4.3	3.6
1979-80	4.6	2.6
1980-81	5.2	2.0
1981-82	5.6	1.8
1982-83	5.8	1.7

*Five year averages ending in the year specificied at 1970-71 prices. In estimating ICORs, the numerator i.e. incremental value added has been calculated as the increment between three-year averages centred on the first and last year of each five-year period; the denominator i.e. investment is the sum of gross domestic capital formation over five years, lagged appropriately with respect to the value added. World Bank, India: Structural Change and Development Perspectives, Supporting Working Papers, April 1985, Report N° 5593-IN.

Source of Information : as in Table 1.

TABLE 3

**Incremental Capital-Ouput Ratio (ICOR) :
Economy-wide and for Public Administration**

	ICOR*	
	1961-62/1973-74	1974-75/1981-82
Economy-wide	5.9	5.7
Agriculture	3.7	4.5
Manufacturing	8.3	8.8
Infrastructure/Services		
Energy and Mining	8.1	18.0
Electricity , gas and water supply	16.2	21.8
Railways	18.2	8.1
Other transport	7.6	4.6
Communications	5.2	5.2
Public Administration	5.3	2.5
Other services	6.1	2.8
Memo. Item		
Public Sector	7.5	6.4

*Estimated as investment rate/growth rate of gross domestic product (GDP), at 1970-71 prices. World Bank , India: Structural Change and Development Perspectives, Supporting Working Papers, April 1985, Report N° 5593-IN.

Source of information : as in Table 1.

STRATEGY FOR MICRO-COMPUTERS IN RURAL DEVELOPMENT

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Abstract

Since the expenditure on rural development programmes is large, pay off from using computers can be immense. The paper draws upon the work done at IIMA to emphasize the need to provide access to micro computers at the district level. Examples are provided to illustrate benefits that will accrue from such usage. In addition to economic benfits like large cost savings there would be other benefits such as providing access to detailed data, improving the quality of data, providing capability of spatial and model based analysis and sharpening monitoring and control through comparisons.

However, provision of micro computers will in itself not lead to these benefits unless a host of other factors are ensured. These include a balanced approach between automation and decision supportive use of computers, involvement of district administrators in identifying and designing suitable applications and provision of package of services like software, maintenance, training by a competent agency.

Introduction

Over the last ten years the Computers and Information Systems Group at the Indian Institute of Management, Ahmedabad, has been working with several government agencies in designing and developing computer applications for rural development. Some of these efforts have already been implemented in the field and have shown significant savings accruing from the use of computer based methods. Others are demonstration systems which are used to exhibit the potential for computer-based decision making in rural development. This paper draws on our accummulated experience and outlines a proposed strategy for ensuring that computers impact significantly on the vital areas of rural development.

Rural development is becoming increasingly important for the transformation of Indian society into a modern nation. It encompasses five distinct types of activities :

i) Provision of basic infrastructure facilities in the rural areas. This covers the creation of new schools, health facilities, rural roads, drinking water supply, electrification. In many of these activities the target location is a village.

ii) Building of medium and large irrigation systems which should become instrumental in improving agricultural productivity in the rural areas. The benefits in such cases accrue to clusters of hundreds of villages comprising a region.

iii) Provision of adequate social services like health and education through increased outlays on personnel and equipment to be pressed into service in the rural areas. These are expected to bring about socio-economic development of the rural population.

iv) Schemes aimed at promoting rural industry, increasing agricultural productivity, providing rural employment. Such schemes are normally floated in specific villages/regions.

v) Assistance to individual families below the poverty line to provide productive resources which can bring about an increase in family income and therefore lift such families above the poverty line. The targetted beneficiary in such cases is the individual family.

The continuing importance of the above activities is evident from the large outlay for them envisioned in the Seventh Plan. For instance, a sum of Rs.10,000 crores is to be spent on a single programme: The Integrated Rural Development Programme (IRDP) which is intended to provide assistance to individual clients. In addition considerable sums of money are routinely spent in the districts on running existing social services. For example, the budget for primary eduction in a typical district in Gujarat is around Rs.10 crores annually. Whereas large sums of moneya are being spent in rural development, there is a feeling that much of this expenditure is not properly utilized. There is frequently a mis-match between the needs of an area and the type of assistance provided and the implementation is often weak.

Proven Benefits from Computers

Since the expenditures are large, potential benefits from using computers can be immense. This is illustrated by one of our first efforts involving a rural project in Dharampur Taluka of Gujarat (1). Here, a group of experts, after having studied the tribal taluka in detail, had recommended to the Gujarat Government the building of a road network in the taluka as well as provision of six key social services from a few selected service centres in the taluka. When an action plan was prepared by the state government agencies, the available budget was found to be totally inadequate. For example, to connect the 45 potential growth centres in the taluka by a road network, the PWD estimated a road length which would have cost the government Rs.9 crores of rupees.

At the Indian Institute of Management, Ahmedabad, computer models were developed for this problem of designing the road network to connect the 45 growth centres and a plan was evolved which brought down the cost to 20% of the original estimates. Similarly, the problem of provision of service centres was discussed in detail to define the objectives. It was shown that there was a very large number of solutions to the problem of locating service centres (around 10^{13}). A computer model was used to obtain the minimum cost solution.

Another example of the very large savings possible from using computers in carefully chosen and designed applications is demonstrated by our experience with rural road planning in several talukas in Kheda district in Gujarat (2). We were able to show that it was possible to develop a network of rural roads which would be 30% shorter than the one that was actually developed without sacrificing on the effective connectivity and access facility provided by the network. This amounts to a cost reduction of Rs.50 lakhs in each taluka. The importance of this saving can be gauged from an estimate that it would cost Rs.11,000 crores to link all villages in India by rural roads (3).

Importance of District-level Microcomputers

We feel that in order to derive the maximum benefits from using computers in rural development, it is essential to supplement the existing strategy of introducing machines at the state-capital with micro-computers at the district headquarters level. The Seventh Plan emphasizes the importance of decentralized planning and effective implementation of programmes at the district level. The working group on district planning noted the need for strengthening the compilation of data and its integration across sectors, and the use of maps to prepare spatial plans (4). Access to district level microcomputers will enhance the capability of planners among several dimensions.

Important amongst these are :

1. Flexible retrieval and analysis of detailed data
2. Improved quality of data
3. Integration of data across departments
4. Spatial analysis through graphics
5. Model based analysis
6. Performance comparisons.

Detailed data

In the past, rural planning has suffered from lack of access to detail about the client/village/taluka district on which expenditure is being incurred. Information that is required for planning may be available at the field but is generally inaccessible for purposes of analysis to either the field officers or the state level officers, because of inability to process flexibly and inter-actively the large amount of detailed data that is involved. Our experience has been that when problems of rural development have been analysed with the aid of detailed data the outcome has often been an improved plan of action.

The necessity of accessing data at a disaggregated level is even more apparent when it comes to monitoring and control of rural development programmes. We have been working closely with a Deputy Commissioner in charge of development programmes in a district in Karnataka. He has acquired a small 8-bit desk top computer for Rs.70,000/- and used the d-Base II package extensively for monitoring the IRDP. He works with the computer himself having picked up this ability through reading a few books. Currently all the data on individual clients who have been recommended for a loan by the DRDO or have been given a loan by one of the 20 banks in the district has been put on the computer. It is used for generating many of the 18-20 routine reports which are required to be sent by him to the state government (5). We have been working with a subet of his data at the IIMA comuter centre to identify the kind of analysis that could strengthen detailed operational planning and reports which would make monitoring more effective. We have discovered that if schemes have to be successful in generating additional incomes for the families they must match and complement the resources available within the village. For example, it would be no use giving loans for milch cattle in villages where the grazing-land-to-cattleratio is already poor and distances to veterinary services are large. The analysis of village data and the types of assets for which clients have been provided loans in the villages highlights the mis-matches that have been made in the past. More important, it cautions against future mis-matches of this kind. Similarly, an analysis of defaulters by the type of asset, the bank and the villages can help identify clusters of poor performance areas which can be followed by district administration to identify the reasons for default. Interestingly, the development commissioner noted that he could release some staff from paper work in his office and sent them to the field.

In almost all the programmes that we have encountered in the social services sector like family planning, nutrition, leprosy, a great amount of data is always maintained on the individual beneficiary. Such record-keeping is elaborate and takes away almost 30-40% of the productive time of the worker. Yet the capability of analysis of this data is so limited that it is of little use to the worker or officer in operational planning. The tasks in the field continue to be peformed quite divorced from the elaborate status data that is gathered. Computing at the field level can make the essential difference and provide reports which will be useful in matching the activities of the field staff with the needs of the client groups.

Data quality

Using district level computers will improve data quality since data capture wil be close to the source enabling much better validation. For example, we discuss an application later where district officers were asked to provide data on location of facilities in each village of Udaipur. Later when they analysed the data in an exercise to plan the location of new facilities they could spot several errors. The enthusiasm with which fresh data was collected to correct the errors was surprising.

Further, since the data collecting agency will depend on the same data that is transmitted upstream, the quality of state-level and national-level statistics will improve substantially. Our experience clearly indicates that if planning and monitoring have to be strengthened, computers would have to be placed at the district level because the correctness of data in all such detailed planning exercises is of paramount importance. No amount of analysis can compensate for poor quality data.

Integrated Planning through Integrated Data

An important advantage from using computers in the ability to integrate data from different sectors thus enabling better coordinated plans between different executing agencies. For example, in order to determine an effective road network it is essential to know the locations of various facilities to which the roads are intended to provide access.

The system developed for Udaipur (described later) allowed integration of data from various departments. For example, the Public Health Engineering Department could now check out those villages which had been identified for boring tubewells for the existence of a village approach road which would allow them to take their heavy rigs up to the site.

Such integrated software can also be used to make trade-offs between expenditures in different departments on the basis of existing coverage of various types of facilities and the utility of increasing the coverage in different sectors.

An essential part of effective planning at the district level is a data base of resources (inventory of resources) and a data base of households. Providing effective access to such an integrated data base is inconceivable without using computers.

Computer graphics

The problems of planning at the district level involves decisions concerning location and movement in space. The best vehicles for grasping such data are different kinds of thematic maps. In the study mentioned earlier, our ability to display a map of Dharampur taluka and inter-actively show the impact of alternate location choices on the coverage and cost on the V.D.U. was invaluable in selling the optimum solution to both politicians and the bureaucracy.

As another example, consider the generalised interactive graphic software developed by us for the purposes of planning various infrastructures facilities at the district level (6). This project was funded by the Electronics Commission and subsequently demonstrated by collecting data from Udaipur district in Rajasthan. District officers from various departments in Udaipur district were invited to a workshop in which they interacted with the software. On the basis of the annual expenditure allocated to their department, they chose specific locations where new facilities could be created. The experiment revealed that the district level officers could work with such software and found it to be extremely useful.

The software allowed them access to detailed data on each village which would otherwise have taken days to retrieve. It was possible for them to identify clusters of villages which were out of reach of existing facilities of various types and to see this data on a district map. They could work with different levels of desired reach in an attempt to cover villages which were not being served currently. Easy access to village data and the ability to draw maps enhanced in a fundamental way their analytical capability.

Model based analysis

An important advantage of computers at the district level is their ability to handle models. This is illustrated by our Dharampur taluka experience. There are typically a large number of options available and merely providing detailed data without the ability to structure this data with the aid of models would create a severe information overload. In every instance, we have found the use of models - simple or elaborate, evaluative or optimizing, to be at the heart of the effort. Models were sometimes used to develop better indices for performance and sometimes for screening choices from many alternatives.

Performance Comparisons

A final advantage of using computers is that they can be used to introduce a high degree of standardization in the government system and this would enable effective cross-comparisons to be made. Such comparisons will highlight areas of substantially better performance and enable learning to be transferred to other areas. For example, Primary Health Centre (PHC) data from several districts can be analyzed to provide clear-cut feedback to PHC's on their performance (7). Feedback has to be quick if it is to be effective, so that a computer-based analysis becomes mandatory.

Comparisons would also be helpful in achieving equitable distribution of resources.

Proposed strategy

We believe that the general trend of providing computing resources at the state level for planning will not be sufficient to make a major impact of computers on rural development. It is essential that micro-computers with suitable software be positioned at the district headquarters if the culture of computer-aided planning is to pervade rural development efforts. Dropping costs of microcoputers has made this a very real possibility. The level of investment required will be of the order of Rs.3 lakha for each district in a state - an expenditure that is no greater than that for a centralized state-level computer. The benefits, as we have argued above, would be more substantial.

Once a micro-computer becomes available at the district a number of useful applications in areas other than rural development can be taken up. Examples of such applications are : planning and monitoring of the public distribution system, and routine data processing in the education, police, revenue and treasuries departments.

However, provision of micro-computers will not in itself lead to these benefits. There are several concommittant factors which are crucial to the success of this effort. These include :

i) A clear understanding that automation of existing procedures is not enough. Designers must have a deep understanding of the problem-context and cannot be 'machine-oriented'. They must have the ability to develop models and to draw on integrated data so as to provide information which is impossible to produce manually rather than merely 'speeding up' and 'cleaning up' existing data.

ii) It is essential to involve users closely with the entire effort. District development officers, District Commissioners, Collectors and other functionaries must be committed to the effort if any real progress is to be made. The development of demonstration models and the use of these in focussed training on computers for decision makers and officers at the district level is very important.

iii) Meangingful support of decision making will often require strong research capability to test out approaches involving new algorithms and sophisticated statistical techniques.

iv) Field level implementation will require substantial use of computer software which is inexpensive. This means that software will have to be specific but capable of application to many districts to spread its cost over several users.

vi) Extensive implementation training of persons concerned with data input as well as data use will have to be undertaken.

We believe that it is possible to deal adequately with all these factors only by involving a number of actors and agencies.

IIM has plans of working with CMC Ltd., and various state governments to provide this kind of integrated package of services at selected districts. If the experiment succeeds it could provide the necessary demonstration effect for extensive use of computers and the district level. Clearly massive government support will be needed. It has to be seen whether the bureaucracy and the computer professional will rise to the occasion.

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UN EXEMPLE DE LA POLITIQUE INFORMATIQUE D'UN AUTRE ETAT AFRICAIN : LA STRATEGIE INFORMATIQUE DE LA COTE D'IVOIRE

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I - INTRODUCTION

En 1967, la Côte d'Ivoire avait opté pour une politique de centralisation de l'informatique par la création de l'Office Central de la Mécanographie chargé de :

- définir la politique informatique nationale ;
- de centraliser les moyens de traitement de l'information pour le compte des administrations publiques et para-publiques ;
- de former les personnels informaticiens pour le compte de l'Etat.

En 1979, il avait été constaté la lourdeur d'une telle organisation compte tenu de l'évolution technologique. Cette lourdeur a conduit les administrations à acquérir les propres moyens de traitement. Cette situation a abouti à une informatisation anarchique des administrations. Devant ce constat, le Président de la République par lettre circulaire a décidé de l'élaboration d'un plan informatique permettant de maîtriser le développement informatique en Côte d'Ivoire.

II - ORGANISATION DE L'INFORMATIQUE.

1. PREMIER PLAN INFORMATIQUE 1981-1985

Le premier plan informatique national a été un plan stratégique qui a défini le cadre général du développement de l'informatique. Deux idées ont sous-tendu cette stratégie :

- Maîtrise de l'informatique par les utilisateurs ;
  En d'autres termes les utilisateurs doivent assurer la maîtrise d'ouvrage de leurs projets informatiques.

- Coordination conduisant à l'harmonisation de l'utilisation de l'informatique.

Pour atteindre les objectifs ci-dessus, le plan avait prévu la réalisation des actions suivantes :

a). Création d'une Commission Nationale pour l'Informatique (CNI). chargée de proposer au gouvernement les axes de développement de l'informatique ivoirienne ;

b). Création d'un Secrétariat Général à l'Informatique (SGI) qui est l'organe exécutif de la CNI et qui est chargée de veiller, au plan pratique à l'exécution des décisions arretées ;

c). Mise en place au sein de chaque département ministériel, d'une Commission Nationale de l'Informatique (CNI). La CNI définit et oriente la politique sectorielle du Ministère ;

d). Mise en place par le SGI, de comités spécifiques chargés d'émettre des avis motivés sur un certain nombre de sujets.

. Comité système d'information pour ce qui concerne la cohérence des systèmes d'informations administratives ;

. comité normes et méthodes chargée des problèmes de normalisation et de méthodes ;

. comité formation, en rapport avec le Ministère de l'Education Nationale et de la Recherche Scientifique étudie les problèmes de formation à l'informatique à tous les niveaux :

- formation des techniciens de l'informatique ;
- formation des utilisateurs ;
- formation des formateurs.

Ce comité est aussi chargé des problèmes relatifs à la recherche en informatique.

. Comité sensibilisation

En rapport avec le Ministère de l'Information, ce comité est chargé d'étudier l'information, ce comité est chargé d'étudier les voies et moyens d'informer le grands publics sur l'utilisation de l'informatique en mettant l'accent sur les défis et les enjeux de l'informatique.

Compte tenu du fait que d'une part le 1er plan était un plan stratégique et d'autre part les utilisateurs devraient assurer la maîtrise d'ouvrage de leur informatique, des actions d'élaboration de schémas directeurs sectoriels (au niveau des départements ministériels) ont été exécutées pour aboutir à une programmation des actions au titre au quinquénat 1986-1990.

2. DEUXIEME PLAN INFORMATIQUE 1986-1990

A la lumière des plans sectoriels de développement de l'informatique, le deuxième plan a défini la politique générale suivante :

- L'importance, même de l'informatique provient de sa matière première, l'information, et entraîne des conséquences sur l'activité des grands secteurs économiques et sur les relations sociales et culturelles.

- L'information est une ressource économique au même titre que les matières premières, le capital, la main-d'oeuvre et l'énergie. Elle a une valeur d'usage, une valeur d'échange et une valeur de travail. Autant elle est disponible et bon marché dans les pays industrialisés autant elle est rare et chère dans les pays du Tiers Monde.

- L'information est essentielle à la marche des organismes tant socio-économiques que biologiques car, il n'existe pas de matières vivantes mais des systèmes dont la vie consiste en l'échange de l'énergie et de l'information par les éléments constitutifs entre eux.

- L'accroissement de la capacité de traitement, de mémorisation et de transmission de l'information est à la fois un facteur de contrôle du développement de la complexité de systèmes et la condition de la stabilité évolutive de ceux-ci par élévation du niveau de nucléation.

- L'informatique, en tant qu'ensemble de techniques et méthodes rationnelles de génération, traitement, mémorisation et transmission de l'information, tient son importance et son essor inéluctable de l'importance de l'information et de l'émergence grandissante à la conscience de l'homme du rôle que joue l'information dans le processus du développement.

- L'informatisation d'un pays est un processus inéluctable que son Gouvernement se doit de maîtriser. Elle favorise la création de gisements d'informations et la baisse du coût d'accès à ceux-ci ; ces gisements d'informations constituent l'infrastructure essentielle à la gestion efficace de l'Etat-Nation.

L'impact de l'informatique ne peut être apprécié à ses seuls résultats directs. La déclaration du Groupe de Yamoussoukro est plus explicite encore :

"Il est ainsi apparu que l'une des principales clefs à la solution du problème de développement de l'Afrique consiste en la maîtrise de la gestion rationnelle de l'information sous toutes ses formes. L'information est une ressource économique. Elle est désormais une matière première de base, dont l'Afrique est malheureusement le moins bien pourvue. De son importance économique résulte l'importance qu'il faut accorder à l'informatique sous toutes ses formes : traitement de données, de textes, d'images, de sons et de connaissances ainsi que la reconnaissance de formes.

L'apport de l'informatique au développement économique et social constitue une problématique nouvelle qui requiert des élucidations, des options politiques et culturelles, une stratégie continentale et des plans nationaux. L'urgence en est d'autant plus grande que le retard informatique de l'Afrique freine son développement et que l'avance informatique de ses partenaires lui est également préjudiciable. L'enjeu est un choix de société et une décolonisastion du futur".

Il est donc nécessaire d'en étudier les effets économiques et sociaux. En effet, l'informatique, au coeur des processus de production, de gestion, d'information, comporte de lourds enjeux touchant à l'indépendance et à la souveraineté qui ne peuvent laisser indifférents les dirigeants de l'Etat et des grandes organisations.

Il faut entendre ici, par souveraineté, la maitrise des informations, donc de leur communication vers des pays tiers, et par indépendance, la liberté des choix stratégiques.

Dans ce sens, la Côte d'Ivoire ouverte à une pratique d'échanges et de collaboration, se doit de tirer le meilleur parti de chacune des coopérations qui lui sont offertes, mais en veillant à conserver l'indépendance de ses choix stratégiques chaque fois que nécessaire.

Eu égard aux différentes décisions du Gouvernement à tout au long du quinquenat 1981-1985 et aux décisions du VIIIè Congrès du PDCI-RDA:

considérant avec satisfaction l'option déjà prise par la Côte d'Ivoire de ne pas être en reste de cette nouvelle technologie de pointe qu'est l'informatique ;

considérant l'usage indispensable de l'outil informatique dans tous les secteurs du développement économique, social et culturel ;

considérant que chaque nation se doit de disposer des informations indispensables pour le raffermissement de sa souveraineté dans la paix sociale ;

La Commission Nationale pour l'Informatique confirme son option pour une stratégie offensive tournée vers l'avenir, privilégiant les technologies avancées, notamment l'informatique et les techniques connexes.

