The utilisation of information technology in German public administration

by

HEINRICH REINERMANN

German University of Administrative Sciences Speyer

Information Systems

Information and Communications Infrastructure

The information and communications infrastructure available to the German public administration can be aptly described as a three-level model comprising computer centres, departmental computers and workstation computers, with a trend towards client/server architectures. Yet development up to this status occurred in stages which are still making their mark on the EDP landscape.

With the emergence of remote data transmission in the late 1960s, the initial batch processing in mainframes was developed further into terminal systems with remote batch processing, inquiry procedures and centralized transaction processing in interactive operation. As a general rule, these operations were department-related, being executed with manufacturer-bound, i.e. different, architectures. With the wish for inter-administrative data exchange growing stronger, the hindrance resulting from the "language barriers" due to this heterogeneity became increasingly cumbersome. The Federal Land North-Rhine/Westphalia was the first authority to react to this. As early as in 1980, it set up a data switching system which - as packet-switched long-distance network based on Standard X.25 - allowed communication between the numerous proprietary systems.

With the rise of minicomputers and their decentral operation as departmental computers, to which several workstations could each be connected (multistation or multiuser systems), a new problem turned up. There was a large number of such minis, each one of them fitted with its proprietary hardware and the respective tailor-made operating systems; this hampered the porting of application programmes to another hardware environment or changeover to another manufacturer. To limit this wide variety of types and protect investments in both hardware and software, an "UNIX ordinance" was passed by North-Rhine/Westphalia in 1988, prompted somewhat by the European Community's Directive 87/95; this ordinance made it compelling on all those procuring multistation systems to choose an UNIX operating system, a rule that was soon followed by all other federal Länder and at Federal level as well. The power of demand so created produced a clear effect. A few years later, departmental computers without UNIX were hardly offered any more.

In the middle of the 1980s, when personal computers spread at the third computer level, a comparable multiplicity of types did not develop from the outset, since uniform hardware (Intel) and a uniform operating system (MS-DOS) became generally accepted as industrial standards.

With the emergence of client/server architectures in the 1990s, however, compatibility problems are being encountered again. The trend is to distribute the application software with its three main components (application logic, data management and presentation) to servers and clients, to get the benefit of a division of labour. So the generated components must be able to cooperate via a network. As different operating systems as well as different types of hardware are meanwhile available to the servers (with UNIX, Windows NT or OS/2) and also to the clients (with MS-DOS, OS/2 or Windows), new communication problems are arising. But a solution is in sight, namely middleware, a software put between the cooperating application units and, making use of the high operating speeds attained by present-day processors, doing the necessary translations in real-time processing. The different types to be allowed for in this context are manageable since, meanwhile, there are but few hardware platforms and operating systems left (certainly not least thanks to the UNIX ordinances).

Along with such necessary modernization of its information and communications infrastructure, the German public administration is facing the task of having to improve considerably its computer equipment ratio. Even in the Land administration of Baden-Württemberg, classified as pretty partial to technology, only twenty percent of appropriate workplaces were actually fitted with electronic equipment in 1995. In other administrations, in the Federal authorities, for instance, equipment ratios even fall quite short of this level. But there are also higher computerization ratios to be found as for example in the Kommunales Rechenzentrum Niederrhein, a communal computing centre at Moers, where about seventy per cent of office workplaces in the integrated municipalities are already fitted with electronic equipment. By the way, the phenomenon that, economically speaking, it takes an inexplicably long time to set up a remunerative technological outfit, is equally in evidence with application software; in one administrative branch with many authorities of the same kind, it so happened that it took almost twenty years before the decided migration to EDP had been completed down to the last authority.

The installation of the so-called information highway as a broadband connection between all participants in electronic multimedia communication, however, has already made great strides in Germany as compared with other countries. Long-range networks, in particular those operated by Deutsche Telekom, are mostly optical fibre networks, thus admitting transmission speeds that do not set any perceptible limits to potential applications. The access networks are based, on the one hand, on a close-knit telephone network connecting virtually every household; the system is presently being digitized as ISDN and expanded by means of ATM into broadband ISDN in accordance with the Euro-ISDN standard that was agreed upon by 20 European countries in 1994. Moreover, there is a cable television network open to two-thirds of all households.

This favourable starting position is going to be improved further due to the regulative policy action taken by the European Union, aiming at a liberalization of the telecommunications market (abolishing monopolies of network providers and telephone services by the end of 1997). New competitors from the energy utility sector, from among local governments having discovered new commitments here or from among the companies and institutions operating corporate networks, that may be opened to other users now, will contribute to galvanizing the market.

