Commission of the
European
Communities

# Electronic Document Delivery — II

*Proceedings of a workshop and exhibition organized by the Commission of the European Communities, Directorate General Information Market and Innovation, Luxembourg, 18–19 December 1980*

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**Edited by J.R.U. Page**

Learned Information
Oxford and New Jersey

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## Table of Contents

# Preface

The Commission has encouraged the establishment of Euronet/DIANE, the Direct Information Access Network for Europe, which provides access to databases containing in electronic form either factual information or, in most cases, bibliographic references to documents. Consequently, the Commission is now going to encourage the establishment of facilities providing access to full documents in electronic form. The programme associated with this encouragement is called ARTEMIS (Automatic Retrieval of Text from Europe's Multinational Information Service).

As a first step the technical feasibility of document digitalization and teletransmission was studied. The ARTEMIS Report confirmed the feasibility and indicated the economic viability under certain conditions.

As a second step an exhibition and workshop was held on 18 and 19 December 1980 in Luxembourg at which systems and services relevant to electronic document delivery were presented and demonstrated. The workshop recommended that pilot experiments should be undertaken, especially to test user reactions.

John Page, the Commission's consultant, assisted the Commission in organizing the workshop and prepared the Proceedings. It is a pleasure for me to thank him now for the competent work he has performed. Nevertheless, it should be made clear that the Evaluation Report with the Consultant's Conclusions which is added to the Proceedings expresses Mr. Page's opinions and not necessarily those of the Commission.

I would also like to thank on behalf of the Commission all workshop participants, especially the speakers and other contributors to the discussions, the members of the Task Force for Document Delivery who also helped the Commission in preparing the workshop and, last but not least, the organizations having demonstrated relevant systems and services, some of them having invested heavily in the demonstrations without receiving a compensation from the Commission.

As a follow-up of the workshop the Task Force for Document Delivery is examining possible future activities and is preparing an action plan on electronic publishing and delivery of documents. Such an action plan is likely to concentrate on a number of pilot experiments covering the whole chain of functions from document ordering to the delivery on the user's desk. The experiments will probably also include satellite communication tests, and they will be complemented by a number of studies, some of them dealing with non-technical issues such as copyright.

## Editorial note

Because of the number of presentations and the need to impose strict time limits on speakers and for the discussions generally, participants were invited to make additional post-workshop contributions in writing if they so wished. The majority of such contributions have been added to the record of the relevant session immediately following the discussion section. In one or two cases presenters also offered texts substantially extending their oral presentations, and consequently the latter have been replaced by the written texts in this volume.

A major written contribution was received from Mr. Blunden and Mrs. Gates, which covered too wide a field to be included in any single session record. This has been included in its entirety at Annex 1.

# EXHIBITION AND WORKSHOP ON ELECTRONIC DOCUMENT DELIVERY — EVALUATION REPORT

by

J.R.U. Page

## The workshop in summary

The Exhibition and Workshop on Electronic Document Delivery was held in Luxembourg on the 18th and 19th December 1980. Equipment manufacturers, systems designers, and others who had responded to the Commission's Call for Proposals for Demonstrations (Official Journal C184 of 22 July 1980) were invited to make presentations and, where appropriate, to demonstrate equipment fulfilling all or part of the chain of functions delineated in the ARTEMIS Report. Participants in the Workshop were invited to consider and discuss two main themes: first, the technical, economic and operational aspects of the proposals presented, and secondly, how systems of the ARTEMIS type might be implemented. This second theme included collaboration between the various interested parties (publishers, host organisations, libraries, equipment manufacturers, etc.), and in particular, the challenge of electronic publishing. Discussion on each of these two main themes was led by two consecutive panels, the members of which made short presentations on particular topics.

## The proposals

Some 15 organizations gave presentations/demonstrations which covered in whole or in part the chain of ARTEMIS functions which may be summarized as follows:

— identification and ordering of documents required as a result of an on-line search of a bibliographic database. (Presumably, ARTEMIS would not exclude document requirements arising in other ways.)

— digitalization of full texts (page images [facsimile] and/or coded characters)

— computer storage of full texts

— matching documents requested with locations of digitalized text

— teletransmission of full texts to requesters

— reception, conversion and delivery of full texts in the form desired by the user.

Two proposals were received (from Pergamon and Correlative Systems International in association with Centre d'Informatique Générale) which covered the total range of the functional chain; a proposal from Altergo Services Ltd. was also for a complete document delivery system, but based on microfiche storage. A further proposal, the MEGADOC system suggested by Philips could also be said to cover the full range of ARTEMIS functions, but was based on techniques still under development and did not therefore conform strictly to the requirement that systems or equipment proposed should be currently available. The remainder of the proposals received (Data Dynamics, Siemens, 3-M, IBM, CREL, ELSAG, AGFA-Gevaert and Antone Systems) were essentially related to individual parts of the total chain of functions. Still other presentations (e.g. that of Gruner and Jahr) were informative in character, presenting specific plans or proposals for projects not arising directly from the Call for Proposals. The Session was concluded by a presentation of the "office of the future" in relation to the requirements for ARTEMIS.

It may also be noted that other organizations, for example Kodak and AM International, had indicated their interests in responding to the Call for Proposals, and had given briefings on ARTEMIS-relevant systems to the Commission, but were not able for one reason or another to present proposals at the exhibition/workshop.

While the number of actual proposals received certainly represented a satisfactory response, some organizations capable of responding may not have noticed the relevant entry in the Official Journal. Others would not have wished to make premature disclosures of equipment, etc. in front of possible competitors and, in any case, the market for development of equipment for ARTEMIS would be small in comparison with that for office automation.

## Technical issues

Broadly, the presentations confirmed that electronic document delivery is technically feasible using today's technology and existing equipment, but integration into fully operational systems will require more work. It was also evident that the pace of current development was very rapid: for example, developments such as the digital optical recorder and disk, might solve current problems associated with archival storage of full texts. Other developments in intelligent printers could provide answers to difficulties in reproducing mathematical and other symbols in original texts. While such developments are now at an advanced stage, quality of the documents produced by current equipment was considered by many to be inadequate: the resolution obtainable by Group III facsimile was insufficient to reproduce some kinds of scientific texts at a level of quality to which users

were accustomed. While higher resolution with existing designs of scanners was possible this would add to the cost of storage and transmission.

It was apparent that the main forces driving the technology to be used in ARTEMIS were the "office of the future" concept, electronic text processing and computer-composition. In the first area, manufacturers were already developing and beginning to market total systems involving sophisticated communicating wordprocessors, high speed facsimile, mainframe computers and intelligent terminals and copiers. In the second area, it was already possible to use digital coding for the reproduction of a large variety of characters, type fonts and even simple graphics. Electronic document delivery systems were therefore likely to become increasingly concerned with digitalized text formats and methods derived from electronic primarily for the fully electronic office.

It can be concluded, therefore, that an essential element in systems design for ARTEMIS is the maintenance of flexibility so that full advantage may be taken of these developments as they occur. In the following paragraphs, specific technological problems and solutions which were highlighted in the presentations and discussions are summarized.

*Document digitalization*

Imaging systems capable of 1–2 seconds per page are state-of-the-art (see, for example, the proposals by CSI and Philips); the need for improved resolution for certain texts has already been noted. While imaging systems employ data compression techniques, there is still a wide margin between the number of bits required to represent a page digitalized by facsimile methods and a coded character page: the considerably higher costs for storage, and more particularly for transmission of facsimile pages remain a major problem. One FAX to coded character system was presented (ELSAG), but this had so far been concerned with highly specialized applications. The technique might however be reviewed as a sub-system.

Coded character systems presented were virtually limited to communicating wordprocessors without the capability of handling extended character sets or graphics, as would be required for the delivery of scientific texts. There were longer-term possibilities of progressive improvements in this area (e.g. the dynamically redefinable character set). The Pergamon proposal included an extended character set based on a composing system for scientific texts, which could be handled by the receiving terminals, and also the use of a page imaging approach for those pages which could not be dealt with by this extended-character coding. This hybrid system is still under development, and nothing is yet known about the data overhead involved. It is however possible that the concept of hybrid systems of this kind could provide a methodology for reducing the high data volumes, and therefore costs, involved in a total page image approach with adequate resolution.

There was little discussion of alternative digitalization strategies: the Pergamon proposal was esentially concerned with material in process of publication, and aside from a brief mention of OCR there was no coded-character proposal which highlighted the problems of digitalizing a back-file of texts. The CSI/CIGL proposal included detailed costing for the preparation of a text back-file conforming to the suggested specification for a pilot experiment quoted in the Call for Proposals.

*Document storage*

Although not forming a specific part of the ARTEMIS study, systems for micrographic storage and retrieval of full texts received considerable attention during the workshop. Advantages in terms of production, storage and copying costs per page were claimed. Modern methods of mechanical retrieval and electronic copying of microfiche and microform were rapid, and claimed as highly cost-effective. Commercially available systems of this kind were presented in detail by Altergo and as a system concept by Antone Systems. A Kodak development in this area was also noted.

In terms of digital storage, the Pergamon proposal was for disk storage on a mainframe computer, while CSI/CIGL proposed a high-speed, high-density tape system for archival storage with comparatively fast access time, working to a disk store for material to be dispatched. In the area of new technology, Philips presented their digital optical recorder and disk system. This would not be available until 1982–1983, but could, it was claimed, constitute a breakthrough in very high density, fast access and easily transportable read-only mass memory. In a following presentation Philips and Gruner und Jahr discussed the application of the MEGADOC System to a Press information retrieval service requiring rapid access to full texts, not unlike a document delivery application.

*Teletransmission*

The main problem in the teletransmission area was seen to be present network tariffs. The suitability or otherwise of packet-switching technology for bulk point-to-point file transfer was not referred to in any detail. The technical characteristics of satellite transmission using small earth stations and transmit-and-receive technologies already demonstrated in projects STELLA and SPINE of the European Space Agency, were such as to permit whole text transfer at megabit per second rates.

Apart from the experimental facilities offered now by OTS, fully operational facilities could become available in 1982/83 as a result of the launch of the European Communications Satellite System (ECS). Satellite systems offer the only immediate possibility of text broadcasting, if that were required, and real-time browsing of full texts, impractical via terrestrial links owing to limitations on data transfer speeds. An interesting possibility in the

further development of data transmission systems using television broadcasting techniques (Broadcast Video-text* Systems such as CEEFAX or ORACLE) was mentioned. In one such development, ANTIOPE-DIDON in France, it is planned to use the whole television band-width (6 MHz) when no video signal is being sent.

*Document reception and reconstitution*

Several different types of user terminals were presented or demonstrated. These included facsimile transceivers capable of unattended operation over the telephone circuits, with automatic selection of bit-rate according to line quality, and communicating word processors operating as remote work stations to a mainframe computer. Intelligent terminals capable of receiving facsimile and coded character data were also likely to be available in the future, although price might be a problem. The Pergamon proposal included a suggestion for a cheap microcomputer-driven composite terminal able to receive extended character-coding and page image data. A prototype was demonstrated without the page image reception facility. The development of very sophisticated terminal devices such as light printers and intelligent copiers for automatic document distribution was also featured in the presentations.

## Operational issues

A number of important issues of a more or less operational character were identified during the course of the presentations and discussions. These are briefly listed below.

*Volume of demand*

It was stressed that as yet, there was no hard evidence available on the quantitative relationships between the volume of online searching, the number of relevant hits per hour's searching, and the number of requests for documents not able to be met in-house. Several speakers considered that the predictions in the Franklin Report and the estimates in the ARTEMIS Report itself were excessive: others believed that demand varied widely according to subject. A suggestion was made that where a very efficient conventional document delivery system existed, demand might have already tended to saturate at a level which might be affected by price, but might also be a function of the amount of time end-users could devote to reading. If this were so, electronic means of document delivery would be competing with traditional methods in terms of relative cost-benefit to users, rather than exploiting a new demand as yet unsatisfied, in areas in which the level of

* Also known as Teletext

demand seemed to have already stabilized. The value of market research and prediction techniques was questionable, it was claimed, in areas such as this, and in consequence, reliable information on the level of demand could only be gained on the basis of practical user-oriented experiments.

Should demand for very rapid electronic document delivery turn out to be relatively low, this might well have effects on the economics of the supply end of the chain, but would certainly place even greater stress on the need for cheap and simple user equipment, the costs of which could be spread over a variety of uses.

*User acceptability*

Many speakers stressed this as a vital area of the design of ARTEMIS-like systems. The need for cheap multipurpose terminals has already been noted, and this as a minimum condition of acceptability by libraries and end users was stressed in the discussions. Electronic document delivery systems should be competitive in price with existing systems and involve the minimum of administrative or technical complications. Supply should be decentralized, with more than one choice of supplying center: electronic document delivery should not be the only method available to users. An effective system for rapid location of documents was seen as a necessary concomitant to an electronic delivery system, if the user were to gain full advantage. Several participants stressed the need for an electronic document delivery system to deal with grey literature in addition to journal articles.

Several participants considered that a major purpose in future experiments or test projects was to find out more about user needs, both quantitatively and qualitatively, and to test their reaction to system features.

*Standards*

While all participants agreed that standardization was a very important issue, and that existing standards did not fully meet the requirements, the workshop did not result in very clearly defined guidelines for future action in this respect, except of course to maintain close contact with the international bodies concerned. The point of view was often advanced that the concept of ARTEMIS as an open system implied the development of necessary standards at interfaces, to which all would be required to conform. On the technical level, some speakers pointed out that to derive formal standards on an international basis would take years: to avoid these difficulties we should start with simple systems with standards already agreed. Nevertheless, there was an awareness of the dangers which would result if precendents in the early history of the data processing industry (in which individual firms tried to ensure a systems and equipment monopoly by the practice of "fencing"), were to be followed by powerful organisations in the electronic publishing and document delivery fields.

It was noted that while great progress had been made by the international bodies concerned in devising standards for teletex and facsimile, these by themselves did not at present go far enough to precisely define such elements as the extended character set and resolution requirements which might be needed for certain types of graphics. The technologists present stressed, however, that ARTEMIS need not be burdened with the detailed definition of standards at the technical level: translation functions at the interfaces could be adequately carried out by microprocessors, and users should not have to worry unduly about what went on in the interior of the systems which would be developed. While the standards problem needs further investigation, it seemed to be generally agreed that the really essential feature was to ensure that interfaces existed enabling relatively simple user terminals to be used for any document delivery systems that might form part of the ARTEMIS concept.

*Operational alternatives*

Two alternative basic delivery concepts, beyond both the conventional system and ARTEMIS, were suggested. Although neither is strictly relevant to the workshop objectives, they are mentioned here as part of the background to the future development of ARTEMIS. The first alternative depends on the perfection of cheap mass storage devices such as the digital optical disc, in order to provide scientific users in a particular field with regular text files relating to their discipline or interests. These files would be distributed by conventional means, for example post, and would be associated with information retrieval packages which could run on users' local computers. The major advantage of such a system would lie in its non-reliance on expensive telecommunications network facilities for access to relevant primary literature.

Another speaker made a proposal for extended use of local word processing and computer facilities as the means of scientific and technical information exchange outside the classical area of formal publication in journals. He pointed out that for example, in a university environment it was quite possible to create a text database of research results free of access charges to others who contributed to the text database systems. Remote users would only have to pay telecommunications charges in accessing other databases in the club.