Elle propose ce qui suit :

La Côte d'Ivoire en adoptant une politique globale, moderne et intensive de l'informatique et des techniques associées, améliore considérablement ses moyens d'action pour son développement économique, social et culturel tout en préservant dans la mise en oeuvre de cette politique, la souveraineté nationale et l'indépendance des choix stratégiques par une maîtrise des développements informatiques.

L'objectif poursuivi étant de favoriser l'intégration et le développement des techniques informatiques dans toutes les couches de la société. Cette politique peut encore ainsi se formuler :

- l'informatique en tant que facteur de croissance et de mutation économique et sociale, doit être utilisée au service du développement du pays ;

- l'informatique, en tant que point de départ d'une nouvelle révolution industrielle et d'un nouveau défi mondial, doit être maîtrisée dans la double perspective de favoriser un raccourci technologique, et de préserver l'indépendance de nos choix stratégiques et la souveraineté nationale, c'est-à-dire, la maîtrise des informations.

Il conviendra donc de la maîtriser avec les moyens adéquats principalement par la disposition de ressources humaines suffisantes et de qualité, ce qui suppose la création de pôles de compétence au sein de l'appareil de l'Etat et l'adoption d'une politique de personnels adaptés au secteur.

La mise en place d'un réseau national de transmission des données étant aussi indispensable que la réalisation d'infrastructures routières pour le développement d'une région, elle devra être considérée comme un préalable à l'insertion de l'informatique.

En un mot, l'informatique ivoirienne doit être mise au service du développement national pour accroître la productivité et améliorer le service rendu à l'utilisateur.

III - CONCLUSION

Nous constatons à la lumière de ce qui précède que la Côte d'Ivoire a opté pour une approche du plan informatique débouchant sur l'élaboration par les utilisateurs de schémas directeurs sectoriels. Il a été fait, à ce niveau, usage de la méthode RACINES.

Enfin, l'étude sur la structuration des systèmes d'information sera réalisée au cours du quinquenat 1986-1990 grâce à la méthode MERISE.

INTERNAL AND EXTERNAL REGULATIONS
AN ABSTRACT ON COMPUTERS AND LAW

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One of the most important changes in the transformation of society from the industrialized period into the information era and "the System Society" is a loss of legal stability. Legislation has for long been the stabilizing skeleton of the social body. Laws have told what is wrong and what is right, and in case of tresspass lawyers and courts have acted as doctors and the law has been a remedy. The loss of legal stability has not yet been as fully recognized as it needs to be.

Rather early, however legislators paid attention to human rights and the need to examine the protection of privacy in a comupterized society. Today special privacy protection acts have been passed in Austria, Canada, Denmark, the Federal Republic of Germany, France, Hungary, Iceland, Luxemburg, Norway, Sweden and the United Kingdom.

Some existing laws look more far reaching than others, but it is impossible to compare them without a deep-sea dive into other legislation. Of great importance to the privacy protection standard is for instance the influence of constitutional rules, secrecy legislation, procedural laws, penal codes, administrative rules etc. - which together make up the legal environment of information, for example, which can make privacy protection both stronger and weaker.

While privacy legislation was an early point of focus, computer technology in a more general way has not been reflected in an acceptable extent in other parts of national legislation. One example of the new problems is that it is hard to prove a theft of computerized information. The owner usually still has the information in his possession. It has merely been copied. It is possible to patent computers - both how they work and methods of processing - and production processes. It is also possible to protect programs by patents or other intellectual property rights such as copyright. It is however often impractical and in any case not an easy task. Already the Xerox machine and the tape recorder have partly killed the intellectual property rights and the computer may very well finish them off.

Also contract law is sometimes in trouble, as we are not used to all the changes computerization brings. Too much has become unforeseeable. Disputes between contracting parties are becoming more and more common, concerning both sales and services and both in court and in arbitral procedures.

The world is not only growing more and more cashless - bank and postal systems started the cashless trend - but also becoming signatureless. The problem is the same when we agree by word of mouth, but the dimensions today are of another kind. There is no area of legislation which is not affected.

Another legal problem entails the services offered by Teletex and other huge new databases. They will no longer just border on more traditional media such as newspapers and radio and television broadcasting which are already being regulated. They will also take over many traditional media functions and therefore require special attention.

In the 60s and early 70s some people warned against computers making the human being transparent. This problem has extended also to companies. Many multinational and other big companies have moved their internal correspondence from the traditional post or telephone channels to electronic mail systems. Lack of secrecy and security make them in many cases very vulnerable.

Aside from imperfect legislation, the legal authorities suffer from inadequate knowledge. Sometimes it is better to have no law at all than an obsolete law. The lack of competence on the part of the legal authorities makes the problem worse still, and perhaps this is one of the most serious questions in most countries that are entering the information society surfing on the Third Wave.

Laws are still made in traditional ways and legislators still think that new rules are taken care of by skilled lawyers who carefully practise the rules in case after case. It is actually not unusual for the rules to be transformed by programmers into technical terms, whereupon they are used for several hundred thousand decisions a year based on information processing. In such an environment it is not to be wondered at if some prophets believe in the need for new constitutions, as they guess the future will demand a new type of democracy.

Computer technology in its marriage with telecommunications does not care about national borders. Therefore it is rather natural that so many international organizations are involved in the legal discussions. In an international world the cherished dream should be that legislation relating to transborder matters could be developed by an international organization and adapted domestically. This seems, however, to be impossible in a world with 170 sovereign states. But it should not be. It is both a challenge and an opportunity. Instead of bringing, as in the international fora, contributions to the debate local variants of laws, built on more or less the same thousand-years-old traditions and philosphies, we could be more constructive setting up an international legal forecast institution to make recommendations and advise member countries on what ought to be done.

WORKING GROUP REPORTS

RAPPORTS DES GROUPES DE TRAVAIL

GROUP A

METHODS FOR STRATEGIC, TACTICAL AND OPERATIONAL PLANNING OF INFORMATION TECHNOLOGIES IN PUBLIC ADMINISTRATION

(English version*)

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*Version française : voir page 250

In discussing planning methodologies, the notion of "information systems" appears to be a more adequate terminology than "information technologies", encompassing better the various aspects discussed during the seminar. Therefore, the terminology "information systems" will be used during the rest of the discussions.

Planning of information systems in public administration is a very broad topic. It can be approached from various angles, such as :

a) planning of information systems at the national level only

b) planning of priorities at the various levels of government for the development of information systems

c) planning of information systems for the decision making process

d) identification of planning methods in order to achieve given objectives.

It is essential that priorities of central governments or local authorities be taken into consideration in planning public administration information systems. In the present discussions we assume that such priorities have been achieved and concentrate on the identification of planning methodologies as mentioned in point d) above.

Information systems can participate in making public administration more effective and efficient only if extensive and detailed strategic, tactical and operational planning is used in the development of these systems. Lack of adequate planning could result into inefficiencies which will not lead to productivity increases. The planning of information systems requires to address the following four dimensions:

- organization and procedures
- people
- data/information
- technology (hardware, software, communications

There is abundant evidence that lack of consideration for one or several of these dimensions in the planning of information systems leads to disappointing results.

Planning of information systems is not a one time activity, it is an ongoing process and changes as the systems are implemented.

Two different planning models were presented during the seminar. One is a highly centralized planning model based on the analyses of activities which may lead to either an approach similar to the Senegal's Schéma Directeur Informatique (1) or to a phased implementation based on the existing situation, like in the case at the Inter-American Development Bank (2).

The second is a more decentralized model, as presented in the paper of the Office of Management and Budget (OMB) of the U.S.A., where a minimum of policy guidelines are combined with strict control at the top and independent Chief Information Officers (C.I.O.) at a scarce decentralized level (states or ministries). It should be recognized however that other countries may have models which are in between of the two above mentioned models.

The choice of the model to be used in a particular country will depend upon many factors, such as : the size and the infrastructure of the country, the legislative arrangements, the availability of human resources and skills in information systems and experience in information systems in the country.

Various examples of information systems planning were discussed in detail, particularly the National Informatics Centre approach in India (3) and the NIMS Data structure model for local authorities in Sweden (4). It is agreed that data structure (5) is a very important factor to be considered in the development of information systems to ensure compatibility and communication at the national level. However, it is also recognizedthat as demonstrated in the Swedish approach, the development of the data structure is a very long and difficult exercise which belongs to long term strategic planning. The planning and development of information systems should not wait until a comprehensive data structure is obtained.

In this connection, it should be recognized that nomenclature and structure of data have already been developed in many national statistical offices, such as : geographic coding, occupational classification, commodity classification, etc., which frequently are not used in the development of national information systems. It is recommended that these data be more fully utilized.

The establishment of standards for hardware are part of the medium term tactical planning process, and are essential, especially in many developing countries, which cannot afford to build incompatibilities in the system.

In the same register, the rapid development of telecommunications technologies and notably the recent use of integrated surfaces of digital network (ISDN) lead to the creation of international systems of information in a growing number of areas. This fast evolution, and notably its impact on the definition of national data and communications standards, should be taken into consideration in planning national information systems in public administration.

It is agreed that the establishment for hardware and software were essential, especially in many developing countries, which cannot afford to build incompatibilities in the systems.

The institutional arrangement required for planning information systems was discussed at length. It is agreed that regardless whether the centralized or decentralized models are used for planning, there should be an institution - either existing or a new one - within the government with the status, authority, legislative recognition, and competency which will enable it to carry out a number of critical functions in this field. These functions may vary according to the model being used from the mere design of policy guidelines to the full development of a centrally planned information system. It was agreed that these institutions should put strong emphasis and priority on data structure starting with quantitative data. As noted above there have been significant resources of quantitative information in developing countries which, if rationally structured, could significantly enhance the information reource base. This institution should also promote the Information Resource Management (IRM) strategy, which gives information on the status of an essential resource similar to human and financial resources. It is recognized that the formation of a national committee which coordinates the standardization of data structure would be very useful. This committee should be under the responsibility of the above mentioned institution and should include the National Statistical Office among its members.

Some countries, like India, have the required expertise to develop standard hardware and software. However, it is noted that many developing countries do not have this expertise.

It is recommended that capability to assist developing countries in this area be developed in the sub-regional organizations such as ECOWAS and SADEC with the financial assistance of the international and other donor agencies. Reference is made to the use of TCDC (Technical Co-operation among Developing Countries) and particularly to the conference on Computer Communication in Developing Countries which will be held in New Delhi in 1987 (CCDC '87).

Numerous evidence of past and ongoing experiences demonstrate that the human and structural dimensions of the planning process play an essential role in the success or failure of information systems. An extensive analysis of the existing organization and procedures in the public administrations involved in the implementation of information systems should be carried out in the early stages of the operational planning process and extensive consideration given to skill requirements and the development of a training program. The elaboration of detailed and well documented operational planning procedures - such as the RACINES (6) program used in the French public administration - contributes to the success of these operations.

(1) See paper "Schéma Directeur Informatique"

(2) See paper by Yves Franchet "Technique de l'Information et croissance de la productivité dans l'Administration Publique"

(3) See Annex 1

(4) See Annex 2

(5) A data model is a logical representation of the data structures which form a database. It defines the entities of interest, the relationships between them and their attributes, including a unique identifier.

(6) See Annex 3

Annex 1

The National Informatics Centre (NIC) of India was set up to play a promotional role in creating appropriate information systems. The centre has been charged with the total responsibility for providing informatics services to government ministries/departments to catalyse decision making in government. It also acts as a nodal agency for the government for realising the following objectives:

(i) To design, develop and implement advanced computer based methodologies;

(ii) To promote adoption of computer based data management techniques;

(iii) To generate specialised manpower in the field of informatics;

(iv) To build intracity and intercity computer networks in the country for interconnecting various ministries/departments of the governments at the centre and the states and associated semi-government and autonomous organisations for setting up of a distributed governmental information system.

Annex 2

The NIMS Data Structure Model

The NIMS Data Structure Model was elaborated from the need to furnish a local planning model with background data. This model was put in operation in the beginning of the seventies.

Although the model was working very well from a methodological point of view, the organisation of input data was a problem. The data were to a great extent already collected and stored. However, they did not have a structure that allowed further compilation.

In order to facilitate the acquisition of planning information, a project on a data structure model was started in the mid-seventies by the NIMS research group at the Nordic Institution of Physical Planning (NORDPLAN). Very soon it became obvious that such a structure could not be limited to planning data but had to include all kinds of information handling at the local level.

The project started out by studying how the computer technology had been so far applied on local information handling. This revealed that mass systems were resulting from an ad hoc approach rather than built upon a common conceptual framework. This had resulted in a chaotic situation where different identifiers existed for the same type of objects, incoherent sets of standards etc.

In order to create such a conceptual framework, the group studied some 20 areas of applications such as handling of building permits, school administration, child care administration etc. Within these applications, functional operations on a very low level were identified (about 4000 operations). A representative set of these functions were analysed and it was observed

- what information was needed to start the operation
- what information was collected during the operation
- what information processing was performed during the operation such as
  - identification successes (what object types involved and their identifiers) the nature of legal operations etc.
  - classification operations processes
  - aggregation processes
  - relational successes (how the involved objects are interrelated in the operation)
  - periodical successes (how the time dimension is applied)
  - geographical processes (how the space dimension is applied)
- what information is saved (stored) from the operation
- how the archiving process is structured.

After this study (which was carried out over a period of four years) a knowledge of the information handling process in the local authorities was acquired.

The next step was to repeat the study of the operation but in a scenario where it was anticipated that a computerized information system was available which would provide a new methodological framework for each operation. We tried to free each operation from date constraints and organizational (and physical) limits.

Based on this analysis an overall information structure was produced as a synthesis. This structure implies both the requirement of each application sector and the data structure with regard to how each identified entity (persons, properties, work segments, etc.) occurs and acts throughout the whole local authority information handling activities.

Only with this overall information structure as a basis it is possible to specify the sectoral applications. This was the next step and prototypes were established for all sectors. Whenever data handling functions were similar between sectors, common software modules were produced.

The next problem was to choose a good data base handling system allowing at the same timeto complete data structures and vast amounts of data. As by the time no existing system fulfilled these requirements a system (J5) was produced in cooperation with another research group.

The model has now been successfully implemented in a few local authorities. It is now studied by many local authorities who wish to improve on their information structure.

The strategy of implementing the model is that of a long term step by step procedure. Implementation can start in any sector, thus giving the potential of further implementation in all other sectors. The following principles are suggested to the local authorities.

1. The data and information structure adapted to the local infrastructure should be accepted as a basis for all further acquisition of computer software and hardware.

2. Implementation should preferably start in sectors not already computerized. Existing systems not based on the information structure should continue to work until they are outdated and will then be replaced.

3. An institutional framework (information control functions) should be established with enough authority to secure the implementation. This institution should also be responsible for the creation and maintenance of the local data dictionary, the priorities of applications and the acquisition of hardware and software.

Annex 3

A methodology for the elaboration of a plan for informatics. The planning process is divided into five phases or activities. Following each phase the results are submitted for approval to a steering committee. The five phases are:

1. User awareness and feasibility study
2. Study of existing situations and choice of general goals
3. Elaboration of three alternative scenarios for future development based on
   a) a continuation of existing trends
   b) a maximum usage of technical possibilities
   c) a compromise solution
4. Elaboration in detail of the chosen scenario
5. Preparation of an implementation plan

Use of the methodology is obligatory for ministries in France for the quinquennial revisions of their plans for informatics. It is also used by many private organizations, partly becuase of the fact that the methodology is very well documented (e.g. check lists for activities and forms).

GROUPE A

METHODES POUR LA PLANIFICATION STRATEGIQUE, TACTIQUE ET OPERATIONNELLE DE L'UTILISATION DES TECHNIQUES DE L'INFORMATION DANS L'ADMINISTRATION PUBLIQUE

(Version française*)

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*English version : see page 242

Pour étudier les méthodes de planification, il est apparu que la notion de "Système d'information" reflétait mieux que celle de "techniques de l'information" les différents aspects abordés au cours de ce séminaire. Elle sera donc adoptée dans la suite de cette présentation.

La planification des systèmes d'information dans l'administration publique recouvre une gamme importante de sujets. On peut l'aborder sous différents angles, tels que :

a) planification des systèmes d'information au seul niveau national

b) planification des priorités à divers niveaux de l'administration publique pour le développement des systèmes d'information

c) planification des sytèmes d'information comme aide à la décision

d) identification des méthodes de planification pour atteindre des objectifs fixés auparavant.

Il est essentiel que les priorités du gouvernement national et des autorités locales soient prises en compte dans la planification des systèmes d'information de l'administration publique.

La suite de cette présentation suppose que ces priorités ont été prises en compte et se concentre sur l'approche proposée au point d) ci-dessus.

Les systèmes d'information peuvent contribuer à rendre l'administration publique plus efficace et efficiente, c'est-à-dire productive, à condition d'être précédés d'une phase de planification à la fois globale et détaillée, aux niveaux stratégique, tactique et opérationnel. L'absence de planification adéquate conduit à des systèmes inefficaces et n'engendre pas de gains de productivité.

La planification des systèmes d'information comporte les quatre dimensions suivantes :

1. organisation et procédures
2. ressources humaines
3. données
4. techniques (matériels, logiciels, communications)

La planification des systèmes d'information est une activité dynamique qui évolue en même temps que les systèmes mis en place, et doit donc être constamment renouvelée.

Deux modèles de planification ont été présentés au cours du séminaire.

Le premier est un modèle de planification très centralisé fondé sur l'analyse des activités économiques, qui peut conduire soit à une approche semblable au schéma Directeur Informatique du Sénégal (1), soit à une mise en oeuvre plus graduelle partant de la situation existante, comme dans le cas de la Banque Interaméricaine de Développement (2).

Le second est un modèle plus décentralisé comme celui présenté par l'Office of Management and Budget (OMB) américain (3), où un minimum d'orientations de politique générale sont accompagnées de règles strictes de contrôle budgétaire au niveau le plus élevé, tandis que le niveau plus décentralisé est confié à des directeurs généraux de l'information totalement indépendants. Il faut reconnaitre que d'autres pays peuvent utiliser des modèles de planification intermédiaires entre les deux types de modèle présentés plus haut.

Le choix d'un modèle de planification dans un pays donné dépend de nombreux facteurs tels que taille du pays, niveau de développement de son infrastructure, organisation juridique, disponibilité en main d'oeuvre qualifiée et expérience acquise dans le développement des systèmes d'information.

Plusieurs exemples de planification de systèmes d'information ont été analysés en profondeur, et notamment celui du Centre national Informatique en Inde (4) et le modèle NIMS d'analyse structurelle des données développé en Suéde au niveau des autorités locales (5). La structuration des données (6) est une approche essentielle dans le développement des systèmes d'information dans l'administration publique, car elle seule permet d'assurer à terme la compatibilité et la communication entre les divers systèmes d'information au niveau national. Cependant, il faut reconnaitre, comme le montre bien l'exemple suédois, que cette approche est un exercice long et difficile, qui relève de la planification stratégique à long terme,et la planification et la mise en oeuvre des systèmes d'information ne doit pas attendre l'obtention d'une structure de données exhaustive.

Beaucoup de services statistiques ont déjà élaboré des répertoires et des structures de données tels que codes géographiques, classifications professionnelles, codes produits etc. Ces travaux sont trop peu souvent utilisés dans le développement des systèmes d'information de l'administration publique, et il a été recommandé au cours du séminaire que leur utilisation soit rendue systématique.

La définition de standards pour les équipements et logiciels fait partie des objectifs de planification tactique à moyen terme, et est une nécessité, surtout dans les pays en voie de développement qui ne peuvent pas se permettre de laisser se développer des parcs de matériel et de logiciels incompatibles. De même, le développement rapide des télécommunications et notamment l'introduction récente des réseaux numériques à intégration de services (RNIS) conduisent au développement de systèmes d'information internationaux dans un nombre croissant de secteurs.

Cette évolution rapide, et en particulier son impact sur les standards de communication nationaux et les structures nationales de données, doivent être pris en compte dans la planification des systèmes d'information de l'administration publique.

Les problèmes institutionnels liés à la planification des systèmes d'information ont été longuement discutés. Quel que soit le modèle de planification utilisé, il a été reconnu qu'une institution existante ou nouvelle devrait au sein de l'Administration avoir le statut, l'autorité morale et juridique, et la compétence qui lui permettent de remplir un certain nombre de fonctions vitales pour le succès de la planification de systèmes d'information. Ces fonctions varient selon le modèle de planification utilisé, depuis la simple définition d'orientations de politique générale jusqu'au développement détaillé d'un système d'information planifié. Cette institution doit donner la priorité aux structures de données en commençant par les structures existantes. Comme il a été indiqué plus haut, la structuration des données quantitatives existantes pourrait améliorer les systèmes d'information. Cette institution doit aussi promouvoir la stratégie de gestion des ressources en information, qui vise à donner à l'information le statut de ressource essentielle au même titre que les ressources humaines et financières. La création d'un Comité National pour coordonner la standardisation des structures de données serait d'une grande utilité. L'institution décrite plus haut devrait avoir la responsabilité de ce comité et devrait inclure le service statistique parmi ses membres.

