

# **THE END USER: A CHANGING PERSPECTIVE**

by

**Heinrich Reinermann**

**Post-Graduate School of Administrative Sciences Speyer**

**Federal Republic of Germany**

## **1. Introductory Remarks**

(1) At first I want to congratulate ICA on its 18th anniversary. Young ladies around that age use(d) to change their names, and it is interesting to notice that ICA is about to do just that - from International Council for ADP to International Council for Information Technology in Government Administration. And, indeed, just as a marriage denotes an important new phase of life, the beginning liaison of modern information technology and public administration might indicate a new era. The challenges are quite enormous and the change, as I see it, is just starting.

(2) The topic you chose for this 20th conference is a very important one, indeed. End user computing is spreading rapidly. Lately, the management of a big German business company felt that the time had come to start thinking about the introduction of personal computers. Imagine their astonishment when they had to find out, however, that some 2.000 personal computers were in use already and had been procured, unnoticed by management, via material requisition slips.

Public employees also prove to be inventive, e.g. when they divert budget money granted for, let us say "measurement devices" in order to buy personal computers instead. Some even bring their own Portables or their kids' computers to the office. Apparently, there must be something to end user computing!

(3) Probably all of you are familiar with the story which is supposed to have happened some decades ago in the United States when the telephone was spreading rapidly and the demand for telephone operators accordingly. Remember that in those early days of telecommunication you only had to pick up the phone and the operator arranged the connection. The shortage of operators, therefore, seemed to limit the growth of the telephone market - unless near to every American would have to serve as an operator. And, as we know today, this was exactly what happened.

Will the same situation return for computing? Given the rapid spreading of information technology and the shortage of programmers, e.g. visible in the backlog of applications, are we all going to become programmers? This seems to be the notion of end user computing - for some a promise, for others a threat.

(4) In such periods of rapid change, experience gained in the past is of limited value only. When energy supply was changing from whaleoil to electricity in the last century, to refer to experience alone was not enough. Imagination and creativity regarding what could be done with this new type of energy was needed.

I think, end user computing is putting us in a similar situation today: The rules of the computing game are going to be very different from the ones we are used to. Prognoses based on yesterday's experiences are of limited value. It may be more important to concentrate on where we want to go, on what could be achieved with end user computing. Goal-oriented and constructive strategies or even utopias about information technology's contributions to public administration seem to be necessary. But, do we have such concepts at our disposal?

(5) "The End user: A Changing Perspective", under this heading I want to list and to classify some of the questions arising from end user computing and to summarize some of the answers which could be provided. I am well aware of the fact, however, that a lot of theoretical work remains to be done with respect to both: explaining the various phenomena in the field of end user computing and founding reasonable decisions to be taken in specific situations.

(6) Having been dealing with computers for some years now, I am probably in constant danger to exaggerate their real meaning for public administrations. So, whatever I am going to say now about end user computing, you should reduce it to its proper perspective and to more

modest dimensions. The public service has a lot more to worry about than information technology. Nevertheless, and this is the concern of my paper, information technology (henceforth: IT) in its modern appearance definitely can contribute to the constant struggle to improve effectiveness, efficiency, and economy of public administration.

## **2. End user Computing: What is it?**

Although all of us know what end user computing is, let me just briefly explain the definition I will follow in the course of this paper. For, this term is by no means self-explaining. Apparently, the mere handling of EDP-equipment by end users does not qualify for its application; otherwise the tapping of central accounting programs or citizen registration routines per terminal and online data processing would be included. The term "user" alone is somewhat misleading as "designer" would be much more appropriate.

The do-it-yourself movement may serve as a starting point. Without doubt: end user computing is a modern version of it. Let us assume you wanted your fence painted and you had two choices: to commission a master painter or to do it yourself. In the latter case, firstly you would decide if, when, and how you wanted this job done, and secondly you would provide yourself with paint, brush, knowledge, and motivation; and thirdly you would paint your fence.

Back to computing jobs: Analogous, you have two choices - to leave them to outside experts in computing centers, or you as layman in IT but as an expert in administration treat them yourself. So far, so good. But here the comparison starts to limp: Does do-it-yourself computing necessarily mean that the end user decides about all the ifs, whens, and hows of the job, or that he himself<sup>1</sup> takes care of the equipment necessary?

Let us be a bit more specific and distinguish some essential decisions which must precede the execution of computer programs. Which of these decisions have to be taken by the end user instead of a central authority in order to qualify computing jobs for being elements of end user computing? Figure 1 lists these decisions and suggests which of them could be considered as necessary conditions for end user computing.

---

<sup>1</sup> For reasons of simplicity the masculin form always is meant to include the female, pars pro toto.

Hence, we talk about typical end user computing when a public administrator in case of a certain computing need, arising more or less spontaneously in the context of his work,

- does not have to prespecify this task to EDP experts, to wait until they have solved his problem, and to apply their procedures as ready-made products without being able to modify them
- but personally applies end user tools without delay as he needs them, allowing him to develop an individual sequence of program steps which portray his problem exactly and are tailor-made for the situation given.

This notion of end user computing, then, does not exclude a framework of central decisions on hardware, networks, systems software, data bases, or even on the type of end user tools installed. It does exclude, however, the mere starting of unmodifiable software procedures, whether via online data processing or provided somehow on personal computers.

The term "computing" in this context is understood in a wide sense and includes processing and electronic exchange of data, text, graphics, and voice.

Among the typical examples of end user computing are, as we all know, information storage and retrieval, word processing, data base queries, spread-sheet and statistical calculations, file management, application development, time management, computer-aided design, business graphics, and communication.