## Economic aspects

Those responding to the Call for Proposals clearly had problems in providing thoroughgoing cost data; many offering equipment suitable only for some of the ARTEMIS chain of functions produced prices without throughput data, and there was some confusion between the throughput data associated with the ARTEMIS forecast cost for a mature system, and the smaller through-

puts associated with the requirements for a pilot operation, given for information in the Call for Proposals. For example, in the ARTEMIS report itself, the cost per page fulfilled included running costs and capital amortization spread over the total steady-state annual volume of requests fulfilled. Comparisons of the cost per page fulfilled based on the smaller number of requests associated with the pilot experiment, but using the same levels of capital and running costs, will obviously produce a figure of cost per page fulfilled much in excess of the ARTEMIS report figure. Further, CSI/CIGL were able to produce detailed costs covering capital and running expenses, but these were not easily allocated to functions, while Pergamon provided unit costs for document capture (keyboarding), computer processing and storage. All told therefore detailed cost comparisons between system elements in the various proposals on an identical basis is not possible with a high confidence level on the data available, and it is equally impossible to make unambiguous comparisons with the ARTEMIS report projections. Nevertheless, the data are probably good enough to make some rather general, coarse indications of the economic parameters.

*Capture and storage costs*

In the case of the Pergamon proposal, these costs will vary widely according to the assumption made on allocation of the cost elements between journal production and the electronic copy delivered. However, unless one allocates the whole of these costs to the electronic copy — an unreasonable assumption since the basis for the Pergamon proposal is use of the composition programs for creating an electronically deliverable document as a by-product — capture and storage costs per document are quite small, totalling around 0.1 to 0.15 ECU's per page. Capture and storage costs seem to be of about the same order of magnitude for any coded character/teletex system on which there are data.

In the case of facsimile, costs are increased above this level by virtue of the increased cost of storage (number of bits per page is approximately one order of magnitude higher than in the case of coded characters). For hybrid systems involving a mixture of coded characters and facsimile, no practical data are yet available; much depends on the data overhead involved.

*Costs of teletransmission*

It is possible to make a rather accurate calculation of the costs of teletransmission using EURONET, and assuming that the bulk, one-way nature of the transmission permits 90% use of total segment capacity (450 bits transmitted per packet). Current EURONET tariffs are on both a time and volume basis, so that we need to make assumptions on bits per page and on transmission time. Assuming an average of 2,500 characters per page and 200 Kbit/page for facsimile, and that both supplying centre and user are connected

to the network by a dialled circuit at 1,200 bits per second, it will require about three minutes to transport one page of facsimile data as produced by the CSI imaging system. For convenience, we can use the German versions of the EURONET tariffs, which include local charges to connect to the network: other PTT's may charge differential rates depending on the distance from the network. Costs to transmit a page of facsimile data at 1,200 bits per second under these assumptions amount to 1.4 ECU's at normal rates and about 1.13 ECU's at night-time rates. Delivery at 300 bits per second turns out to be about twice as expensive owing to the time charges incurred.

Making the same calculation for transmission of a similar page in coded characters (20,000 bits per page), the page may be transmitted in a little over 16 seconds at a cost of 0.35 ECU's at normal rates or 0.25 ECU's at night-time rates. The costs at 300 bits per second are 0.5 ECU's and 0.4 ECU's respectively.

*Terminal costs*

The actual component of total costs represented by the user terminal is dependent on the number of documents delivered over time and on the cost of the equipment and the necessary supplies. The ARTEMIS report indicated that the cost per page could vary between 0.06 and 0.02 ECU's for small and large users of teletex pages, and 0.35 and 0.10 for small and large users of facsimile. However, it may not be realistic to allocate all terminal costs to document delivery in the case of the end user or small library since machines would probably only be purchased for several applications.

Under these circumstances it seems somewhat artificial to try to calculate comparative user terminal costs per page: actual costs of purchase or rental are probably more useful. They are given below for the machines presented or demonstrated at the workshop:

| | |
|---|---|
| — Data Dynamics | |
| (Communicating Word Processor) | £7,000 (purchase) |
| — Pergamon | |
| (Basic Terminal — No Printer) | £1,200 (purchase) |
| — AGFA-Gevaert | |
| (Intelligent Multimode Printer) | (under development) |
| — IBM 6670 | |
| (Intelligent Copier) | BF 50,000 per month (rental) |
| — 3-M | |
| (Fax Transceiver) | BF 15,000 per month (rental) |
| — Siemens | |
| (Teletex Terminal) | DM 20–25,000 (purchase) |
| — CREL | |
| (Facsimile Receiver) | FF 2,500 |
| (Multilingual Terminal) | FF 20,000 |

These costs relate to items of equipment which have very different functions. For example while both the Siemens and the Data Dynamics teletex terminals could act as user terminals for coded character delivery, both provide additional intelligence and facilities for local text processing. The IBM 6670 is an intelligent printer-terminal with many more additional facilities compared with other printer-terminals: the 3M FAX Transceiver is not only a FAX terminal but also a digitalizing machine. Price comparison should therefore only be made in association with comparisons of functions.

*Conclusions on costs*

It is disappointing that more accurate and comparable data were not forthcoming as a result of the workshop presentations: however, it seems fair to draw the general conclusion that capture, storage and terminal costs could result in an acceptable overall level, particularly in the case of teletex. Where facsimile transmission must be used, the characteristics of the tariffs derived for interactive traffic on packet-switched networks result in heavy penalties for bulk data transfer.

## Electronic publishing and the implementation of ARTEMIS

While electronic publishing is not synonymous with electronic document delivery, the two concepts are clearly closely related; from the publisher's point of view, delivery of a full text electronically is a form of on-demand publishing. Since digital versions of articles were now commonly produced in the course of composition of a journal, publishers had the choice of distribution in electronic or printed form. With regard to document delivery, it was pointed out that, while secondary publishers had hitherto made the running in applying electronics and computer technology to open up new markets in the shape of online and other forms of information retrieval services, it was now for primary publishers to take up the challenge of all forms of electronic distribution of full texts, since they alone had the rights in the material.

*Problems arising as a result of electronic publishing*

It was pointed out that the possibility of alternative forms of publication could have the effect of reducing income from the printed version: publishers would have to ensure that their costs were fairly spread. It was also recognized that electronic publishing, if uncoordinated between publishers, could result in a cacophony of systems: we would be running a risk that the secondary services would have reduced opportunities to obtain the primary material in a form they could use, and this might in the end result in a break-

down in effective and comprehensive information retrieval possibilities. Publishers would also need to retain present methods of ensuring the quality of information entering the full text databases.

It was accepted that there were solutions to these problems: electronic distribution would for example make it easier to know who was using information and therefore simplify the charging problem, including any copyright royalties. The need for publishers to adopt a cooperative approach to marketing of electronic products was also stressed. It was announced that a feasibility study is being undertaken by PIRA in the U.K. on how such a cooperative system might be established, to be operated by a consortium of the major publishers. The four major publishing groups and a number of others were already included, and discussions were being held with Dutch, German and American publishers on possible participation.

*The Elsevier initiative in electronic document delivery*

Following a statistical analysis of loan patterns of various journals on data supplied by the British Library Lending Division, including the age of articles being requested and the type of library making the request, Elsevier had concluded that there was a case for entering the electronic delivery market using present technology: this, however, would require cooperation with libraries and other publishers. They believed that requesting libraries, without the purchase of highly sophisticated equipment, could be supplied with electronically delivered copies at about the same level of price obtaining in the present international document delivery market using traditional methods. Informal discussions were proceeding in Europe and North America on this topic. It was hoped that a pilot scheme could be started at the end of 1981 or beginning of 1982, to be followed, if successful, by a full-scale operation towards the end of 1982. From the analysis of the BLLD survey, it appeared that the biomedical field offered the most promise, although this would probably require resolutions of 12 lines per millimeter rather than eight, i.e. at the limits of present technology.

*General considerations in the implementation of ARTEMIS*

There were several comments relating to the implementation of ARTEMIS in the two panel discussions, but because of the shortage of time, it was felt necessary to provide a further opportunity for those interested to contribute to this aspect of the workshop task by an additional session in the afternoon of 19 December, which was chaired by Prof. Kirstein. Also briefly discussed during this session was the possible relation of the concept of ARTEMIS as a conduit for information flow with other services beyond the scope of pure document delivery.

The following represents a very brief summary of the main points on the implementation of ARTEMIS made during the early discussions and at the special session.

Tests were required before ARTEMIS could be implemented on an operational scale. These tests should not be primarily directed toward development of equipment and techniques, since equipment development would in any case follow the pattern set by the commercial market, which included high-speed transfer of added-value information (banking and other applications), the office-of-the-future concept and electronic publishing. Tests or pilot projects should be mainly directed towards evaluating user requirements and user response to possible systems: at present we did not know who, or how numerous, the likely users of practical electronic delivery systems were or might be. The object of a test programme was therefore to gain information on these and other important aspects of user reaction to electronic document delivery. Second, the information on cost-effectiveness of various types of systems provided in the workshop presentations was not really sufficient to provide all the information on economics of electronic document delivery systems necessary for planning and decision making: actual tests with real full-text databases and real uses were probably necessary to obtain useful economic data. Thirdly, the tests should embrace a spectrum of likely technologies of capture, storage and reception. It should also be recognized that user acceptance would have to be secured during the test programme, but the transition between traditional and electronic methods of delivery would be relatively gradual, particularly in the areas in which demand for document copies was already nearing saturation. User motivation would therefore be an important concern in the design of the test programme: it would be an essential step in creation of the market.

Each test would require the collaboration of an information producer, an equipment manufacturer, a host organization and a user population. A problem to be tackled in design of a particular test would be to select a representative user population in the light of the type of information to be made available, and to ensure that the database itself was as complete as possible in its particular field or area of coverage. Particular types of information mentioned in connection with a programme of user-oriented tests were bio-medicine, grey literature, technical manuals and patents.

The question of who should organise and conduct the programme of tests received much attention. The general consensus appeared to be that the Commission should encourage the formation of consortia between information providers, equipment manufacturers, and host organisation to design and operate particular test programmes: the Commission could be helpful in organising user participation. Two main roles were foreseen for the Commission. First, to provide a forum for the organisation of test programmes and for exchange of information among intending participants in ARTEMIS. Second, some coordination would be required, if only to ensure that the results of different tests were comparable. Further, coordination was necessary to define the conditions under which a series of

experimental closed systems could ultimately be merged in an eventual operational open system. Some participants, while agreeing with the general line that tests should be operated by consortia of interested organisations, considered that financial help from the Commission would be most useful, if only to avoid the necessity for individual firms to undertake the entire financial risk. In these ways, the Commission would be directly assisting in creating the market for electronic document delivery.

Beyond the test programme, the Commission also had a role in helping to ensure that the move to electronic publishing would not be carried out in such a manner as to endanger existing facilities in information location and information retrieval.

**Recommendations**

(1) The Commission should promote in collaboration with other interested organisations, such as publishers, telecommunication system operators, host computer organisations, libraries, booksellers, equipment manufacturers and document supply centres, a programme of tests of electronic document delivery systems. These tests would be designed primarily to:

(i) establish user demand for such systems in specific areas of document supply, in both quantitative and qualitative terms,
(ii) establish user reaction to the different technologies and different methods of organising systems likely to be used in first-generation ARTEMIS systems,
(iii) establish more clearly the relative costs of the different technical approaches possible.

With regard to types of documents or document subject areas to be included, consideration should be given to tests in the areas of micro-electronics literature, technical manuals, bio-medicine, grey literature such as Government reports and patent documentation. With regard to techniques of digitalization, storage and reception, the tests should be able to provide information on the user reactions to both the quality and costs for facsimile, coded character, hybrid and micrographic systems.

(2) To achieve the objectives set out in Recommendation 1, the Commission should continue active consultation with interested firms and organisations to define what should be done, thus arriving at a series of project definitions which could form the basis for additional calls for proposals where these were judged to be the appropriate mechanism for promoting joint action between potential partners in tests.

(3) In addition to consultation for the promotion of joint offers for tests in Recommendation 2 above, the Commission should:

(i) act as a forum for exchange of information on planning and execution of the test programme,
(ii) insofar as is necessary, coordinate test programmes so that results may be comparable,
(iii) assist as necessary in identifying and contacting groups of users in the test programmes to ensure adequate coverage,
(iv) be prepared to offer financial assistance in the execution of agreed test programmes. This could take several forms, for example, paying the charges for user terminals, paying for digitalization of material to provide adequate backfiles, etc.

(4) A study should be commissioned as soon as possible to define the general user requirements of a low-cost terminal, capable of being used for other purposes as necessary. The aim would be to devise a practical interim ARTEMIS standard, and to provide a guide to systems designers and manufacturers. This study should also include a survey of existing terminal equipment and items being currently developed.

(5) In association with other concerned organisations, studies of the requirements for document location systems, including online union catalogues, needed in operational document delivery systems, should be undertaken.

(6) The possibilities and the limits of both narrow and broadband systems for document delivery should be investigated with priority. Satellite experiments could be considered within this framework, in order to determine what are the operational features of practical systems of this kind, and to determine the value of the online browsing facility which could be provided by this means. An assessment of the technical, political, and operational possibilities of using television channels as one-way broadband conduits for document transmission should also be carried out.

(7) The Commission should continue negotiations with the PTTs to reduce tariffs for point-to-point bulk data transfer during off-peak hours, with special reference to the use of EURONET for this type of traffic.

# SESSION I

## INTRODUCTION

R.K. APPLEYARD
CHAIRMAN

OPENING ADDRESS

by

J. Barthel
Minister of Telecommunications and
Energy for the Grand Duchy of Luxembourg

Mr. Chairman, Ladies and Gentlemen, as Minister of Telecommunications and Energy for the Grand Duchy of Luxembourg it is a great pleasure for me to open this most interesting two-day meeting. In a rapidly changing world we must be bold and resolute in meeting the resulting economic challenge. It is certain that reduced economic growth on a world scale will bring about increased vulnerability to our European economies, and this must be met by new initiatives and development strategies. We are on the eve of industrial change under the pressure of demography and radical changes in demand, and above all changes in our competitive position. I do not have to dwell on the limitations of Western Europe's natural resources: the energy crisis should have convinced even the optimists of the extreme vulnerability of our economies. Those responsible for policy will have to ensure the redeployment of our resources into areas in which we can be more competitive. New technologies will revolutionize numerous activities, for example, in the area of communications, and will greatly influence the division of labour internationally. Industrialized countries need qualitative growth rather than purely quantitative growth which is more and more reaching its limits.

Brain-power, which Europe possesses in abundance, is a trump card which must be used optimally in the future. The process of development in Europe must involve the more and more rapid diffusion of new technologies. Europe possesses a scientific and technical community which supplies the intellectual foundation for the creation of knowledge and its adaptation to the economic process. This community constitutes the scientific and technical potential which is qualified to produce the new knowledge which when applied to social and economic development, results in new resources, products and procedures. This constitutes the capacity of Europe to use science and technology to

contribute to the solution of development problems, in exporting its know-how to other parts of the world.