Certains pays en voie de développement, tel l'Inde, ont l'expertise nécessaire pour élaborer des standards en matière d'équipement, de logiciel et de communications. Mais la plupart des pays en voie de développement n'ont pas cette capacité.

Il a été recommandé au cours du séminaires d'assister les pays qui en ont besoin à développer cette expertise, par exemple en utilisant des institutions sous- régionales comme ECOWAS ou SADCC avec l'assistance financière d'autres organisations bilatérales ou multilatérales. La coopération technique entre pays en voie de développement pourrait également être mobilisée, et il a été fait référence à la conférence de New Delhi de 1987 sur la communication entre ordinateurs dans les Pays du Tiers Monde (CCDC 1987).

Les expériences, passées et en cours, de planification des systèmes d'information dans l'administration publique démontrent que les aspects humains et organisationnels jouent un rôle prépondérant dans l'échec ou le succès de ces opérations. Il est essentiel d'accorder à ces facteurs une place importante dans les phases initiales de la planification opérationnelle des systèmes d'information et d'établir des plans de formation détaillée en fonction des besoins. L'élaboration de procédures détaillées de planification opérationnelle accompagnées d'instructions et de documentations détaillées, comme, par exemple, celle du programme RACINES (7) utilisé dans l'administration française contribuent au succès de ces opérations.

Recommandations

Le groupe considère que ce champ d'investigation, c'est à dire les méthodes de planification de l'informatique, a une telle importance que Données pour le Développement doit continuer à l'étudier dans le cadre d'un groupe de travail.

Une première phase pourrait consister en une analyse comparative des approches méthodologiques dans un certain nombre de pays. Une telle analyse pourrait être réalisée à partir d'études de cas effectuées par les membres de DPD intéressés par le sujet. Plusieurs membres du groupe ont exprimé leur souhait de réaliser une telle étude dans leur pays (Ding Di Qing pour la Chine, A. Hallouda pour l'Egypte, Ken Jones pour la Norvège, Jean-Raoul Jourdan pour la France, William Mudiwa pour le Zimbabwe et Owe Salomonson pour la Suède).

Il convient auparavant que le secrétariat de DPD élabore un cadre commun pour ces études de cas

Les objectifs de l'analyse pourraient comprendre :

- la mise en évidence des différences entre les méthodologies ;

- la définition des facteurs essentiels qui expliquent ces différences.

Ces éléments constitueraient la base d'une seconde activité en vue de fournir des critères pour le choix de la méthode la plus appropriée.

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(1) Cf. la présentation sur le Schéma Directeur Informatique du Sénégal.
(2) Cf. la présentation par M. Yves Franchet "Technique de l'information et croissance de la productivité dans l'administration publique".
(3) Cf la présentation par MM. Hermann Habermann et Frank S. Reeder "Increase of productivity in public administration through the use of information technologies in the U.S. Federal Government Administration".
(4) Cf Annexe 1 (voir version anglaise du rapport de groupe)
(5) Cf Annexe 2 (voir version anglaise du rapport de groupe)
(6) La structuration des données est une représentation logique de la structure des données qui forment une base de données. Elle définit les unités étudiées, leurs relations et leurs attributions, y compris une identification unique.
(7) Cf annexe 3 (voir version anglaise du rapport de groupe)

GROUP B

METHODOLOGIES AND TECHNOLOGIES TO PROJECT TOTAL PROJECT COSTS, MONITOR AND CONTROL PROJECTS AND RELATED EXPENSES AND EVALUATE INCREASES IN PRODUCTIVITY

(English version*)

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1. DEFINITION

The group focussed on information system projects in public administration, that is, we are dealing with activities whose goal is to develop an information system making use of new computer-based communications and data processing technologies to improve public sector productivity. By "public sector" we simply mean to exclude projects that are situated in for-profit or competitive private sector organizations.

Our report concerns how to understand and evaluate productivity improvements from the new technology ; but we recommend that any such project first be assessed in comparison with other alternatives for increasing productivity in the public sector whether computer-based or not.

Further, we concentrated our attention on information system implementation primarily rather than technology creation (which is outside our scope) or user training (which is the subject of another group). But we do not intend that people leave these out of account in project evaluation.

2. SUMMARY

The group concluded that analysis of productivity of public sector information system projects is always necessary.

- This is so in spite of the fact that there is not a single concept of productivity that can be applied universally to all projects.

- It is so even though many important aspects of productivity cannot be precisely quantified.

We provide therefore a recommended framework for conceptualizing productivity - general guidelines for evaluating the impact of projects - and finally examples of specific methods of assessment.

We suggest that the concepts and procedures be treated as tools to be adapted and modified to suit specific projects, rather than as fixed formulae.

We strongly believe that making explicit in advance what are a project's expected effects and the ways they will be evaluated will both improve the accuracy of the projections for the project and also help public administrators learn how to improve productivity assessments of future projects.

Finally, we urge that in the evaluation process both costs and advantages be conceived as comprehensively as possible in the beginning, even if not all the elements will be assessed. Simply taking them into account conceptually may help prevent some of the serious projection errors that have been so frequently reported.

3. CONCEPTUAL FRAMEWORK

Below we provide a general framework for evaluating information system projects. There are three stages in a complete evaluation of such projects :

(1) EX ANTE (in advance of project)
(2) DURING (monitoring or formative evaluation)
(3) EX POST (after completion)

(1) EX ANTE assessment attempts to project the productivity advantages; these should be expressed as a limited set of objectives that can be measured or at least observed. Costs and methods of realising these objectives by installing an information system need to be specified, schedules adopted, and staffing programmed.

(2) EX POST assessment determines what resources were actually used (time, costs, etc/.) and how close they are to expected values. It also determines what advantages were actually realised in comparison with objectives.

- very often, the expected benefits will be long-term gains which cannot be evaluated until the system has been in place for several years.

- very often, the nature of a project will change during implementation; because of changing needs, new technologies becoming available, and new objectives added.

(3) MONITORING, or evaluation during implementation, is to keep consistency between the objectives and what is actually happening.

- it is important to check regularly to see if targeted outcomes are being achieved. If the expressed effects are expressed objectively and precisely, it is possible to monitor progress towards these targets.

- the monitoring process can continously reconcile the evolving projects' objectives with the overall goal and ex post evaluation.

There are three domains for evaluating the effects of every public sector project, whether ex ante or ex post :

- (i) Financial/economic cost-benefit analysis (well known methods and techniques);

- (ii) Programmatic benefits related to the specific mission of the organisation;

- (iii) Broader social gains to be realised.

Even in the competitive sector, (i) and (ii) are always undertaken. For information system projects, however, the standard techniques for assessing (i) and (ii) are not readily applied. There is little understanding in any type of organization about how to evaluate information systems projects with respect to objectives (i) and (ii). The public sector uniquely has the responsibility of an even more difficult evaluation - assessing a project's impact on domain (iii), the broader social goals.

A great deal of work needs to be done to refine established techniques in areas (i) and (ii) if we are to go beyond the calculation of numbers of characters or pages or messages per unit time or per employee. Even more needs to be done to develop assessment methods for evaluating social impacts. In addition, the following special problems must be confronted :

- how to evaluate a project that is changing, evolving ?

- how to evaluate, given that the effects of such projects are both uncertain and politically sensitive?

- in Public Administration, every project always has a political objective to justify it. How is this assessed?

- every project always produces private gains as well (reflected in the costs of purchases from private vendors). These must be monitored for fairness.

- often the public sector initiates but does not implement or continue a project; this is done by the private sector. What are the implications for evaluation?

- effects occur in the short and long term ; how can project evaluation deal with the fact that social and even specific benefits may lie far in the future?

4. RECOMMENDED PROCEDURES

(Steps to follow for project evaluation)

a) In any evaluation, the costs (expected, ex ante and actual, ex post) as well as the benefits (first expected, then realized) must be broken down into the three components :
   - financial
   - specific mission-related advantages
   - broader social gains

b) Then the elements within each component must be listed as comprehensively as possible, both on the cost side and on the benefit side. For example, costs must take into account the social cost of reorganizing work when information technology is introduced. Qualitative benefits such as accuracy in public records or more equity in access to information need to be included as well as quantitative ones.

We recommend that these elements be concerted into precise checklists so that all aspects of cost and benefit are considered in the analysis of a project.

- some items in the checklist (especially the economic costs and benefits) can be given quantitative measures

- some can be represented by rough estimates ("Rules of xxxxx" defined ratios, approximations based on experience).

- some may be only checked for presence/absence, or represented by ordinal classification.

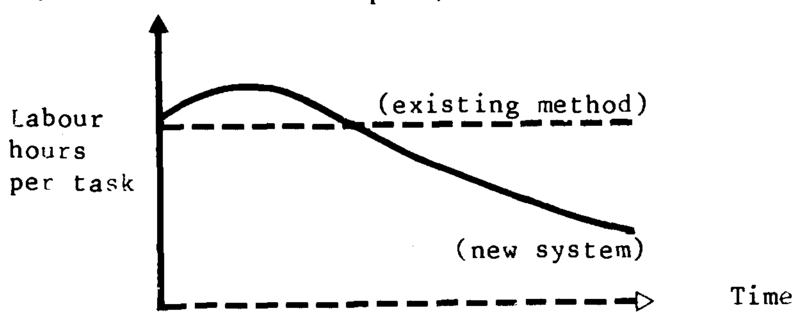
c) The components and their elements must be assigned weights to represent their relative importance. For example, if a project has great social significance or is required by law, then while its economic costs/benefits must be estimated, their weight will be low compared to the social goal served. In other instances, the social value may be negligible.

d) Weights assigned to the components and techniques for measuring or otherwise representing their elements in the evaluation depend on the nature of the project. For example, a detailed and exhaustive analysis should be undertaken only if the project is large scale; small projects may rely more on assessments by approximation.

e) Last, actual vs. expected benefits, and costs can be compared for evaluation purposes in a number of ways. More detail is provided in the appended material. Here we give some summary examples :

   - scenario construction

   The effects of various types of projects can be projected over time given no change, and given the introduction of different types of information systems (both ex ante and ex post).



- Social accounting

Social accounting methods for projects which are large enough to have an impact on the aggregate social economy. Here, the effects of the project are assessed on the growth in the Gross Domestic Product, public sector savings, investment rate, the capital-output ratio, etc.

It must be noted that this method does not take into account the operation of the informal sector; in cases where the informal sector is large, the approach by scenarios is more appropriate.

- Traditional cost/benefit analysis

Standard accounting methods (e.g. examining net present value or internal rate of return) are not described here because they are better known than other approaches to evaluation. We recommend that public sector evaluations not rely exclusively on these, because the accounting often overlooks costs (as well as benefits) that are hard to estimate (e.g. creating or maintaining local expertise for system use and support). We believe the omission of elements not easily quantified is responsible for many budget failures.

In general, we believe the inclusion of a conceptual framework and qualitative elements in evaluation provides better methods for assessing performance or productivity improvements. To the extent that feedback loops are built in for judging the evaluation itself, public sector organizations can learn from previous successes and failures to develop robust evaluation techniques for future projects.

For this end, sharing experiences nationally and internationally will be of significant value, permitting a more rapid and more adequate development of methods for understanding the advantages and disadvantages that information technology brings to the public sector in the performance of its myriad functions.

GROUPE B

METHODES ET TECHNIQUES
PERMETTANT DE PREVOIR LE COUT TOTAL DES PROJETS,
DE CONTROLER LES PROJETS ET LES DEPENSES CORRESPONDANTES
ET D'EVALUER LES ACCROISSEMENTS EN PRODUCTIVITE

(Version française*)

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*English version : see page 255

1 . CHAMP DE L'ETUDE

Nos discussions se rapportent aux projets de systèmes d'information dans l'administration publique, c'est-à-dire que nous nous occupons des projets dont le but est de développer des systèmes d'information qui utilisent les nouvelles techniques de l'informatique et de la communication pour améliorer la productivité dans le secteur public.

S'agissant de l'administration publique, il a été considéré que les projets entrant dans le champ de l'étude ne se situaient pas dans le secteur concurrentiel.

Notre rapport se concentre sur la compréhension et l'évaluation des accroissements de productivité qui peuvent être obtenus à partir de l'utilisation de technologies nouvelles. Nous souhaitons toutefois souligner que tout projet doit d'abord être évalué en comparaison avec d'autres solutions alternatives, informatiques ou non, pour l'amélioration de la productivité.

D'autre part, nous limitons notre analyse à la mise en place de systèmes d'information et nous ne nous préoccupons pas de développement de techniques (ce qui est en dehors de notre champ d'étude) ou de la formation (ce qui fait l'objet d'un autre groupe de travail). Cela n'implique aucunement que ces aspects ne doivent pas être pris en compte dans l'évaluation des projets.

2. RESUME

Tout projet de mise en place de systèmes d'information dans l'administration publique nécessite obligatoirement une analyse et une évaluation de la productivité.

- bien qu'il n'existe pas de concept unique de productivité qui s'appliquerait universellement à l'ensemble des projets.
- bien qu'il ne soit pas toujours possible de quantifier avec précision certains aspects de la productivité de l'administration.

Il nous semble important de définir un cadre général permettant la conceptualisation de la productivité et d'y inclure des propositions sur les méthodes d'évaluation de l'impact des projets. Des exemples spécifiques de ces méthodes seront exposés.

- ces concepts et ces procédures doivent être considérés comme des outils qui seront adaptés et modifiés en fonction de chaque projet spécifique. Il ne peut y avoir de formules fixes.

- nous insistons sur l'importance de spécifier à l'avance l'impact prévu du projet ainsi que les méthodes d'évaluation de ces effets. Ceci contribuera à l'amélioration des prévisions et permettra aux administrateurs d'améliorer leurs techniques de prévision pour les projets futurs.

Finalement, nous insistons sur l'importance dans le processus d'évaluation d'analyser dès le départ l'ensemble des coûts et des avantages de façon exhaustive, même si certains de ces éléments ne seront pas pris en compte ultérieurement. L'inclusion de ces éléménts dans le cadre conceptuel permet d'éviter de graves erreurs de prévision qui sont faites fréquemment.

3. CADRE CONCEPTUEL

Nous présentons ci-dessous un cadre général pour l'évaluation d'un projet de système d'information:

Il y a trois stades dans l'évaluation des projets des systèmes d'information :

(1) EX ANTE (avant le début)
(2) PENDANT (suivi, évaluation forma-tive)
(3) EX POST (après la fin du projet)

(1) L'évaluation EX ANTE a pour but de faire une projection des gains en productivité, qui doivent être exprimés en un ensemble d'objectifs limités qui peuvent être mesurés ou au minimum observés. Les coûts et les méthodes pour la réalisation de ces objectifs par la mise en place d'un système d'information doivent être spécifiés, des calendriers adoptés, et l'utili-sation des ressources humaines pro-grammée.

(2) L'évaluation EX POST détermine les ressources qui ont été actuellement utilisées (temps, coûts, etc.) et l'écart avec les valeurs prévues. Elle détermine aussi les avantages qui ont été actuellement obtenus en comparaison avec les objectifs.

- souvent, les bénéfices ne seront obtenus que dans le long terme, et ils ne peuvent être évalués avant l'utilisation du système pendant plusieurs années.

- souvent, la nature d'un projet sera transformée pendant réalisation: soit il y a des besoins nouveaux, soit des techniques nouvelles deviennent disponibles ou encore, des objectifs supplémentaires rajoutés.

(3) Le suivi ou l'évaluation pendant la réalisation a pour but de maintenir la cohérence entre les objectifs et ce qui se réalise.

- il est important de vérifier régulièrement pour savoir si les objectifs précis sont atteints. La précision et l'objectivité dans la spécification des objectifs à réaliser rend possible le suivi du progrès vers le but.

- le processus de suivi doit continuellement réconcilier d'un projet qui évolue avec le but global et l'évaluation ex post.

Les méthodes d'analyse et d'évaluation ex post et ex ante sont souvent similaires et font appel aux mêmes techniques.

La première étape consiste à décomposer le but global - l'accroissement de la productivité ou du rendement dans l'administration publique - en objectifs élémentaires.

- ces objectifs seront souvent le reflet de la mission particulière de l'organisation.

- le projet - la mise en place d'un système informatique d'information - doit être défini en fonction de ces objectifs ou besoins.

- ensuite les ressources financières, matérielles et humaines ainsi que les autres besoins et contraintes du projet doivent être déterminés.

- l'évaluation nécessite la comparaison des avantages espérés avec le niveau d'effort que le projet nécessite.

Il y a trois domaines pour l'évaluation des effects de tout projet du secteur public, que ce soit ex ante ou ex post :

Dans le secteur concurrentiel, (i) et (ii) sont toujours pris en compte. Toutefois, pour ce qui concerne les projets de systèmes d'information - que ce soit dans le secteur concurrentiel ou dans l'administration publique - les techniques d'évaluation (i) et (ii) sont encore à l'état embryonnaire. Beaucoup reste à faire pour préciser ces techniques si nous souhaitons aller plus loin que le seul calcul du nombre de feuilles ou caractères par unité de temps.

L'administration publique a de plus la responsabilité d'une évaluation encore plus difficile - l'évaluation de l'impact du projet dans le domaine (iii): les objectifs sociaux.

Ci-dessous, nous proposons une liste d'étapes qui pourraient être suivies pour l'évaluation d'un projet:

(a) Dans toute évaluation, les coùts (prévisionnels - ex ante - et réels - ex post -) et les avantages (prévisionnels et réalisés) doivent être analysés selon les composantes :

- financière
- spécifiques à la mission de l'organisation
- sociale et globale.

(b) Ensuite, une liste aussi complète que possible, de tous les éléments de chaque composante (aussi bien pour les coùts que pour les avantages) doit être préparée. Par exemple, dans les coùts, il faut prendre en compte le coùt social de la réorganisation du travail impliquée par l'introduction de l'informatique. Des avantages qualitatifs - tels que l'amélioration de la qualité de l'information du secteur public, ou une plus grande égalité dans l'accès à l'information - doivent être pris en compte à côté des données purement quantitatives.

L'analyse des ces éléments pourrait se faire à l'aide d'une liste de contrôle ("checklist") afin de ne point oublier certains éléments de coûts et avantages.

- à certains éléments de la liste pourrait être associée une mesure quantitative (par exemple pour les coûts et avantages et économiques).

- d'autres pourraient être représentés par des approximations (basées sur l'expérience ou des ratios définis).

- d'autres encore pourraient être représentés par un indicateur d'absence ou de présence ou encore par un classement ordinal.

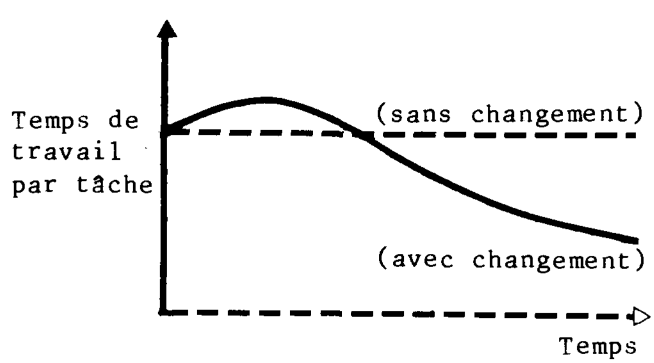
(c) Ensuite, des pondérations doivent être attribuées au différents éléments selon leur importance relative. Par exemple, pour un projet avec un grand impact social ou encore où la collecte d'informations précises est prescrite par la loi, les éléments économiques peuvent se voir attribuer un poids faible. Dans d'autres cas, le facteur social pourrait être égal à zero.

(d) L'estimation de l'importance relative de chaque facteur ainsi que les techniques pour les représenter dépendent essentiellement de la nature du projet. Par exemple, une analyse exhaustive et très détaillée n'est essentielle que dans le cas de projets importants. Par contre, pour les petits projets, il suffit d'adopter une analyse par approximation.

(e) En dernier lieu, nous comparons les prévisions avec ce qui a été réalisé. Il existe plusieurs techniques pour ce faire. Nous donnons ici quelques exem-ples sommaires:

- La méthode des scénarios:

Plusieurs scénarios peuvent être construits pour prévoir l'évolution d'un système dans le temps avec ou sans introduction de systèmes d'information, et les différences évaluées. Le tableau suivant illustre cette méthode:



- La comptabilité sociale

Pour des projets d'une certaine taille qui peuvent avoir des effets sur les aggrégats économiques, une méthode baséee sur l'analyse de l'impact de l'introduction d'un système d'information sur ces aggrégats économiques (tel que le PIB du secteur public, le taux d'épargne et le taux d'investissement du secteur public, le rapport capital-produit, etc.) peut être utilisée.

- Le techniques financières conventionnelles

Dans certains cas, ces techniques (bien connues) pourraient être utilisées. Toutefois, nous ne pouvons nous limiter à la seule évaluation financière. Nous pensons que l'omission des aspects non-financiers est souvent à l'origine des sous-estimations du coût final des projets informatiques.

En général, nous pensons que l'utilisation d'un cadre conceptuel et l'inclusion de facteurs qualitatifs permettent de mieux évaluer l'accroissement de la productivité ou de la performance. Dans la mesure où nous introduisons des contrôles ("feedback loops") de la méthode d'évaluation elle-même, les organismes du secteur public peuvent tirer des enseignements pour affiner leurs méthodes d'évaluation pour les projets futurs.