Applications

When considering the information and communications infrastructure's applications in Federal, Länder and communal administration, one meets with an extraordinarily wide variety. Historically, one can observe how the sequence of technical computer generations was turned to account for the respective generations of applications. Yet, frequently, this was done by making attachments to existing designs, since both the time and the money needed for thorough reconfigurations seemed to be lacking.

For a long time now practically all routine administrative work is executed with the aid of computers. The initial batch processing has meanwhile been replaced almost everywhere by interactive operations, employing the three levels of computing, i.e. computer centre, departmental computer and workstation computer, so that sequential processing, inquiries, analyses or transaction processing can be launched from the workplace. This has led to the development of partly complex software packages for fiscal and labour administration, for the social welfare offices, for residents' registration, land surveying, or manpower management. However, these are often oriented vertically to the respective authority's departmental hierarchy, thus hindering inter-connections beyond the limits of the department concerned.

With the rise of databases, online services have been spreading, some of them being also available on CD-ROM. As illustrative examples, reference may be made to "Juris", the juristic information system with its documentation of established law, jurisdiction and legal literature, to the inquiry system operated by the Federal Government's Press and Information Office, or to local council information systems. With the progress of networking, the number of online information providers is rising as well; many municipalities and universities, but also Federal and Land authorities have recently begun to present themselves in the Internet's World Wide Web. Yet surprisingly, the interest manifested by our administrations in the use of online services is quite small compared with other countries.

In the eighties, office automation made its entry into German administrative authorities with the departmental and workstation computers. Office automation means electronic mail, documentation filing, scheduling and space administration, but also the so-called personal or end-user computing (word processing, spreadsheet analyses, file management or business graphics) as well as specific applications that till then had "taken a back seat" due to a certain ponderousness of decision-making processes in the EDP sector (at the local level, for instance, applications in the registry, social welfare or car registration offices). All the same, two obstacles continue to hinder full utilization of the office automation potentials. On the one hand, the astonishingly low number of workplaces fitted with the necessary equipment sets certain limits, a fact which also handicaps the implementation of welcome decisions like those taken by the Conference of the Ministers of the Interior or the Baden-Württemberg Land government and requiring, from 1995 onwards, to have all letters sent exclusively by electronic mail wherever technically feasible. The other obstacle is that both individual and departmental applications in office automation have spread sporadically.

As a result, electronic workflow management stands supreme amidst the present development of applications. Here, the information and communications infrastructure available by now is employed to integrate administrative operations and procedures in a process-oriented way from start to finish, incorporating all applicable programmes and data and all bodies concerned; all this being rendered feasible from any workplace by making use of the programme and data resources with a uniform user interface and without any media discontinuities. The necessary technical basis is generally provided by client/server systems.

These require conversion of the outdated proprietary user systems, many of which were designed as early as in the 1960s and installed in the 1970s. An example of this is FISCUS, intended to replace the existing automated taxation procedures and operated already in pilot versions. As a client/server system, it links the workplaces within the various tax offices via local networks and, via public networks, it also connects all local tax offices, computing centres and, in future, it will connect even tax consultants and taxpayers.

EDP organization

The most outstanding characteristic of EDP organization in Germany - interpreted as the distribution of information and communications functions to various responsible bodies - is probably the high degree of alignment and inter-administrative cooperation. Yet different phases and focal points can be made out here.

During the pioneer period in the 1950s and the expansion phase in the 1960s, computers were still used without much inter-authority cooperation. EDP came up at the proper time to help cope with the rapidly growing strain on public administration at a time when the labour market was extremely tight; and, initially, it spread in a sporadic fashion.

In the late 1960s, however, a trend was already set towards order and alignment in the EDP landscape. Computer purchase and operating costs were high, EDP experts were scarce, and the overlapping of state and local-government functions called for harmonization, an abundance of data made available by EDP was to be exploited to gain management information, and the impending imbalance of computerization between urban and rural areas was to be corrected. In organizational terminology, the solution was to be as follows: centralization of physical resources; procurement, programming and operation of computers were united in computing centres, these being shared, whenever possible, by several authorities. Besides these, specialist computing centres were set up for the big branches like fiscal, labour or police administration. EDP harmonization questions were delegated to coordinating and consulting bodies, Land-level or communal automation committees or similar groups.