It is exactly in this context that one must welcome the conclusions drawn by the heads of government of the Community, who met two weeks ago: they asked the competent authorities of the Commission to examine all possibilities in improving innovation and the transfer of knowledge. In effect, Europe's big chance is to play the innovation card. The capacity to exploit new possibilities for development and technological innovation, and human and financial resources, are the essential foundation for future economic and social growth in Europe.

Public authorities must ensure a climate in which innovation can flower: this is the creative force inherent in market economies. Exportation of knowledge permits the financing of imports of essential raw materials and energy. Innovation will however only be successful to the extent that sufficient human and financial resources can be attracted. If telecommunications and informatics bring a completely new dimension to the different ways in which technology can bring about changes, the possibilities in terms of applications are so numerous that all elements of the economy and society are affected.

However valuable in itself the individual's intellectual capacity, it is becoming more and more clear that this has less and less economic value in a world in which significant developments and their results are only brought about by the work of a group. These groups are composed, in general, of an adequate number of specialists by function and by geographic distribution. This necessitates good collaboration within the group and above all good communications, which in my view determines the success of their work.

I would like to stress the communications element in this today. The process of communication between people can be classified as reception- or transmission-oriented: for example, hearing and seeing is reception-oriented, while speech and movement is transmission-oriented. In the present context, "movement" means writing or typing a text, or typing a command to a computer system. A round-table discussion is probably the most complete method of communication, since it permits the use of all the senses simultaneously, and without the need for technological aids. Conferences, however, require a great expenditure of time and use of energy resources. The many duty trips which must be undertaken to provide face to face, i.e., the most sophisticated level, of communication between individuals is only possible at the cost of an enormous expenditure of time and kerosene. This becomes more and more incompatible with the necessity to both economize in energy and to increase our competitiveness.

There is a tendency to be dazzled by the breathtaking speed at which the international automatic telephone network has developed, but to forget that this only results in a partial means of communication between people. The telephone network provides for intercommunication between individuals, but even

in association with the telex and data networks, it cannot be a valid replacement for the direct interaction obtained in meetings and conferences. Nevertheless it must be our aim to equal the effectiveness of direct face to face communication by telecommunications developments. It is moreover our duty to try to achieve this aim quickly as an economic necessity for Europe. You, Ladies and Gentlemen, have come here today to take a decisive step in this direction, and I, as Minister for Telecommunications and Energy of the Grand Duchy of Luxembourg would like to give you all encouragement in this important work.

ACKNOWLEDGEMENT

*R.K. Appleyard, Director General, Information Market and Innovation*

Thank you, Minister, for your encouragement: may I say that we think very much as you do, in terms of the possibilities for developing the European market and the importance of communications in this respect. Before we begin the formal presentations in this session I would like briefly to indicate what the Commission has done in this area of information transfer. We started a long time ago by building our own bibliographic database as many others did, but we have come a long way since then. An important milestone was the creation of the EURONET data transmission network providing unique facilities for all the nine member countries at reasonable tariffs. EURONET is the infrastructure for a real common market in computer-based information, and with the help of our main advisory body the Committee for Information and Documentation in Science and Technology (CIDST) we have gone on to help promote the supply of information services and databases, to fill this network with activity stemming partly from this, and partly from the interest of the European computer industry, we began to think about the problems of telematics in relation to the European market: the Commission put a paper discussing these problems to the council of ministers about a year ago. In addition, as we have just heard, the recent European Summit has in the last few weeks recognized the extraordinary role which innovation must play in industrial and economic renewal. It is clear that one of the main waves of innovation is the whole complex of telecommunications and informatics.

It is within this framework that the Commission intends to do its duty in promoting markets and supply in this area. The subject we are discussing at this workshop is part of this telematics complex: we launched a feasibility study on the digitalization and teletransmission of documents, and the

contractor Arthur D. Little responded with the ARTEMIS concept, which is a notion of a marketplace in which suppliers and users can meet, together with a system of common standards and procedures. Further, ARTEMIS was not limited to document delivery, but could also embrace electronic publishing. The report has been received with great interest, and we in the Commission are now at the point at which we must decide on future action to help further progress in this area: Should we provide a platform for further discussions, should we identify scenarios for preferred development, should we already be elaborating common procedures, standards or legal frameworks, or should we be supporting the development of interfaces, special equipment or software, or supporting the implementation of pilot experiments? Perhaps we should be encouraging the development of full text databases with a contribution to development costs. In any case funds will be limited.

We will certainly not ourselves wish to operate systems or provide services: We will wish to promote appropriate action to create and stimulate the market. In ARTEMIS we will do our best, but no more than necessary, to help the parties involved to create a market for the electronic delivery of documents. We are at the stage of asking ourselves questions about what should be the role of the European Community and the Commission as its executive body in this business. For myself, I believe there must be a role since innovations on this scale have to depend on large markets and the largest market on this side of the Atlantic is that formed by the European Community. For us, the goal of this meeting is to obtain your help in determining the way we should go and what we can do to help in this area.

# DOCUMENT DELIVERY - THE DEMAND

by

C. Van de Weteringh

Chairman of EUSIDIC
European Association of Information Services

ABSTRACT

This EUSIDIC contribution to the subject of document delivery will deal with the users' point of view who are only part of EUSIDIC membership.

The user requirements for an online document delivery system are discussed and an impression is given of the potential market. It is stressed that any system should have a wide variety of interfaces in order to enable the user to connect it to other systems for electronic mail.

The role of the European Commission in setting up a system like ARTEMIS is appreciated. This system is not only important for online information retrieval; it may greatly stimulate the penetration of electronic mail in user organizations as a further step towards the office of the future.

INTRODUCTION

This contribution on 'The demand for document delivery' is made from the point of view of a user of online bibliographic systems. In that respect, I am hoping that it will give a fair account of what the users' requirements are. As far as EUSIDIC is concerned, this may mean that my opinions will not be the same as those of the rest of EUSIDIC membership: database producers and network operators.

THE NEED FOR DOCUMENT DELIVERY

It is useless to make a long plea on the need for document delivery. The Franklin-report and the resultant long discussions in the information community, both nationally and internationally have amply proven the point, in principle. Moreover, it is an old discussion already. Decades before the computer began to infiltrate our profession we set up elaborate systems for interlibrary loans. The computer has only intensified and accelerated that discussion. Online systems are extremely useful things for document discovery, but, in our enthusiasm about them, we may have glorified them and forgotten that document discovery is not the same as document delivery, not the final answer to the question.

I have said that there is a need in principle. It is, of course, frustrating to find a document in an online search of which you, judging from the title, know that it is the complete answer to your question. And then discover that you cannot get hold of the paper itself....

However, the hard need in practice has still to be demonstrated. Costigan's book[1] on 'Electronic delivery of documents and graphics' quotes a draft copy of a paper by Engelke, but does not mention its source. An author search in the LISA-database for Engleke readily produced a reference[2] with an abstract. I hope that it was just mere coincidence when I discovered that the quoted journal is not available in the Netherlands and that I could not get a copy of the original paper in time for this meeting. This again illustrates the principle need.

The doubts about the real needs are clear from Engelke's abstract which I will now read out:

'The impact of telefacsimile in the US has been negligible as only California, Michigan and Nevada have state-wide telefacsimile networks. The advantages of speed of service in transmitting whole journal articles are offset by high costs and the need for libraries to change their interlibrary loan operations in order to use the system efficiently. A better use might be for transmitting interlibrary loan requests as it saves time and work and is cheaper than telex or telephone. Transmission of journal articles is not yet economically

feasible; but this could be achieved if faster equipment giving clearer copy were produced at a reasonable price. Telefacsimile equipment is being improved all the time but so far with little effect on library operations. Libraries should decide what equipment is needed and press manufacturers to develop it'.

So, there are some doubts whether traditional library users have large and urgent needs enough to justify the cost of any system. However, it should be borne in mind that EURONET/ARTEMIS is used by intermediaries and will continue to be so, certainly in the next few years. And for those, it is a matter of professional life or death to prove the effectiveness of their information systems to their customers/end-users even at considerable cost. This becomes even more pressing when the presently existing gap for business and commercial information is filled. For that sort of information, timeliness can be a matter of huge sums of money, much more so than for the traditional technical and scientific information.

Summarizing: automation of document delivery is a final link in the chain between information originator and end-user. At this point in time, our choice for it may be based more on principle than on cost-effectiveness. It is my opinion that we have to make that choice.

## THE MARKET FOR DOCUMENT DELIVERY

Let us then have a look at the potential market.

It is difficult to get reliable statistics about the penetration of online systems. Everybody knows that it has grown, but the actual size is still unknown. Nevertheless, there are some figures available which, at least, give some indication.

The number of organizations in the Netherlands which use online systems has grown from 12 in 1974 to 62 in 1979 (Table 1)[3].

Table 1

Organizations in the Netherlands using online systems.

| Year | Number |
|---|---|
| 1974 | 12 |
| 1975 | 29 |
| 1976 | 40 |
| 1977 | 50 |
| 1978 | 58 |
| 1979 | 62 |

From 1976 to 1978 the number of terminal operators has risen from 113 to 137 and, in that same period, the use in hours more than doubled.

In the EUSIDIC Working Group 'National User Groups' we collected a number of figures from which we were able to distill with reasonable accuracy that the total online usage in Western Europe in 1978 had been about 100,000 hours and, then, was growing by about 25-50% per year. This figure might give an estimate of the document delivery market if we knew the average search length and the number of online prints.

Statistics from the Dutch PTT have shown that the average session length for searches in the Lockheed- and SDC-systems is about 13 min. A session here is defined as a call to the node. Since there will be a number of very short calls, e.g. to test the availability of the system, we may expect that the average search length is higher. This has been confirmed by a recent membership survey in the Netherlands' Association of Online Users: the average search length is about 21 minutes.

This brings our total number to 300,000 searches per year which is 50% higher than the Franklin-report estimate. In the same report the number of hits per search and the number of relevant hits are taken to be 85 and 30, respectively. In my opinion, these figures are much too high, since I had a vague recollection that, for some cost calculations a couple of years ago, we used a figure of 16 online prints per search. Again, the Dutch survey helps us out: Dutch online searchers produce an average 17 prints per search.

Up to now I have used two parameters, the value of which is available for the Netherlands only. However, there is no indication that, in these two respects, there are large variations between users in various countries. I think that we may reasonably assume that the figures are representative for the whole of Western Europe.

The total market for online prints then is some 5 million per year which is slightly lower than the 6 million document requests from the Franklin-report. However, we have to realize that there is a large difference between a printed reference and a request for a full document. In my opinion, only a small proportion of the prints will appear to be so relevant that they lead to an order for the document. Therefore, I think, that the Franklin-figure used in the ARTEMIS-report is a factor 5-6 too high.

All this, of course, is for the total online market; ARTEMIS's future will depend on the market share EURONET/DIANE can take. On top of that there is another potential market: the demand for documents generated by other searching methods than online.

Up to now I have spoken only about the online bibliographic market. The actual market for facsimile- and Teletex-equipment is, of course, much larger. For some countries A.D. Little has produced a forecast (Table 2)[4].

Table 2

The market for facsimile stations
(in thousands)

| | 1977 | 1982 | 1987 |
|---|---|---|---|
| USA | 25 | 40-60 | 150-300 |
| United Kingdom | 3 | 10-30 | 20- 80 |
| W. Germany | 3 | 10-30 | 50-150 |

I am convinced that such a growth will also stimulate the use of an ARTEMIS-system.

## THE ORGANIZATION OF DOCUMENT DELIVERY

In general, users do not show much interest in the actual organization of an information system as long as it provides them with a reliable quick, simple and cost-effective service. One problem, however, needs further elaboration.

In EURONET/DIANE the majority of documents is of a technical or scientific nature. A lot of them will contain graphs and photographs and even more will need special character sets, e.g. for mathematical symbols. The present equipment at the user-end cannot handle these and I am afraid that we have to wait for the breakthrough of graphics terminals to make full use of document delivery via Teletex.

From an organizational point of view this might be remedied by national delivery centres, but, for the average user, this would take away the major attraction of the system which is speed.

For the near future, therefore, I am afraid that facsimile will be our major instrument to cope with this type of documents, although personally, for a number of reasons, I would prefer to have Teletex.

Whatever the organizational structure might become, a first requirement will be nearly total flexibility which means a wide variety in available interfaces. The user should be able to connect any equipment for electronic mail he might intend to purchase.

## THE IMPACT OF ARTEMIS

Finally, let me say a few words about what I consider to be the possible real impact of ARTEMIS. Of course, the provision of a document delivery system for online searching is important. But much more important is, that, like with other new information technology, it may serve as a catalyst to introduce technology somewhere in an organization, which can be used for other applications. It is like the real, future role

of EURONET/DIANE: not only to provide access to STI-hosts for information departments, but serve as a general European network for disseminating information in all disciplines. The addition of new technology to the network will give extra impetus to the use of new communication applications in our lives. This means that ARTEMIS can serve as another starting point for office automation in our professional environment.

In a few decades, information will be the major asset for Western Europe, if it is not already that now. Any way to better manage that resource should be applauded. If the Commission succeeds in maintaining a reasonable pace for further developments in this and related areas like Videotex, they will play an important role in setting the scene for our future information society. And, Mr. Chairman, I am afraid that information society will be our only alternative to survive.

REFERENCES

1. D.M. Costigan, Electronic delivery of documents and graphics, Van Nostrand Reinhold, New York, 1978.
2. H. Engelke, Interlending Rev., 6 (2) Apr. 1978, 44-49
3. Netherlands' Association of Online Users, Membership surveys 1977 and 1979.
4. Strategic impact of intelligent electronics in US and Western Europe. Vol. 5: Business communications, A.D. Little, Apr. 1979.

# DOCUMENT DELIVERY - THE COMMISSION'S INVOLVEMENT

by

C. Vernimb

Commission of the European Communities

During the last six years, when EURONET became established, the Commission has initiated more than a hundred studies which, more or less, were closely related to EURONET, amongst them the ARTEMIS study (1). I dare say the ARTEMIS study belongs to those few which have the greatest consequences, one of them being this exhibition and workshop.

However, this was not at all clear from the beginning. Quite early on we realised that EURONET had to be backed up by a fast document delivery service. We commissioned the Franklin Study (2) which concluded that documents should be ordered electronically in order to do away with postal delays, at least in one direction. But the Franklin-report also dealt with copyright, an issue which soon provoked a quarrel between publishers and librarians resulting in a stoppage of all further development of document delivery within the framework of EURONET, with one exception: the parties involved and the Committee (3) advising the Commission on IDST policy questions could agree to the Commission undertaking a purely technical study on document digitalisation and teletransmission, provided that it did not touch on the copyright issue. Ergo ARTEMIS.

In parallel to the technical study the copyright issue was very carefully approached last year, first by a discussion with representatives of publishers, then by a similar discussion with librarians. On reaching what we felt was a measure of common ground as a first basis for a compromise, we held, in November last year, a workshop with publishers and librarians. We were mistaken, the common ground was insufficient and the quarrel continued. The only point on which all parties could agree was to collect more factual information on document delivery practices and their implications in order to establish

a better platform for a second round of discussions. The study, "Facts on Document Supply", was launched six months ago. Yesterday the Document Delivery Task Force which has been advising the Commission on this study, assessed with the contractor the progress made so far. We learned that there are tremendous difficulties in compiling reliable facts on, e.g., changes on the number of journal subscriptions and on the number of photocopies made. We, therefore, do not yet know whether a useful report can be produced or not. In any case, there will be another workshop concentrating on the copyright and other policy issues involved in document delivery. All those of you who are more interested in discussing copyright issues are referred to that workshop which will probably be held in the second half of next year.