Le rapprochement des expériences conduites aux niveaux national et international permettrait d'améliorer et d'aller plus vite dans l'élaboration de ces techniques.

GROUP C

SOCIAL AND BEHAVIOURAL APPROACHES TOWARDS INCREASING PRODUCTIVITY

(English version*)

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1. BACKGROUND

At the present time, governments in all countries, developing and developed, are seeking to maintain and improve public services in conditions of severe financial constraint. They also face the problem of having to make policy decisions of a strategic nature in areas which may be poorly understood and where the information is incomplete. Included among these complex decision-making problems are :

- how to ensure economic growth in a turbulent, uncertain international economic environment ;

- how to allocate existing economic resources among competing public services e.g. health, housing, education ;

- how to meet the demand for new services from the public in areas such as environmental control, consumer protection, participation in decision-making.

There is also the on-going pressure to rationalise and improve the effectiveness and efficiency of public service agencies themselves.

Computerisation is seen as an important means of improving the functioning of public services, both at the decision-making level and at the service delivery level. Computerised systems currently are generally oriented towards routine processing in the administrative area e.g. social security, taxation. It is recognised, however, that more advanced technologies may be useful in facilitating decision-making under conditions of uncertainty e.g. decision-support systems, economic and financial modelling. It is also being increasingly recognised that information should be regarded as an important organisational resource in much the same way as capital and labour. Public service organisations must safeguard their information resources carefully if they are to contribute effectively to government policy-making in important economic and social areas. In this regard, however, the acquisition of information in itself will not necessarily lead to good decisions or an improvement in the quality or quantity of public services. Careful diagnosis and analysis of problems is needed to determine appropriate information needs. Furthemore, cost-benefit analyses must be undertaken to ensure that scarce resources are invested only in information systems which are necessary and will result in important, positive outcomes. It is important to take explicit account of the pre-existing organisational structure and administrative and social arrangements in the design and implementation of information systems. Otherwise, there is a danger that technical solutions will be imposed which will not be appropriate to the situation or which will not work effectively because of employee resistance or lack of knowledge. From the point of view of the general public also, it is important that social and human issues be considered in parallel to technological questions when a new system is being designed.

2. GUIDELINES

Given the above background, governments need a set of guidelines to ensure the proper utilisation of computerised information systems. Among the areas in which guidelines are needed are :

- impact of information systems on the general public
- work re-organisation
- user participation
- motivation of employees
- training.

2.1 The General Public

The ultimate aim of many computerised information systems in public administration is improved service to the general public. In setting objectives for systems, designers and decision-makers should seek to reduce unnecessary bureaucracy and "red-tape". Systems should be designed in such a way as to increase speed and equitability of service to individuals, ensure privacy and confidentiality of personal data and provide increased possibilities for participation in decision-making.

Additionally, the objective should be to decentralise services where administratively and technologically possible, that is, to bring services closer to the public who are the ultimate end-users.

2.2. Work Re-organisation

The introduction of technology offers an important opportunity to review existing work procedures and organisation. It is almost always possible to streamline procedures to the benefit of both the employees and the administration. Among the initiatives which ought to be considered are :

- the elimination of unnecessary procedures and duplication of activities through a thorough and comprehensive analysis of existing work systems, clerical or automated ;

- standardisation of procedures to ensure consistency and equity of treatment ;

- delegation of decision-making to the appropriate level and a reduction in the number of hierarchical levels ;

- development of job descriptions and job profiles to ensure that "the right man is in the right place". Too often, skills and capabilities of employees are not used effectively because of inadequate personnel management practices ;

- job enrichment and enlargment to ensure that employees have varied and challenging tasks. In this context, the possibility of creating teams or work groups should be considered.

2.3 User Participation

One of the most important prerequisites to successful implementation of computerised information systems is active and positive user involvement. Every attempt should be made to ensure that the users' knowledge and experience is utilised in the design, planning and implementation of systems. There should be user representatives on all project steering committees to ensure that human and administrative factors are addressed in the development of computer systems, it is not just a question of getting the "right system" in the technical sense. It is also important to "get the system right" and this can only be achieved through user participation at all levels and at all stages of the project.

Participation should not be restricted to only managers but should also include lower level employees. This will lessen the possibility of user resistance or non-acceptance of the system. Participation, therefore, has practical benefits from both a psychological and cost point of view.

2.4 Motivation of Employees

Employees will be motivated to accept and work with computerised systems if they are convinced that benefits will follow from their introduction. In many instances, the benefits will be in terms of reduced monotony of work, improved work environment and the satisfaction of providing a better service to the public. However, it may also be necessary in certain circumstances to review existing reward systems e.g. salary structures, promotion systems. It is necessary to develop mechanisms and procedures to ensure on-going motivation of staff once the novelty effects of computerisation have worn off.

2.5 Training

The importance of training of all categories of employees cannot be overestimated. In this regard, the training of senior managers and decision-makers in the potential of technology use is just as important (maybe even more so) than systems training for end-users. Without a knowledge of information technology in general, it is not possible for managers to make a positive contribution to the design and planning of projects in their own areas of responsibility. In some countries, it is mandatory for managers to acquire this expertise. Incentives are offered in the form of financial bonuses or a recognised diploma or certificate to encourage management to acquire and update their knowledge of the non-technical aspects of computer-based information systems.

2.6 Summary Remarks

The **process** whereby computerised information systems are introduced into public service organisations is just as important a determinant of the success of computerised information systems as good technical design and planning. Experience has shown that a **socio-technical approach** is the most effective approach to ensuring optimum use of technology in public administration. The key features of this approach are diagnosis of existing work systems and the active participation of users at all levels. The objective is to find an integrated solution to the administrative or decision-making problem which will promote an improvement in the functioning of the organisation, while simultaneously ensuring that the interests of employees and the general public are satisfied.

GROUPE C

APPROCHES SOCIO-ORGANISATIONNELLES ET COMPORTEMENTALES
DES ACCROISSEMENTS DE PRODUCTIVITE DANS L'ADMINISTRATION PUBLIQUE

(Version française*)

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1. CONTEXTE

Les gouvernements, dans pratiquement tous les pays, sont confrontés à des problèmes complexes d'ordre organisationnel, financier et de gestion de l'information.

En conséquence, la prise de décision dans un tel contexte doit prendre en compte plusieurs stratégies appelant les interrogations suivantes :

- comment assurer une croissance économique suffisante face à l'utilisation des conditions économiques internationales ?

- Comment, par la participation à la prise de décision satisfaire les nouveaux besoins du public et assurer la protection du consommateur ?.

- Comment améliorer la situation d'une admministration complexe ?

Un système d'information automatisé (simulation économique, financière etc.) peut faciliter la prise de décision dans ce climat d'incertitude et contribuer à l'accroissement de la productivité de l'activité administrative.

Ainsi, il apparaît clairement que l'information en elle-même devient de plus en plus un facteur de production au même titre que le capital et le travail. Il en résulte que chaque gouvernement se doit de maîtriser et de sauvegarder soigneusement son capital en information.

A cet effet, il est indispensable de prendre en compte les aspects techniques et sociologiques résultant de l'introduction de techniques nouvelles au moment de la conception et de la mise en oeuvre du nouveau système.

2. LIGNES DIRECTRICES

Un certain nombre de lignes directrices doivent guider les gouvernements dans la recherche de solutions appropriées. Au rang de celles-ci, il convient de citer :

- l'impact sur le grand public ;
- la réorganisation du travail ;
- la participation des utilisateurs ;
- la motivation du personnel ;
- la formation.

2.1. IMPACT SUR LE GRAND PUBLIC

Les objectifs assignés aux nouveaux systèmes d'information automatisés doivent aboutir à la réduction des pesanteurs administratives et à l'optimisation des coûts de gestion.

Il est important de ne jamais perdre de vue les objectifs généraux de performance accrue, d'équité, de protection des libertés et de possibilités, pour les utilisateurs, de participer à la prise de décision au moment de l'élaboration de nouveau système d'information automatisé.

Egalement, chaque fois que le progrès technologique le permet, l'on ne doit pas perdre de vue la nécessité de décentraliser les systèmes.

Enfin, il importe que le grand public puisse comprendre les plus- values générées par un nouveau système.

2.2. REORGANISATION DU TRAVAIL

L'introduction d'un système automatisé exige presque toujours une réorganisation du travail dans l'organisme considéré. Elle doit être l'occasion, s'il en était besoin, de bien définir les profils de poste et de carrière ainsi que les actions de formation y afférentes.

En effet, le processus d'automatisation d'un système, peut très souvent se révéler comme l'occasion appropriée de réorienter les procédures dans une voie plus efficace.

2.3. PARTICIPATION DES UTLISATEURS

Un des préalables les plus importants, pour une mise en place réussie de tout système automatisé, est la participation effective de l'utilisateur aussi bien dans les phases de conception de planification que de réalisation. Ceci est d'autant plus vrai que les utilisateurs sont les seuls acteurs connaissant réellement tous les asspects du processus à automatiser et en sont les destinataires privilégiés.

Aussi est-il important de tenir compte de l'aspect psychologique dans la mesure où l'utilisateur ressent qu'il est impliqué dans toutes les phases du processus, qu'il sera convaincu que l'on aura pris en compte ses besoins et qu'il sera donc plus motivé pour accepter le système.

2.4. MOTIVATION DU PERSONNEL

Afin de faire participer activement les personnels de l'administration au processus d'automatisation, il est nécessaire de les motiver. La clarté des objectifs du système constitue l'un des moyens d'assurer cette motivation. Il en est de même des possibilités d'évolution de carrière, des appointements et autres primes, du sens de la responsabilité, d'un travail intelligent ainsi que la fonctionalité des procédures.

2.5. FORMATION

L'importance de former toutes les catégories de personnel ne doit pas être sous estimée en ce sens que la formation du personnel lui donne la possibilité de comprendre et d'accepter les nouvelles technologies. De ce fait, la participation à des actions de formation et de sensibilisation doit être encouragée.

Toutefois il convient de veiller à la définition de programmes de formation adaptés à chaque catégorie de personnel (décideurs, personnel d'encadrement, personnel d'exécution).

2.6. REMARQUES/RESUME

Le processus d'introduction des systèmes d'information de l'administration est aussi important que la qualité de la conception technique de la planification : il en détermine en réalité le succès. Une expérience montre qu'une approche socio-technique est la plus utile pour assurer l'utilisation optimale des nouvelles techniques de l'information de l'administration publique. Les éléments fondamentaux de cette approche sont le diagnostic des méthodes de travail existantes, des structures d'organisation avec des procédures de fonctionnement, avec une participation active des utilisateurs à tous les niveaux. L'objectif est de mettre au point une solution intégrée au problème, soit de gestion administrative, soit de prise de décision, que concerne l'introduction du système d'information en question, de manière à promouvoir l'amélioration du fonctionnement de l'organisation, tout en assurant que les intérêts des employés et le public sont pris en compte.

GROUP D

TRAINING AND SUPPORTING THE USERS OF INFORMATION TECHNOLOGIES IN PUBLIC ADMINISTRATION

(English version*)

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SCOPE : It was recognized that to increase productivity in public administration through information technology would require emphasis on training of various actors involved in the design, implementation and use of information systems. Rather than catalogue training needs for all types of functionaries, the group attempted to prioritize the tasks. It was also proposed that the group's recommendation should cover short term and long term solutions. This report outlines the recommendations. It also presents (as annexures) status reports from some countries represented in the group.

TRAINING OF USERS

1) It was strongly felt that greater emphasis needs to be put on training of users, computer professionals and trainers for fully exploiting the potential of computers in public administration. Currently the importance of training is not being recognized by informatics policy makers in most countries.
   To highlight the importance of training, it is proposed that regional workshops could be held with participation from concerned ministers and senior civil servants to focus on various issues in training. These could be supported by international agencies.

2) In terms of user training, priority should be given to senior civil servants to create the right climate for developing productivity oriented applications.

   For these administrators exposure to computers should preferably be integrated with wider training in public administration. The objective of the training would be to demystify computers, demonstrate their potential and illustrate its limitations. This could be best done through suitably designed demonstration packages and some hands-on experience with PCS.
   Exposure on computers also needs to be provided to middle level civil servants, particularty those who deal with information services. These would include statisticians, economists, planners, documentation specialists. The training should be based on easy-to-use packages like spreadsheet, data base manager, word processing which are available on PC's.

3) Training of users should not be seen as a one time activity. It should be a continous process comprising of initial training programmes, subsequent refresher courses and user assistance on a permanent basis.

4) In many countries governments will need to take the initiative, as existing resources which can handle training may be scarce. Different countries have successfully experimented with different solutions. For example central civil serivce training institutions, existing management and public administration institutes, universities have all been used. It is important that the trainers who handle such training should have a user's perspective on computers and not a technician's perspective.

5. Professional societies particularly those whose members work as civil servants could also play a role in some countries. Mass media can also play an important role in moulding public opinion which is conducive to computerization. Well presented TV programmes have been successfully used in some countries.

6. For middle level civil servants, resource centres (PC laboratory) may be created where they could get exposure in a self learning mode with limited assistance from resource personnel present in the labs. Such centres could also be equiped with other training aids like videofilms, CAI packages, books etc.

TRAINING OF COMPUTER PROFESSIONALS

The following types of professionals need to be trained

- Information Analyst
- Systems Analyst
- Programmers
- Operators/Data entry personnel
- Technical specialist

1. In choosing applications and designing systems, there is very little interaction amongst users and professionals. Such interaction can be facilitated by broadening the training of specialists to include modules on communication (written and oral) exposure to organizational functions and interpersonal skills. This could also help in improving the choice of applications.

2. Since information technology is evolving rapidly there is need to update the knowledge and skill of professionals through periodic refresher courses.

3. In most countries there are no dedicated institutions to train information analyst/systems analyst. Resources for training professionals are grossly inadequate, particularly in developing countries. The calibre of trainers, equipment required, are of such order that many developing countries find it difficult to establish training institutions.

It is strongly recommended that regional centres may be set up to train new computer professionals, offering refresher courses to existing professionals and to do research in promoting effective uses of computers in developing countries. Faculty of such institutions need to keep in constant touch with practices.

Perhaps setting of such regional centres will require a strong initiative and support from international agencies.

NEED FOR A NATIONAL MASTER PLAN

1. There is a great shortage of trained professionals, trainers on the one hand and sometimes surpluses of certain categories of professionals in many countries. In case of shortage governments are not able to compete with the private sector, and are therefore not able to recruit and retain professionals. Corrections to such unbalance take time because of long duration of academic programmes. Therefore there is basic requirement of developing a manpower master plan in consonance with the computerization plan of each country. Since rapid developments are taking place such master plans need to be continuously updated. This master plan should also include user training particularly for estimating the number of trainers required.

   In fact most countries face a severe shortage of trainers. Users' trainers could be drawn from civil servants (those who have been trained and found to be good communicators), computer professionals with the right orientation, professional institutions and societies.

2. With such a severe shortage of trainers, greater reliance has to be placed on pedagogical tools like video assisted instructions, films, computer aided instruction. In developing country contexts, good books need to be written and the already available pedagogical software needs to be shared. Trainers should also be exposed to such tools.

LONG TERM SOLUTIONS

In the long run computer exposure would have to be integrated with the education system from which most of the public servants are drawn. It is recommended that such exposure be initiated in universities, professional institutions and in schools keeping in view the available resources within each country. It is important to integrate use of computers in all disciplines and not just focus on language training. Perhaps the first place to begin would be in institutions which train teachers.

PROPOSAL FOR A WORKING GROUP

Since the problem of training is very important, it is proposed that DFD work in this area on a continuous basis. Interested DFD members could be invited to participate in such a working group, which could take the following types of activities.

a) Developing case studies on selected developing and developed countries on the national strategy for training and manpower development in computers

b) Taking up specific research projects e.g. evaluation of use of computers in schools

c) Developing curriculla for various types of training programmes

d) Establish a catalogue of available Information Technologies Training Aids (video, CAT, etc.)

Such activities could culminate in the designing of a workshop for trainers to be held in different regions which could further lead to pilot projects in some countries. International assistance could be sought for such activities.

ANNEXURE

The training of French Civil Servants in using information technologies

1. A comprehensive diagnosis

In 1984, an interministerial project was launched, initiated by CESIA (Center for Studies of Government Information Systems) in order to :

- make a diagnosis on the status of civil servants training in using information technologies

- formulate recommendations in order to improve the existing situation.

The study shows :

- a lack of training
- an underestimation of the importance of the use of training

2. First priority : high level civil servants training

- As far as senior civil servants (the highest level) are concerned, 2 days sensitization seminars have been organized since the beginning of 1986, averaging 500 people.

- In order to sensitize 100 000 high level civil servants, a "training kit" (SIVA) has been realized by CESIA ; a trainer's "suitcase", comprising 8 training modules, holding about 350 views (slides, overhead projections), trainers and trainers' guide, exercise disquettes, etc. The product aims at helping trainers organize high quality sensitization seminars.

3. Other users training

The training of other users is relevant to each agency or ministry. Each of them should establish a user's training plan consistent with their computer equipment program.

They should also identify and train internal trainers. At the local level, French Administration has about 2 million agents, less than 10% located in Paris.

Training of users and computers professionals in INDIA

For public administrators, the emphasis on training in computer recent. The Personnel department has a massive programme of training all personnel in the Indian Administrative Service where junior (1-7 years service) middle (8-14 yrs Service) and senior officers will be trained in Management for 6, 4 and 1 week respectively. A significant component of this training (15%) will be on appreciation of computers, which will include some hands-on experience on micros wherever possible. Such training is largely conducted by Institutes of Management and public administration. Training of computer professionals, who are working in government has been largely by vendors. Very few of the university trained computer information scientists choose to work in government. However, the government sponsors its computer professionals to courses of 2-12 weeks duration which are organised by Institutes of Management, and a central government enterprise called CMC. Some private organisations are also training programmers who find employment with government. All universities have small computers and there is an experimental programme of introducing computers in 1000 secondary schools.

Training of users in ZIMBABWE

The training of users is centralised at the scientific computer centre in the Ministry of Finance. The centre has a main frame with several work stations at user sites.

High level civil servants

There is no formal training for ministers as such but a great deal of interest is developing among some of them. This has been shown in the Ministry of Education where a lot of micro computers have been installed and several ministers have visited the sites. Also when the Government of Zimbabwe together with the Computer Society of Zimbabwe launched a work shop in information technology for Saddac countries in May 1986 the ministers who came to open and close the conference were exposed to the vendor display and demonstrations. This prompted them to urge the organisers of the workshop to organise a special workshop for ministers on computer appreciation.

CASE STUDY : SENEGAL

1. Computer professionals training

In Senegal, the following institutions train computer profes onals.

ENSUT: National Superior University Technology School
- trains technology University graduates in computer Sciences
- equiped with 1 mini and some micros.

IFP: Institute for Professional training (Private institution)
- trains programmers and management information systems analysts
- equiped with 5 micros (IC, APPLE)

IPG : Private Institute for Management (Private Institute)
- trains programmers
- equiped with some micros.

DTAI : Direction of Automated Information Processing
- trains : data entry personnel, programmers, computer engineers together with IBM Senegal (entry level is Master of Sciences or Economics)
- equiped with a mainframe (IBM 4341) and many microcomputers.

2. Users training (future and actual civil servants)

The University, as well as some professional institutions, integrate computer initiation into their general courses.

ENEA : National School for Applied Economics
ENOM : National Administration and Lawyers Schools (Magistrats)
Polytechnical School of Thies
University of Sciences, Economics, Law, etc. :
These institutions have some microcomputers, but insufficient in number.
CESAG : African Institute for Superior Management Studies : regional institutional for member countries of Western Africa Economic Community. Apart from sensitization programs integrated in the general courses of the Institute, the CESAG organizes specialized seminars on BASIC, micro software (LOTUS, DBase, Multiplan, etc.), sensitization to computers. It also trains its trainers.

GROUPE D

FORMATION ET ASSISTANCE AUX UTILISATEURS DES TECHNIQUES DE L'INFORMATION DANS L'ADMINISTRATION PUBLIQUE

(Version française*)

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Il a été reconnu que l'accroissement de la productivité dans l'administration publique à travers les technologies de l'information devrait nécessiter de mettre l'accent sur la formation des divers acteurs impliqués dans la conception, la mise en place et l'utilisation des systèmes d'information. Plutôt que d'établir un catalogue des besoins de formation pour tous les types de fonctionnaires, le groupe a choisi de s'occuper en priorités des tâches.

Il a également été proposé d'étendre les recommandations du groupe à des solutions pour le court et le long terme. Le présent rapport met en relief les dites recommandations. Il présente également (en annexe) la situation au niveau des Etats représentés dans le groupe.

FORMATION DES UTILISATEURS

1. Il a été fortement ressenti la nécessité d'attacher la plus grande attention à la formation des utilisateurs, des professionnels de l'informatique et des formateurs, pour exploiter pleinement les potentialités des ordinateurs dans l'administration publique. De nos jours, l'importance de la formation n'est pas très bien perçue par les responsables des politiques d'informatisation dans la plupart de pays.