### **3. Reasons for and Prerequisites of End user Computing**

End user computing calls for some technical and human conditions.

(1) Before an audience of distinguished experts in the field of ADP and in order to avoid to carry owls to Athens, I want to touch briefly only upon **the technical side**. End user computing requires, above all, low cost and easy to manage access to computers, software tools, and data at all times and from the end user's desk. Technical progress meanwhile has provided these prerequisites - more or less. At any rate, for public administration there is no need to wait any longer - to the contrary, it is necessary to deal with end user computing now in order to reach soon as high a level on the learning curve as possible.

(1.1) There are **four main technical prerequisites** for end user computing: hardware, networks, software, and data.

Microcomputer-based workstations are in the center of **hardware** conditions. The trend here goes from today's mostly used 16-bit-processors to 32-, and even 64-bit-workstations with extra special processors for graphics and communication. Performance of workstations today equals that of mainframes some years ago. Storage capacity is large. Especially promising for end user computing may be the CD-ROM (Compact Disc, Read Only Memory) which today puts some 500 MB external storage on the end user's desk. This is a lot considering the fact that the complete data bases of 2/3 of the 3,000 public information retrieval systems offered worldwide, fit on one such compact disc.

Progress in the **network** area has been intensive, too. Local Area Networks (LAN), Private Automatic Branch Exchanges (PABX), and Wide Area Networks (WAN) have led to the fact that now communication - after data processing - is subject of automation. End user computing will especially benefit from the Integrated Services Digital Network (ISDN) which is going to make integrated voice, word, data, or graphics processing available at each telephone extension.

The success of end user **software** tools is mainly due to their versatility, user-friendliness, and low prices which for their part root in standardized microprocessor operating systems and very large editions or sales, respectively (for examples refer to Figure 1).

As far as access to data is concerned, the growing number of computer-based data banks both inside and outside public administration is an important resource for end user computing.

(1.2) Despite all these achievements: The **technological conditions** for end user computing are **far from optimal yet**. The IT market is growing and highly innovative which has led to an explosion of hardware and software choices. But high innovation usually has to be paid for by a low grade of standardization. Especially when you consider micro to micro and micro to mainframe communication with down- and up-load of data and programs, incompatibility of operating systems, data base management systems, and networks becomes evident. Henry Nanjo, head of the City of San Francisco's Computer Service Center, told me lately: "Should our City Hall collapse one day, this will not have been caused probably by an earthquake but by an overload of tons of copper cables we need to connect our heterogeneous IT systems!" To relieve the incompatibility problem is of utmost importance, at least for two reasons:

- the real clou of end user computing is not to permit a public servant to install a stand-alone system and to consider his office to be an isolated island, but to let him participate in and to contribute to public administration's information and communication system. This, of course, requires distributed systems
- especially end user systems can only be expected to grow evolutionary and spontaneously over time. To define a total system concept in advance as a basis for compatible procurements, therefore, is near to impossible. Plug compatible systems would reduce such barriers to flexible and learning information systems.

There are more technical problems to end user computing, e.g. with regard to reliability, to avoidance of uncontrolled states, to built-in measures of securing data, to ergonomics, to better specification languages (which, after machine code, assembler, problem-oriented, and design languages, now must get attention), or with regard to the quality of user interfaces (e.g. self-explaining systems with little training requirements).

In total, the problems still to be solved call for increased efforts of quality control by authorized institutions which check the conformity of IT products with prespecified criteria and which grant quality certificates without putting too many restraints on the technological progress, however.

(2) ***The human conditions*** for end user computing are twofold: skill and motivation.

As far as *skill and knowledge* are concerned we have to be aware of a tremendous training challenge ahead of us. On the one hand this is due to the fact that with non-expert computing the sheer number of trainees is growing enormously; for, computing is no longer reserved to a certain "guild", nor becomes the public service (management included) impure by joining the "EDP cast". Beyond the quantity problem, end user computing challenges the quality of training: For administrators, to handle EDP equipment has proven to be much less a difficulty than to be master of it in the sense of knowing what to do with it. Therefore, computer exposure and computer literacy as training goals must be supplemented by efforts to teach how electronics can be utilized to improve one's work. In this period of time, the biggest share of training must be devoted to in-service programs because to wait for the next generation of public servants would mean to depreciate the existing one as well as to omit present opportunities.

***Motivation*** to meet the challenge imposed to a human being by computing machines generally seems to be high. Sometimes even measures have to be taken to keep employees from spending too much time and effort on "their" computing systems. This resembles the do-it-yourself-situation

described so perfectly by Mark Twain when Tom Sawyer had to paint Aunt Polly's fence and his friends even gave him their marbles and pocket-knives in exchange for the chance to enjoy working.

#### 4. The End user: Who is it?

When talking about end user computing the first group of end users which comes to one's mind is, of course, the **public service**, namely at all clerical, staff, secretary, and management levels.

But dealing with "changing perspectives of end user computing", I think it necessary to include a second group of end users: the **clients** of public administration. The more the emphasis shifts from automation of data processing towards automation of communication, the more the relations between public administration and its clients must be taken into account. Administrative automation in the future will mean more than to design information systems inside public administration; their links to society must be born in mind as well, especially links to business, science, social and cultural institutions, and to the private citizen.

Therefore, the notion of end user computing should include users in the environment of administration who utilize IT

- to support operative business connections with respective agencies
- but also to make use of public administration's data bases which will be more and more considered to be common as technological progress allows this.