I should now like to report on another aspect of the Commission's involvement in document delivery. One year ago we started discussions with ESA, the European Space Agency, on possible cooperation between ESA and the Commission for implementing a very first phase of ARTEMIS, a so-called test bed, named APOLLO. APOLLO was to be limited to a few hundred documents to be stored and transmitted in facsimile mode from the ESRIN computer, a EURONET host in Frascati, to a small number of terminals. APOLLO should also have tested satellite communication. We had already formulated rather complete project specifications when our Document Delivery Task Force, which we informed, advised the Commission:

i. to await the results of today's exhibition and workshop

ii. to invite interested hosts through an open call for tender to participate in the test bed

iii. to decouple the satellite experiment from the rest.

Let me now return to ARTEMIS and the purpose of this workshop. The technical feasibility and the economic viability of electronic document delivery will be demonstrated. I do not intend anticipating the results of Panel 1 but it seems that judging from the proposals received, the technical feasibility is not in question. The economic viability, however, seems in need of further scrutiny. To facilitate the discussion I have put the main cost figures given in the ARTEMIS report in graphic form (fig. 1). Costs are given for document capture and storage, for teletransmission and for printing for both of the competing, or complementary, modes, facsimile and coded characters. In both cases the first and the last carrier is paper, in between the document appears in electronic form. In addition to the present teletransmission costs, reduced costs are given (in brackets) which are proposed for negotiations with the PTTs.

COSTS OF ELECTRONIC DOCUMENT
1.capture and storage
2 teletransmission and
3.printing in EAU/page according to the ARTEMIS Report



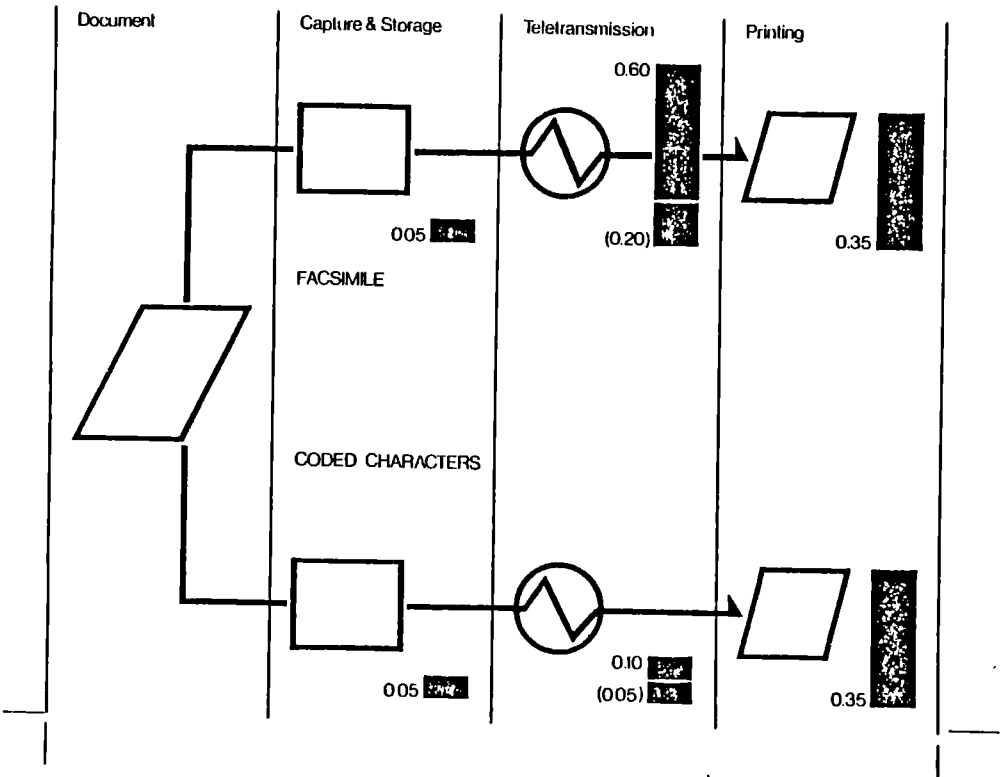
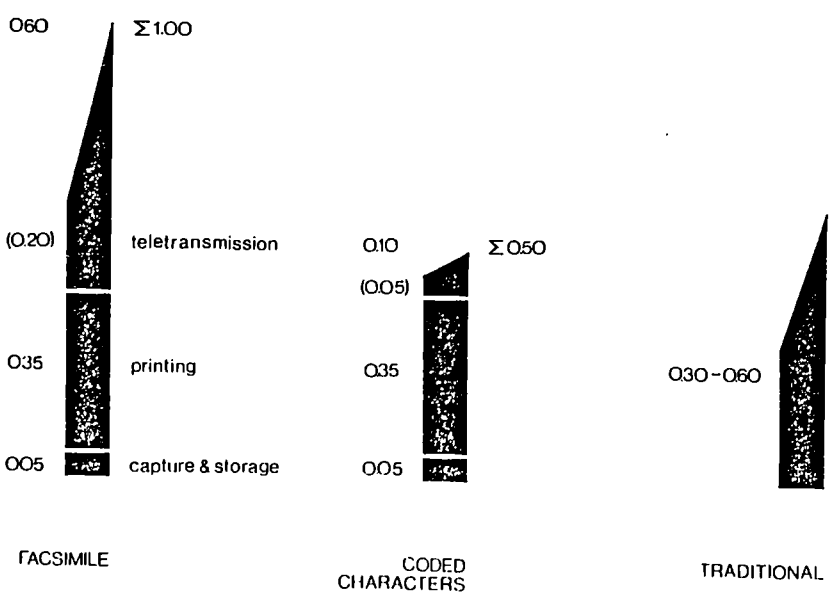



Fig. 1

COSTS OF ELECTRONIC DELIVERY OF DOCUMENTS BY
1.facsimile
2.coded characters and
3.traditionally in EAU/page according to the ARTEMIS report



For both of the operation modes, the costs for capture and storage are the same and small, whereas amortising the costs for the receiving terminal is also the same but expensive. Fig. 2. compares the costs for both of the operation modes, facsimile and coded characters, with one another and with the costs for traditional document delivery by means of photocopying and mailing. In my opinion two essential conclusions can be drawn from the comparison:

The costs for the teletransmission of full documents must be reduced considerably (especially for facsimile), e.g. by means of a special tariff for overnight bulk transfer, and the costs of the receiving terminal, preferably a terminal which accepts facsimile as well as coded characters, should be as small as possible. It will be the task of Panel 1 to adjust these cost figures to those which will be extracted from the various proposals.

Panel 2 will deal with another conclusion of the ARTEMIS Report: that market forces alone would not bring ARTEMIS into being. Obviously, an environment needs to be created in which a market can develop. According to the ARTEMIS Report, important ingredients for the proper development of the market are standards. As a complement to the activities of CCITT, CEPT and ISO, the Commission might here be faced with a suitable task, either by inviting the parties involved to agree on rules and standards, or by supporting the development of appropriate interfaces. Furthermore, Panel 2 should consider the need for supporting the development of full text databases by public funds in order to speed up the take-off of the market. In this context the general question of the proper timing of any action which might influence the development of the market must be dealt with. With all this in mind the impact of a growing ARTEMIS on the interests of the different stakeholders must not be forgotten.

The conclusions of the two Panel discussions should then permit us to identify the next steps to be taken.

REFERENCES

1. ARTEMIS, A System for Document Digitalisation and Teletransmission, Report to Directorate General XIII of the Commission of the European Communities by A.D. Little, April 1980.

2. Problems of Document Delivery for the EURONET User, Technical Report, prepared for the Commission of the European Communities by Paul D. Gillespie, Paul Katzenberger and John Page of the Franklin Institute GmbH, Munich. K.G. Saur, Munich, New York, Paris 1979, ISBN 3-598-10069-8.

3. Committee for Information and Documentation on Science and Technology (CIDST).

# INTRODUCTION TO THE PROPOSALS RECEIVED

by

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International Institute for Applied Systems Analysis



## CALL FOR PROPOSALS - THE ARTEMIS CHAIN OF FUNCTIONS

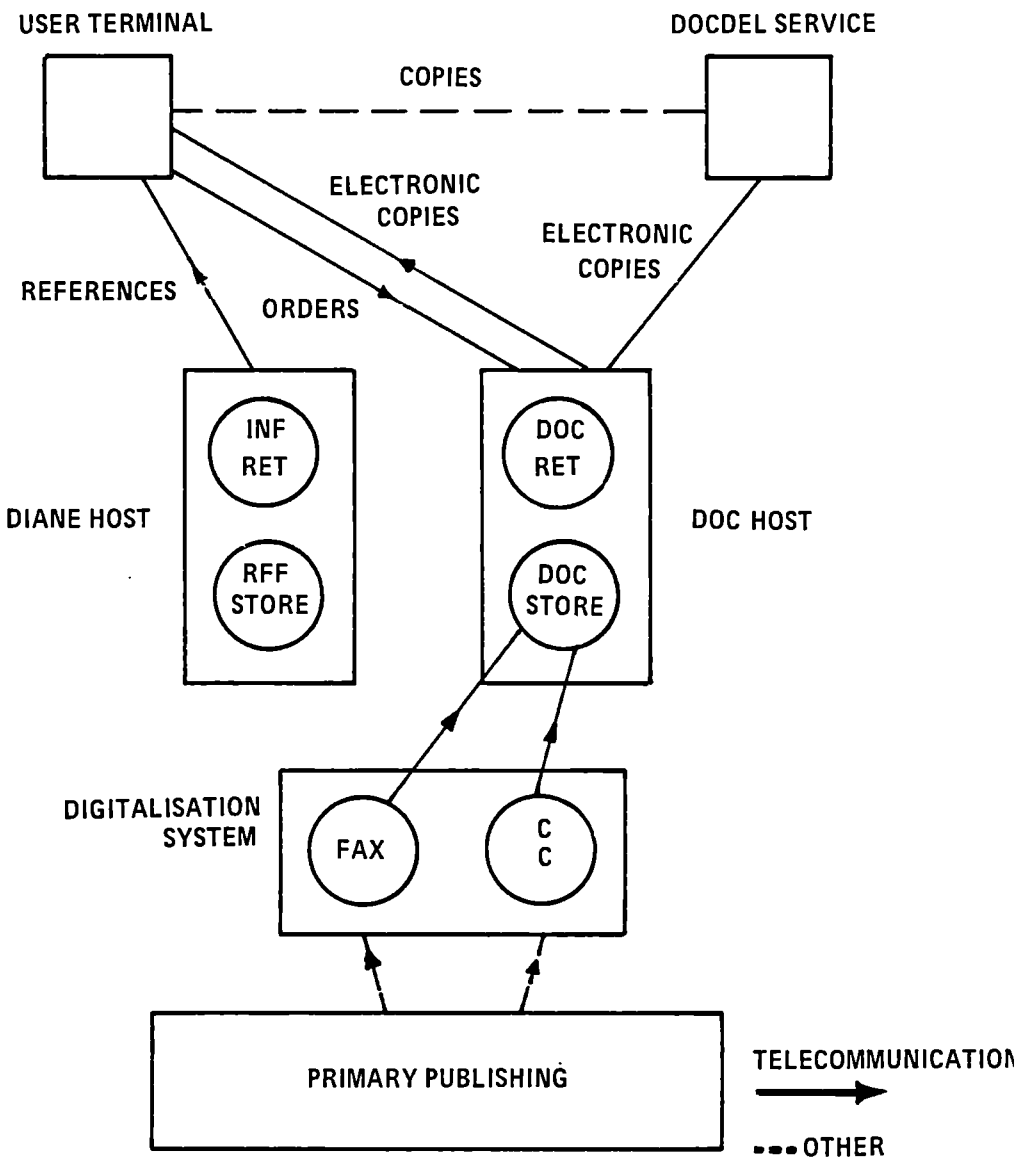
Some 15 proposals were received in answer to the Commission's Call for Proposals for demonstrations published in the Official Journal C184 of 22nd July. While this response was satisfactory, other organizations capable of responding might not have seen the Official Journal entry: others may have hesitated to disclose their equipment in front of possible competitors.

Firms and organizations responding to the call for proposals were free to make proposals relating to the whole chain of ARTEMIS functions, or offer equipment or systems which covered part of the chain only. ARTEMIS functions are shown graphically in the figure below.

## PROPOSALS RECEIVED

Two proposals were received, from Pergamon and CSI/CIGL, which covered the full range of ARTEMIS functions. A further proposal from Altergo Services Ltd. also related to a total system, but was based on microfiche storage. Philips also introduced their Megadoc system, which could be said to cover the full range of functions but was not yet operational. Other proposals received (Data Dynamics, Siemens, 3M, IBM, CREL, Elsag, Agfa Gevaert and Antone Systems) were concerned with equipment which fulfilled part of the ARTEMIS functional chain, while Gruner und Jahr in association with Philips presented current work in applying elements of the Megadoc system to the management of a large newspaper file. The presentations were concluded by a paper from Rank Xerox, summarizing the likely

## ARTEMIS FUNCTIONS



developments in the fully electronic office concept in relation to ARTEMIS requirements.

The speaker went on to summarize the main features of the proposals to be presented (see Session II) he also noted that other organizations, for example, Kodak and AM International had indicated their interest in responding to the call for proposals, and had given briefings to the Commission, but were not able for one reason or another to present proposals at the exhibition/workshop. Kodak were developing a high resolution, rapid access, large storage volume microform spool system with image processing, and AM International had delivered a very high speed, high resolution facsimile system meeting the ARTEMIS requirements to the Satellite Business Systems Corporation in the USA. The British Library had indicated its interest in co-operation with other organizations in ARTEMIS: they had pointed out that they had much experience in acquisition, storage and retrieval of documents of all kinds. A Belgian consultancy firm (J. Sansen) indicated its willingness to provide a document reception and delivery service to end users. A European company which wished to remain anonymous had informed the Commission that it was developing a very low cost, high density optical database with rapid and inexpensive access, which would be available in 1983.

DISCUSSION

*M. Cremer*, Chairman, CIDST

In this context one has to distinguish between

-- Document ordering, i.e., requests for primary documents after they have been bibliographically listed, an activity which involves not only libraries but also publishers and booksellers;
-- Information delivery, i.e., requests for, and delivery of, secondary information available online in printed and nonprinted form;
-- Document delivery, i.e., the transmission of primary documents in printed and non printed form via publication channels (including electronic publishing) by publishers and the like, and sale by booksellers and distribution through lending libraries or on an online basis.