Il a été proposé que des séminaires soient mis sur pied avec la participation des ministres et des hauts cadres de l'administration publique pour mettre l'accent sur les divers utilisateurs dans le cadre de la formation ; ceux-ci pourraient être soutenus et financés par les organismes internationaux.

2. En matière de formation des utilisateurs, la priorité devrait être accordée aux hauts fonctionnaires pour créer les meilleures conditions orientées vers l'accroissement de la productivité. Pour ces administrateurs, l'initiation aux ordinateurs devrait être largement intégrée dans le programme de leurs écoles de formation, l'objectif de cette formation étant de démythifier l'ordinateur, de démontrer ses possibilités et ses limites. Cela se ferait beaucoup mieux à travers l'usage de packages de démonstration adéquats et de quelques manipulations de micros de type PC.

L'initiation aux ordinateurs nécessite aussi d'être dispensée aux cadres moyens de l'administration, particulièrement ceux qui traitent des services d'information. Ceux-ci concernent les statisticiens, les économistes, les planificateurs, les spécialistes de la documentation. La formation devrait être basée sur des packages d'utilisation facile tels que le courrier électronique, la gestion des bases de données, le traitement de texte qui sont disponibles sur les PC.

3. La formation des utilisateurs ne doit pas être perçue comme une activité ponctuelle. Elle devrait être un processus continu comprenant les programmes de formation initiale, les cours de recyclage ultérieurs et l'assistance permanente aux utilisateurs.

4. Dans beaucoup de pays les gouvernements doivent prendre les initiatives pour que l'attention soit portée sur les ressources existantes qui peuvent gérer la formation. Plusieurs pays ont eu des expériences heureuses avec des solutions différentes. Par exemple des institutions de formation d'agents de l'administration publique, des écoles existantes de gestion et d'administration publique, des universités, ont été mis à contribution. Il est important que les formateurs qui assurent cette formation aient des perceptions de techniciens.

5. Les associations professionnelles, particulièrement celles dont les membres sont fonctionnaires de l'administration, peuvent également jouer un rôle dans certains pays. Les mass-media peuvent aussi jouer un rôle important dans la sensibilisation de l'opinion publique pour promouvoir l'informatisation. Des émissions de TV bien conçues ont été utilisées avec succès dans certains pays.

6. Pour les cadres moyens, des centres disposent de micros PC peuvent être crées ou ils peuvent bénéficier d'initiation sous forme d'auto-formation avec une assistance limitée par des personnes ressources présent dans ces centres. Ces centres aussi pourraient être équipés avec d'autres outils de formation tels que les vidéofilms, des packages CAI, des livres, etc.

FORMATION DES PROFESSIONNELS DE L'INFORMATIQUE

Les catégories de professionnels qui suivent ont besoin de formation :
- analyste
- analyste de système
- programmeurs
- opérateurs, personnel de saisie
- spécialistes techniciens.

1. Dans le choix des applications et la conception des systèmes, il y a très peu d'interactions entre les utilisateurs et les professionnels. De telles inter-actions peuvent être facilitées en élargissant la formation des spécialistes pour y inclure des modules de communication (écrite et orale), des exposés sur les fonctions des organisations et les relations inter personnelles. Cela aiderait aussi à améliorer le choix des applications.

2.Comme les technologies de l'information évoluent rapidement, il est nécessaire de remettre à jour les connaissances et aptitudes des professionnels par le biais de cours de recyclage périodiques.

3. Dans beaucoup de pays, il n'y a pas de structure de formation appropriée pour former des analystes informaticiens et des analystes de système. Les ressources utilisées dans la formation des professionnels sont souvent inadéquates, surtout dans les pays en voie de développement. Le niveau des formateurs, l'équipement nécessaire, sont tels que la plupart des pays en développement ont des difficultés à mettre en place des institutions de formation.

Il est fortement recommandé que des centres régionaux puissent être créés pour former de nouveaux professionnels de l'informatique, offrant des cours plus actuels aux professionnels existants, et pour mener des recherches et promouvoir des utilisateurs efficaces des ordinateurs dans les pays en développement. Les facultés de ces institutions doivent rester constamment en contact avec les praticiens.

La mise en place de tels centres régionaux nécessitera vraisemblablement une initiative et un appui important des organismes internationaux.

BESOINS POUR UN PLAN DIRECTEUR NATIONAL

Il y a un besoin urgent de professionnels formés et de formateurs d'un côté, et parfois un surplus de certaines catégories de professionnels dans beaucoup de pays. En cas de besoins les gouvernements ne sont pas en mesure de rivaliser avec le secteur privé.

En conséquence, ils ne peuvent recruter ni conserver des professionnels. Les corrections de tels déséquilibres prennent du temps, car les programmes de formation sont de longue durée.

Dès lors, surgit un besoin fondamental d'élaborer un plan directeur du personnel en rapport avec le plan directeur d'informatisation de chaque pays.

Comme des évolutions rapides se font jour, de tels plan ont besoin d'être réactualisés continuellement. Ces plans devraient également inclure la formation des utilisateurs, particulièrement pour évaluer le nombre des formateurs nécessaires.

En fait, beaucoup de pays font face à un manque notoire de formateurs.

Les formateurs des utilisateurs devraient être choisis parmi les agents de l'administration (ceux qui ont été formés et reconnus comme de bons communicateurs), les professionnels de l'informatique ayant de bonnes dispositions.

2. Avec un tel manque de formateurs, une plus grande attention doit être accordée aux outils pédagogiques tels que : enseignements assistés par la vidéo, films, enseignement assisté par ordinateur.

Dans le contexte des PVD, de bons ouvrages doivent être rédigés et les logiciels pédagogiques déjà disponibles doivent être partagés. Les formateurs doivent être également initiés à l'usage de tels outils pédagogiques.

LES SOLUTIONS A LONG TERME

A long terme, l'initiation à l'ordinateur devrait être intégrée dans le système éducatif qui fournit la plupart des agents de l'administration publique.

Il est recommandé que de telles formations de base soient mises en oeuvre dans les Universités, les institutions de formation professionnelle et les écoles en ayant en vue les ressources disponibles dans le cadre de chaque pays.

Il est important d'intégrer l'utilisation de l'ordinateur dans toutes les disciplines et pas seulement dans l'utilisation des langages.

Il faudra vraisemblablement commencer par les institutions qui forment des professeurs.

PROPOSITION POUR UN GROUPE DE TRAVAIL

Du fait de l'importance du problème de la formation, il est proposé à DFD de travailler dans ce domaine de façon continue. Les membres de DFD intéressés pourraient être invités à participer dans un tel groupe de travail, qui pourraient conduire les types d'activités ci-après :

a) élaboration d'études de cas sur des pays développés ou en voie de développement sélectionnés portant sur la stratégie nationale pour le développement de la formation, le développement des ressources humaines dans le domaine informatiaque ;

b) conduite de projets de recherche spécifiques :
exemple : évaluation de l'utilisation des ordinateurs en milieu scolaire ;

c) développement de cursus pour plusieurs types de programmes de formation ;

d) élaboration d'un catalogue des outils pédagogiques aux technologies de l'information disponibles (vidéo, ouvrages, films, EAO, etc.).

De telles activités peuvent déboucher sur l'organisation de séminaires pour formateurs à tenir dans différentes régions, qui pourront conduire ultérieurement à des projets-pilotes dans certains pays. L'assistance internationale devrait être sollicitée pour de telles activités.

GROUP E

ADMINISTRATIVE REGULATIONS FOR INTRODUCING INFORMATION TECHNOLOGIES TO INCREASE PRODUCTIVITY IN PUBLIC ADMINISTRATION

(English version*)

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*Version française : voir page 294

Introduction

We began our discussion by talking about the fact that one way to improve efficiency was to share information from several different sources in the public sector of a country. There was a long and interesting discussion of the problems associated with this approach. In general the group felt there had to be a balance between the efficiency of a government agency and an individual's rights. In general, the group felt that the balance should be in favour of the individual's rights.

Then we discussed the issue of having laws or regulations that forced productivity. In general, the group felt that such regulations were very difficult because they require a good and objective definition of "increased productivity" in administration.

In summary, the group felt there should be regulations to protect an individual's rights, but that there should not be regulations to force productivity. The reason for this is that the public sector is so different from that of the private sector. In the private sector, the free market and the profit motive drive increases in efficiency and productivity. In the public sector, there is no such profit motive, so something else might be needed.

One method is regulation to increase productivity. Another method is to have regulations to allow an individual to have access to public documents to check if an agency is doing their job efficiently. This right would have to be balanced to the national interest.

Service to the people, which is the product of the public sector, is difficult to define in objective terms. To regulate in an arbitrary manner in order to force productivity may result in a loss of service. That is why the group was cautious about regulations to simply force productivity.

The group had a brainstorming session to think of different kinds of regulations.

1. Base legislation (or Constitutional regulations) to control the kind of data bases that can be formed and who should have access to them.

2. Laws to protect an individual's rights.

3. Regulations to define an agency's role.

4. Regulations to force productivity.

5. Regulations for security of decentralised data base terminals (Example : 24 hour security guard, encription requirements, etc.)

6. Regulations to enforce consistency in order to have efficiency (Standards)

   a. Telecommunications
   b. Laser discs
   c. Bar codes (EAN, Universal code)
   d. Hardware
   e. Software

7. Regulations to restrict the tax agency's access to other records.

8. Postal Code regulations

9. Relaxed regulations on copying software in order to increase productivity. (Should there be any?)

In discussing the scope of the topic, the group realized there were many possible areas of regulation. Agencies exist only by recognition of a specific mission. Since there are many public agencies with many different missions, there would be many specific regulations. The group felt it could not discuss the problem in such specific detail. The groups narrowed the list to three general areas. These three should not be considered exhaustive. Rather, they were the three of most interest to the group and also the group felt it could only handle three in the time allowed.

Recommendations

Area 1: Regulations concerning the protection of individual rights when sharing data between different data bases in order to get efficiency.

Potential problems :

1. Regulations to prevent data sharing can lead to some inefficiencies in the system as a whole.

2. Restricts creativity.

3. Potentially, there will be less data available to agency officials

Recommendations :

1. In countries where there are registration systems or peron numbers, there should be regulations to protect each individual's rights and prohibit sharing of information between data bases unless there is legal authority.

2. In making these regulations, countries should look at already existing regulations and definitions in other countries.

3. Each individual country should decide where such regulations should be - either in administrative regulation, or in law, or in the Constitution.

4. There should be regulations to control the creation of new sensitive data bases. (The group did not have time to define "sensitive", however they felt the definition in Article 6 of the Council of Europe Convention (1) is good).

Area 2 : Regulations that attempt to force productivity

Potential problems :

1. Agencies will continue with old systems because they cannot meet the arbitrary standard for productivity to obtain new technology.

2. Agencies will overestimate the expected productivity gain.

3. One fixed standard is not appropriate for all kinds of requests for new technology.

4. Many times, returns on new technology investments are long term, not short term.

5. Doing the agency task better (effectiveness) is also an improvement in efficiency, but it may not meet the cost-benefit standard.

6. It is extremely difficult to define productivity and efficiency.

Recommendations :

1. There should not be one fixed regulation that says in order to get new technology an agency must demonstrate cost benefit to an arbitrary fixed standard.

2. Any regulations about productivity or efficiency must carefully define the terms.

3. Regulations in this area should allow for exceptions.

4. Regulations about proving benefits before approving money for new technology must recognize that if the agency can do their task better, that is a benefit comparable to a strict cost saving.

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(1) "Article 6 - Special categories of data : Personal data revealing racial origin, political opiions or religious or other beliefs, as well as personal data concerning health or sexual life, may not be processed automatically unless domestic law provides appropriate safeguards. The same shall apply to personal data relating to criminal convictions." Council of Europe Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data, 27 June 1980.

5. There should be regulations to allow the public access to official agency documents to check the agencie's efficiency.

Area 3 : Regulations to force standardization (in hardware, software, etc.) in order to gain efficiency.

Potential problems :

1. Very difficult to define standards.

2. Restricts creativity and special purpose applications. For a special purpose application, complying to the standard may be inefficient.

3. Standards may become outdated.

4. If there are standards, then there must be a system to check if the standards are being met.

Recommendations :

1. It is dangerous to have rigid standards of a general nature.

2. Some regulations force standardization can lead to efficiency, but regulations about standardization must be written carefully to include definitions and allow for exceptions.

3. Regulations to force standardization within an area (for example, all agencies related to Education) can be beneficial, but regulations that force standardization between areas can be dangerous. Just because a standard is good in one area does not mean it is automatically good in another.

GROUPE E

LEGISLATIONS ET REGLEMENTATIONS RELATIVES A L'INTRODUCTION DES TECHNIQUES DE L'INFORMATION POUR ACCROITRE LA PRODUCTIVIE DANS L'ADMINISTRATION PUBLIQUE

(Version française*)

Président: Simon Corell

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*English version: see page 289

Il ressort du débat qu'il peut y avoir plusieurs types de dispositions juridiques et réglementaires compte tenu des missions variées des divers secteurs de la vie nationale. C'est ainsi qu'il apparaît judicieux de les regrouper en trois grands domaines.

RECOMMANDATIONS

DOMAINE 1 : DISPOSITIONS RELATIVES AUX LIBERTES INDIVIDUELLES

Problèmes soulevés :

1. Il est certain que la mise au point de réglementations pour empêcher tout échange de données entre les différentes bases de données existantes entraîne nécessairement une certaine inefficacité dans le travail.
2. Celles-ci limitent la créativité des individus.
3. Par ailleurs, on ne devrait pas permettre une trop large manipulation des données aux fonctionnaires des différents départements.

Recommandations :

1. Dans les pays où il existe des répertoires de personnes physiques utilisant un numéro national d'identification, il est opportun d'élaborer des dispositions juridiques et réglementaires pour protéger les libertés individuelles et collectives et assujettir tout échange entre différentes bases de données à une autorisation préalable.
2. Dans l'élaboration de ces dispositions, les expériences existantes en la matière dans d'autres pays doivent servir de référence (voir annexes).
3. Il demeure à la discrétion de chaque pays de voir si ces dispositions sont du domaine de la règlementation administrative ou de la loi ou encore de la Constitution.

4. Toute création de fichier "sensible" doit faire l'objet d'une réglementation stricte (pour la définition d'un fichier "sensible", se reporter à l'article 6 de la Convention Européenne en annexe).

DOMAINE 2 : DISPOSITIONS VISANT A ACCROITRE LA PRODUCTIVITE

Problèmes soulevés

1. Les secteurs de l'administration continuent à utiliser les anciens standards faute de mieux.
2 Les responsables ont tendance à surestimer les gains de productivité attendus.
3. S'agissant des nouvelles technologies, il n'est pas judicieux d'avoir une standardisation rigide.
4. D'ordinaire, les retombées positives des investissements en matière de nouvelles technologies sont à long terme plutôt qu'à court terme.
5. On peut considérer comme un bénéfice appréciable toute amélioration dans le travail de l'administration.
6. Il est très difficile de définir la productivité et l'efficience s'agissant de l'administration publique.

RECOMMANDATIONS

1. Il convient d'exiger avec prudence d'un département de justifier en terme de coût/bénéfice l'investissement en matière de nouvelles technologies.
2. Toute réglementation relative à la productivité ou à l'efficience doit définir précisément les échéances concernées.
3. Les dispositions prises dans ce domaine précis doivent admettre quelques exceptions.
4. Les réglementations qui évaluent les avantages en terme de cout/bénéfice de l'utilisation des technologies nouvelles doivent considérer que l'amélioration du travail effectué dans les administrations constitue l'un des bénéfices attendus.
5. Il convient de prendre des dispositions juridiques pour permettre l'accès des documents officiels au public. Cela permettra de contrôler l'efficience du travail effectué.

DOMAINE 3 :DISPOSITIONS EN VUE D'UNE HARMONISATION (MATERIELS, LOGICIELS, ETC...) NECESSAIRE A UNE MEILLEURE EFFICIENCE
Problèmes soulevés :

1. L'harmonisation est très difficile.
2. Cela limite la créativité et gêne la mise au point d'applications spécifiques.
3. Les standards peuvent devenir dépassés.
4. S'il en existe, il doit être possible de vérifier qu'ils sont appliqués.

RECOMMANDATIONS

1. Il peut être dangereux d'avoir des règles d'harmonisation trop rigides.
2. Il peut être efficient d'avoir des standards, cependant l'harmonisation doit se faire prudemment et permettre des exceptions dans certains cas.
3. Il convient de faire une harmonisation par secteur et d'éviter d'ériger des règles qui s'imposeraient à plusieurs administrations de missions différentes si elles ne sont pas fondées sur des gains de productivité clairement identifiés.

DEUXIEME PARTIE

LE SCHEMA DIRECTEUR INFORMATIQUE

DE LA REPUBLIQUE DU SENEGAL

LE SCHEMA DIRECTEUR INFORMATIQUE DE LA REPUBLIQUE DU SENEGAL

INTRODUCTION

Le gouvernement du Sénégal a constitué un Schéma Directeur Informatique pour l'ensemble de l'administration sénégalaise, en appliquant la méthode du "Réseau des données de l'administration publique" définie par l'association internationale Données pour le Développement. Il a été le premier pays au monde à mettre en oeuvre cette méthode, qui est maintenant largement utilisée.

L'association internationale Données pour le Développement a participé, à la demande du gouvernement du Sénégal, à la conception de ce schéma directeur. Les communicatons ci-après présentent l'ensemble du schéma directeur, puis, selon la méthodologie du réseau de données dans l'administration publique, les trois volets principaux de ce schéma directeur: personnes morales, personnes physiques et système d'information foncier.

Jean Salmona

PRESENTATION GENERALE

ABDOULAYE M'BOW

Bureau Organisation et Méthodes

I. INTRODUCTION GENERALE

C'est en 1971 que le Gouvernement du Sénégal a demandé au B.O.M. de réaliser une étude pour connaître la situation de l'Informatique dans l'Administration.

L'étude achevée en octobre 1971 a permis de constater :

- que l'ensemble des applications existantes à cette époque au Centre comptable André Peytavin (CCAP) assurait la gestion automatique du budget de l'Etat (dépenses et recettes) : toute écriture dans une chaîne sectorielle, est répercutée dans la chaîne trésor en règlement ou en encaissement ;

- une absence de plan informatique et notamment d'un Schéma Directeur informatique (S.D.I.).

Depuis cette date, le B.O.M. s'est attelé à réaliser le Schéma Directeur informatique, qui a pu démarrer grâce à un financement du FED de 179.774 UCE en 1979. La réalisation du S.D.I. est placée sous la responsabilité du Directeur du B.O.M.

Outil de gestion et de coordination des activités des administrations du Sénégal, le Schéma Directeur informatique intégre trois axes principaux :

a) études relatives à l'aspect économique du traitement de l'Information :

. sensibilisation, formation et audit,
. comptabilité des coûts informatiques ;

b) études relatives à l'intégration des applications :

. cartographie numérique,
. entités personnes morales et personnes physiques ;

c) études normatives :

. description standardisée d'application,
. raport standardisé annuel,
. réalisation de l'intégration des applications.

II. AXES PRINCIPAUX

21. Aspect économique de l'information

211. Sensibilisation, formation et audit

2111. Sensibilisation et formation

Les sessions 1 et 2 ont été animée par J. M. PONCELET, Professeur à l'ICHEC à Bruxelles et à l'Université Catholique de Louvain, Responsable des projets informatiques I.P.C.I. Les sessions de mai 1980 avaient également été animées par celui-ci.

Les sessions 3 et 4 ont été animées par Thierry PORNEL, licencié en Sciences Economiques et en Informatique de gestion, agrégé de l'Enseignement Supérieur, Consultant en Informatique de Gestion et collaborateur au Centre Informatique de l'ICHEC.

21112. Impact de l'action menée

Au-delà du bénéfice sur le plan "savoir", l'impact le plus important du séminaire se situe très certainement en une prise de conscience concrète de la réalité informatique avec pour conséquence directe : une nette amélioration des rapports utililiateurs - D.T.A.I.

A la suite d'une petite initiation à la programmation, les 150 participants venant des ministères et établissements publics ont pu se rendre compte (par le biais d'exemples et travaux pratiques) de l'importance d'une bonne formulation et définition des problèmes (analyse), de l'impact de l'introduction de données erronées dans le système (circuit de recyclage des erreurs, contrôles de de validité, etc...),des difficultés sur le plan du dialogue utilisateur-informaticien,etc...

L'informatique démystifiée rend les contacts plus faciles et introduit surtout beaucoup plus de compréhension entre les deux parties.

Cette action de formation et de sensibilisation a facilité considérablement le travail d'audit car les participants (donc les utilisateurs à rencontrer) ont été dans le **"coup"**

2112. Audit

21121. Objectifs

Compte tenu de l'ancienneté des principales chaînes informatiques de l'Administration, il a été jugé opportun d'effectuer un audit des utilisateurs afin de recueillir l'avis de ceux-ci sur les services rendus par les traitements informatiques et sur les améliorations pouvant y être apportées.

21122. Champ d'action

Cet audit a été réalisé du 19 janvier au 28 mars 1981 par M. Michel HECQUET, Responsable de l'Informatique administrative à l'Université Catholique de Louvain.