Without doubt, end user computing conceived in this way points to a "new generation" of administrative automation which is, however, not yet discussed enough, neither by public administration nor by its clients.

#### 5. End user Computing and Division of Labor

As we have seen, end user computing means do-it-yourself-computing instead of prespecified computing designed by external experts. End user computing is a striking example of one of modern IT's most interesting characteristics: It is suitable to reduce the division of labor. Modern IT can be used to reintegrate split tasks, here substantial as well as instrumental tasks, within one position. But by the same token, end user computing can enhance the independence and discretion of employees. Should public management consider this a threat or a challenge?

This question is not principally new: Whoever wants a job done by others, whether a private household by craftsmen or an agency head by employees, as the principal is interested in ex ante-influencing the action of his contractors and in ex post-examination whether they have observed the instructions given.

But there are general limits to controlling the behavior of "contractors":

- it may be against the law or considered inhumane to control behavior aspects of others, or this can be unnecessary because no influence on the expected results is recognizable
- control of behavior may be impossible, uneconomical, or even counter-productive (imagine that the employees suspect the agency management of utilizing end user computing for performance measurement and, therefore, start to exchange unnecessary letters, maybe even automatically, or they patch up nice looking reports from already existing ones, just in order to improve their image)
- a superior may give up controlling his employees because he thinks it to be too troublesome (to take care of and cultivate relations to others usually means intensive work, whereas to retreat to one's own desk is easier)
- or, finally, to give rein to employees may be used deliberately as an instrument to enhance performance and motivation.

Depending on type and level of control, then, it is generally not clear beforehand if an employee really is aware of all goals and rules for his work, has substituted or supplemented these by his own procedures, in a certain case applies the appropriate rule, and whether he recognizes opportunities for discretion and utilizes this discretion in accordance with the agency's mission and goals.

In this respect, end user computing on the one hand betters the situation of superiors because the employees' behavior to a certain extent "coagulates" in software and data and in so far is easier to check. Of course, this presupposes, and here comes the difficulty for management, that the technical and intellectual means for this kind of control have been made available at all.

End user computing, consequently, forms just another sub-group of general management problems. But it raises special questions such as: To which extent can we afford "organizational slack", "creative disorder", or "organized anarchy" by end user computing? How much "management by results" versus "management by direction and control" of someone's behavior is adequate? And how can we reach and hold the right balance?



## 6. Promises of End user Computing

The supply of EDP services by computer centers may be considered as the early stage of administrative automation; its maturation phase is now indicated by the supplementation of computer centers with decentralized end user computing services.

(1) The first promise coming to one's mind is **reduction of application backlogs**. Computing jobs left aside because there was no chance of getting them done in time, now can be taken up again. Or tasks can be fulfilled with higher quality, e.g. because data now can be included which were not accessible before and full use can be made of them in terms of calculation or graphical presentation. Thus, end user computing enables "quick knowledge" and "value-added jobs". Beyond that, end user computing reduces routine work and so frees the public service to apply our real human talents to a higher extent, among others perception of problems, planning and organizing, creativity, judgement, and concern for people whether clients or employees. As Dale Yoder from Stanford University has mentioned already in the beginning of the computer age: "Who behaves like a computer will probably be replaced by one", which means nothing else but the more routine work can be left to the computer, the more we can and must make use of our real human capabilities.

Here, with respect to these effects of end user computing on public tasks, an answer can be given already to the question put so often, namely if IT is responsible for unemployment: Indeed, automation sets free human labor, this is one of its purposes. But, on the other hand, at least for the comprehensible future, this human labor is needed again to raise the supply of public administration's services to higher quality levels as the upcoming "service society" or "information society" will demand them.

Computer services by end user computing are available much faster, also. One reason is that coordination between agencies can be lessened and thus much time can be won. In a German university, e.g. the computer center was charged with planning and coordination as to if, how, and which personal computers should be used. When they came up with recommendations finally, some of the PC suppliers listed had gone out of business already.

Another reason for savings of time by end user computing lies in its effect to reduce division of labor: The administration expert, instead of having to communicate his problem and his administrative knowledge to EDP experts only in order to enable them to come up with the program for his problem,

now is able to do also the computing himself which saves time and misunderstandings. The substantial work can be done without disruptions forced sometimes by central computers and without having to adhere to overall computing regulations which not seldom fill several files and outnumber the material regulations by far. In this respect end user computing contributes to deregulation efforts.

And at least end user computing which serves the purpose already when done "quick and dirty" is more economical than to hand those jobs over to computer centers equipped with sophisticated technical and human resources. This indicates that besides promises for the single administrator end user computing offers advantages for the institution as a whole, too: e.g. reduction of interagency conflict and overhead expenses, or limitation of damage following system failures.

(2) A second set of promises refers to a phenomenon which is most remarkable, indeed. End user computing very likely releases ***impulses for the employee to personally reflect over his work*** and to redesign it. Apparently, end user computing is a challenge to think over whether a certain task could be done better or organized more efficiently, how many restrictions are imposed really by laws and regulations, or how much freedom of movement is in fact available. I have seen people developing activities they were not believed capable of before.

End user computing as a special answer to the general "make or buy" question is different from the mere carrying out what others have planned and designed. Rather, end user computing can serve as a medium or as a catalytic agent that sets free the human potential to innovate. Very much like vocabulary and grammar tools of our regular human language allow me to express whatever I want to, end user tools enable me to formulate an individual problem as I conceive it and in accordance to the goals I want to achieve, rather than having to adhere to prespecified software constructs, procedures and steps developed and prescribed by some external central authority. It is here where you find the most typical difference between end user computing and traditional software procedures, provided centrally and meant to use EDP more or less in an instrumental and technical way as means to automatize the given, unchanged administrative world.