The last-mentioned category (document delivery) is the theme of this Workshop. Document delivery via the screen or a facsimile process is already a fact of technological life. But it should not be forgotten, in this context, that:

-- whereas the utilization of primary documents published by traditional methods involves either their purchase and use (and re-use as often as the user wishes) or borrowing from libraries, online utilization presupposes:
    a) the use of one or several sets of hardware (screen, printer, etc.) in view of the wide range of not-always-compatible equipment on offer;
    b) the payment of postal charges for each user operation;
    c) the payment of charges for use of the database;

-- it is therefore reasonable to assume that the application of the new technology will be restricted at first to specific types of documents, e.g., socio-economic material or tabulated factual information, and to specific types of users who really need rapid access to documents and who (or whose firm or institution) have the necessary equipment and financial resources;
-- the traditional system (publishing and bookselling, libraries, lending, copying processes) will continue to meet the needs of the majority of users, and one should therefore not be over-optimistic with regard to the new technological resources in the field of scientific and technical information that are under discussion here. As J. Page has already pointed out, the main areas of application remain those of office rationalization and the streamlining of in-house information facilities.

It is worth stressing again that communications technology appears to be advancing faster than the pace at which the information sector (including libraries, archives, publishers, booksellers) can adapt its own technology and overall strategy.

It must not be forgotten, furthermore, that the changes in cost structures that have already been mentioned can easily lead to the emergence of privileged user categories, and to discrimination between users. The changed role of libraries and publishers in the new technical scenario must also be examined in greater depth: the high cost of the necessary technical investments could well be reflected, for example, in stronger monopolistic tendencies on the part of the major publishers or in a trend towards greater concentration.

In the context of the Workshop, one ought also to investigate the reasons for the continuing upward trend in the annual total numbers of books and periodicals (in terms of numbers of titles) published in certain countries (e.g., the Federal Republic of Germany).

These critical remarks are in no way intended to belittle the significance of the new communications technology for the information and publishing sectors. The Commission and the CIDST are fully aware of the situation and have drawn the relevant conclusions. A glance at the programme and activities of DG XIII reveals the interesting fact that the influence of the scientific and technological information sector is being felt far beyond its own compass:

-- EURONET is the first data transmission network in which the European PTTs have managed to achieve common standards and a highly developed technology. Whether the network will be intensively used for its original purpose, that of transmitting scientific and technical information, is open to question, but it seems certain to be used on a large scale for third-party traffic and it has undeniably played a major role in shaping national developments in member countries and elsewhere.

The Commission, by fostering technical developments in the STI field, has also exercised a considerable influence on the development of video text processes, although here again the major areas of application may be expected to lie elsewhere. Examples that spring to mind are video text conferences and studies in the fields of agricultural and environmental information. The fact that the systems and equipment presented at the Document Delivery Workshop can be applied only to a limited extent in the STI field has already been mentioned. Electronic publishing and the special case of the electronic journal are of special significance in this context. A distinction has to be drawn between the use of electronic systems for traditional publishing in printed (or micro-) form, the entry and editing of manuscripts in electronic form and publication solely in an electronically stored form. In the first case, electronic storage can be provided as an ancillary service, giving the user an alternative choice; in the last-mentioned case, there is a fundamental change (as already indicated) in the scenario, the chain linking the author, publisher, bookseller, library and user.

# SESSION II

## PRESENTATION OF PROPOSALS

W.L. RENAUD

CHAIRMAN

# ELECTRONIC DELIVERY OF PRIMARY DOCUMENTS
## (A TECHNICAL PROPOSAL)

by

D.H. Barlow
Kent-Barlow Information Associates

In my presentation I am not going to describe:

- a cooperative publishers association type approach to deal with already published literature,

nor

- an implementation of the ARTEMIS scheme exactly as laid down in the report,

nor

- a scheme that a group of large publishers might conceive.

Instead I am going to describe a concept approach that a major publisher like Pergamon could take, that:

- deals with new literature and journals to be published,
- is complementary to any larger central scheme,
- tackles the problem of quality character representation and later the application of graphics,
- operates as part of the publishers future production process,
- makes documents available to end users via low cost terminals,
- can open up the market for the publisher.

What is motivating Pergamon in this direction? First, let me say that this is not the sole approach being studied, Pergamon is involved in the other approaches I have mentioned. However this approach was felt to be the one of the future which gives the opportunity for publishers to restore the old original simple links that used to exist between the originator of material and the user. Today's communication systems (and tomorrow's even more) interpose brokers, and a range of specialists

into this chain - often delaying communication and making it more costly.

So with this background let me review the proposed pilot or experimental system which Pergamon would be happy to set up as one of the 'test beds' proposed in the ARTEMIS report. Since the system proposed utilises not only publishing techniques in Pergamon but also a host computer system, Infoline, which is now linked with the Télésystèmes host in France, all components for a successful experiment are under a single control. Problems raised by multilingual users can be tested; there are in the initial stages, no awkward copyright problems, and tests can be set up almost immediately.

## THE SYSTEM

The subject area of the proposed system is based on microelectronics and electronic components. This is a subject field that is germane to the Commissions Telematics program as well as fitting in with Pergamon's own range of journals of which 26 lie in this field.

The system concept embodies all stages in the document delivery chain from original manuscript processing, digitization, storage, to retrieval and printout at the users premises. The system will link the INSPEC database to be mounted on Pergamon-Infoline with a specially generated database of full text articles of Pergamon primary publications that are referenced in the INSPEC database. In this way regular users of the INSPEC database via Infoline and Euronet will be able to search in the normal manner for bibliographic references; by selecting the references pointing to journals published by Pergamon, the user would be able to obtain electronic delivery of the full text.

The full text of these journals will eventually be keyboarded as part of the production of the primary journals. However in the initial stages these texts would be separately keyboarded to cover not only the text but full digitization of mathematical symbols. In this way a full text version of the article with mathematical symbols would be available for storage in a separate file cross linked in the Infoline system to the INSPEC abstract number.

Some new developments have been made in document delivery direct to the user. The Pergamon approach assumes that adequate use and acceptance of the service in a pilot experiment can only occur if the terminals are low cost and are capable of producing a full alpha numeric and mathematical symbol range.

There are terminals that perform these tasks both for facsimile and teletex but they are generally expensive. The development performed and which you will see demonstrated uses a low cost microcomputer, and can handle extended character

sets. A page image approach, using the Correlative Systems International approach is also employed.

## BASIC CONCEPTS

The ARTEMIS report which is an invaluable mine of information paints the scenario of both digitized text (teletex) and facsimile databases being required. While this will be necessary to cover past literature, future emphasis will be on teletex.

The report also postulates the need for Group 3 facsimile receivers, plus digital terminals, both dedicated to document delivery purposes. It is our view (borne out by the initial development we have undertaken), that other approaches should be considered.

In the ARTEMIS report little was said on the problems of the large character sets required in the digitization of scientific articles. Further, the report when discussing output concepts visualizes a document reproducing centre in which high cost Group 3 digital facsimile equipment would provide printouts of full text articles for distribution to users in the neighbouring geographical area. An alternative view is that terminal systems should be sufficiently inexpensive so that each user is in possession of one at his place of work. We think that users will prefer to access the system themselves rather than rely on a third party to obtain the article for him.

Consequently it is the view of Pergamon that attention must be directed to development designed to help the individual user. This aid should take the form of a cheap terminal plus visual display unit. Such a terminal unit if made up of a microcomputer could be used for other experimental work or the setting up of individual personal files as well as acting as a personal document delivery system.

Hence the Pergamon concept involves three aspects:

- An overall system
- Large character sets
- Low cost microcomputer terminals

## THE SYSTEM IN DETAIL

Editorial Coverage - 25 titles of the Pergamon range dealing solely with microelectronics and computer areas.

Database size - Preliminary analysis indicates that the test bed would require a database of manageable size:

| | |
|---|---|
| Articles | 1,200 |
| Total Pages | 11,000 |
| Illustrations | 5,000 |
| Number of Characters | 50 Megabytes |

Image handling/Illustrations - Dependent on complexity of the illustration, either direct digitization or page image.

The treatment of illustrations is an area of development. Existing technology while capable of digitizing graphical and line drawings does not yet possess the high resolution required to permit its use for generating print quality reproduction of diagrams and figures for inclusion in reputable scientific journals. In such journals, print quality, the aesthetic appearance of diagrams together with the ability to resolve adequately minute variations in parameters, are all qualities deemed important in the editor's view. Consequently the Pergamon approach proposes two development channels:

1) A page image processing system based on Correlative Systems International equipment. (CORRSYS)
2) A direct digitized approach, as a byproduct of the journal typesetting system.

## PAGE IMAGE APPROACH

In this approach the CORRSYS equipment optically scans a complete page to produce a dot matrix of the image. Resolution of the image can be adjusted from 1024 x 512 up to 2048 x 3072 elements per page. The image is then stored on magnetic disc and can be retrieved through CORRSYS software by identification of the image number. The complete image is displayed on a local low-cost remote visual display unit terminal. In the Pergamon Document Delivery System this system would be applied to generate images of complete pages which contain illustrations.

## DIRECT DIGITIZATION

Pergamon is already involved in computerized typesetting of certain publications and would envisage applying these techniques to the Document Delivery System. Manuscripts would be keyboarded prior to computer typesetting and the resultant machine-readable record would form the input to the Document Database. It is envisaged that most mathematical symbols, chemical structures and some line drawings can be digitized in this mode. Those that could not be digitized at present would be image-stored. Output of text from the Document Database would be to remote, low-cost, microprocessor-driven terminals in which software conversions would be made for the display of special characters.

Figure 1 shows the overall schematic of the system.

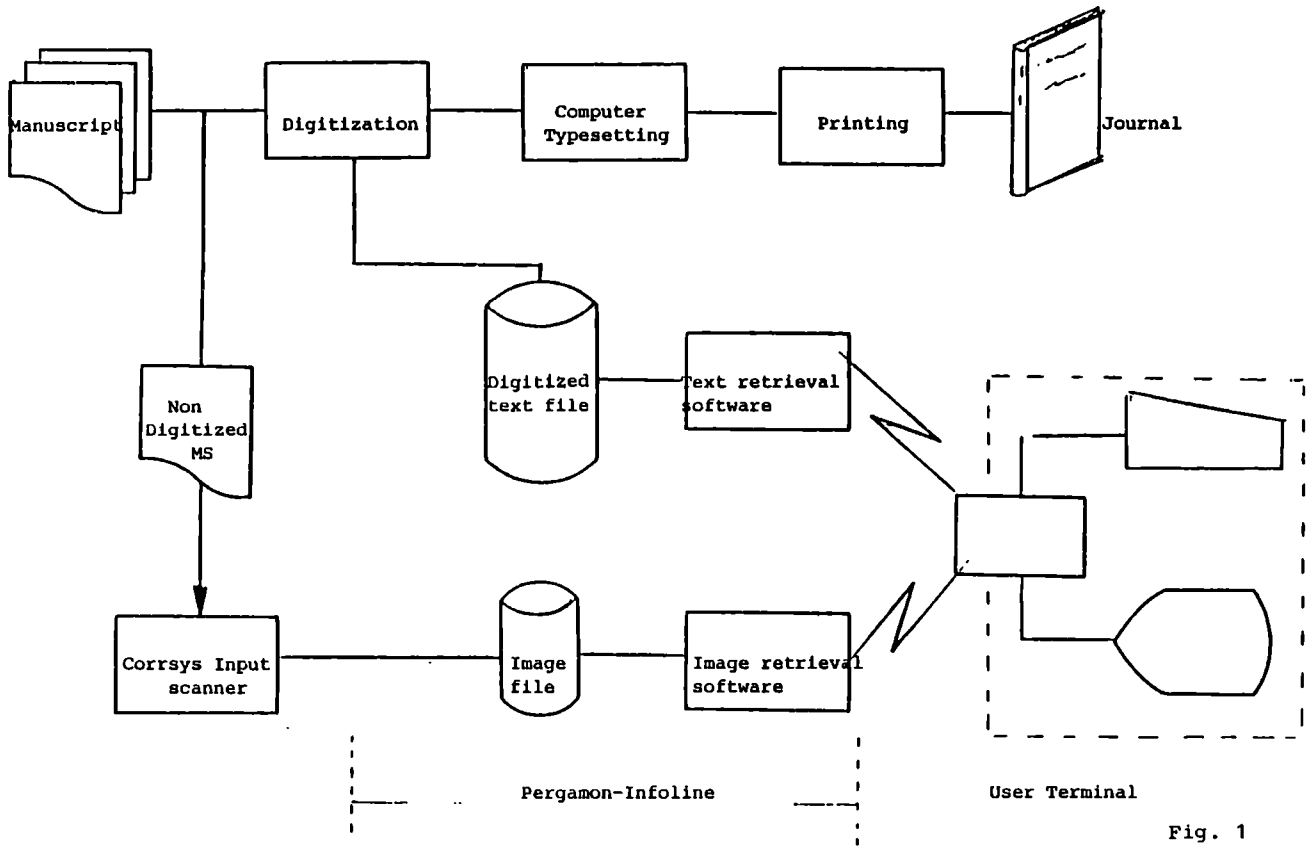

Manuscript
Digitization
Computer Typesetting
Printing
Journal
Non Digitized MS
Digitized text file
Text retrieval software
Corrsys Input scanner
Image file
Image retrieval software
Pergamon-Infoline
User Terminal

Fig. 1

## THE CHARACTER SET PROBLEM*

Present Pergamon typesetting programs already enable complex mathematical equations to be set automatically.

Similarly chemical structures are also being digitized, set and stored in structure files.

In addition, for scientific composition a wide range of signs and symbols, together with Greek, German and mathematical script plus floating accents are necessary.

A range of such symbols and characters are stored as digital codes which are called up by entry of mnemonic codes. The codes are entered onto the database and remain part of the database and are used to initiate typesetting procedure.

## HOW IT WORKS

### Receipt of Manuscript

Copy editing, after refereeing and all the normal intellectual processes are performed, follows normal practice. In editing, macro codes are added to identify portions of the article such as Title.

The text is keyboarded into the master database either through typing for OCR scanning or direct key-to-disc entry. Mathematical formulae would also be keyboarded using special character codes and suitable fonts. Simple illustrations would undergo direct digitization and enter into the file. Those requiring more detailed resolution would be formed as page images and stored in a separate file.

## PRODUCTION

After keyboarding normal computer composition techniques are followed. Once make-up and pagination are completed, the final item of data is added to the text database, namely the page and issue numbers.

From this the computer generates the Article Identification Number (AIN) which can be made up of the CODEN ref, vol No., issue No., page start number and author. This is the unique key to identify the article.

## DATABASE MOUNTING

In the system, files of text and image data would be created on the Pergamon-Infoline host computer, after an initial editing program had removed unwanted typesetting control characters.

* Samples are given in the figures at the end of this presentation.

The host computer would also set up links between the appropriate secondary database of abstracts and bibliographic references, in this case the INSPEC file, and ensure that a marker was added to inform enquirers that the full text was available for electronic delivery.

## USER SEARCH

To the user, the system is very simple: He logs into the host computer, and then initiates a search on the INSPEC database to locate items pertinent to his interest.

In the demonstration the query posed is to search for articles covering:

> Temperature effects on component failure rates
> which have been published.

You will be able to see how the search is formulated and how the search yields a set of three relevant articles, all of which are tagged for electronic delivery.

## DELIVERY

To obtain the document, the command Deliver accesses the text file, and after a check procedure the full text of the article is down loaded to the users terminal.

## THE USER MACHINE

The heart of the user equipment is a low cost microcomputer, the Transam Tuscan S100 machine and a Visual Display Unit monitor.