Il a porté sur les principales applications traitées à la D.T.A.I., à savoir :

- la solde des établissements publics,
- la douane,
- les impôts,
- les dépenses de matériel,
- la comptabilité des établissements publics,
- ainsi que sur le système informatique de la Régie des Chemins de Fer.

2113. Principales conclusions

Les rapports d'audit précisent, pour chacune des applications étudiées, les problèmes recensés, et les recommandations correspondantes.

Il ressort de ces rapports qu'un certain nombre de problèmes se posent au niveau de toutes les applications. Ils sont liés

- à la mauvaise qualité de la saisie des données, qui provoque un grand nombre de rejets ou d'erreurs ;

- au volume très important des états produits par les chaînes et leur forme ;

- une insuffisance d'information des utilisateurs sur les possibilités des applications, et sur l'utilisation optimale des moyens de communication avec les programmes (documents d'entrée, correction des rejets, etc...) d'où un important besoin de formation.

2114. Suites données à l'Audit

La D.T.A.I. s'est fixée, pour chaque application ayant été soumis à l'audit, le plan d'action suivant, en trois phases :

1°) analyse du rapport d'audit, et détermination des suites à donner à chacune des recommandations formulées par Monsieur HECQUET ;

2°) élaboration d'un planning de réalisation des actions retenues, et soumission aux utilisateurs ;

3°) exécution du plan d'action.

En 1981, la D.T.A.I. a suivi ce plan d'action :

- pour les deux applications solde,

- pour l'application Comptabilité des Etablissements publics.

En 1982, les rapport relatif aux autres applications devraient être exploités de façon analogue.

212. La comptabilité des coûts informatiques

2121 . Présentation du projet

- Tel qu'il est spécifié dans les clauses particulières du contrat, la "comptabilité des coûts informatiques" doit essentiellement

. établir avec précision les coûts des divers travaux réalisés par la D.T.A.I.,

. proposer une politique de facturation de la consommation des ressources de la D.T.A.I. par les différents utilisateurs.

2122. Réalisation

- M. Daniel MOURY, Expert belge, a séjourné à la D.T.A.I. du 28 mai au 15 juillet 1980.

A l'issue de ce séjour, M. MOURY a rédigé (en août 1980) un rapport relatif à la mise en place à la D.T.A.I. d'un Système Automatisé de Comptabilité des Coûts Informatiques (S.A.C.C.I.).

- La D.T.A.I. après étude de ce document a suivi les recommandations de l'Expert et a opté pour l'acquisition d'un logiciel de facturation qui permet :

  . d'assurer la facturation des travaux utilisateurs,
  . de suivre l'exploitation en ordinateur grâce à des états d'analyse et de contrôle.

- C'est dans cette optique qu'un Ingénieur de la D.T.A.I. a effectué un voyage d'études à PARIS (CITIBANK) et BRUXELLES (GB-INNO) du 30/03/81 au 10/04/81.

- A l'issue de ce voyage, la D.T.A.I. a acquis le logiciel "JARS" en décembre 1981.

A l'heure actuelle :

- le logiciel est installé sur ordinateur,
- l'algorithme de facturation est établi,
- les coûts de revient des différentes ressources ont été déterminés.

22. Etudes relatives à l'intégration des applications

221. Le système d'information foncière

2211. Historique

C'est un outil de gestion des données urbaines qui découle de l'entité "sol, superstructure et réseaux" du Schéma Directeur Informatique. La Direction du Traitement Automatique de l'Information est le maître d'oeuvre du projet et a mené les opérations suivantes qui ont été discutées lors de la dernière réunion du Comité National Informatique :

- le choix d'une zone pilote
- la saisie partielle des données
- le transfert du logiciel de base NIMS 80.

Les travaux devaient être poursuivis aux fins de constituer la banque de données foncières alimentée par les informations relatives aux immeubles bâtis, non bâtis sur les propriétaires et les usufruitiers.

2212. Travaux

A partir des plans de restitution du Cadastre complétés par les informations contenues dans les dossiers techniques du Cadastre, les dossiers de permis de contruire du Ministère de l'Urbanisme et les bulletins de recensement des Impôts, une saisie systématique des immeubles bâtis et non bâtis devait être opérée par une équipe composée d'agents du Cadastre, de l'Urbanisme, des Impôts.

C'est l'objet de la lettre n° 5553/PR/SG/BOM du 23 juillet 1984 adressée à Messieurs :

- le Ministre de l'Economie et des Finances
- le Ministre de l'Urbanisme
- le Ministre de l'Education nationale.

Suite à cette lettre, des ressources humaines ont été mises à la disposition du projet, ensuite transférées à la brigade topographique du Cadastre chargée des travaux de levées sur le terrain pour la constitution de la base de données conformément aux recommandations n° 11, 12 et 13 du CNI du 5 janvier 1984.

Les véhicules et les crédits de leur fonctionnement estimés à Vingt millions dse francs n'ont pas été dégages par le Ministère de l'Economie et des Finances.

Le projet qui facilite le rôle fiscal du Cadastre ayant connu un ralentissement remarqué dans ses activités a entraîné avec ses insuffisances en moyens, une inutilisation du personnel mise à sa disposition durant un trimestre.

Et au mois de mars 1984, le Directeur du Cadastre a remis ce personnel à la disposition de leur service d'origine. A ce jour, le Comité National Informatique ne dispose que des éléments ci-dessus présentés, concernant le système d'information foncière.

222. Personnes physiques

Le système de gestion du répertoire national des personnes physiques est au point et le démarrage imminent de la phase d'identification est envisageable.

Cependant, des études se poursuivent pour l'amélioration, notamment par la mise au point d'un système de phonétisation des noms avant la recherche automatique et par le perfectionnement du système d'immatriculation des personnes physiques ne figurant pas au répertoire.

2221. Les dispositions juridiques

Elles ont été naturellement prises dans le double objectif de sauvegarder les libertés individuelles et collectives mais surtout en conservant toutes la règlementation en vigueur régissant les associés et le circuit d'échange d'informations.

Un projet de décret a été introduit dans le circuit administratif. La Cour Suprême a recommandé l'élaboration d'un projet de loi invoquant le principe du respect des libertés publiques que certaines dispositions sembleraient mettre en cause. De l'avis du secrétariat permanent, le décret qui reprend les éléments du répertoire à mettre en place n'enregistre que des données d'état-civil consignées sur l'extrait de naissance de la personne et il prévoit d'accorder à tout citoyen le droit d'accès aux informations le concernant.

Le démarrage du répertoire est uniquement conditionné par la mise en place des dispositifs juridiques.

2222. Perspectives de développement

Pour répondre aux sollicitations sans cesse croissantes des Directions du ministère, il s'avère nécessaire d'augmenter :

- la puissance de calcul de l'unité centrale actuelle, voire même doubler cette unité centrale pour des raisons de BACK-UP, de sécurité de fonctionnement dans la perspective d'une prise en charge totale des élections par la Direction de l'Automatisation des Fichiers (DAF) ;
- la mémoire centrale
- le volume disque
- les terminaux (consultation et développement intéractif)
- la vitesse des imprimantes (gros volumes d'édition en période électorale)
- la densité des dérouleurs de bandes.

Les dispositions d'extension de la configuration actuelle de la DAF en rapport avec les élections prochaines sont en cours d'étude.

En outre, il apparaît de plus en plus nécessaire de connnecter au site central de la DAF, les services extérieurs du Ministère de l'Intérieur (Aéroport-Commissariat central Police judiciaire - Direction Passeports Police des Etrangers).

Devant l'urgence de ce besoin d'interconnexion, la DAF envisage de mettre en place un réseau privé (radio par exemple) ; cependant des études prenant en compte la mise en place du futur réseau national de transmission des données s'imposent avant toute option définitive.

223. Personnes morales

2231. Introduction

Le volet "personnes morales" du Schéma Directeur Informatique confié à la Direction de la Statistique, vise à satisfaire deux objectifs pour arriver à la coordination des actions des différentes administrations s'intéressant à la gestion des entreprises :

- définir un système unique d'immatriculation des personnes morales,
- établir un répertoire inter administratif qui prendra en compte les entreprises, les établissements, les associations et assimilés sans omission, ni double compte.

Ces travaux ont été menés par deux axes principaux

- constitution du répertoire de base ;
- élaboration des textes législatifs et règlementaires qui régissent le répertoire et les administrations associées.

2232. Constitution du répertoire de base

Le répertoire de base sera constitué à partir des fichiers existants et automatisés c'est à dire :
- fichier CSS
- fichier IPRES
- fichier IMPOTS

Pour cela les méthodes d'appariements automatiques et manuelles sur raison sociale, boîte postale et adresse ont été retenues. Ce répertoire sera éventuellement complété par une enquête et par les régistres (commerce, artisan etc...)

- <u>Appariement manuel et semi-automatique des fichiers non appariés CSS/IPRES</u>

  Plusieurs phases d'appariements manuels et semi automatique ont été effectuées sur les fichiers des noms appariés CSS et IPRES.

  Suite à ces opérations, on a comme résultat au dernier tour d'appariement automatique un fichier CSS-IPRES qui compte 3797 unités appariées soit 49 % du fichier CSS et 61 % du fichier IPRES.

- <u>Appariement automatique (CSS/IPRES)-IMPOTS</u>

  Le fichier précédent sorti des travaux d'appariement qui compte 3797 unités a été apparié avec le fichier des unités simples Impôts soit 7593 unités. Cette opération a donné un résultat non significatif de telle sorte qu'on a été obligé de faire l'appariement couple (CSS/IPRES) avec le fichier IMPOTS d'une façon manuelle.

- <u>Appariement manuel couples CSS-IPRES avec les simples IMPOTS</u>

  Cette opération tire à sa fin. Actuellement plus de 50 % du fichier couple IPRES-CSS ont été appariés avec le fichier IMPOTS. On espère avoir au moins un fichier triple CSS-IPRES-IMPOTS égal à 60 % du fichier couple CSS-IPRES. Cette phase pourra être achevée sur l'échéancier 84/85.

2233. Perspectives

Le traitement des unités multiples, le recours aux fichiers non automatisés, la possibilité d'une enquête auprès des unités marge CSS, IPRES, IMPOTS pour l'amélioration de ce répertoire de base suivront.

La méthodologie n'est pas encore discutée par le groupe des correspondants. Toutefois, le fonctionnement du répertoire entre dans sa phase active aussitôt après le traitement de ces multiples.

En effet, les unités du répertoire de base seront immédiatement immatriculées après ce dit traitement.

Le projet de décret a été élaboré, discuté et complété lors de la réunion des correspondants du 12 avril 1984 à la Direction de la Statistique. Ledit projet de décret a ensuite été complété par les organismes et services associés pour adoption lors de la réunion tenue au Bureau Organisation et Méthodes le jeudi 14 juin 1984.

Le débat fructueux a permis de faire des amendements et de donner certaines précisions.

A l'issue de cette réunion le projet de décret mis au point a été introduit dans le circuit accompagné d'un rapport de présentation et du document détaillant les principes de fonctionnement et de gestion du répertoire. Après ces travaux, les formulaires de déclaration qui avaient été proposés lors des études antérieures (voir document principe de constitution et de fonctionnement du répertoire des entreprises et association en annexe) sont en cours de réalisation.

23. Etudes normatives

231. Description standardisée d'applications

La multiplication des applications informatiques dans **un** système administratif cloisonné favorise les duplications. Un des rôles du Comité National Informatique est de limiter au minimum souhaitable de telles duplications.

L'objectif de l'étude est de développer une bibliothèque des applications existantes de manière à favoriser les échanges de systèmes entre cellules administratives. Cette bibliothèque débouchera sur un système de documentation automatique.

232. Plan et rapport standardisés annuels

Les coûts impliqués par l'utilisation des ordinateurs exigent de la part des divers responsables et du Comité National Informatique un suivi rigoureux des dépenses effectuées, à l'occasion de l'utilistion des personnels, des matériels et des fournitures par rapport aux avantages effectifs.

L'étude envisage de concevoir le schéma :
- d'un rapport à dresser chaque année pour les utilisateurs d'informatique à l'intention de leurs autorités hiérarchiques. Ces divers rapports seraient consolidés par le BOM à l'intention du Comité National Informatique.

- d'un plan de développement pour l'année budgétaire suivante Les inscriptions budgétaires seraient obtenues. après adoption dudit plan par le Comité National Informatique.

233. Autres parties du Code de l'informatique

Le code de l'informatique se penche en outre sur :
- la définition d'une politique générale,
- la conception d'un guide administratif à l'intention des utilisateurs actuels et potentiels de l'informatique.

Outre les ressources locales, ce projet bénéficiera de l'assistance d'un expert détaché par le ministère français de la Coopération pour un mois.

III - CONCLUSIONS ET PROPOSITIONS

L'étude du Schéma Directeur Informatique achevée en 1978 a trouvé un financement pour sa réalisation de 179 774 UCE au niveau du Fonds Européen de Développement (FED).

Ce crédit est quasiment épuisé au moment où ce rapport d'activités du Schéma Directeur Informatique montre que la réalisation ne fait que démarrer dans les entités les plus significatives des administrations

- personnes physiques
- personnes morales
- système d'information foncière.

Du 8 au 12 avril 1985, une mission d'évaluation de l'ensemble du projet a été envoyée par l'Association "Données pour le Développement" de Marseille (DPD) l'adjudicataire du projet Schéma Directeur Informatique. Voiçi les conclusions et propositions de l'expert : Monsieur KEN JOHNS;

3.1. Conclusion

Chaque sous-système va entraîner une mesure d'intégration des systèmes d'information dans plusieurs administrations et permettra d'atteindre les objectifs élevés du projet. En raison des différentes pratiques de réalisation de chaque sous-système, l'intégration des trois sous-systèmes est passé à l'arrière-plan, par exemple l'utilisation d'identifiants communs pour les entités principales dans les trois sous-systèmes.

Les difficultés rencontrées ont entraîné des retards tels que la réalisation a pris plus de temps que prévu. L'environnment dans lequel les systèmes devraient être mis en oeuvre est continuellement modifié, ce qui entraîne également des problèmes.

L'organisation administrative du projet, avec des commissions inter-administrations, semble avoir bien fonctionné dans l'ensemble, apportant l'engagement nécessaire des différents organismes concernés et la coopération entre eux. L'engagement des organismes responsables de la mise en oeuvre des trois sous-systèmes a varié avec le temps ; il est satisfaisant actuellement sauf pour le SIF. Il aurait fallu peut être dès le départ, confier la responsabilité de ce sous-système à un organisme utilisateur, comme le Cadastre, et de le faire précéder par un programme de sensibilisation et de formation permettant de créer un environnement satisfaisant;

3.2. Propositions

1. DPD et le B.O.M. devraient remplir immédiatement leurs obligations contractuelles envers le FED (documentation et information sur le projet). Les rapports annuels au Comité National de l'Informatique sur le SID présentent un intérêt particulier pour le FED.

2. Pour permettre au Gouvernement sénégalais de planifier et budgétiser la réalisation du SDI, et pour faciliter des demandes de financement à long terme auprès du FED, DPD et le B.O.M. devraient entreprendre ensemble une étude coûts/avantages des trois sous-systèmes (RPM, RPP et SIF). Une demande de financement pour l'utilisation pendant un mois de deux spécialistes devrait être adresée au FED.

3. En ce qui concerne le SIF, l'analyse coûts/avantages devrait permettre également de réexaminer l'objectif du sous-système, de désigner un organisme utilisateur responsable et de définir l'ensemble des procédures et de l'organisation, en tenant compte des difficultés actuellement rencontrées, et de l'intérêt nouveau du Cadastre pour l'automatisation des répertoires et de la cartographie.

VOLET "PERSONNES MORALES"

ISSA N'DIAYE
ADAMA FHAL

Direction de la Statistique

Introduction

Plusieurs établissements recueillent et gèrent des informations détaillées sur les entreprises et établissements avec lesquels ils sont en contact.

La masse d'informations ainsi réunie est malheureusement dispersée dans plusieurs fichiers. De plus les règles de gestion différentes interdisent ou rendent très difficile tout usage commun et tout échange.

La création d'un répertoire des entreprises, des établissements et des associations a été décidé pour servir de bien entre ces divers fichiers. Un identifiant commun à toutes administrations et organismes servira à immatriculer de façon discriminatoire toutes les unités répertoriées. Ainsi seront évités les omissions et les doubles comptes.

Cette opération, baptisée " projet personnes morales" a été confiée à la Direction de la Statistique qui est responsable de la mise en place du répertoire et chargée d'en assurer la gestion.

I.- OBJECTIFS ET INTERET DU REPERTOIRE

Le système d'immatriculation unique et le répertoire visent à satisfaire deux objectifs :

- mettre à la disposition des utilisateurs administratifs ou statistiques, un répertoire des entreprises, des établissements et des associations leur fournissant une identification satisfaisante pour leurs besoins propres ;

- assurer un rôle de coordination interadministrative en permettant et favorisant les échanges et en allégeant les formalités les plus courantes auxquelles sont soumises les administrations.

On peut donc assigner au répertoire, les fonctions suivantes :

- immatriculer de manière unique sans omission ni doubles comptes l'ensemble des unités relevant du champ du répertoire à l'aide d'un identifiant commun à toutes les administrations ;

- centraliser au niveau d'une cellule de gestion, mise en place à la Direction de la Statistique, les informations relatives à la vie des unités recueillies par les administrations associées, à la gestion du répertoire à l'occasion de leurs contacts avec les administrés ;

- contrôler et éventuellement corriger ces informations avant de les prendre en compte ;

- rediffuser ces informations à l'ensemble des services intéressés.

Chaque administration ou organisme associé aura ainsi connaissance des événements (création, modification, cessation d'activité) collectés par ses propres services, mais aussi ceux collectés par d'autres services.

On peut attendre d'un tel dispositif une amélioration très sensible de la qualité des fichiers de chaque associé.

II.- ANALYSE DE LA SITUATION ACTUELLE

Un grand nombre de services administratifs et para-administratifs sont en relation avec les entreprises. La plupart d'entre eux ont constitué les fichiers et procédé à leur immatriculation. Dans le document intiluté "Principe de constitution et ...." les fichiers gérés par les services ont été étudiés en détail :

- Caisse de sécurité sociale (C.S.S.)
- I.P.R.E.S
- Direction des Impôts
- Greffes des Tribunaux de Commerce
- Chambres de métiers
- Direction de la Statistique

ainsi que le fichier des associations détenu par le Ministère de l'Intérieur.

Cependant dans le cadre des travaux actuels pour la constitution du répertoire initial, seuls les trois fichiers de la CSS, de l'IPRES et des Impôts seront pris en compte vu les contraintes matérielles de temps et de moyens mis en oeuvre.

Dans le cadre de cet exposé nous donnerons une description de ces trois fichiers réduite à l'essentiel.

1) Fichier Employeur de la CSS

Ce fichier concerne tous les employeurs de personnel salarié relevant du code du travail et du code de la marine marchande. Il est informatisé et sa gestion est confiée à la DTAI. Il se réduit à 10500 unités environ si l'on exclut les employeurs de personnel domestique et les veuves.

L'unité répertoriée est l'établissement que l'on repère par un numéro composé d'un identifiant (5 chiffres + lettre clé) qui désigne l'entreprise et d'un numéro d'ordre d'établissement.

Le fichier s'enrichit d'environ 90 unités mensuellement dont 70 pour la seule région de Dakar. Les changements relatifs au propriétaire au gérant, à l'adresse, à l'activité principale ou à la tranche d'effectif salarié ne remettent pas en cause la continuité de l'existence de l'établissement. Cependant la cessation définitive d'emploi de personnel provoque la radiation ou suppression du fichier avec bien entendu les précautions nécessaires.

2) Fichier employeur de l'IPRES

Le champ couvert par ce fichier est identique à celui de la CSS. Ce fichier est également informatisé. A l'opposé de la CSS toutefois il est géré à l'IPRES même, ce dernier possédant son propre service informatique. Il comprend 11 681 chiffres de 1982 unités non compris les employeurs de personnel domestique.

L'unité répertoriée ici est soit l'entreprise soit l'établissement au gré de l'employeur. Les unités sont identifées par un numéro à 8 positions entièrement numériques dont les cinq premiers chiffres identifient l'entreprise, les trois derniers identifiant de manière interne et séquentielle à partir de 101 les établissements.

Le fichier augmente d'environ 20 unités par mois environ. On enregistre également 80 modifications environ, y compris les cessations. Notons toutefois que l'IPRES, contrairement à la CSS, se fonde sur la définition juridique de l'entreprise pour définir sa continuité; par conséquent un changement de propriétaire ou de gérant provoque l'immatriculation d'une autre unité.

La modification des autres variables est sans conséquence sur la continuité de l'unité. Soulignons que l'IPRES conserve dans un fichier les unités ayant cessé d'appartenir à son champ.

3) Fichier des Contribuables de la Direction des Impôts

Ce fichier est plus volumineux et plus complexe que les deux précédents. Il concerne tous les contribuables. En 1977 déjà il comptait 200 000 unités.

Le fichier est difficile à gèrer pour les raisons principales suivantes : identification et mise à jour des unités. L'identification se fait sur liste alphabétique. La fréquence des homonymies entraînent bien souvent des inscriptions multiples. Modifications faites à partir des déclarations annuelles d'impôt sur le revenu ou s'appuyant sur les résultats des recensements effectués. Toutes ces considérations font que ce fichier est loin d'être fiable.