This typical effect of end user computing is probably more powerful than traditional employee suggestion systems. For, with end user computing you can implement and realize your proposals yourself and right away; the work improvements are for the benefit of the employee himself and so is the

credit. End user computing, then, provides for conditions which enable the public servant to become an "intrapreneur", an attitude which, of course, is highly welcome in an environment characterized principally by lack of market competition.

One may hesitate to use terms like "Computer Liberation" or "New Age of Enlightenment"<sup>2</sup> to characterize this phenomenon. But it certainly supports the view that we simply could try to provide an employee with a personal computer and see what happens, instead of relying on a thorough analysis of needs as they can be recognized by external EDP experts. At any rate, the attitude of end user computing to encourage and promote innovation by employees suggests that we think anew about the proper arrangement and competences of divisions for organization and methods. It seems that an IT which comes closer and closer to the end user, generally also calls for a much higher user involvement and participation.

It goes without saying that acceptance of IT by the public service is all the less a problem the more the end user can influence and design "his" system himself and the more learning by doing, learning as you need it, and learning by exchange of ideas with colleagues is involved.

## 7. Threats of End user Computing

No light without shadow, though. I want to classify some of the risks related to end user computing in four groups: uneconomy, mistakes and violation of laws, disintegration of public administration, and the danger of copying and freezing given administrative behavior instead of utilizing end user computing to change this.

(1) A few years back, some unit of the American Army near Tuscon/Arizona tried its luck with personal computers after having experienced a high application backlog for quite some time. But the experiment resulted in a chaos and was stopped until an orderly framework for computing was developed. Indeed, with regard to **economy** of end user computing quite a few pitfalls are conceivable.

Personal computers may serve as a status symbol mainly or may not be worked at full capacity. Of course, such effects on economy become smaller

---

<sup>2</sup> Hartmut Wedekind, Brauchen wir eine neue Aufklärung?, in: Arbeit und Informationstechnik, Informatik-Fachberichte 123, ed. by Klaus Theo Schröder, Springer 1986, pp. 391-402.

and smaller the more IT prices go down. After all, we have also given up to question the capacity utilization of telephone extensions in the meantime.

Decentralized procurement of end user computing devices may result in less discounts negotiated, higher maintenance costs caused, or more time and efforts needed to familiarize users with different systems. To ignore central EDP resources, in addition may result in re-inventing the wheel and in double work. End user programs may prove to be odd, poorly documented, and, thus, not usable by others. Data stored in a local system may be needed by others, too, and better were generally accessible. One will also have to bear in mind that central batch or dialog processing in quite a few cases still remains superior to end user computing in terms of economy, so for standard applications of mass routine administration.

On the other hand, the effects of end user computing on economy are difficult to quantify, e.g. because personal handling of IT by the single employee may be more costly but still necessary in order to learn and to utilize the benefits of end user computing later on.

In this context also the often expressed fear must be seen, employees might abuse personal computers to play games. Firstly, this is of course a question of leadership. Secondly, end user computing by calling it playing sometimes is brought into contempt by EDP veterans who are confused by this secularization of their art. And finally, I personally do not dislike the label "toy" for personal computers because this connotes the dominance of man over machines, after all.

However, a more severe influence on economy might have the fact that end user computing allows the public servant to improve a reached solution time and again, e.g. to beautify texts and graphics much more than necessary or to exaggerate software elegance to the detriment of the real task.

(2) One of the major dangers of end user computing lies in the risk that bringing privately owned portables to the office or using personal computers in ways considered to be wrong from the institution's point of view, may result in some sort of a "shadow administration" besides the official one.

**Programs** run **and data** processed can be **wrong or not up to date**, either by mistake of the end user or by deliberate manipulation both by the end user or some unauthorized person who was able to get his hands on the PC. Data and programs stored locally are more difficult to protect than in computer centers mainly because one must rely upon the personal skill,

trustworthiness, and integrity of the many individuals involved. Certainly, there are technical means to extend the security advantages of computer centers to the end user world, but they are neither perfect yet nor their applications widespread. Among such means are to equip personal computers with hard discs only so that programs and data used can be better controlled by down-loading them from mainframe to micro, and periodical online-checks of what the end user is doing, the anticipation of which possibly could prevent the ill-willing end user from misusing his equipment.

A related problem is how to guarantee the **uniform application of laws** and regulations in an end user computing environment. Do official forms have to be used or is an individually programmed print-out acceptable? May the text of a letter or decree be formulated at liberty? Are official procedures or private ones used for processing of an application? Are the algorithms correct? Are exceptional cases taken care of properly? Maybe that we sometimee are in danger to carry the principal of uniformity too far, but nevertheless, here is a major problem of end user computing that solutions have to be provided for.

With regard to **legal problems** may it suffice here to have a look at the privacy issue. End user computing causes, by definition, a proliferation of stored personal data just because of letters produced by automatic word processing or files with personal data stored in data base systems. Which administrative task justifies the storage of which personal data and for how long? Which data may be transferred or combined for processing? Can these restrictions be guaranteed by the IT system in use? Does it allow specific data elements to be blocked or deleted? Is prevented that flexible discs or other media containing personal data are removed from office and processed unauthorizedly elsewhere?