This microcomputer comprises a basic 16K system with twin 5¼ inch drives, at a cost of £1200 approximately. To cope with the extended character set, a special ROM has been built. For the demonstration, 26 of the graphic and non-used ASCII codes have been eliminated and replaced on call-up by a series of special characters such as:

△ superscript
subscript
etc.

Thus, by use of low cost special ROMs at around £40 per chip any range of characters can be built and called into operation as required.

In summary this approach is inexpensive, and permits users to perform other business functions, avoiding the necessity for a high investment for information alone.

A limitless range of characters may be generated and by down loading the complete artwork onto its internal discs can reduce PTT connect charges.

## THE PROBLEMS

In the time available we have not had time to sort out all the problems. For example we are not showing in the demonstration a printed output, but the same adaptation of the 9 x 12 matrix system on the printer will produce the same character range and quality as you will see on the video.

Obviously there are other refinements to be added, such as the scroll up and down etc.

But the demonstration shows a complete simulation of a search and the document delivery together with the capabilities of this approach. If one was seeking a really cheap user kit then the discs could be eliminated and the store raised to 56K. Such a system would cost £846. Graphics are the next development to be undertaken. Concepts are under study to use digitizing boards on which the manuscript transparencies would be laid and the curver traced through to directly digitise their position. These are not new techniques but do need some adaptation to ensure that suitable resolution is obtained.

## THE NEXT STEP

Already this development has thrown up a number of needs that must be looked at if future schemes along these lines are to mature.

- A common character set representation
- Conversion packages to interface between different photo composition systems and the common character set.
- An agreed Article Identification Number.
- Completion of development of graphics representation.

Much of this would emerge in prototype form from the 'test bed' study.

## ECONOMICS

So far I have said little on economics other than the low cost of the terminal.

The costs divide into:

1) Initial keyboarding of the text and illustration files.
2) Loading on the host computer.
3) Storing.

4) Interrogating and telecommunications delivery.
5) User equipment.

In all these the figures appear to be low where they are under the system operators control.

1) Initial keyboarding.
For computer composition, figures are quoted of £1.00 per 1000 characters in the UK for keyboarding, with a further £0.44 per 1000 for OCR scanning and computer input.

But the question is - is this a first page make-up charge and if so how much should be allocated to document delivery?

2) Since no indexes are being generated, the load time for a typical article of 4.7 pages @ 2000 characters per page (i.e. 9.4K characters) will be minimal.

3) Storage costs are estimated at £1 per Megabyte per month.

4) Transmission costs per article are dependent on PTT tariffs.

5) User equipment could be as low as £850 and as such, possesses computing facilities that can be used for other purposes.

CONCLUSION

In this presentation I have tried to outline one possible system of the future to which publishers as they use more computer compositon will gravitate. There can be many variants but I invite you to view the demonstration to see that acceptable quality document delivery can be achieved today on low cost equipment - an approach that we hope will benefit publisher and user alike.

ADDITIONAL NOTES ON THE DEMONSTRATION

Two Tuscan microcomputers were used, one to simulate the Infoline host computer and the other as a local terminal. After a simulated INSPEC search, the terminal microcomputer displayed screen by screen, the full text of selected articles. As explained above, an extended character set feature was included in the demonstration, but hardcopy printout was not yet available. A combination of page images and coded characters was also not demonstrated. Although therefore a full demonstration of all the features in the Pergamon proposal was not attempted, Commission officials convinced themselves of the validity of the approach taken.

DISCUSSION

*G. Zwaenepoel, DPWB/SPPS*

I would like to make a comment to what Mr. D.H. Barlow has said about the need for an extended character set for the coding of technical and scientific texts and graphics.

In my opinion, it is important that this character set would be an extended version of the "Teletex" standard of CCITT because most European PTT's will introduce a Teletex service in the next years. Presently, the basic "Teletex" character set contains:

- the "IAS"-set (or "ASCII") as a subset;
- a limited number of mathematical characters;
- no chemical symbols;
- geometric graphical capabilities are limited to vertical lines, horizontal lines and points.

It is however possible to code additional characters by using:

- the (at present) undefined positions in the basic Teletex set
- the "escape" procedures defined by ISO

Proposals have already been made: e.g. the "Telidon" alpha-geometric code and the "Dynamically Redefinable Character Set" (D.R.C.S.), which could be integrated in the CCITT standard for Teletex.

I would like to propose that the Commission should use its influence to obtain from ISO and CCITT the standardization of a suitable extended Teletex Character Set.

*Question: G. Morganti, SIP*

These new services will involve the PTT's, the EDP industry and information producers. At the same time, the PTT's are

establishing Teletex services which differ because they are essentially terminal-to-terminal; however, the equipment conforms to international standards, and will exist everywhere. It would be very advantageous if we could use it for document delivery purposes. Is there compatibility between the Teletex standard and what we require, and can Teletex terminals be used to interrogate text databanks?

*Reply: D.H. Barlow, Kent-Barlow Information Associates*

While there are others more competent than I to discuss this question, I would imagine that the Teletex service will be a suitable vehicle for interrogating the full text databases, but the real question is whether the service can accept the full range of digital representations of the characters needed by the scientific and technical information community.

*Question: H.J. Ehlers, Ernst Klett Printing and Publishing*

I suggest that you use the American standards system for identifying articles as your article identification number.

*Reply: D.H. Barlow, Kent-Barlow Information Associates*

We were not aware of any particular American standard but I am delighted to hear that such a thing exists.

*Question: A.L. Van Wesemael, IFLA*

I would like to know why you did not decide to use the ISSN number for article identification, secondly, did you take into consideration the work of ISO TC46 in character set standardization?

*Reply: D.H. Barlow, Kent-Barlow Information Associates*

The ideas I discussed were our first thoughts: certainly the ISSN number is a useful means of identifying an article. We were aware of the work of TC46, but they have not yet gone into the necessary fine detail for the kinds of range of characters we will need. The problem needs a lot of further study.

*Question: P.L. Holmes, EUSIDIC*

I have a number of related questions: first, what speed of asynchronous transmission are you expecting: second, what is the number of bits per page, taking into account the handling of the extended character set: third, the transmission time per page of text: fourth, the number of simultaneous users expected: and fifth, the trade-off between cost, price and the likely low volume of use?

*Reply: D.H. Barlow, Kent-Barlow Information Associates*

These points are still under development and it is too early to give definitive results in a simple form.

$$\delta x = h_1 \delta\xi_1 a + h_2 \delta\xi_2 b + h_3 \delta\xi_3 c$$

$$\frac{\partial x}{\partial \xi_1} \cdot \frac{\partial x}{\partial \xi_2} = 0$$

$$\frac{\partial a}{\partial \xi_2} = \frac{1}{h_1}\frac{\partial h_2}{\partial \xi_1} b, \qquad \frac{\partial b}{\partial \xi_1} = \frac{1}{h_2}\frac{\partial h_1}{\partial \xi_2} a$$

$$\frac{\partial}{\partial \xi_3}\left(\frac{\partial x}{\partial \xi_1} \cdot \frac{\partial x}{\partial \xi_2}\right) = \frac{\partial}{\partial \xi_1}\left(\frac{\partial x}{\partial \xi_3}\right) \cdot \frac{\partial x}{\partial \xi_2} + \frac{\partial x}{\partial \xi_1} \cdot \frac{\partial}{\partial \xi_2}\left(\frac{\partial x}{\partial \xi_3}\right)$$
$$= -2 \frac{\partial x}{\partial \xi_3} \cdot \frac{\partial^2 x}{\partial \xi_1 \partial \xi_2}$$

$$e_{11} = a \cdot (a \cdot \nabla u) = \frac{1}{h_1}\frac{\partial u_1}{\partial \xi_1} + \frac{u_2}{h_1 h_2}\frac{\partial h_1}{\partial \xi_2} + \frac{u_3}{h_3 h_1}\frac{\partial h_1}{\partial \xi_3}$$
$$e_{23} = \tfrac{1}{2} b \cdot (c \cdot \nabla u) + \tfrac{1}{2} c \cdot (b \cdot \nabla u) = \frac{h_3}{2h_2}\frac{\partial}{\partial \xi_2}\left(\frac{u_3}{h_3}\right) + \frac{h_2}{2h_3}\frac{\partial}{\partial \xi_3}\left(\frac{u_2}{h_2}\right)$$

$$\frac{\partial u_r}{\partial t} + u \cdot \nabla u_r - \frac{u_\theta^2}{r} - \frac{u_\phi^2}{r}$$
$$= -\frac{1}{\rho}\frac{\partial p}{\partial r} + \nu\left[\nabla^2 u_r - \frac{2u_r}{r^2} - \frac{2}{r^2 \sin\theta}\frac{\partial(u_\theta \sin\theta)}{\partial\theta} - \frac{2}{r^2 \sin\theta}\frac{\partial u_\phi}{\partial\phi}\right]$$

$$\frac{\partial u_\theta}{\partial t} + u \cdot \nabla u_\theta + \frac{u_r u_\theta}{r} - \frac{u_\phi^2 \cot\theta}{r}$$
$$= -\frac{1}{\rho r}\frac{\partial p}{\partial \theta} + \nu\left[\nabla^2 u_\theta + \frac{2}{r^2}\frac{\partial u_r}{\partial\theta} - \frac{u_\theta}{r^2 \sin^2\theta} - \frac{2\cos\theta}{r^2 \sin^2\theta}\frac{\partial u_\phi}{\partial\phi}\right]$$

$$\frac{\partial u_\phi}{\partial t} + u \cdot \nabla u_\phi + \frac{u_\phi u_r}{r} + \frac{u_\theta u_\phi \cot\theta}{r}$$
$$= -\frac{1}{\rho r \sin\theta}\frac{\partial p}{\partial \phi} + \nu\left[\nabla^2 u_\phi + \frac{2}{r^2 \sin\theta}\frac{\partial u_r}{\partial\phi} + \frac{2\cos\theta}{r^2 \sin^2\theta}\frac{\partial u_\theta}{\partial\phi} - \frac{u_\phi}{r^2 \sin^2\theta}\right]$$

$$h'(f) = \tfrac{1}{2}ct = \int_0^h \frac{dz}{\left(1 - \frac{f_0^2}{f^2}\right)^{1/2}}$$

Examples of mathematical formulas of varying degrees of complexity

$$\text{or}\quad \frac{1}{h_1h_2h_3}\begin{vmatrix} h_1a & h_2b & h_3c \\ \dfrac{\partial}{\partial\xi_1} & \dfrac{\partial}{\partial\xi_2} & \dfrac{\partial}{\partial\xi_3} \\ h_1F_1 & h_2F_2 & h_3F_3 \end{vmatrix}$$

$$\frac{\partial a}{\partial r}=0,\qquad \frac{\partial a}{\partial\theta}=b,\qquad \frac{\partial a}{\partial\phi}=\sin\theta c$$
$$\frac{\partial b}{\partial r}=0,\qquad \frac{\partial b}{\partial\theta}=-a,\qquad \frac{\partial B}{\partial\phi}=\cos\theta c$$
$$\frac{\partial c}{\partial r}=0,\qquad \frac{\partial c}{\partial\theta}=0,\qquad \frac{\partial c}{\partial\phi}=-\sin\theta a-\cos\theta b$$
$$\nabla V=a\frac{\partial V}{\partial r}+\frac{b}{r}\frac{\partial V}{\partial\theta}+\frac{c}{r\sin\theta}\frac{\partial V}{\partial\phi}$$

$$n\cdot\nabla\mathrm{F}=a\left(n\cdot\nabla F_r-\frac{n_\theta F_\theta}{r}-\frac{n_\phi F_\phi}{r}\right)+b\left(n\cdot\nabla F_\theta-\frac{n_\phi F_\phi}{r}\cot\theta+\frac{n_\theta F_r}{r}\right)+c\left(n\cdot\nabla F_\phi+\frac{n_\phi F_r}{r}+\frac{n_\phi F_\theta}{r}\cot\theta\right)$$

$$\nabla\cdot\mathrm{F}=\frac{1}{r^2}\frac{\partial(r^2F_r)}{\partial r}+\frac{1}{r\sin\theta}\frac{\partial(\sin\theta F_\theta)}{\partial\theta}+\frac{1}{r\sin\theta}\frac{\partial F_\phi}{\partial\phi}$$

$$\nabla\times\mathrm{F}=\frac{a}{r\sin\theta}\left[\frac{\partial(F_\phi\sin\theta)}{\partial\theta}-\frac{\partial F_\theta}{\partial\phi}\right]+\frac{b}{r}\left[\frac{1}{\sin\theta}\frac{\partial F_r}{\partial\phi}-\frac{\partial(rF_\phi)}{\partial r}\right]+\frac{c}{r}\left[\frac{\partial(rF_\theta)}{\partial r}-\frac{\partial F_r}{\partial\theta}\right]$$

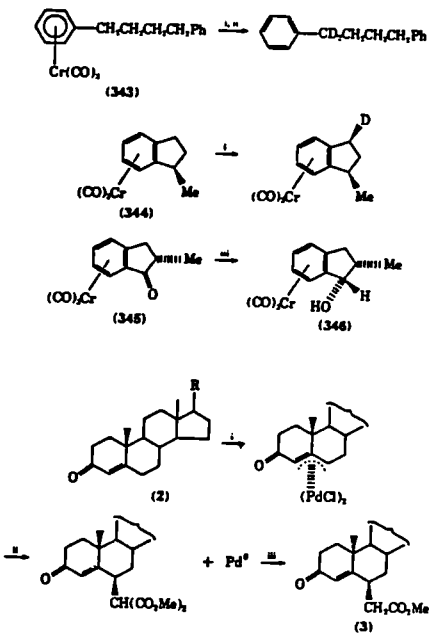
$$\nabla^2V=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial V}{\partial r}\right)+\frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\frac{\partial V}{\partial\theta}\right)+\frac{1}{r^2\sin^2\theta}\frac{\partial^2V}{\partial\phi^2}$$

$$\nabla^2\mathrm{F}=a\left[\nabla^2F_r-\frac{2F_r}{r^2}-\frac{2}{r^2\sin\theta}\frac{\partial(F_\theta\sin\theta)}{\partial\theta}-\frac{2}{r^2\sin\theta}\frac{\partial F_\phi}{\partial\phi}\right]+b\left[\nabla^2F_\theta+\frac{2}{r^2}\frac{\partial F_r}{\partial\theta}-\frac{F_\theta}{r^2\sin^2\theta}-\frac{2\cos\theta}{r^2\sin^2\theta}\frac{\partial F_\phi}{\partial\phi}\right]+c\left[\nabla^2F_\phi+\frac{2}{r^2\sin\theta}\frac{\partial F_r}{\partial\phi}+\frac{2\cos\theta}{r^2\sin^2\theta}\frac{\partial F_\theta}{\partial\phi}-\frac{F_\phi}{r^2\sin^2\theta}\right]$$

spherical aberration: $S_I^\bullet = S_I + \Sigma\sigma$
coma: $S_{II}^\bullet = S_{II} + \Sigma Q\sigma$
astigmatism: $S_{III}^\bullet = S_{III} + \Sigma Q^2\sigma$
Petzval sum: $S_{IV}^\bullet = S_{IV}\pi$
distortion: $S_V^\bullet = S_V\pi + \Sigma Q^3\sigma$

$$q^{(1)}=\begin{pmatrix} q_{1,r+1} \\ q_{2,r+1} \\ \vdots \\ q_{r,r+1} \\ 1 \\ 0 \\ \vdots \\ 0 \end{pmatrix},\qquad q^{(2)}=\begin{pmatrix} q_{1,r+2} \\ q_{2,r+2} \\ \vdots \\ q_{r,r+2} \\ 0 \\ 1 \\ \vdots \\ 0 \end{pmatrix},\ \ldots.$$

$$Z=\cfrac{g_1}{s}+\cfrac{1}{\cfrac{g_2}{s}+\cfrac{1}{\cfrac{g_3}{s}+\cfrac{1}{\cfrac{g_4}{s}+\cfrac{1}{\cfrac{g_5}{s}+}}}}$$



Example of chemical structure diagrams

# SYSTEM VIPS 2000 (VIRTUAL IMAGE PROCESSING SYSTEM)

by

D. Borrey
Correlative Systems International

## INTRODUCTION

CORRELATIVE SYSTEMS is a Belgian computer systems company having its European headquarters in Brussels.