On the one hand, this typical aligned innovation strategy (bearing resemblances to today's outsourcing) proved to be a good thing: computers, i.e. novel and expensive equipment, could be turned to use in a surprisingly short time and on a remarkably broad basis. Yet it also revealed disadvantages; when some computer practice had been gained, it became more and more evident that computerization had quite some significance for administrative policy, helping users to reach their targets. The mere duration of harmonization procedures to be agreed upon on a broad basis, possibly even Land-wide, the highly valued individual variety being limited by compulsory conformity, or what we call in German the "convoy syndrome" (meaning that the slowest ones determine the type, extent, date and costs of progress), all these facts were perfectly able to restrict the various users' organizational sovereignty, thus driving the aligned EDP infrastructure into a legitimation crisis. With the steeper rise of technical progress (such as minicomputers, workstation computers, networking or database systems) in the 1980s, this crisis became aggravated. For this progress allowed users to change over to decentral, autonomous EDP and, at the same time, was a challenge to the computing centres, requiring them to update their equipment continually in line with the state of the art. The latter fact presented quite some difficulties so that, today, the EDP infrastructure features a considerable spectrum from ultra-modern to outdated systems (part of them still without PC, networking or databases).

The characteristic target of our times is to close the gap between the users' expectations and the options offered by the information and communications infrastructure. To the EDP using authorities this means that they must recognize that an essential portion of EDP functions, namely politico-administrative control, forms part of the administration's cardinal functions and should, by no means, be executed by way of outsourcing; as a strategic instrument, information and communications technology must be brought into harmony with the authority's own concept of administration. For the DP centres, this means that structures must be worked out making it possible to translate the progress in information and communications technology into the service offers needed by the user authorities to attain their strategic aims; this process is under way, combined with an obvious concentration on few units of a critical size that permits today's heterogenous hardware, system software and application systems to be operated by appropriately specialized and qualified staff.

Qualifications

Public administrations, on the one hand, are major users of information and communications equipment; on the other hand, they exercise an essential influence on the further development of information and communications technology as well as on its application in the social sphere. Therefore, an adequate knowledge of information and communications technology on the part of the civil service is of really decisive importance. This does not only apply to EDP experts but to staff in specialist administrations and key positions as well, one reason being their role as users of information and communications technology and the other one lying in their capacity to control the employment of such technology not only with a view to their own scope of responsibility (coordinating information system with administrative strategy) but also with due regard to social effects outside the administration (paving the way for the installation of information and communications equipment or setting up barriers to its use).

Accordingly, assessments of qualification efforts must direct their attention to two groups of curricula. On the one hand, there is the question of "What can information and communications technology do for me?", i.e. of knowledge about the availability and operation of such equipment at the workplaces, either for online database inquiries or for workgroup computing (from electronic transaction processing via communication to scheduling). For, in spite of all possible aids in the operation of information and communications equipment, with graphic user interfaces for example, information and communications technology without specific training still continues to be utopian. On the other hand, there is the question of "What must I do for information and communications technology?", i.e. knowhow about layout, command and control, involving a knowledge of the equipment's potential to improve efficiency in one's range of responsibility; also, it implies the ability to communicate with information and communications experts, a capability that is gaining ever greater importance due to the interdependence between administrative information systems and administrative strategies, further emphasized by the trend in the new public management concepts to delegate responsibility for resources back to the line. It goes without saying that such curricular subjects cannot be imparted in a course of professional training alone but must be supplemented in further training courses as well, since, faced with the rapid technical progress, one cannot wait for up-to-date knowledge of information and communications technology to be brought in by newly recruited staff. Finally, it appears to be an important criterion that the curricula must not only comprise cognitive knowledge but emotionally affective and ethical viewpoints as well.

Originally, knowledge of information and communications technology in the German civil service was naturally determined by a few autodidacts, followed by the retraining of those

venturing to approach this new technique. Here, a great service was done for instance by the "Kooperationsausschuß AdV Bund/Länder/kommunaler Bereich", a cooperation committee of Federal, Länder and local authorities, which reached an agreement in 1973 on a group of training modules for the impartment of basic and specialist data processing knowhow in training and development courses. Originally conceived for the supplementary training of already employed staff, since a special branch for the professional EDP training of future civil servants was not yet in existence at that time, it was primarily the module dealing with basic DP knowledge that also gained an enormous influence on education in the EDP sector in general. Another trail-blazing event was the founding in 1984 of the "Akademie des Deutschen Beamtenbundes", an academy run by the German civil service association; here, it was anticipated that the civil service would be deeply pervaded by information and communications technology, and this insight was translated positively and conducively into training programmes.