Obviously, it is necessary to think about how end user computing can be "sealed up" in order to make sure that only official or authorized programs and data are processed. One is tempted to say: The smaller electronic devices get, the bigger the problems of leadership and organization become!

(3) A third risk area refers to the notion that public administrations are information and communication systems (emphasis on "systems") and that we must not allow them to fall to disintegrated pieces just because personal computers seem to allow this. On the contrary, end user computing should be part of the growing **systematization of administration** which I would like to predict.

I consciously avoid using the term "industrialization". It would trigger associations which stem from experiences made with factory work which, however, are not at all of necessity for the imminent organizing of the office world. Nevertheless, we like to refer to the present phase of change as second Industrial Revolution. After all, by that it is to be made clear that, in contrast to the first Industrial Revolution, its objective is not to replace physical human labor by power machines: by means of microelectronics the second Industrial Revolution automizes data processing. It is not concentrated on matter and energy but on information, hence on "mental processes" which characterize office and administrative work.

Indeed, one of the most striking innovations by computers might be the fact that "data processing", being traditionally more or less an unrecognized part of other work, has been laid open as genuine design object. Via the stages "batch processing in computer centers" and "opening of computer centers to users via teleprocessing" meanwhile a completely different situation has been reached by the end user and communication orientation which will give rise to more intensive systematization of administrative acting.

This will be brought about by a simple but notwithstanding fundamental phenomenon: On principle - within economic and legal limits that is - it is possible to have from each desk "online" access to data files electronically kept at any other place. This will have far-reaching consequences, namely for survey, storage and exchange of data. It finally means - corresponding to "Computer-Integrated Manufacturing (CIM)" - computer-integrated administrative acting. My working term for this is CIVIS (for "Computer-integriertes Verwaltungs-Informationssystem", at the same time the Latin word for "citizen") since CIA (for Computer-Integrated Administration) may be misleading and ICA (for Integrated Computing in Administration) also is in use already.

"Data management" is to be the prominent feature of the growing systematization of administration. Understood as holistic organizing of data sources, data flows and data sinks, it will succeed in the years to come. Thinking in data base terms will have taken effect; data are being understood as genuine organizational elements instead of "ingredients" and derivatives of programs only. The real quality of modern IT will have been applied, namely to represent public administrations in their capacity as information and communication system. The risk implied in low-priced workstations to let develop fragmented data processing islands will have been avoided. System thinking already discussed and demanded intensively in the sixties and

seventies, but then - as it becomes apparent today - put aside too soon, will have experienced a renaissance.

Consequently, from today's view, more order has to be brought into data keeping. Knowledge concerning existent data files including their syntactic, semantic and pragmatic cataloguing has to be improved and deficiencies in the field of data necessary for tasks have to be removed. One must no longer consider data more or less as property of certain authorities, agencies or programs; one should rather come to a "Common Data Property" (Daten-Allmende), of course only as far as authorization for access is desirable. The communication orientation of IT has to be used to systematically exchange data between the entitled agencies in order to reduce double work but above all to reduce the fact of not being informed.

Certainly, this will be something that the upcoming "information society" is going to expect from us, namely that we conceive, describe and design our institutions, here public administration, as information and communication systems. It is quite obvious that this is going to put some constraints on end user computing!

(4) A major risk or challenge of end user computing I see, finally, in that we must avoid to use it only to **copy existing traditional administrative procedures** and behavior. For, with regard to the efforts concerning administrative automation we find ourselves right in transition from a first broad stage of development to a second one. Object of the first one - and here, no doubt, a lot has been reached - has been the computerization of existing administrative processes. This was difficult enough, because it was necessary to have the work of intelligent human beings now be carried out by machines. The administrations themselves, however, with their functional comprehension and their organizations rather served as model. To a large extent they remained unchanged by data processing in substance and structure.

Other examples of technological progress, however, show that things must not rest there. As a rule, technological progress is not managed in such a way that the field of application itself remains undisturbed with regard to conception and structure. On the contrary, technological progress can be used in a way that it does not only produce mechanical imitations of the field of application found, but also changes it.

In the year of its 100th anniversary, the automobile may serve as principal witness: To integrate the spark-ignition engine in the traffic system took more

than mounting it on the existing horse-drawn carriage. The potential immanent in this technological innovation could only be realized by means of transforming the whole traffic system as you can see by road construction, traffic law, insurance, car registration, technical control associations, and mainly, of course, by our increased mobility itself.

I would like to characterize such alterations of the fields of application by the term "social innovation" in order to contrast it clearly with "technical innovation". Technical innovation furnishes the initiation for social innovation, does not suffice, however, without the latter. Technical and social innovations complement one another like two sides of a coin.

The forthcoming second broad development stage of administrative automation will, with technological progress still increasing, possibly be marked by such social innovations. And it is very important to manage end user computing in such a way that it supports this trend.

In order to make the background for this understanding more apparent, some of the many feed-backs of information-technological progress to public administrations, which are possible and partially already tackled, especially are to be pointed out.

You can come to ***new types of organizational structures***, you can modify agency structures, working processes and job descriptions by reevaluation of organizational criteria to be applied. The possibility given by IT to integrate, on principle, each place of work into a network of electronic connections with other desks and data bases serves as background. As far as it is useful to have access from one desk to information in other offices or agencies, a part of the tasks formerly charged to the "owner" of those data now can directly be carried through on the spot. Therefore, the division of labour existing within and among authorities can be reconsidered. To be more precise, it can fundamentally decrease. Up to the present, technological progress has often been associated with "Taylorization", but now a change of trend is possible: A holistic execution of duties can be increasingly taken into account, job descriptions can be augmented, qualification standards raised, and "alienation" reduced. Extent of communication, vulnerability to errors and handling time of administrative processes can, in some cases, be drastically cut down by such changes of the division of labour. Or, for the purposes of closer citizens relations, functions can be transferred to field offices and can thus compensate for deficiencies caused sometimes by territorial reforms.