Subsidiaries of CSI are currently established in the U.K., France, Netherlands and Luxembourg.

CORRELATIVE SYSTEMS is following an aggressive policy in its three main departments:

* Software services
* Computer and electronics
* Image processing.

CSI has been in the field of image processing since 1977 when a first prototype was developed for the EEC.

In 1978 a first integrated data and image processing system was produced for the CCB bank in Brussels.

Today several operational systems are installed in Belgium and France in banking and administration.

## THE PAPER PUSHING CRISIS

* Paper was the foundation of administrative systems prior to the existence of data processing equipment and it has remained the primary medium for recording, communication and storing information.

Despite advances in computer and communications technologies, electronic media has had little impact on the use of paper. In fact, there are indications that data processing systems have contributed substantially to the paper problem which exists today.

* Lower costs of technology have led to considerable discussion concerning "Office Automation", the primary thrust of which is the reduction (if not the elimination) of paper from the office environment.

* Applications of electronic document processing are in progress with two important clients, one in the banking area and the other one in public administration. Both the capture of document images at the entry point in the organization (the mail room) and using the document in its electronic form for all further use in the bank (data entry, document sorting, correction, retrieval, archiving). In both instances as well as in the ARTEMIS project, the purpose is not to eliminate the paper document itself, but rather to eliminate its physical movement in or out of the organization.

## IN YOUR INFORMATION PROCESSING BUDGET IT IS THE PAPERWORK THAT IS THE MOST EXPENSIVE

It is obvious that paper or its microreduction on film is and will remain for a certain number of years, the prime media for inter-business communication. The volume of paperwork in business today not only has major effects on communication, your marketplace, customer demands and overhead, but paperwork also has a significant cost impact on your information processing budget.

In the last decade the computer industry has made significant strides in addressing the paperwork and paper flow problems through on-line data acquisition, point-of-sale systems, decentralized data entry, optical character readers, etc., all of which flow into various information systems. Today's techniques for permanent storage of documents are generally limited to expensive photographic film (microfilm or microfiche) devices.

Still, the volume of paper is phenomenal and increases constantly despite today's data processing systems and photographic film techniques.

## THE VIRTUAL DOCUMENT: A NEW WAY NOT TO HANDLE DOCUMENTS

Regardless of the sophistication of today's state-of-the-art data processing systems and photographic devices, one must almost always retrieve the paperwork for one reason or another. Human error in coding source documents for data entry is one reason for retrieving the paperwork. Another common, but more

difficult situation, occurs when archived information stored on microfilm or microfiche must be retrieved.

Most data processing systems handle, store, and process information extracted from source documents (invoices, purchase orders, cheques, vouchers, credit files, etc.) via a data entry system. The source documents are then filed and perhaps archived on microfilm or microfiche at some later date. At this point the source document and the computer data record become physically separated creating a missing link between the two. The task of recreating the link between document and data record then becomes the single most expensive item of information processing.

## VIPS.2000 - THE VIRTUAL DOCUMENT

The VIPS.2000 system (videofiche image processing system) using Videofiche technology is the first computer system which integrates both document image and data processing.

VIPS.2000 allows data entry, and image storage/retrieval directly on the computer using digital media.

The system features the digitizing of the document images, automatic character recognition, simultaneous retrieval/display of document images and related data records, data entry of complementary information, and all data processing features of standard computer systems.

VIPS.2000 allows automatic retrieval on the computer terminal of source document images and direct comparison with related data records; it also allows retrieval of all types of document images on the same terminal and provides for hardcopy printing.

VIPS.2000 is the first integrated image and data processing system.

## VIRTUAL IMAGE PROCESSING SYSTEM INTEGRATES BOTH DOCUMENT IMAGE AND DATA PROCESSING

The VIPS.2000 system features the on-line processing of the virtual representation of a document image by a computer system.

The virtual document is a new concept which integrates document images and their related data.

Unlike classic data processing systems, VIPS.2000 handles the document as a whole and does not require the encoding of the alphanumeric data of the document.

The concept of the virtual document also allows the recording of information such as signatures or handwritten data which cannot be processed by traditional computer systems.

The virtual record is a virtual document stored in compressed form on a computer medium.

## VIPS.2000 PROVIDES ACCESS TO INFORMATION WITHOUT ENCODING OF DATA

The virtual image processing system is an integrated system to record, identify, store and display virtual images of documents together with their related data records using standard data processing equipment and peripherals.

It allows to integrate the source document and support information in traditional data processing applications such as database, data entry, validation, control and distribution of information.

VIPS.2000 can record any type of document (letters, financial and accounting documents, drawings and schematics) and provides direct on-line access to their virtual image and their related data record on the same terminal.

## IMAGE PROCESSING TECHNOLOGY

The principle of image processing is fairly simple in concept.

A document can be represented by a certain number of white and black points. Using a digital scanner and a fast transport, the system will create a digital matrix representing the image of a document. This matrix for most A4 type applications is 1024 points by 1536 lines. The resolution factor when the document is restored on a terminal is a direct function of the point density. To accommodate several document sizes, resolution requirements and volumes, the system has a full range of cameras and transports.

Once the document is digitized and held in a peripheral buffer memory, it is identified for further reference in the computer system either by encoding of a reference key or by direct character recognition logic. The central processor, a very fast minicomputer with high speed direct memory access, processes the image as a matrix of points, compressing the images by elimination of redundant blank points; identifies, classifies and stores the document on disc as a standard computer record. The system will create two files on the disc: a data file which contains all the reference keys of the recorded images in a direct access, isam or database structure. A second file, linked to the first one by a pointer, contains a compressed version of the images recorded in the form of a matrix of points.

Once recorded and identified, the images can be accessed and displayed on a graphic computer terminal.

It is important to mention that the prime database record does not have to be resident on the system but can be stored on a mainframe computer connected to the dedicated minicomputer via standard line protocols or high speed channels.

For storage of large document files, the system uses high density videotape or mass storage devices.

Documents are organized on the tapes in a file structure that can be accessed sequentially but by direct positioning.

High density tapes can store from 30,000 to 300,000 documents per reel depending on size and resolution.

VIPS.2000 SYSTEM

It is not reasonable today to consider applications which will eliminate paper documents completely from the organization but rather specific, economically justifiable applications such as: document processing in banking, credit cards and airline applications or document storage and retrieval in administration or technical applications or where there is an economic justification for faster access to the document.

SYSTEM COMPONENTS:

* The Scanners

CSI developed a complete range of scanners depending on speed and resolution requirements.

In the upper range CSI produces high speed document transports which can scan complete document images at the rate of two to five documents per second. In these cases, OCR and pattern recognition techniques are used for document identification.

For office type application, CSI proposes sheet per sheet transport; documents are individually identified via the keyboard and associated with the database.

* Processors

Are normally dedicated minicomputers connected to their peripherals via high speed DMA lines.

Databases will normally be resident on the host computer.

* Terminals

Can be local or remote, when local, images will be available instantaneously on the full graphic screen.

* Printers

Image printers are not yet fully available on the market, but satisfactory solutions can be achieved with electrostatic and electrographic printers, laser printers being of course the best solution.

* Storage

Present systems use magnetic disc storage for on-line, direct access storage of documents.

High density video tapes are used for sequential and mass storage.

More economical solutions should be available within 2-3 years with optical disc or laser films.

FROM TODAY TO ARTEMIS

Most system components are available today in the VIPS system to start an experiment.

For this workshop we have prepared a demonstration of all the features defined in the call for tender of the Commission:

* Image scanning
* Image storage
* Database access
* Euronet communication
* Image communication
* Image printout

The system is used as a peripheral to a host computer located in Brussels.

We will demonstrate all these features in detail plus a certain number of other features of the VIPS system.

# A PROPOSAL FOR THE ARTEMIS PROJECT BY CENTRE D'INFORMATIQUE GENERALE LIEGE (CIGL) AND CORRELATIVE SYSTEMS INTERNATIONAL (CSI)

by

J. F. Mahieu
Centre d'Informatique Générale Liège

## CIGL

CIGL is a subsidiary of the Centre d'Informatique Générale and is specialized in the field of databanks. It has been a host on EURONET for some months, and is at present operating EPIC, a databank in the field of chemical thermodynamics; a second database in the field of finance and economics, called SGB DOC, will be offered in a few weeks. Negotiations are proceeding towards the operation of several other databanks. The CIG group is a major element in informatics in Belgium, and also has subsidiaries throughout Europe and in South America.

## THE CIGL/CSI PROPOSAL

The proposal covers all the ARTEMIS chain of functions; all components are included, from system development and the provision of original documents from the SGB DOC database. However, it is not excluded that other documents could be incorporated into a pilot experiment. The proposal emphasizes digitalization by facsimile methods, rather than coded characters, although the latter could also be accepted.

The system proposed is outlined in figure 1 attached.

## METHOD OF OPERATION

### Storage of Documents

Documents are digitalized by optical scanner at a rate of 2,000 A4 pages per hour; they are indexed, data-compressed, and

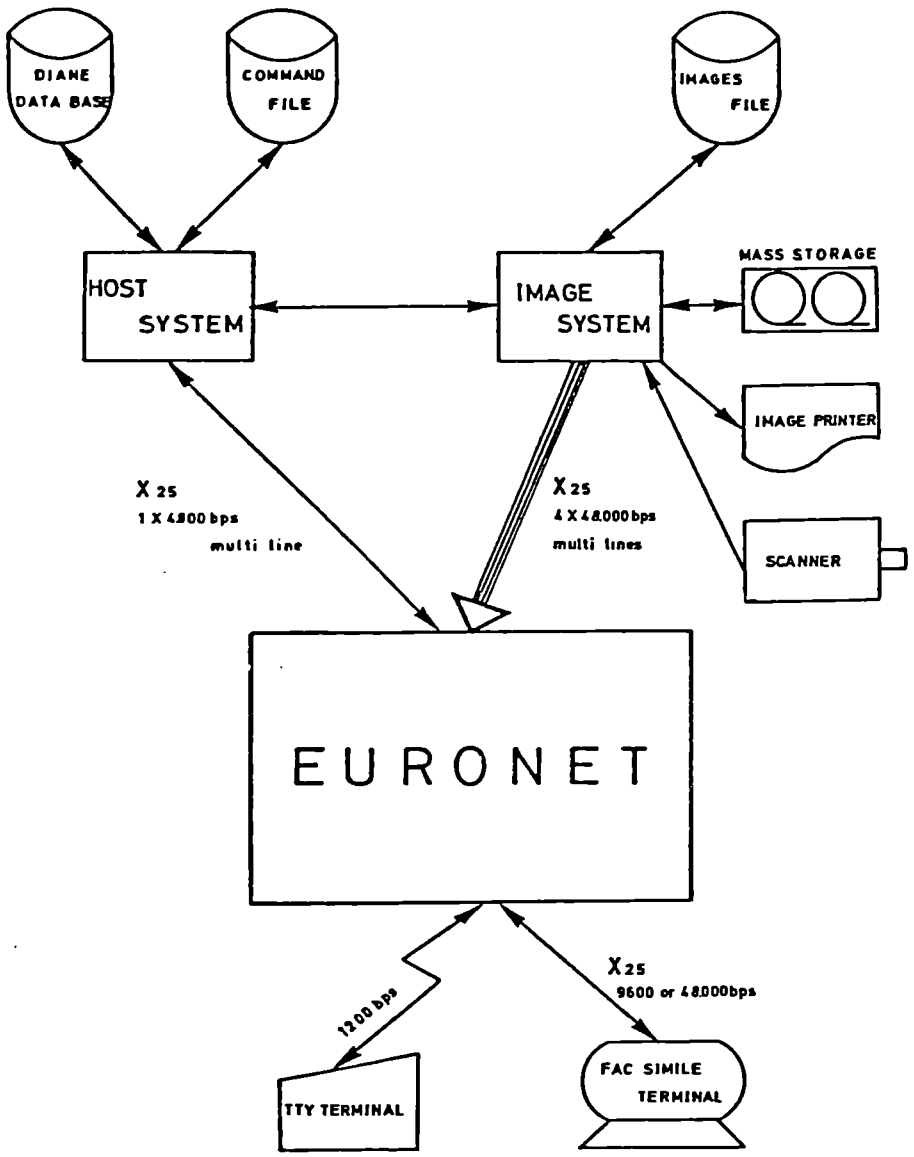

DIANE
DATA BASE
COMMAND
FILE
IMAGES
FILE
HOST
SYSTEM
IMAGE
SYSTEM
MASS STORAGE
IMAGE PRINTER
SCANNER
X 25
1 X 4.800 bps
multi line
X 25
4 X 48.000 bps
multi lines
EURONET
1200 bps
X 25
9600 or 48.000bps
TTY TERMINAL
FAC SIMILE
TERMINAL

Fig. 1

stored in mass memory. The present storage method is a tape system especially developed by CSI, but will be replaced in the future by digital optical disc.

Document Ordering

Documents are ordered by the user in real time following a normal DIANE search on the host; he specifies the references required, and indicates the method of transmission he wishes (post or electronic), and the delivery delay he can accept. The host confirms the availability of the documents and the delivery delays. The host will also operate order management and accounting routines.

Monitoring of the Image System

The image system is considered as a peripheral to the host, which gives orders to select documents from the mass storage. These are then sent to temporary storage (disc) and then transmitted by the image system either via the network or by post. Finally, the host instructs the image system to destroy the records temporarily stored. Document transmission will normally be by night but there is also an immediate delivery possibility.

Transmission of Documents

Documents are transmitted to the network by the image system, which is directly connected to the network by four 4.8Kb/sec. circuits. This will enable the transmission of 10,000 pages in 10 hours, in conformity with the Request for Proposals (pilot experiment).

Document Reception

It is suggested that users will be connected to the network by leased line and receive the facsimile images using a Group III facsimile receiver at 9.6Kb/sec. or 4.8Kb/sec.; if necessary, slow terminals at 1,200b/sec. could also be used.