Meanwhile, the civil service's qualification in the subject of information and communications technology has become something normal. Professional basic education and further training curricula contain respective instructions. There is a wide variety of institutions within and outside administrative authorities that offer relevant training and development, ranging from universities via technical colleges, vocational training academies, administrative and economic training academies, databases, manufacturing companies, consulting and congress firms to adult evening classes and schools providing general education. Above all as regards the use of information and communications equipment but also, to a somewhat lesser extent, the control thereof, education and training opportunities can be easily found by anyone seeking them. So gaps in relevant knowledge within the civil service are due not so much to insufficient opportunities as to a lack of demand.

Since the 1970s, the civil service's qualification in information and communications technology has been substantiated on a scientific basis. Out of the traditional faculties of mathematics, physics and electrical engineering and sponsored by the Federal Ministry for Research and Technology in a supra-regional informatics research programme (Überregionales Forschungsprogramm Informatik 1971), independent scientific departments of informatics were set up first of all at universities and, shortly after that, at technical colleges as well. These approaches were soon followed by the establishment of administrative informatics and legal informatics as demand-oriented computer sciences. Yet these could not rely on promotion through some kind of supra-regional research programmes; a compromise was found by a reassignment of existing staff positions. This may be presumed to be one of the major reasons why the number of research and teaching staff positions for legal and administrative informatics continues to be rather scarce, with the result that emphasis is mainly on the impartment of knowledge through indirect strategies.

To summarize, we may state that the race between technical progress and the qualification of both specialists and all-rounders in the information and communications technology sector still requires quite considerable effort to allow it to keep going.

Technological Policy Background

There is a wide variety of socio-cultural assessments of science and technology, including for instance reports in the media, technological, research, labour and economic policies, and the establishment of law. The stance taken by the Germans towards technology is more of the cautious, wait-and-see type, sceptical, critical, even timid or peevish, an attitude, however, that is older than information and communications technology. Even Arnold Gehlen had

remarked with astonishment that one would not expect such polemical anti-technology tones, such resistance to the cultural equality of technology with other fields of culture among a people of such technical ingenuity. In connexion with EDP, this was again confirmed. Although the computer was invented by Konrad Zuse in Germany in 1936, the practical implementation of an invention, the exploitation of its potential, once again, had to surmount strong mental reservations in this country.

As regards EDP in public administration, these reservations materialized in the form of impact research, a fact that is hardly misinterpreted as an expression of the anxiety that this new technique might change the good old traditional administrative procedure for the worse. There were two prominent fields where this was to be proved correct and prevented by counter-measures: the protection of personal data and privacy and the so-called humanization of work.

In 1970, the world's first data protection law was passed in the Federal Land of Hesse - followed by all the other Länder and at Federal level with respective acts, all of them stipulating commissioners for data protection in public administration - thus becoming the harbinger of a remarkable technological discussion in Germany. In 1974, the German Bundestag's legal committee put a damper on conceptions of integrated data processing, refusing plans for a uniform personal identification mark. In 1983, it was in connexion with the population census that EDP was up before the Federal Constitutional Court, an occurrence that met with a surprising public resonance (while, strangely enough, another court judgement delivered in 1977 on intensified information of the general public had remained almost unnoticed). By virtue of this court decision, data protection enjoys the status of a basic right. The individual has the right of informational self-determination, legitimately deciding herself/himself in principle whether or not her/his personal data may be disclosed and utilized. Restrictions are only admissible where the public interest prevails and the law so allows. The relevant pros and cons are thus weighed up before the eyes of the public which, however, does not lessen controversies, as became evident in the process of amending all data protection laws following the census judgement as well as in connection with the introduction of specific provisions into laws on internal security or the economic and social systems of order. Another round of amendments was begun in 1995, as the European Union had passed a directive on data protection, to the scope of which the relevant provisions in the member states now have to be adapted.

Humanization of work, the second great outstanding topic in the socio-cultural assessment of information and communications technology, focussed on a number of subjects, a feared layoff of human labour due to computerization (with "chips for jobs" as a characteristic slogan), growing alienation due to intensified division of labour and monotonous preparatory work for the moloch computer, the danger of accurate monitoring of employees' behaviour and performances, the feared polarization of staff qualifications (few highly qualified persons as compared with a larger number of dequalified staff), and also the ergonomically correct design of video workstations. Since 1974, respective studies have been advanced by a Federal programme to promote the humanization of work.