It is possible to come to a new grade of ***citizen-administration relationship*** by means of modern IT ("citizen" understood in a wide sense as client, incl. business). Far beyond the well-known subjects e.g. the readability of computer printouts, the progress in IT could be the initiation to put more fundamental questions to citizen-related tasks. The technology potential can be used for a new quality of public relations and citizens' participation. The distance between citizens and administration might thus again be put up for discussion and that in at least the following dimensions:

- intellectually by reducing the administration's advantage of information
- socio-psychologically by decreasing communication-barriers
- and politically by better examining public action

It is possible to widen the employees' freedom of movement by more ***delegation***. Because, the super-fast technology on the one hand, and a time-consuming co-ordination over several hierarchical levels on the other hinder each other. "Management on a slack rein" will be facilitated by better management information for superiors as well as by selective and immediate informing of the employee on the scope of his job and on the ideas and goals of management. Thus, sharpened efficiency control for employees, many times suspected, is not at all immanent to IT.

The objective of a "***cybernetic management***" as was propagated in the sixties and seventies can, in view of today's potential of IT be reapproached. Management information systems, namely externally oriented ones (concentrated on the supply of public goods) as well as internally oriented ones (concentrated on the improvement of administration) do have a new chance. Cybernetic administrative management, by using information as resource, as well as citizens' information by providing information as product, will be among the typical administrative functions in an "information society".

With appropriate computer support it is possible to raise the effectiveness of human labour by cutting back routine work to the advantage of those activities which emphasize more our ***human qualities and abilities*** not replaceable by machines. Instead of displacing the staff to the periphery of central information systems and thus making them mere slaves of anonymous information systems, automation support can be arranged in such a way that information systems serve the employee as the center of administration.

It is possible to influence ***legality of administrative acting*** in a positive way, e.g. by knowledge-based systems bringing the respective legal position correctly into the handling of cases, or by the fact that by means of IT each

single job description and its relevant part of legal data banks can be correlated more closely, thus allowing to inform an employee specifically about changes of law.

This might be sufficient evidence for the fact that with regard to the level reached meanwhile in the field of IT we do not have to be satisfied with copying traditional administrative behaviour. On the contrary, it is possible to influence in a considerable way the quality of the execution of public tasks by regarding them in an IT-oriented way. The outcomes of an authority - and with that the real evaluation scale for public management - are being influenced not only by increased costs for IT, more wide-spread and used in a more intensive way, but also by the benefits of changes in administrative acting caused.

Therefore, public administration will need social innovations in order to adapt to the transition into "information society" as had already been the case during the transition from "agrarian society" to "industrial society" (then supplementation of sovereign by service administration). Obviously, modern IT implies a lot more than just technical questions. Rather it demands an 'information-oriented view' of administration. IT is not 'neutral' like typewriters which could simply be added to handed down structures and procedures. Products of IT cannot be finished fully by their suppliers because their effective functioning requires integration into the environment of the user which can only be done by himself. The full exploitation of IT requires a design which must include the mutual adaptation of both, IT and public administration. Thus, those could be right who claim that after administrative reforms which started from public tasks (privatization, deregulation), personnel (education, leadership), or organization (territorial and functional reforms), the next years will bring about reforms which start from the working techniques of administration, here most of all from IT. End user computing must be seen in this context; it must be embedded in corporate computing.

## **8. Information Management**

(1) Hence, what it all comes down to is adequate leadership. End user computing needs **corporate strategies**. The challenge is to allow creative intrapreneurship but at the same time not to lose control. Compare economics: The belief that local decisions taken by entrepreneurs in a market economy are superior to a centrally planned economy, does not prevent us from having market regulations.

Do we dispose of corporate strategies concerning end user computing today? Let me quote two answers, public managers gave me to this question. The first one admitted: "The only administration-wide 'strategy' we have to master the PC wave is a decree which regulates the bringing along of electric appliances like immersion-heaters or radiators, for reasons of current supply and security." The second one certainly seemed to have an over-all strategy in mind when he said: "We have provided the PC-freaks with a playground, well fenced in so that they may play without disturbing others." However, as I tried to point out in this paper so far: To mark out enclaves for end user computing is near to the opposite of what is needed really. Not to prevent administrations from being disturbed is at stake but to make sure that public administrations **are** changed, indeed. The two opinions expressed might not be significant but nevertheless suggest that much remains to be done.

Before going into Information Management in more detail let me recall that the field of information processing actually consists of four sectors:

- Information Management as control from the point of view of administrative policy
- administrative support of Information Management
- services for information processing
- and the operating functions of information processing.

Although real operations lastly deliver the results wanted from information processing, they must be escorted by the other three sectors. Sometimes, however, the operational aspects seem to get most of the attention, e.g. when administrations believe that to arm the offices with personal computers is all that needs to be done today.

(2) Information Management is one of today's fashionable terms. What I understand by it is **more than just new figures in organization charts**, entrusted with

- bringing order into technological equipment, and
- bringing order into information processing.