L'unité répertoriée est le contribuable. C'est-à-dire pour celles interessant le répertoire, il s'agit des entreprises et nom, établissements. Le numéro d'immatriculation comporte 6 positions et une lettre clé. Le fichier est organisé en "séries". En pratique les sociétés et entrepreneurs ont des numéros commençant par 00 à 08.

Au sein de ces catégories les numéros sont attribués séquentiellement.

Des mesures d'assainissement de ce fichiers sont à l'étude. Signalons aussi l'existence de "fichier contribuables actifs" annuel qui répertoirie par type d'impôt les contribuables effectivement taxés au cours de l'année. Bien que pouvant contenir des doubles comptes ce fichier donne une meilleure approximation du nombre des contribuables.

En 1981, par exemple, ont été taxées au titre de l'impôt sur le revenu (y compris le BIC) 14 665 personnes dont environ 10 000 sociétés et entrepreneurs individuels.

III.- DESCRIPTION DU REPERTOIRE

3.1.- Champ d'application

Il est constitué des trois catégories ci-dessous :

- les personnes morales à proprement parler c'est-à-dire:

  . Sociétés, quelle que soit leur forme juridique.
  . Associations et assimilés (syndicats, parties politiques).

- les entrepreneurs individuels : artisans, commerçants, membres des professions libérales.
- les administrations, collectivités locales et organismes publics employant du personnel non titulaire.

Les fichiers de la CSS, de l'IPRES ainsi que celui des Impôts, les registres du Commerce, des métiers et celui des associations couvrent théoriquement entièrement ce champ.

Le nombre d'unités entrant théoriquement dans ce champ est d'environ 200 000 dont 300 000 au maximum sont assez bien cernés par les procédures administratives et figurent dans au moins un des fichiers précédents.

3.2.- Les unités répertoriées et leur identifiant

3.2.1.- Les types d'unités

Le répertoire immatricule les entreprises et leurs établissements.

3.2.2.- Unités actives et inactives

Toute unité immatriculée qui cesse son activité restera inscrite au répertoire. Ceci permettra de réactiver une unité, de conserver la trace de toute unité ayant appartenu au répertoire.

3.2.3.- Le numéro d'identification national

Ce numéro d'identification est un numéro neutre ne comportant aucun code caractéristique de l'unité. Il est composé de 7 chiffres (6 chiffres séquentiels et un chiffre clé) et est appelé NINEA (numéro d'identification national des entreprises et des associations). Il identifie l'entreprise. Il est complèté par un numéro, composé de deux chiffres qui ordonnent et identifient l'établissement à l'intérieur de l'entreprise et d'un chiffre clé. Le numéro d'identification national de l'établissement est, en définitive, un numéro qui compte 10 positions. Il est désigné sous l'abréviation NINET. Ces deux numéros, NINEA et NINET doivent pouvoir être retenus facilement et leur utilisation présenter le moins de risque possible, notamment les inversions de chiffres qui fort heureusement sont détectées par clé de contrôle.

3.2.4.- Règles d'utilisation

Le numéro d'identification de l'entreprise, NINEA et le numéro d'ordre attribué aux établissement d'une même entreprise NINET, ne pourront plus jamais servir à identifier une autre entreprise s'agissant du NINEA ou un autre établissement à l'intérieur d'une même entreprise pour ce qui est du NINET.

A terme les identifiants NINEA et NINEA devront servir de référence exclusive dans les rapports interadministratifs et avec les unités. D'ici là les numéros internes de gestion précédemment utilisés coexisteront avec les nouveaux identifiants.

Pour repérer l'appartenance d'une unité à un groupe tout organisme peut, s'il le désire, compléter le NINEA par le code de son choix à condition que cette mention ne figure pas dans la zone intitulée NINEA et qu'ensuite elle soit non significative pour le public.

3.3.- Les données contenues dans le répertoire

Le répertoire ne contiendra que les informations nécessaires à l'identification des unités (nom ou raison sociale, adresse, ...) et à leur classement en sous-ensembles (activité principale, effectif salarié)

Dans l'ensemble des informations relatives à l'entreprise et à l'établissement il existe un grand nombre de redondances qu'il faudra s'attacher, dans l'organisation des fichiers à réduire, pour éviter un encombrement inutile.

3.3.1. Description de l'entreprise

On distinguera les propriétés propres aux personnes physiques, celles qui sont propres aux personnes morales et celles qui sont communes aux deux groupes.

Les éléments distinctifs porteront sur l'identité des personnes physiques, leur état civil, sur l'identité commerciale pour les personnes morales. Les éléments communs porteront eux sur la localisation, l'activité, la taille, l'appartenance aux différents organismes.

3.3.2. Description de l'établissement

Les éléments descriptifs se rapporteront à la localisation géographique, l'activité, la taille, les modalités d'exploitation, etc...

3.3.3. Codification des données

La nécessité d'harmoniser les codifications utilisées par les différents associés amène à utiliser certaines nomenclatures. Pour le code localité, le nouveau "code général des circonscriptions administratives" mis au point par le Ministère de l'Intérieur, pour le code activité principale la nomenclature CIII, pour le code nature de l'établissement la codification à 1 chiffre proposée dans le document "Principes de constituer...", pour le code catégorie juridique et le code appartenance ou renvoie également à la proposition contenue dans le document précité.

3.4.- Organisation du répertoire

Le répertoire sera constitué de dossiers manuels décrivant les événements qui jalonnent la vie de l'entreprise et de fichiers inforamtiques.

Six fichiers sont proposés pour pour la gestion du répertoire dont le principal comprend toutes les unités actives ou ayant récemment cessé leur activité. Le nombre restreint d'entreprises à établissements multiples (moins de 10 % des unités) nous fait opter pour la solution consistant à choisir l'organisation en fichier plat au niveau établissement avec répétition des données de l'entreprise lorsque celle-ci compte plusieurs établissements. Il est envisagé par la suite d'opter pour la solution d'un fichier hiérarchisé pour limiter les redondances au niveau des variables.

La description de l'enregistrement du fichier principal ou fichier GESTION est faite dans le document de référence "Principe...". Les autres fichiers, Libellés, Avis Mouvement, Cessations et Clients se sont également décrits.

IV.- FONCTIONNEMENT DU REPERTOIRE

Le répertoire est géré par le Centre d'Identification National créé au sein de la Direction de la Statistique. C'est un outil qui est mis à la disposition des "associés", administrations et services publics en relation avec les entreprises.

On distingue les "associés amont", administrations ou organismes qui concourent à l'alimentation du répertoire des "associés aval", administrations ou organismes destinataires de certaines informations relatives à certains sous-ensembles du répertoire.

4.2.- Principe général de fonctionnement

Les associés amont auxquels tout ou partie des unités sont tenues de déclarer les événements qui jalonnent leur existence renseignent un "formulaire de déclaration au répertoire" qui est ensuite transmis au Centre d'Identification National (C.I.N.).

Le C.I.N. effectue alors des opérations de contrôle, d'identification, d'inscription et de rediffusion de l'information.

Le fonctionnement du répertoire n'induit aucune modification dans les procédures utilisées par les associés pour la gestion de leurs administrés. Les associés amont ont juste à remplir un formulaire supplémentaire destiné à la Direction de la Statistique.

4.3.- La mise à jour du répertoire

4.3.1.- Les événements pris en compte par le répertoire

Ce sont soit des événements qui affectent l'unité dans son ensemble tels par exemple la création d'unité, cessation d'activité..., soit des événements modifiant les caractéristiques de l'unité tels par exemple un changement de nationalité. Un événement affectant un établissement peut avoir des implications sur l'ensemble de l'entreprise et vice versa.

4.3.2.- Contrôle - validation

Avant d'être inscrit dans le répertoire, tout événement devra être contrôlé et validé par le service compétent du C.I.N.

Les invraisemblances ou incohérences feront l'objet de vérification auprès de l'associé émmetteur ou d'autres sources ou même parfois directement auprès de l'unité.

4.3.3. Les règles de mise à jour : continuité de l'existence d'une unité

Les règles proposées peuvent être aménagées en fonction des habitudes administratives des associés dans la mesure ou celles-ci sont compatibles entre elles.

- Entreprises individuelles. Elles existent avec la personne physique et disparaissent avec elle. L'entreprise disparait aussi en cas de cession ou de vente du fonds suivi de retrait des affaires. Cependant un changement d'activité de localisation n'est pas une cause de discontinuité.

- Personnes morales. L'unité ne cesse d'exister que si la dissolution est prononcée par le responsale juridique (Ministère de l'Intérieur, Chambre des Métiers, Greffe du tribunal de commerce). Ne sont pas des causes de discontinuité, le changement d'activités, la création ou la suppression d'établissement, le changement de forme juridique et le changement de localisation.

- Transformation de l'entreprise individuelle en société. La mise en société ne constitue pas une cause de discontinuité si l'on s'attache à la notion d'employeurs et à des notions économiques d'entreprise.

- Etablissements. Il n'existe pas de définition juridique pour eux. Seuls sont admis des critères de durée afin d'éliminer les chantiers temporaires. L'établissement disparaît avec l'entreprise ou si cette dernière le vend ou cesse son activité dans ce lieu. Un transfert de l'activité d'un lieu à un autre n'est pas une cause de discontinuité si la nature ou l'objet de l'établissement n'est pas modifié. Il y a également continuité si le lieu d'activité étant conservé, les effectifs, les moyens de production ou l'activité changent.

4.3.4.- Règles de mise à jour : procédures pratiques

Les événements précédemment cités induisent les procédures suivants pour la création d'une unité, l'entrée de champ, la sortie de champ, la cessation ou la reprise d'activité, la radiation d'une unité.

- Création d'une unité

Toute réception d'une demande d'immatriculation en provenance d'un associé fera l'objet d'une vérification sur des listes pour s'assurer que l'unité n'est pas déjà inscrite au répertoire.

Si l'unité figure au répertoire à l'état actif alors on procède à une "entrée de champ".

Si l'unité figure au répertoire à l'état inactif alors on procède à une "reprise d'activité".

Si l'unité ne figure pas au répertoire alors on contrôle les éléments d'identification transmis par l'associé et on attribue à l'unité un numéro d'identification NINET on crée ensuite un enregistrement à l'état actif et on fait passer le code appartenance de l'associé émetteur à 1 et ceux des autres associés de 0 à 2, ensuite on adresse un "avis d'immatriculation" à tous les associés amont concernés.

Entrée de champ

Elle peut être provoquée soit par une demande d'immatriculation d'une unité déjà inscrite au répertoire soit par une "demande d'entrée de champ" quand on sait que l'unité est inscrite ou en cours d'inscription sans pour autant connaître ce numéro soit en précisant le NINEA de l'unité.

Dans les deux premiers cas une recherche de l'unité dans le répertoire ("identification") est d'abord effectuée. Avec la procédure d'entrée de champ on fait passer le code appartenance de l'associé émetteur à 1 et on lui envoie un "avis d'entrée de champ" où sont indiqués tous les éléments d'identification de l'unité tels qu'ils figurent dans le répertoire.

Sortie de champ

Une unité tout en restant active, peut ne plus faire partie du champ d'un associé. Un associé amont averti qu'une unité soit de son champ remplit une "demande de modification-radiation". La modification est inscrite au répertoire et le code "appartenance" de l'associé passe de 1 à 3.

Mensuellement l'associé recevra un "avis de sortie de champ" récapitulant tous les événements de ce type survenus au cours de la période.

Cessation d'activité

Le répertoire continue de considérer cette unité comme active jusqu'à ce que deux au moins des associés amont aient déclaré sa cessation.

Si la demande de modification-radiation informant de la cessation d'activité est la première transmise au CIN alors le répertoire enregistre la sortie du champ de l'associé émetteur et fait son code appartenance de 1 à 3 mois ne modifie pas le code état de l'unité.

Si la cessation d'activité a déjà été signalée par un associé alors le code appartenance de l'associé émetteur passe de 1 à 3, le code état de l'unité passe de 0 à 1 et un avis de modification-radiation est transmis à tous les associés amont concernés avec la mention "cette unité est considérée comme inactive dans le répertoire".

Si la cessation d'activité a déjà été signalée par plusieurs associés et l'unité est donc déjà inscrite comme inactive. Le code appartenance de l'associé émetteur passe de 1 à 3 et un avis de modification-radiation lui est adressé.

Reprise d'activité

Deux cas peuvent se présenter. Soit l'associé fait une demande d'immatriculation, ignorant que l'unité figure au répertoire à l'état inactif, soit l'associé est au courant et envoie un formulaire de modification radiation demandant la réactivation de l'unité.

Cette réactivation fera passer le code état de l'unité de 1 à 0 et le code appartenance au champ de l'associé à 1 et un avis

de modification radiation informant de la reprise d'activité de l'unité est adressé à tous les associés amont concernés par l'unité.

- Radiation

Les unités fictives, les immatriculation multiples soit toute inscription injustifiée répertoire seront radiées c'est-à-dire que l'enregistrement sera tout bonnement éliminé.

- Modification d'une caractéristique de l'unité

L'associé amont averti d'une modification d'une de données caractéristiques de l'unité inscrite au répertoire remplit une demande de modification radiation indiquant l'ancienne donnée et la donnée modifiée.

Les associés amont concernés recoivent un avis de modification radiation une fois la substitution effectuée.

4.3.5.- Traitements informatiques

On fera du traitement par loto pour la mise à jour du répertoire après le contrôle et la saisie des documents de mise à jour. Avec cette méthode l'identification se fera manuellement sur des listes du répertoire produites tous les mois et triées selon des critères aptes à faciliter les recherches.

Une solution micro-ordinateur est également envisagée. Avec cette deuxième méthode l'identification se ferait directement en interrongeant le fichier.

.4.- Documents de mise à jour et leurs circuits.

Les demandes de mise à jour constituées par des formulaires spéciaux sont remplies en double exemplaires pour les unités intéressées et transmises au CIN par les soins des associés amont.

Les formulaires utilisés sont : la demande d'immatriculation, la demande d'entrée de champ et la demande de modification radiation.

4.4.1.- Demande d'immatriculation

Il serait intéressant de pouvoir disposer d'un formulaire unique qui jouerait aussi bien le rôle des "ficles de création" et autres documents utilisés par l'associé amont pour l'inscription d'une unité dans son fichier que celui de la "demande d'immatriculation" utilisée pour la gestion du répertoire.

Dès réception, la demande est prise en charge par un agent du CIN qui, entre autres opérations, procède à l'ouverture d'un dossier manuel dans lequel seront classés tous les documents concernant l'unité et, en premier lieu, la demande d'immatriculation et le double de l'avis d'immatriculation.

4.4.2.- Demande d'entrée de champ

Toute inscription d'une unité dans le fichier d'un associé amont devra être signalée au C.I.N. par l'émission d'une "demande d'entrée de champ".

Mensuellement un "avis d'entrée de champ" qui, récapitule et liste les unités pour lesquelles une entrée de champ a été enregistrée au cours du mois. Cet avis est envoyé à chaque associé amont.

4.4.3.- Demande de modification radiation

Cette demande doit être remplie par l'associé amont dans les deux cas suivants : l'unité déclarée l'évènement ou l'évènement est porté à la connaissance de l'associé amont (presse....)

L'avis de modification radiation est envoyé sans délai aux associés concernés y compris l'associé émetteur.

Si l'évènement implique pour un ou plusieurs associés une sortie de champ, une demande de sortie de champ devra être adressée au répertoire. Il suffira pour cela que l'associé envoie au CIN un formulaire de modification radiation.

Après traitement un avis de sortie de champ est adressé en retour à la fin du mois.

4.5.- Les informations diffusées par le CIN

L'information des associés amont passera par les avis cités précédemment. Ils bénéficieront des services rendus aux associés aval et autres clients du répertoire.

Les associés aval peuvent recevoir périodiquement des listes extraites du répertoire en plus de leurs besoins spécifiques. Ils peuvent également transmettre au CIN des demandes d'identification ponctuelles.

Ces services sont gratuits pour l'ensemble des associés.

Quant aux clients ils peuvent obtenir toute information gérée par le répertoire à l'exception toutefois des informations relatives à l'effectif salarié. Ils doivent également accepter les tarifs et délais fixés par le CIN et s'engager à ne pas publier ou communiquer l'information reçue à des tiers sauf autorisation préalable du CIN.

4.6.- Les contrôles effectués

Ce seront des contrôles de validité de la mise à jour, des contrôles de cohérence des codes appartenance au champ des associés (trimestriel), des contrôles de qualité du répertoire, des contrôles de gestion.

5.- Mise en place du répertoire

5.1.- Principe général de constitution du répertoire initial

Le répertoire initial sera obtenu par fusion des fichiers actuellement gérés par les trois organismes : IPRES, CSS et IMPOTS. Aucune opération de type enquête visant à améliorer l'exhaustivité n'est envisagée. La couverture du champ sera donc très partielle, pour certaines catégories, en particulier les artisans.

5.2.- Procédures pratiques de constitution

5.2.1.- Préparation des fichiers

Un traitement préalable des différents fichiers sera réalisé ; élimination de certaines catégories comme les gens de maison par exemple. Une procédure particulière sera utilisée pour ce qui concerne les unités inscrites au registre du commerce.

5.2.2.- Fusion des fichiers

Toutes les unités figurant dans au moins un des fichiers traités devront être inscrites au répertoire sans omission ni double compte.

Le premier travail sera de repérer les unités communes à plusieurs d'entre eux, ceci afin d'éviter les inscriptions multiples de la même unité au répertoire.

Les critères d'appariement retenus ont été les identifiants notamment pour les fichiers C.S.S., IPRES, IMPOTS pour les autres unités, qui constituent la plus grande partie de notre population, le rapprochement entre les différents fichiers se fera essentiellement sur le nom ou la raison sociale de la personne et son adresse. Dans les opérations d'appariement les procédés automatiques seront associés aux procédés manueles. Les procédures d'appariement se feront par itérations successives dans l'ordre suivant :- fusion, ceux inscrits à la CSS uniquement et ceux inscrits à l'IPRES uniquement, en plus de cette distinction le fichier obtenu sera scindé en fichier de sièges ou établissements principaux et fichiers des établissements secondaires ; l'appariement du fichier impôt et celui des sièges ou établissements principaux. Le fichier résultat de ces appariements successifs contiendra les unités inscrites dans au moins un des fichiers sources mais une fois et une seule avec l'ensemble des informations contenues dans le (s) fichier (s) de base auxquel (s) elle (s) appartient (iennent).

Cependant l'information répertoriée doit être choisie après l'analyse de l'ensemble des données descriplives de l'unité. C'est-à-dire que le résultat des appariements ne peut être directement le répertoire initial lui même, mais des fiches d'analyse. Les valeurs les plus sures seront choisies à partir de ces fiches, formatées et codifiées de manière uniforme pour constituer le répertoire initial. Les établissements secondaires seront traités dans le même sens et intégrés au répertoire initial.

5.2.3.- Immatriculation

Le répertoire initial étant constitué, il reste à affecter à chaque unité un numéro d'identification national. Il sera attribué séquentiellement par ordinateur et communiqué sans délai aux associés.

5.2.4.- Répérage des immatriculations multiples

Les échanges interadministratifs rendus possibles par l'existence du répertoire permettront progressivement de repérer les doubles comptes et d'améliorer la qualité du fichier central.

Dès la constitution du répertoire initial, il sera possible de communiquer aux associés la liste des unités absentes de leur fichier et qui semblent, de par leurs caractéristiques, relever de leur champ.

5.3.- Textes législatifs

Voir Principe de Constitution et de fonctionnement du Répertoire national des Entreprises et des Associations.

5.4.- Calendrier de mise en place : période transitoire

Voir Principe de Constitution et de fonctionnement du Répertoire National des Entreprises et des Associations.

5.5.- Le Centre d'Identification national

Voir Principe de Constitution et de fonctionnement du Répertoire national des Entreprises et des Associations.

VOLET "PERSONNES PHYSIQUES"

COMMISSAIRE IBRAHIMA DIALLO

Direction de l'Automatisation des Fichiers
Ministère de l'Intérieur

1.- *PRESENTATION DU SCHEMA DIRECTEUR INFORMATIQUE*

Le Schéma Directeur Informatique a été entrepris en Décembre 1978 dans le souci de rationaliser et d'harmoniser les procédures de travail dans l'Administration publique Sénégalaise. Il a pour objet de mettre en place un cadre de référence pour le développement coordonné des systèmes d'information de l'Administration publique. Cela constitue une première dans l'utilisation de la méthodologie dite "Réseau des données de l'Administration Publique (GOVERNMENT DATA NETWORK)" définie par l'Association Données pour le Développement, et fondée sur l'analyse des flux d'information et sur la planification correspondante des systèmes d'information.

Ce schéma directeur comporte trois volets qui sont :

- *"Personnes Physiques",*
- *"Personnes Morales"*
- *"Sols, superstructures et réseaux",*

Il s'articule autour du principe d'un numéro d'identification unique pour chaque entité de base (personne, entreprise, parcelle) et d'utilisation de ce numéro comme identifiant commun dans tous les fichiers de l'Administration.