Also in 1974, the Federal Personnel Representation Act took effect, reforming personnel representation law applicable since 1955 and strengthening the staff delegates' rights. According to Article 75, para. 3, clause 17 of this act (and comparable provisions in the Länder's personnel representation acts), the introduction and application of technical equipment intended to monitor staff behaviour or performances are subject to codetermination on the part of the respective authority's staff council; in case of disagreement, a conciliation

board has the right of ultimate decision. Following a supreme-court decision by the Federal Administrative Court in a final unbiassed judgement, this provision is meanwhile open to wide interpretation; accordingly, it is not the subjective intentions of the head of an authority that matter: the only decisive point is whether the computer in question is suitable for employee monitoring. This is the reason why computerization, in general practice, is subject to codetermination, though within the limits of the authority's directorial competency for the organization and monitoring of performances.

Meanwhile, even the trade unions have realized that refusing the 1976 Siemens study entitled "Büro 1990" (i.e. "1990 office", referred to as an example) merely on the grounds of job-killer and dequalification aspects was biassed. Today, many reasons tell in favour of the view that welcome targets like the preservation of jobs would have been better attained precisely with a positive attitude towards information and communications technology.

Formative and layout research endeavouring to utilize the computer potential for further improvement of good administrative action is being initiated in Germany but with some hesitation. It did not come to the top till the early 1990s, when the German economy encountered quite some difficulties on a world market undergoing a process of reorganization, because it was then that the interrelationships between economic prosperity and locational factors within the responsibility of state and administration were realized. Against this background, the discussion on technical progress carried on in the media, in politics, in associations and science clearly took a different turn. Now, it is widely realized that promoting and utilizing information and communications equipment is an absolute must, if we do not want to be too late for world-wide economic reorientation, which has been gathering considerable momentum for quite some time now. It is also conceded that, at least for a decade, the opportunities offered by information and communications technology have not been seized resolutely enough. But the character of this discussion continues to differ from that in other countries. For instance, visions such as in Japan and the U.S.A. with the target of a "fifth computer generation" or a "national information infrastructure initiative" and calling for mutual strenuous efforts are uncommon in this country. Even the event of the century, the shift of the German capital from Bonn to Berlin following the unification, must be considered from this viewpoint as a missed opportunity (although some interesting development projects have been launched for the future distributed information system "Informationsverbund Berlin-Bonn"). Here, no model has been put up for discussion in political quarters as yet that could spur on state, administration and economy in the transition to the information society. There continues to be a lack of a trendsetting policy with this in view, providing a reliable foundation for decision-makers, and coordinating the courses to be taken in fields like research, transfer, education, economic, labour, and fiscal policy or the promotion of original innovation.

Yet, obviously, the discussion has now been opened, and there are numerous initiatives, among them a 25-member council for research, technology and innovation reporting to the Federal government (which submitted its first 41 recommendations to the Federal Chancellor in 1995); an operation called "Aktion Innovation 96"; a Federal act to safeguard locational conditions in Germany (1994 Standortsicherungsgesetz); a technology assessment office with a staff of eight called "Büro für Technikfolgen-Abschätzung" (TAB) and reporting to the German Bundestag (established in 1993, it draws up reports for the Bundestag committee on research, technology and technoloy assessment); a new working hours act ("Arbeitszeitgesetz" of 1994) admitting greater scope for employers and employees; a Federal government report (of 1996) "Info 2000: Deutschlands Weg in die Informationsgesellschaft", dealing with Germany's way into the information society; as well as hundreds of different

Federal and Länder programmes for the promotion of information and communications technology. The European Commission, too, has given top priority to the information society's development, for example by means of the above-mentioned liberalization of the telecommunication market and a skeleton research programme.

On the other hand, the critical socio-cultural attitude towards computerization has created favourable preconditions for sensitivity in regard to information and communications technology. The introduction of electronic processing in authorities and utilization of its potentials, after all, is not a subject for legal action but forms part of the administrative development; this process can only be mastered in mutual efforts by all concerned. However, it is a precondition to this that indolence and reluctance to accept change are cast off, attitudes that may have sneaked in as a result of the high levels of economic welfare and the individual's social security. This requires, as the German Federal President put it in a nutshell, that the whole nation must become enterprising again.