To be sure, as a rule both is necessary and a consequence of the technological progress reached in recent years. However, Information Management as approach to pay attention to entirety of electronic equipment and information goods, is necessary only, not sufficient. If the actual challenge of today's IT is that it has the potential to feed back to the user world and may change its appearance considerably, then decisions based on administrative policy are needed. Naturally, this cannot be the responsibility of information resources managers or chief information officers, as they are being installed, e.g. in the United States since the Paperwork Reduction Act

of 1980. Rather Information Management is to be regarded as integrative component of the functions of each member of public management, no matter on which hierarchical level it is located. Information Management means that each public manager personally assumes responsibility not only for traditional subjects of control like personnel or budget resources but also for information and IT.

Information Management in this sense is - this cannot be surprising after the beforesaid - similar to customary management descriptions. It mainly consists of

- holding a "philosophy" for dealing with IT, or having an automation policy
- releasing technical, organizational and economic restrictions and standards
- avoiding mere improvisation, (without falling into planning bureaucracy, on the other hand) but disposing of an automation plan as sum of the respective decisions taken and their background concerning the application of IT as well as the according administrative-political measures
- identifying, taking and implementing decisions of administrative-political meaning
- investigating whether goals and restrictions are met or are still adequate, respectively
- and finally public relations, not only externally but also internally, with respect to IT.

From the various questions raised by end user computing with respect to Information Management today I only want to mention two: the ***planning process*** and the economy problem.

The term "DP-planning" may characterize the conventional procedure to carry out data processing projects as it has developed and proven to be useful for converting manual administrative functions to data processing in the first broad development phase of administrative automation. Actually, DP-planning assumes that the existing agency can be regarded as to be organized in an optimal way in most respects already, with the exception of automation still to be conducted. The solution is supposed to be already included in an automation order - it has only to be distilled by data processing experts. Since the latter have too little knowledge about administration, and the administrative staff too little knowledge about data processing, DP-planning has to put a great deal of efforts into transferring the knowledge of administrators to data processing experts. Therefore, its methods and tools pay a great deal of attention to stock-taking and description of organizational structures, work processes, quantities of cases to be handled, data sets and data flows. Already because of the amount of

material collected and its way of representation, readiness and ability of public management for co-operation are hindered.

From the view of the administration which remains, to a high degree, unchanged with regard to its organization, staff relations and functions, design has actually not taken place (certainly from the point of view of technology which the agency is converted to). In this respect, the design-phase is skipped over. Therefore, DP-planning can be most useful for well-defined problems as they exist, to a large extent, when converting manual procedures to computers is at stake. However if, actually, the point is today to understand IT as provocation and chance to redesign our public administrations, in so far exactly those well-defined problems do not exist. An automation problem does not contain already its solution. The cardinal questions are where the problem is located and how, what should be the objectives, restrictions, alternatives of actions and their consequences (whether to be accepted or to be refused). First of all, those questions have to be realized and to be answered.

This is why we need a control process for end user computing which is able to cope with such problems - just Information Management. DP-planning must be overlapped by and embedded in it. Therefore, it is important that management and administrators are not being diverted from essential decisions by too many technical details. On the contrary, they should be given a chance, already in the early stage, to bring in their political and professional assessments.

For data processing experts it is sometimes difficult to understand this basic approach. They prefer early and clear-cut definitions of data structures and procedures in order to be able to optimize "their system". In fact, the point is, of course, the administrative function. First of all, it must be put precisely in its desired shape.

As far as **economy** and cost justification of end user computing is concerned I want to draw your attention to some principal and methodical difficulties. Imagine you were going to build a subway in your city. Obviously, to measure its economy after the first few kilometres were opened, would be wrong. Naturally, internal and external costs still must be relatively high because both subway staff and citizens are at the foothills of their learning curves only. Benefits, on the other hand, still must be relatively low because advantages of the traffic network planned or effects on city development could not possibly have been realized. Similarly, end user computing should

not be measured alone by comparing e.g. its costs to those which would occur if computing was left as usual to computer centers.

(3) Information Management as a function of public managers which cannot be delegated, and **supporting measures** on the other hand must be distinguished. The latter are the administrative, service and operating functions of information processing.

With regard to those supporting measures of Information Management, I confine myself to outlining them only, **at first functionally**, and, afterwards, institutionally.

(3.1) Information Management requires **administrative** support. Part of it is, on the one hand

- preparation of binding technological, organizational and economic restrictions and standards, of the automation plan, of particular management decisions and of public relations
- and, on the other hand, revision within the sphere of responsibility whether the automation "philosophy", the automation plan and the standards released are matched (revision of applications and plans).

**Services** for information processing, too, support Information Management if they are meant to increase the ability of users to innovate. The following are to be pointed out:

- observing the market for information technology and the general developments in the field of "administration and automation"
- unselfish consulting, high in quality, with regard to organizational, technological, financial, economic or legal questions
- information brokerage to better use the various and scattered data bases which often can be found and made full use of with difficulties only
- development and maintenance of system software and application software
- model-like presentation of exemplary technological-organizational solutions to problems
- education and training as well as practical instruction
- exchange of experience.

Finally, the **operational functions** of information processing are to be mentioned:

- operation and maintenance of facilities for data processing and data exchange
- to collect, to modify, to analyze, to distribute and to secure data.