2.- VOLET PERSONNES PHYSIQUES: OBJECTIFS

S'agissant du volet "Personnes Physiques", il s'est fixé comme objectif de définir un système généralisé d'identification nationale pour pallier une stituation déplorable au niveau de l'Administration.

En effet, aprés analyse des divers organismes qui recouvrent la quasi-totalité des domaines d'intervention de l'Administration Publique Sénégalaise que sont le Ministère de l'Economie et des Finances (Direction des Impots - Service Central Solde- Sécurité Sociale- Pensions), la Justice (Registre Commerce), la Fonction Publique (Main-d'Oeuvre- Statistiques du Travail), l'Education Nationale (Bourses), le Ministère de l'Intérieur (CNI- Elections- Etrangers) etc..., il est apparu que les données relatives aux personnes physiques détenues par ces divers organismes sont toutes nominatives et les organismes qui les gèrent utilisent des systèmes d'identification souvent différents.

Une harmonisation rapide s'imposait du fait que :

- la multiplication des fichiers entraine des redondances d'informations, créant ainsi des risques de contradiction dans la mise à jour et d'erreurs lors des multiples saisies,

- la variété des systèmes d'identification exclut tout rapprochement et entraine un gaspillage de supports et de ressources informatiques trés dommageable, sans parler de la surcharge de travail tant en maintenance qu'en exploitation de ces différents fichiers.

3.- ANALYSE DU PROJET:ETUDE PREALABLE

C'est ainsi que la Direction de l'Automatisation des Fichiers du Ministère de l'Intérieur s'est vue confier la maitrise d'Oeuvre de ce projet compte-tenu de l'expérience acquise en matière d'idenfication et d'immatriculation de personnes avec la Carte Nationale d'Identité informatisée.

Arés les premières prises de contact avec les différentes administrations concernées, un premier lot parmi elles fut retenu pour être priorisé dans l'étude préalable vu l'importance de leurs fichiers et leurs missions spécifiques. Ce sont les "associés". Il s'agit de :

- la caisse de Sécurité Sociale
- le Service de la Main d'Oeuvre
- le service des Statistiques du Travail
- l'IPRES (Retraite)
- les Pensions et Rentes viagères
- le Service Central de la Solde
- la Direction de la Fonction Publique
- la Direction des Impôts

L'étude préalable démarra en Mars 1982 avec la mise en place d'un groupe de travail comprenant une équipe d'informaticiens de la DAF et des représentants des divers associés.

Des entretiens avec les responsables lors des visites des différents organismes ont permis d'étudier dans le détail le fonctionnement et le contenu de leurs fichiers, et de définir, en étroite collaboration avec les services concernés, les principes directeurs du système d'identification national, axé sur la mise en place d'un "répertoire national des personnes physiques".

Un voyage d'études a été organisé en France auprès de l'INSEE qui gère un répertoire similaire et des organismes qui sont ses correspondants (Caisses de retraite, Impôts , Etat civil) et qui alimentent ce répertoire national. Les points forts et les faiblesses du système français ont été bien analysés et ont guidé la mise au point du répertoire final.

La création de ce système d'identification vise à satisfaire deux objectifs immédiats :

+ mettre à la disposition des utilisateurs un répertoire qui servira de référence pour les fichiers administratifs en leur fournissant une identification et des informations satisfaisantes pour leurs besoins propres; ce qui devrait permettre à chaque service associé :

= d'éviter les inscriptions multiples d'un même individu dans son fichier,
= d'être informé des décès,
= de disposer de données d'état-civil fiables,

ce qui est essentiel aussi bien pour la gestion administrative que pour les administrés eux-mêmes auxquels les erreurs peuvent être préjudiciables.

+ assurer un rôle de coordination inter-administrative en permettant les échanges et en allégeant les formalités auxquelles sont soumis les individus.

De plus, on doit attendre du répertoire national les effets indirects suivants :

- favoriser le développement de l'information démographique et économique,

- améliorer le fonctionnement de l'état-civil et sa fréquentation par l'obligation de fournir une pièce d'état-civil lors de l'immatriculation et la détection des erreurs d'état-civil ou fraudes grâce au logiciel d'identification.

4.- <u>FONCTIONNEMENT DU REPERTOIRE NATIONAL</u>

Il faut souligner, toutefois, qu'il ne s'agit nullement de regrouper les différents fichiers administratifis, qui garderont toutes leurs spécificités quant à leur utilisation et leur contenu.

Le contenu du répertoire est limité aux informations d'état-civil nécessaires à l'identification des personnes à savoir : numéro d'idenfication national ou NIN, nom et prénoms, date et lieu de naissance, filiation, situation matrimoniale, profession, et éventuellement, date et lieu de décès, numéro de l'acte de décès.

L'alimentation du répertoire est assurée par les services associés. Grâce aux informations qu'ils lui transmettent, la Direction de l'Automatisation des Fichiers procède à la mise à jour du répertoire . Cependant, lorsque le fonctionnement et la fréquentation de l'état -civil le permettront, ce sont les centres d'état-civil qui en assureront l'alimentation.

Pour toute personne à inscrire dans leur propre fichier, les associés demanderont à la DAF de leur communiquer, s'il n'est pas déjà connu, le NIN de la personne : c'est une demande d'identification.

Si cette personne ne figure pas au répertoire, la DAF informe le service intéressé qui demandera alors son inscription en remplissant un imprimé approprié accompagné d'un extrait de naissance : c'est une immatriculation.

Par ailleurs, tout évènement susceptible de modifiér ou de compléter les données inscrites au répertoire national, porté à la connaissance d'un service associé, sera signalé à la DAF : c'est une demande d'inscription modificative; il peut s'agir de mariage, décès, adoption, changement de nom, bref de tout changement d'élément d'état-civil .

5- PERFECTIONNEMENT DU SYSTEME D'IDENTIFICATION : LA PHONETISATION

Le systéme informatique de gestion du répertoire donne la possibilité de rechercher un individu à partir de ses données d'état-civil qui sont nom, prénoms, et filiation. l'utilisation de la phonétisation de ces noms et prénoms permet d'éliminer une bonne partie des erreurs de transcription courantes ou des interprétations différentes sur une orthographe.

5.1- QUELQUES STATISTIQUES

Les statistiques menées sur une population d'environ 800.000 individus nous ont donné les résultats suivants:.

- les noms :

Les 100 noms Sénégalais les plus courants représentent 90% de la population pour une longueur moyenne de 6 à 7 caractéres.

5.2-PRINCIPES DE LA PHONETISATION

Les travaux menés en collaboration avec des spécialistes en phonétique de l'Université de Dakar ont porté sur une liste de 200 noms des plus fréquents, constituant ainsi la base de l'étude.

Cette liste contient des noms sénégalais mais aussi ceux des pays limitrophes.

Les symboles proposés pour la phonétisation sont ceux de la norme internationale avec quelques changements pour des besoins techniques.

Pour les transcriptions phonétiques, des tables sont utilisées et font apparaître le symbole équivalent à chaque consonne, chaque voyelle, aux bigrammes, aux trigrammes, aux cas particuliers, qui, eux, sont représentés sous la forme de l'orthographe traditionnelle.

5.3- PREMIERS RESULTATS

Le programme de phonétisation est opérationnel et des tests pratiques, effectués dans des conditions normales de recherche, sont très encourageants.

De nouvelles règles sont en cours d'étude pour la mise en place de tests de recherche plus poussés.

VOLET "SYSTEME D'INFORMATION FONCIER"

PAPA SITIA DIAGNE
PAPA A. LETT
CIRE SALL

Direction des Domaines

L'activité première de la Conservation foncière consiste à garantir le commerce juridique des droits immobiliers. A ce titre cette institution doit assurer une manutention correcte de tous les documents pouvant justifier à tout moment l'exercice de ces droits, support de la garantie des relations d'affaires.

Dans ce sillage l'apport de l'informatique est important pour plusieurs raisons dont notamment une consultation rapide et fiable des données historiques et la garantie du respect d'une procédure administrative précise.

D'ailleurs c'est suite aux recommandations du Comité National Informatique dont le Secrétariat est assuré par le Bureau Organisation et Méthodes que le système d'Information foncière a été mis en chantier sous la responsabilité de la Direction du Traitement automatique de l'Information.

La réalisation de ce système aura des applications utiles dans des domaines aussi variés que le Cadastre , l'Urbanisme, la Statistique, les Impôts et l'Enregistrement.

A ce jour, la première partie du système relative au Cadastre et à la Conservation foncière a été réalisée at testée à partir d'une zone pilote de deux cents titres fonciers située dans le périmètre du Point E.

Notre propos est de vous faire le point de ce travail inachevé dans le double souci de préciser les objectifs et d'énumérer les contraintes.

I- Transfert et Implantation de la première partie du système

Cette partie permet d'ores et déjà la prise en compte et la mise à jour des données afférentes :

A) - aux parcelles :

- numéro TF
- numéro de lot
- bureau de la CF
- TF complémentaire du lot
- ilot et voies adjacentes
- adresse
- superficie, nature , numéro dossier du Cadastre, date du dernier procès-verbal de bornage et identification du géomètre
- coordonnées X et y des sommets et distances

B) - aux informations juridiques relatives au TF :

- date de création du TF
- numéro du TF mère et date de création
- droits réels constitués par démembrement
- clauses d'interdiction
- propriétaires
- hypothèques

C) - aux informations relatives à la Direction des Impôts :

- numéro de liasse
- numéro de bulletin
- code valeur (vénale ou locative)
- valeur vénale du terrain ou valeur locative du bâti
- code exonération
- date expiratinn de l'exonération

D) - aux informations relatives aux personnes propriétaires ou titulaires de droits réels et/ou hypothèques

E) - aux clauses d'interdiction.

L'intérrogation du système permet de consulter toutes ces informations à partir de transaction-écran, par simple indication de l'identifiant d'un titre foncier ou d'un lot.

En outre, l'indication d'un numéro de compte contribuable permet d'obtenir, par transaction-écran :

- les informations d'identification de la personne correspondante
- les titres fonciers ou lots qu'elle possède
- les titres fonciers ou lots sur lesquels elle est titulaire d'un droit réel
- les titres fonciers ou lots sur lesquels elle possède un droit d'hypothèque.

La consolidation de cette première partie du système nécessite quelques activités complémentaires du Projet en vue de réaliser :

- au niveau de l'interrogation du système :
  - l'affichage des titres fonciers et/ou lots afférents à un ilot
  - l'affichage des titres fonciers et/ou lots afférents à une voie
  - l'édition de la feuille des coordonnées d'un titre foncier ou d'un lot, de l'état des droits réels et charges , du certificat de propriété et du titre foncier lui-même (image d'un feuillet du livre foncier).
- au niveau du contrôle des données , l'écriture d'une routine qui permettra, lors de la saisie des coordonnées et distances :
  - de recalculer les distances à partir des coordonnées entrées pour les comparer aux distances entrées ;
  - de recalculer, de la même façon, la surface pour la comparer à la surface entrée.

Le projet devra en outre reprendre l'ensemble des documents de saisie , notamment la fiche de morcellement et la fiche de prise en compte des informations afférentes aux personnes, pour mieux les adapter au système.

Il devra, enfin, concevoir et réaliser un des utilisateurs qui devra refléter au moins deux parties :

- une partie relative à l'utilisation du produtt informatique, notamment au niveau des documents de saisie et des transactions-écran ;

- une partie descriptive des procédures administratives (au niveau du Cadastre, de la Conservation foncière , de la Direction des Impôts et de la DTAD relatives à la prise en compte et à la mise à jour des données, et à l'interrogation du système.

II- <u>Définition des étapes ultérieures</u> :

Celles-ci concernent essentiellement :

- la création de la base de données
- la mise en place des équipements informatiques et de télécommunications
- la prise en compte de besoins de l'Urbanisme et de la Direction des Impôts au niveau du système.

<u>La création de la bse de données</u> :

Elle devra se faire par zones successives, en tenant compte des sections cadastrales.

Cette étape nécessite la consultation des dossiers techniques du Cadastre et des Livres fonciers, ainsi que des travaux de complément sur le terrain pour la mise à jour de ces dossiers.

Ces activités permettront de réaliser un état exact des lieux , sur carte, avant la codification des informations y afférentes sur les bordereaux de saisie.

Pour atteindre cet objectif, le Projet doit comprendre un certain nombre d'équipes du Cadastre et de la Conservation foncière disposant de moyens adéquats : voitures(plus carburant) , matériel de bureau et de dessin, etc.

A cet effet , il est proposé un redéploiement de personnel issu du Cadastre , du Service géographique et des Services techniques communaux vers le Projet en vue de constituer 3 équipes comprenant chacune un ingénieur géomètre et 3 chaineurs.

En outre, la Conservation foncière devra mettre à la disposition de ces équipes tout le personnel nécessaire en vue de la consultation des Livres fonciers.

Le Secretariat général de la Présidence de la République (BOM notamment) et le Ministère de l'Economie et des Finances (notamment la DTAD) sont chargés de mettre à la disposition de ces équipes les moyens de fonctionnement nécessaires à la réalisation de leurs travaux.

La prise en compte de tous les titres fonciers de Dakar dans la base de données en 20 mois, nécessite un rythme de travail de 1.000 titres foncier et/ou lots par mois et, par conséquent , de 30 titres foncier et/ou lots par équipes et par jour.

Enfin le Projet devra, au fur et à mesure de l'avancement du travail de ces équipes, mettre en place, au sein des sections cadastrales et des bureaux de la Conservation foncière des structures chargées de la mise à jour des données de la base. Ces structures exigeront des moyens internes qui seront également à pourvoir.

VOLET "SYSTEME D'INFORMATION FONCIER"

PAPA SITIA DIAGNE
PAPA A. LETT
CIRE SALL

Direction des Domaines

L'activité première de la Conservation foncière consiste à garantir le commerce juridique des droits immobiliers. A ce titre cette institution doit assurer une manutention correcte de tous les documents pouvant justifier à tout moment l'exercice de ces droits, support de la garantie des relations d'affaires.

Dans ce sillage l'apport de l'informatique est important pour plusieurs raisons dont notamment une consultation rapide et fiable des données historiques et la garantie du respect d'une procédure administrative précise.

D'ailleurs c'est suite aux recommandations du Comité National Informatique dont le Secrétariat est assuré par le Bureau Organisation et Méthodes que le système d'Information foncière a été mis en chantier sous la responsabilité de la Direction du Traitement automatique de l'Information.

La réalisation de ce système aura des applications utiles dans des domaines aussi variés que le Cadastre , l'Urbanisme, la Statistique, les Impôts et l'Enregistrement.

A ce jour, la première partie du système relative au Cadastre et à la Conservation foncière a été réalisée at testée à partir d'une zone pilote de deux cents titres fonciers située dans le périmètre du Point E.

Notre propos est de vous faire le point de ce travail inachevé dans le double souci de préciser les objectifs et d'énumérer les contraintes.

I- Transfert et Implantation de la première partie du système

Cette partie permet d'ores et déjà la prise en compte et la mise à jour des données afférentes :

A) - aux parcelles :

- numéro TF
- numéro de lot
- bureau de la CF
- TF complémentaire du lot
- ilot et voies adjacentes
- adresse
- superficie, nature , numéro dossier du Cadastre, date du dernier procès-verbal de bornage et identification du géomètre
- coordonnées X et y des sommets et distances

B) - aux informations juridiques relatives au TF :

- date de création du TF
- numéro du TF mère et date de création
- droits réels constitués par démembrement
- clauses d'interdiction
- propriétaires
- hypothèques

C) - aux informations relatives à la Direction des Impots :

- numéro de liasse
- numéro de bulletin
- code valeur (vénale ou locative)
- valeur vénale du terrain ou valeur locative du bâti
- code exonération
- date expiratinn de l'exonération

D) - aux informations relatives aux personnes propriétaires ou titulaires de droits réels et/ou hypothèques

E) - aux clauses d'interdiction.

L'intérrogation du système permet de consulter toutes ces informations à partir de transaction-écran, par simple indication de l'identifiant d'un titre foncier ou d'un lot.

En outre, l'indication d'un numéro de compte contribuable permet d'obtenir, par transaction-écran :

- les informations d'identification de la personne correspondante
- les titres fonciers ou lots qu'elle possède
- les titres fonciers ou lots sur lesquels elle est titulaire d'un droit réel
- les titres fonciers ou lots sur lesquels elle possède un droit d'hypothèque.

La consolidation de cette première partie du système nécessite quelques activités complémentaires du Projet en vue de réaliser :

- au niveau de l'interrogation du système :
  . l'affichage des titres fonciers et/ou lots afférents à un ilot
  . l'affichage des titres fonciers et/ou lots afférents à une voie
  . l'édition de la feuille des coordonnées d'un titre foncier ou d'un lot, de l'état des droits réels et charges , du certificat de propriété et du titre foncier lui-même (image d'un feuillet du livre foncier).
- au niveau du contrôle des données , l'écriture d'une routine qui permettra, lors de la saisie des coordonnées et distances :
  . de recalculer les distances à partir des coordonnées entrées pour les comparer aux distances entrées ;
  . de recalculer, de la même façon, la surface pour la comparer à la surface entrée.

Le projet devra en outre reprendre l'ensemble des documents de saisie , notamment la fiche de morcellement et la fiche de prise en compte des informations afférentes aux personnes, pour mieux les adapter au système.

Il devra, enfin, concevoir et réaliser un des utilisateurs qui devra refléter au moins deux parties :

- une partie relative à l'utilisation du produtt informatique, notamment au niveau des documents de saisie et des transactions-écran ;

- une partie descriptive des procédures administratives (au niveau du Cadastre, de la Conservation foncière , de la Direction des Impôts et de la DTAD relatives à la prise en compte et à la mise à jour des données, et à l'interrogation du système.

II- Définition des étapes ultérieures :

Celles-ci concernent essentiellement :

- la création de la base de données
- la mise en place des équipements informatiques et de télécommunications
- la prise en compte de besoins de l'Urbanisme et de la Direction des Impôts au niveau du système.

La création de la bse de donnés :

Elle devra se faire par zones successives, en tenant compte des sections cadastrales.

Cette étape nécessite la consultation des dossiers techniques du Cadastre et des Livres fonciers, ainsi que des travaux de complément sur le terrain pour la mise à jour de ces dossiers.

Ces activités permettront de réaliser un état exact des lieux , sur carte, avant la codification des informations y afférentes sur les bordereaux de saisie.

Pour atteindre cet objectif, le Projet doit comprendre un certain nombre d'équipes du Cadastre et de la Conservation foncière disposant de moyens adéquats : voitures(plus carburant) , matériel de bureau et de dessin, etc.

A cet effet , il est proposé un redéploiement de personnel issu du Cadastre , du Service géographique et des Services techniques communaux vers le Projet en vue de constituer 3 équipes comprenant chacune un ingénieur géomètre et 3 chaineurs.

En outre, la Conservation foncière devra mettre à la disposition de ces équipes tout le personnel nécessaire en vue de la consultation des Livres fonciers.

Le Secretariat général de la Présidence de la République (BOM notamment) et le Ministère de l'Economie et des Finances (notamment la DTAI) sont chargés de mettre à la disposition de ces équipes les moyens de fonctionnement nécessaires à la réalisation de leurs travaux.

La prise en compte de tous les titres fonciers de Dakar dans la base de données en 20 mois, nécessite un rythme de travail de I.000 titres foncier et/ou lots par mois et, par conséquent , de 30 titres foncier et/ou lots par équipes et par jour.

Enfin le Projet devra, au fur et à mesure de l'avancement du travail de ces équipes, mettre en place, au sein des sections cadastrales et des bureaux de la Conservation foncière des structures chargées de la mise à jour des données de la base. Ces structures exigeront des moyens internes qui seront également à pourvoir.

§II - La mise en place des équipements informatiques et de Télécommunication

Le projet est chargé de faire, en rapport avec le Support technique de la DTAI, nne évaluation de ces moyens.

Toutefois , il appartient à la DTAI d'acquérir et d'installer ces équipements.

§III- La prise en compte des besoins de l'Urbanisme et de la Direction des Impôts :

Les besoins de ces 2 services ont clairement été exprimés dans la définition des spécifications du système.

Les activités nécessaires à leur prise en compte sont, au niveau de l'Urbanisme :

- la création d'un répertoire informatique permettant d'apparier le numéro de titre foncier et le numéro du dossier du permis de construire ;
- la conception et la réalisation des documents de prise en compte des données relatives aux permis de construire ;

- l'écriture des programmes de prise en compte et de mise à jour des données de la zone pilote afférentes aux permis de construire ;
- l'écriture de programmes d'interrogation.

L'ensemble des activités doivent être menées par le Projet, au Sénégal.

Toutefois, il est nécessaire de consulter le Groupe NIMS sur la finalisation des documents de saisie et les programmes informatiques. Ceci nécessite, notamment, une mission de ce groupe au Sénégal.

Les activités nécessaires à la prise en compte des besoins de la Direction des Impôts nécessite essentiellement l'écriture de programmes de consultation. Ceux-ci devront fournir :

- la liste des propriétaires et autres détenteurs de droits taxables ainsi que les TF et/ou lots correspondants ;
- la liste des TF et/ou lots de chaque ilot ;
- la liste des TF et/ou lots de chaque voie ;
- la liste des immeubles bâtis par TF et/ou lots.