Impulses for New Departures in EDP

The main impetus for the establishment of EDP in the 1960s originated from the amazing expansion of public administration following the "economic miracle", an expansion including both the service functions (e.g. in social welfare, health, labour administration and education) and the exercise of sovereign powers (such as fiscal administration, judicial authorities or residents' registration). Above all, in view of the then tight labour markets, computerization was the obvious choice for handling these masses of routine functions.

The rising costs of EDP and the danger of the growing computer applications drifting apart were the principal motives for the alignment phase around 1970, resulting in a system of order - legally substantiated as well - being established for the EDP sector which, however - as explained above - was installed not so much within the traditional administration, as in the form of specific authorities and region-oriented computer centers.

Since the 1980s, the rapid technical progress has turned out to be an impulse calling for a certain reaction. A steep increase in the number of workstation computers, networking, software development methods, database systems, a wide variety of application programmes, partly of high complexity, and a rapid sequence of updated versions, as well as electronic workflow management - all these developments required to be integrated without interrupting normal service, but are often just added to the existing equipment without thorough redesign.

Hence, it was in the middle of the eighties that systematization efforts were made once again, beginning with a Baden-Württemberg Land-wide concept. The intent behind this initiative to activate EDP in public administration is the endeavour to enforce information management in the sense that political and administrative guidance also be exercised for the resource information. The point is that information and communications technology is to be integrated more closely into an authority's traditional procedures of planning and decision-making. By establishment of a central control unit, it is to be ensured that the potentials inherent in the information and communications equipment, with its ever increasing capacity for decentral applications, are put to full use for the attainment of an efficient and low-cost administration.

In the 1990s, the implementation of this initiative has been gaining weight as the traditional system of administration, on its part, is now facing a profound restructuring process triggered off primarily by the endeavour to safeguard and improve Germany's attractiveness as an industrial and business location. It is in particular the new international division of labour

which clearly shows how greatly our standard of living is dependent upon attractive locational conditions for the economy, locational conditions that are partly influenced by the levels of taxes and fiscal charges, the stability of financial conditions, the degree of regularization, the duration of administrative procedures as well as the extent of bureaucratic state functions being passed along to private business. A further impetus for the present reorientation moves in public administration comes from the population, manifesting itself for example in demands for greater transparency and a better service quality of administrative action; and there are other moves made by the civil service, for instance out of the desire for a more challenging working environment with greater responsibilities and more scope for independent work. The fact that information and communications technology is in a key position to provide assistance in all these respects is being realized more and more by those responsible. Accordingly, the present main incentive for the further development of EDP in the German public administration may be seen in the opportunity to test new models of administration, to adapt them to the information and communications potential, but also to enable the information and communications sector to render even better service as regards the available hardware, system software and application software as well as in counseling and guidance.

Meeting the Challenge of Technical Progress

The rapid technical progress in the information and communications sector is a continual formidable challenge to public administration and its EDP equipment. It was in particular during the last decade that trends changed severely, the following changes becoming visible:

- from mainframes via departmental computers, workstation computers and primarily local networking to client/server systems;

- from isolated applications in line with the administration's hierarchical structure to problem-related cooperation and networking of all concerned;

- from separate large-scale applications (like fiscal administration, residents' registration or personnel management), individual special-purpose applications and office communication to integrated user systems with a uniform user interface;

- from rigid text masks to graphic interfaces, allowing the use of computers with a certain degree of intuition;

- from procedural to object-oriented programmes;

- from hierarchical to relational databases;

- from self-developed to standard software based on generally applicable reference models and allowing adaptation to individual requirements;

- from proprietary to open systems and, accordingly, from a sellers' to a buyers' market;

- from local and single-medium data to ubiquitous and multi-media data, merging written, pictured and audible forms of communication;

- from a "patchwork" of administrative data to systematic administrative knowledge graded with the aid of data models and accessible via networks to the most varied users;

- from semi-skilled EDP staff doing the programming and software services for the applications in their respective branch of administration to highly qualified experts able to recognize correlations between various applications and to ensure an all-embracing configuration management;

- from expert-oriented methods of software development to modeling methods safeguarding communication between information and communications experts and users, thus ensuring that their intentions are put into effect;

- from special-purpose EDP authorities to an information and communications infrastructure integrated into administrative development via information management by the political and administrative directors;

- from computing centres and computer regions to system houses and consulting firms subject to competition;

- from EDP utilities financed by adjustable contributions to service units having to earn most of their budget;

- from application software requiring a lot of maintenance and tending to resist amendments, to information and communications technology capable of responding flexibly to changed user requirements.