(3.2) For carrying out these three functions giving support to Information Management, several types of **institutions** can be taken into consideration, among them:

- organizers (as experts in the allocation of tasks to executants (man or machine) also responsible for the organizational integration of information technology)

- information advisers (the more the transition to "Information Society" urges to consider information as a resource and as a product, the more important it seems to care for professional knowledge about locating and making use of data collections)
- commissioners for questions concerning the application of information technology (with the role of a personified impulse generator for Information Management to be practised by management)
- centers for administration and automation (as places for collected expert knowledge concerning organizational, legal, financial, ergonomical, economical and technological questions of administration and automation)
- computing centers (as places for programming and operation of data processing and data exchange systems)
- and administrative informatics (as scientific reflection concerning "administration and automation" in the form of descriptive-empirical statements on the one hand, and assistance to administrative action via education and training, publications and participation in projects on the other hand).

Any of such institutions can take part in some of the delegatable functions of information processing, as vice versa a certain sector can be laid on several institutional shoulders. Dependent on the size of the administration to be regarded and on its level of knowledge and experience, these institutions can be organized in a more or less decentralized way, and they can be maintained within the administration or made use of as external establishments.

As a whole, Information Management is grounded on a complex structure, partially, however, already existing and, as a rule, clearly exceeding the conventional data processing department. It can certainly be put into operation by order, e.g. administrative decree. More important, however, is to permanently exemplify its actual use. Public management must be exemplary in executing Information Management and must be willing to really exploit the potential of modern information technology in daily management tasks, to use management information itself actively and to instruct and examine the subordinated levels with regard to automation planning. A good example is the best master.

## **9. Role of the DP-Infrastructure**

Thus, in a world of administrative automation coined today by end user computing, the traditional DP-infrastructure still has an important role to play. Installed some twenty years ago, computer centers, DP-professionals, and coordinating committees have gained high merits. Generally speaking they have managed successfully that a new, sophisticated, and expensive working technique, the computer, could be utilized by public administrations

on a broad scale and within a comparatively short period of time. Certainly, the experience of this DP-infrastructure, the many lessons learned in the development of traditional computing systems should not be lost.

There is no doubt, however, that end user computing with its "profanation" of computers is a challenge to DP-infrastructure. Nevertheless, the real promises of end user computing lie as I tried to show in its repercussions on administrations as information and communication **systems**. And to take care of those effects calls for an IT-infrastructure, maybe even more than ever before.

But, of course, a reorientation is indispensable. DP-professionals are threatened by the very technological progress they have promoted. The aforementioned word by Dale Yoder applies here, too: "Who acts like a computer will probably be replaced by one". The IT-infrastructure has a lot more to do than running machines which, to a growing extent, can be left to the end user. There are examples already where the traditional DP-infrastructure did not assume timely responsibility for the new administrative, service, and operating functions called upon by end user computing and has been overthrown by new institutions. However, where the existing DP-infrastructures manage to adapt to the new world of informatics, evident in these days above all from end user computing, where they conceive their contributions mainly as aid to self-help of administrators and as ongoing effort to sustain information management by public managers, then their future prospects are bright - and ICA will have an important mission for the next twenty years to come.



**LITERATURE:**

Blaser, A. and M. Zoeppritz, Enduser systems and Their Human Factors, Heidelberg, Berlin, New York and Tokyo 1983

Bonin, H., Beeinflussung und Erkennen von Auswirkungen komplexer DV-Vorhaben der Verwaltungsautomation. Doctoral Dissertation, Post-graduate School of Public Administration Speyer, 1985

Garstka, H., J. Schneider and K. H. Wiegand, Verwaltungsinformatik Textbuch, Darmstadt 1980

Grochla, E. and N. Szyperski, Management-Informationssysteme, Wiesbaden 1971

Hollah, A., Kommunikationstechnik und öffentliche Verwaltung, München 1984

Kraemer, K.L., W.H. Dutton and A. Northrop, The Management of Information Systems, New York 1981

Krallman, H. (Hrsg.), Informationsmanagement auf der Basis integrierter Bürosysteme, Berlin 1986

Langefors, B., Theoretical Analysis of Information Systems, Lund 1967

Martin, J., Manifest für die Informationstechnologie von morgen, Düsseldorf and Wien 1983

Nora, S. and A. Minc, Die Informatisierung der Gesellschaft, Frankfurt and New York 1979

Reinermann, H., H. Fiedler, K. Grimmer and K. Lenk, Organisation Informationstechnik-gestützter öffentlicher Verwaltungen, Berlin, Heidelberg, New York and Tokyo 1981

Reinermann, H., H. Fiedler, K. Grimmer, K. Lenk und R. Traunmüller, Öffentliche Verwaltung und Informationstechnik - Neue Möglichkeiten, neue Probleme, neue Perspektiven, Berlin, Heidelberg, New York und Tokyo 1985

Scheer, A. W., Personal Computing - EDV-Einsatz in Fachabteilungen, München 1984

Schröder, K.T. (ed.), Arbeit und Informationstechnik, Informatik-Fachberichte 123, Heidelberg etc. 1986.

Simon, H.A., The Shape of Automation for Men and Management, New York, Evanston and London 1964

Szyperski, N. and H. Lippold, Manager in der Interaktion mit Computeranwendungen. Ergebnisse einer internationalen Benutzerstudie, Köln 1982

Traunmüller, R., H. Fiedler, K. Grimmer and H. Reineremann, Neue Informationstechnologien und Verwaltung, Berlin, Heidelberg, New York and Tokyo 1984

Vetter, M., Aufbau betrieblicher Informationssysteme, Stuttgart 1982

Wellar, B.S., Systems and Services in an Information Society: Implications for Local Governments and Their Communities. - Proceedings of the Eleventh Australian Conference on Urban and Regional Planning, Brisbane, Australia, November 1983

Wind, T., Benutzer und Informationseinrichtung, Doctoral Dissertation, Kassel 1979