The changes behind these trends must be considered as really drastic. Have public administration, on the one hand, and the EDP sector, on the other, mastered these shifts? The scene is not uniform; yet, broadly speaking, it does not so far really look like it. Externally, this manifests itself in the "productivity paradox", in as far as investments in information and communications equipment have not been followed by adequate benefits, as well as in a crisis of confidence in EDP, since it has left behind a legacy of former decisions, by some people considered as burdens that will have to be remedied in the years to come.

On account of ever new generations of information and communications equipment, an orderly change in the administrative information systems proper would have been necessary. A clear course would have had to be pursued from the monolithic mainframes, which initially fitted perfectly into the rule-governed world of administrative bureaucracies (conditionally programmed administrative procedures running smoothly in programmed EDP machines), to the client/server systems available today, capable of supporting cooperative networks instead of hierarchies, such networks fitting well into modern administrative conceptions. But to reach this aim, EDP would have had to be freed from isolation and integrated into the processes of decision-making in the user administrations; in addition, EDP itself would have had to be debureaucratized, delegating greater responsibility to the specialized administrations, also including responsibility for information and communications equipment, and centralized management and service divisions would have to be set up to this end.

Maybe this idea was too ambitious. Anyhow, it was not often implemented. Instead, the mainframes of the 1970s were followed by ever new layers of information and communications equipment, comprising the PC in the eighties and LAN-based electronic processing in the 1990s, all of them intended to remedy the previous stage's shortcomings, but involving new shortcomings whenever they failed to be integrated into existing systems. This led to attachments instead of new designs and thus to a multiplicity of information and communications equipment and applications; so the potential inherent in the new electronic

techniques could not be fully utilized, just the thing to provoke the reproach of leaving behind a "productivity paradox" and burdens for the future.

The way out seems to be obvious: the isolated existence of EDP equipment and the lack of interest in EDP on the part of the political and administrative leaders must be ended. The EDP users' legitimate interests may not be rejected by those responsible for EDP, but, on the other hand, must fit into centrally formulated skeleton plans. The administrative information systems must be integrated into the strategies of administrative development.

Focuses of Electronic Data Processing

From computerization to administrative concepts

The range of benefits derived from information and communications technology by the German public administration extends from the initial conversion of traditional administrative action to a new technique - on a scale of more or less 1:1 - to recent assessments of information and communications technology as a catalyst or "enabling technology" for the development of administrative concepts. This confirms another analytic statement by Arnold Gehlen saying that, as a general rule, new technologies are initially considered as just suitable for the mere rationalization of existing structures, whereas creative applications allowing a redesigning of the existing landscape will only come into focus following a volte-face in formulating the question, as Gehlen put it; then, advantage is taken by the specific features of such new technology which meet the demands and serve the ends of current times. As far as concerns information and communications technology, these features include the generation of ubiquitous information, which henceforth will enable traditional barriers in the development of administration to be surmounted. Presumably, this will result in a general trend towards a logical concatenation of all information essential to administrative action (organizational intelligence), made avaiable via networks in every place where it can be of help in the appropriate fulfilment of functions in accordance with today's demands on efficient administration. The trend beginning to show in this regard shall now be outlined from five perspectives.

Trends of administrative development based on information and communications technology

As in many other states, Germany's public budgets suffer from the serious problem of excessive expenditures. Among the reasons for this are that those benefiting from current programmes defend their interests, and the standards of performance expected from the various service-offering departments are aimed at permanent perfection. How can the state regain free scope for new up-to-date service functions? One may safely assume that the decisive factors in this regard include the availability of information on the grounds for and consequences of public action as well as the political willingness to turn such information to use. Here, information and communications technology can bring its capacities to bear as an "enabling technology" in the build-up of information systems, opening up sources of information not accessible in the past, such as product and programme budgeting, costs and results accounting, comparisons between authorities, public opinion polls, project evaluation, accounting, controlling and many other approaches. Greater transparency of the effects of and specific interests in the allocation of resources may well be expected to lead to corresponding demands and support from the public, then enabling politicians to take action in conformity with the system. Instituting administrative information systems of this type is a task, the major

part of which still lies ahead of us. This task must be mastered, if public administration is ever to be enabled again - beyond formalistic responsibility in the sense of adherence to bureaucratic competencies and regulations - the better to assume substantive responsibility towards society in the sense of an efficient provision of the necessary public goods. Decision aids and data processing as dealt with in the present paper are being interlinked in this context by a particularly close relationship.

A second trend in present developments in administration lies in the fractal organization approach. By uniting professional competence and responsibility for resources and delegating most of them, more self-determination is to be attained for every individual organizational unit. The purport of this is to achieve greater scope of action and better motivation for a speedy adaptation of administrative action to changed conditions, simultaneously ensuring personal responsibility for the consequences of decision-making. Here again, it is the information systems - this time with a view to the internal relations in public administration - that allow such guidance to be exercised by means of contracts, assigning resources against performance promises and performance control, aided by appropriate information and communications equipment. Further support for the administrative strategy of organizational disentanglement comes from the information and communication technology's trend to client/server systems. These allow administrative information systems to be dimensioned precisely as is considered appropriate by any organizational unit. Thus, the greater freedom of public administrations as aimed at by fractal organization in order to admit more responsibility for results and better results through a faster pace of innovation has its counterpart in an information and communications infrastructure compatible with this.

In the third place, viewed horizontally, the networking of public administrations and their clients is an impetus to uncover and optimize the working connexions that have developed. It is assumed that there are considerable potentials for improving the quality of administration as well as for minimizing processing times and costs and also the shifting of bureaucracy from the public sector to private economy. First approaches based on information and communications technology include workflow management systems considering administrative procedures from launch to result as process chains and reorganizing them on the basis of common updated data and in compliance with the applicable responsibilities and cooperations; and they also include telecooperation among several authorities, meeting commitments with a certain division of labour, or the intermeshing of the authorities' and clients' systems of information by electronic data exchange.

Fourthly, the creation of challenging up-to-date working environments benefits from information and communications technology. For this technology allows functions to be fulfilled in a more integral and responsible way, permits the necessary open communication as digitized information is accessible from the workplaces, and it grants greater sovereignty in the individual modes of working since it improves flexibility in terms of both space and time (teleworking; part-time jobs; telepresence; telecooperation; and further modes of working which are rendered possible by the mobility of information technology working materials, by the mobility of work results or the traceability of individual contributions to workflow-aided administrative procedures).

Last not least, the matter should be considered from the viewpoint of the general public. Here, too, information and communications technology meanwhile has a potential to offer that is capable of assisting up-to-date administrative action. In this regard, mention should be made of an improved transparency of the services offered and sovereign functions fulfilled by the administration, including normative premises and responsibilities, of the numerous

opportunities to facilitate access to the authorities in line with the trend to "virtual administration" (such as distributed administration in branch offices close to the citizens, concentrating formerly dispersed services in one place, self-service or mobile administration visiting those concerned, as required), as well as of new ways and means for opening administration to the public by electronic record keeping and new opportunities for information-and-communications-technology-aided community participation (even including virtual realities presented with the aid of graphic information systems).

Integrating Administration and EDP

It can be seen from these five perspectives that the existing systems of information always offer the answers to those questions put to them. Where the questions change in regard to contents, topicality, evaluability, accessibility or presentation of information, the systems of information have to be modified as well. In other words, the strategies of administrative development must be worked out with due reference to the administrative information systems, the administrative information systems, on their part, being derived from the administrative strategies. EDP and administration may not live separate lives, they must be integrated from the viewpoint of political and administrative leadership. Discussion on this subject has begun in public administration in Germany. What is more, there are concrete examples for the implementation of all five perspectives. Strengthening this trend may well be the principal task of the years ahead.

Bibliography

Brinckmann, Hans and Kuhlmann, Stefan, Computerbürokratie. Ergebnisse von 30 Jahren öffentlicher Verwaltung mit Informationstechnik, Opladen 1989.

Bonin, Hinrich, Verwaltungsinformatik - Konturen einer Disziplin, Mannheim et al 1992.

Mayntz, Renate et al, Informations- und Kommunikationstechnologien in der öffentlichen Verwaltung, Band 1 bis 4, GMD-Studien Nr. 75, 76, 77 und 78, St. Augustin 1983 and 1984.

Reinermann, Heinrich, Fiedler, Herbert, Grimmer, Klaus, Lenk Klaus and Traunmüller, Roland (eds.), Neue Informationstechnik - Neue Verwaltungstrukturen?, Heidelberg 1988.

Reinermann, Heinrich (ed.), Führung und Information, Heidelberg 1991.

Reinermann, Heinrich (ed.), Neubau der Verwaltung: Informationstechnische Realitäten und Visionen, Heidelberg 1995.