SYSTEM COSTS

In conformity with the Call for Proposals (pilot experiment) we have evaluated the costs of providing an ARTEMIS system which will store a million pages in facsimile form and be capable of transmitting 10,000 pages per day. Costs are made up as follows:

-- hardware costs, including host adaptation and acquisition of an image system - 2,500,000 BF
-- software development costs including host software and image-systems software required for compression

and monitoring of high speed transmission - 8,400,000 BF
-- start up costs, excluding copyright charges and document preparation - 3,480,000 BF
-- operational costs (excluding online ordering but including order management, maintenance, personnel and connection) - 11,910,000 BF per year

Thus, a total investment is needed of 32,430,000 BF, and running costs of 11,910,000 BF per year for the delivery of 2 million pages per year, i.e., a unit cost of 6 BF per page.

THE DEMONSTRATION

The demonstration covers all elements required in an operational document delivery service:

-- document digitalization, by the VIPS 2000 system installed here in Luxembourg
-- data compression of digitalized image
-- storage on disc by CIG Brussels using teletransmission
-- document ordering: the required pages of Nature, Science and the ARTEMIS report have been loaded at CIG Brussels and can be called for on request from the terminal in Luxembourg
-- transmission of the document via EURONET
-- reception of the document by facsimile terminal.

While the demonstration fulfills all the functions in the ARTEMIS chain, it differs from the system presented (for a pilot project) in the following particulars: *

-- The digitized images are stored on disc at the host, rather than on mass storage on the image system.
-- Transmission speed of data from the host is at 1200b/sec. to a 4.8Kb/sec. X 25 connection to EURONET.
-- Most importantly, text can only be received on the facsimile receiver at a speed of 1200b/sec., which is the maximum speed at present available for switched connections to EURONET.
-- Further, the terminal you will see demonstrated can undertake more functions than those suggested in the presentation: it combines both TTY and facsimile features, and we have also added an electrostatic printer for paper copies, the scanner already mentioned and a floppy disc allowing the local storage of page images received on line.

Additional development will have to be carried out for the system to conform to standards yet to be defined, and to increase the capacity of the system in line with the objectives set by the Commission. Nevertheless, the demonstration shows that a system of the ARTEMIS type can function satisfactorily and can progressively be developed to adapt to the needs of the market and the Commission's objectives. It is our belief

* The demonstration system is shown in fig. 2 attached.

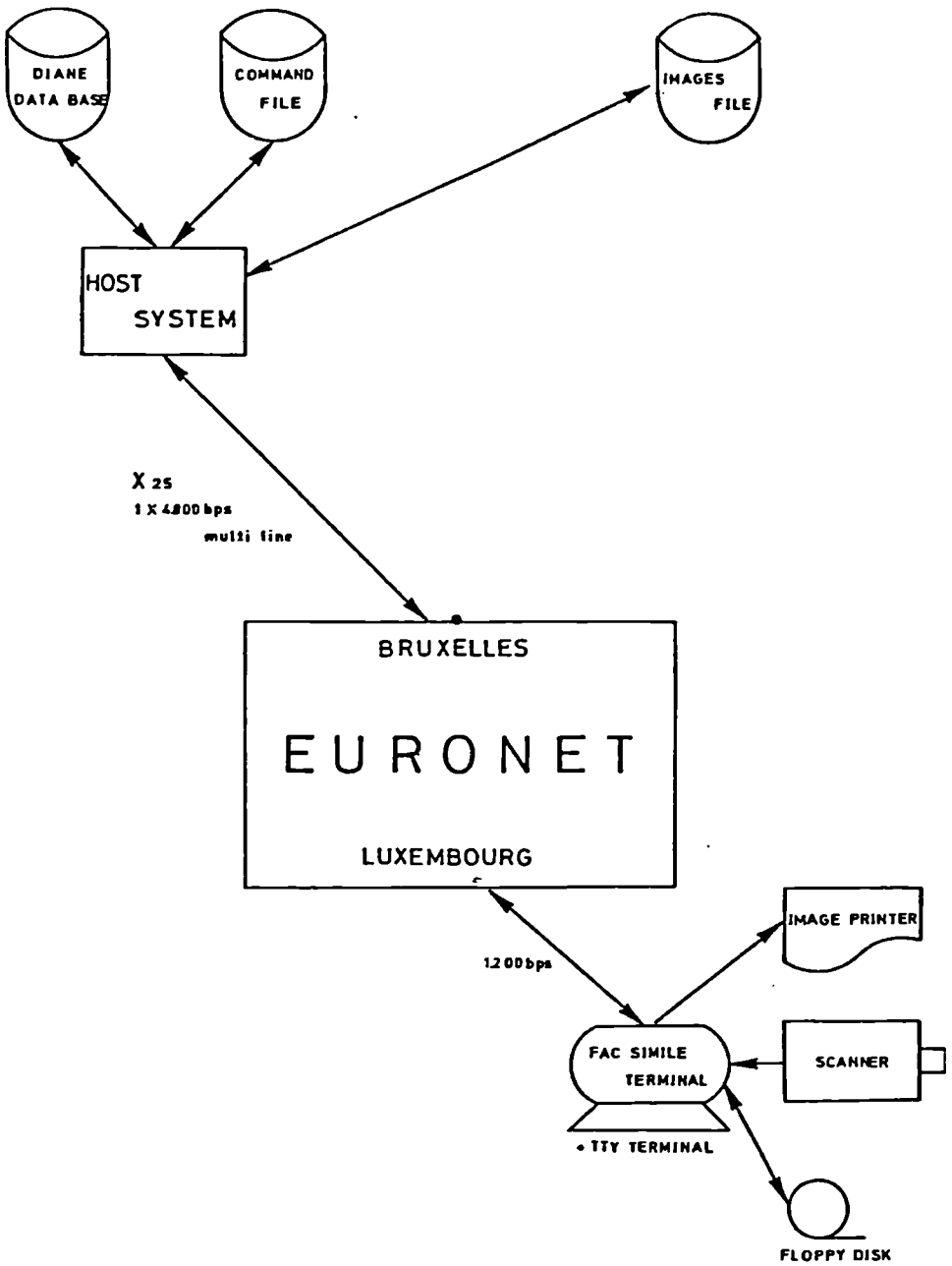

DIANE
DATA BASE
COMMAND
FILE
IMAGES
FILE
HOST
SYSTEM
X 25
1 X 4800 bps
multi line
BRUXELLES
EURONET
LUXEMBOURG
1200 bps
IMAGE PRINTER
FAC SIMILE
TERMINAL
SCANNER
+ TTY TERMINAL
FLOPPY DISK

Fig. 2

that from a technical point of view, a pilot project can now be launched: we are ready to collaborate with the Commission in order to undertake such an experiment.
Photocopies of the actual output from the terminal are reproduced on pages 54 and 55.

Note: Commission officials convinced themselves that the demonstration fulfilled all the conditions set out in the Call for Proposals.

DISCUSSION

*Question: M. Cremer, Chairman of CIDST*

The cost of BF 6 per page did not appear to include any copyright fee, nor transmission costs nor any allowance for costs incurred by the user in receiving the page image.

*Reply: J.F. Mahieu, CIGL*

That is correct. Royalties and network costs, have not been included (although the cost of circuits to access the network are included); nor have we made any assumption about user costs. Nevertheless we feel that the costs indicated are within the limits set by the Commission: we agree network costs are high and perhaps the Commission should seek alternative, cheaper methods of transmission.

*Question: A. Horder, Data Dynamics Services Ltd.*

Are the documents scanned by a CCD scanner or a laser scanner?

*Reply: D. Borrey, Correlative Systems International*

It is a 1725 CCD scanner.

*Question: G. Zwaenepoel, DPWB/SPPS*

In your system the document-scanner makes, during the digitalization phase, discrimination between only two gray levels (white and black). By the way, most facsimile equipments use the same method. Would it be possible to upgrade your system so that it would be capable to digitize photographs, which generally contain more than two gray (half) tones, while delivering an output signal compatible with the facsimile Group III (and future Group IV) CCITT standard?

*Reply: D. Borrey, Correlative Systems International*

The problem of gray level is essentially one of cost; if you go to a system which requires 4 or 5 bits per point, you will require 4 or 5 million bits to describe a document. This will be expensive in buffer storage, in archival storage and above all in transmission costs. We can easily modify the equipment so that it outputs 4 or 8 or even 15-bit gray levels: the problem is essentially one of cost-performance. We can give you the equipment if you are prepared to pay the price.

Written clarification *(G. Zwaenepoel, DPTB/SPPS)*
It is technically feasible to print "pseudo gray tones" with a normal Group III - facsimile receiver (which can print only dark points with a constant diameter).*

This requires of course that the scanning process in the Fax-transmitter, which normally delivers an analog signal, is followed by a suitable form of analog/digital conversion which outputs a signal compatible with the "MHC" (and ev. also the "MRC") data-compression code defined in the Fax-Group III standard.

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* Ref: - Steve Temple, "Coding with gray data: a new algorithm for digital facsimile", Communications International, December 1980, P 61-62
- Philips Data Sheet No. TDS 3306-11-80.E, "P-Fax 2003 Series Facsimile Transceivers"

## 2.3 Requirements and Behaviour of Users of Scientific and Technical Information

### 2.3.1 Delivery Delay

The user's willingness to pay for quicker delivery or sacrifice higher quality for speed of delivery is shown conceptually in Figures 2.3.1.A and 2.3.1.B. In theory, both curves are concave to the origin, monotonic but stepped rather than smooth (e.g. the curve levels off from, say, 18.00 on one day till 08.00 the next).

These curves describe particular users on particular occasions. For a large number of users on different occasions, similar curves can be drawn to indicate the tolerable delay for a given proportion of the times for a given proportion of users (e.g. half the users, 90 per cent of the time). Users may prefer a predictable, but slower, delivery service to one that is usually faster, but cannot be relied upon. They also have quite different requirements for the documents and these can be classified as follows:

- Specific information;
- News;
- General information to maintain professional awareness.

Besides knowing the theoretical shape of these curves, there are also some practical measures related to documents in the two more urgent of these three requirement classes:

- Delivery quicker than reading speed (one page in one minute) is rarely useful to the reader himself, so the curve levels out below one minute*;
- Some works of reference lose almost all their value when the next edition is published, at which time the curve drops sharply;
- Where numerous documents are requested at the same time, overnight delivery is acceptable.

ARTEMIS may be able to offer three speeds of response:

| | |
|---|---|
| FAST | Within minutes to the designated printer. |
| OVERNIGHT | Overnight to user's mailbox or printer. |
| WHEN FOUND | Search time for source document to be found and digitalised, then either FAST or OVERNIGHT delivery. |

*Quicker delivery may be valuable for reasons other than the reader's ability to assimilate the content, such as: lower telecommunications charges or large volumes to be delivered in limited time.

tetramethylbenzidine containing hydrogen peroxide (*10*). Mounted sections were examined by light- and dark-field microscopy and most were lightly counterstained with cresyl violet.

After qualitative examination, counterstained sections were used for quantitative study. Outline drawings of LGN neurons containing HRP reaction product were made at a magnification of 1000 with the aid of a microscope drawing tube. In the same way, cells within the same high-power field which were stained for Nissl substance, but which did not contain reaction granules, were also outlined. Usually 10 to 15 acceptable neurons were present in each field; cells were only selected if they had clear plasma and nuclear membranes and a distinct nucleolus. Drawings were made on paper fixed to a digital graphics tablet (Tektronix 4953), and a Nova 2 computer was used on line to calculate the cross-sectional area of each cell, perform statistical analysis, and provide histograms of cell size.

In the normal adult cat (N1), we injected HRP into the left area 17 and the right area 18. On both sides, LGN neurons containing reaction granules were visible in laminae A, A1, and the C complex, but on the right side, ipsilateral to the injection in area 18, labeled cells were also present in the medial interlaminar nucleus and, to a lesser extent, in the posterior nucleus, pulvinar, and nucleus lateralis posterior, in accordance with earlier reports (*2*, *11*, *12*). Figure 1, A and B, shows histograms of the areas of 138 cells from the left LGN (combining laminae A and A1), and 144 cells from the right. The cells containing HRP product are plotted as solid bars within the histograms of the whole population. It is clear that the marked neurons on the right are larger than those on the left (by 28 percent); although there is considerable overlap, more large cells are filled retrogradely after an injection in area 18 than after one in area 17. This observation supports the concept that the postulated Y cells have been labeled selectively by injection of HRP in area 18, and confirms the independent results of Gilbert and Kelly (*11*). The histograms show that the distribution of the total cell populations on the two sides varies somewhat. This is not entirely surprising because the samples are not from precisely the same antero-posterior level in the LGN. However, the mean total cell size on the two sides is similar, while the differences in both mean and distribution of the labeled cells between sides are large.

In the four monocularly deprived cats (MD1 to MD4) HRP was injected into area 17 on one side and into area 18 on the other with the intention of marking, principally, the X cells and the Y cells, respectively, of the LGN. We measured cell areas as before, but collected the data for lamina A1 and the binocular part of lamina A separately. The effect of monocular deprivation in these experiments was to produce differences in mean cell area ranging from 23 to 47 percent between laminae A and A1 on the same side and between corresponding laminae on opposite sides (Table 1). In three kittens (MD1, MD3, MD4) good labeling of cells was obtained after injection into area 17; in the fourth kitten (MD2) the reaction in the LGN related to the area 17 injection was too weak for sufficient cells to be measured. In two of the kittens (MD1, MD2) the area 17 injection was on the left, contralateral to

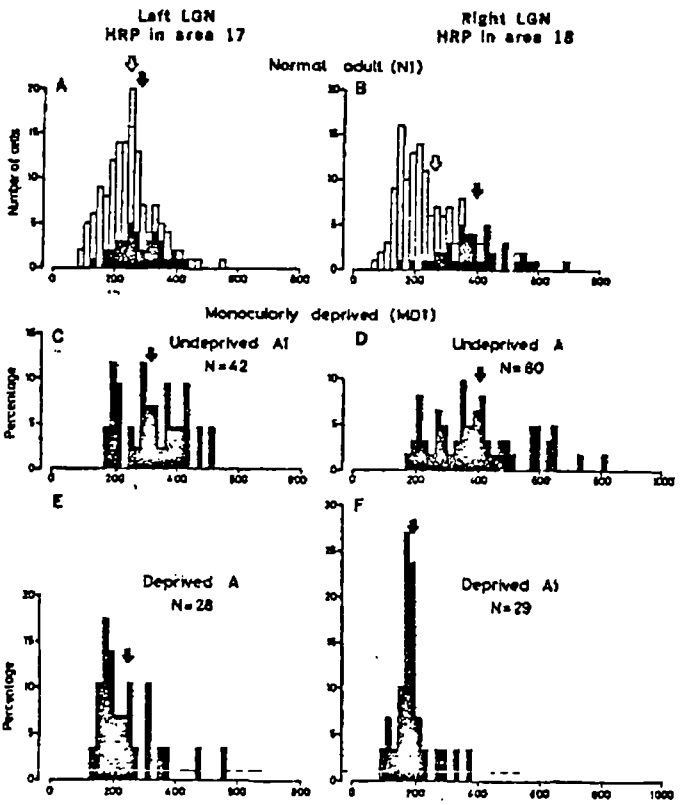



Fig. 1. Histograms illustrating distributions of cell areas in the LGN. (A and B) Normal adult cat (N1). HRP was injected into the left area 17 (A) and the right area 18 (B). Measurements from laminae A and A1 are combined. The outline histograms illustrate the distributions of all cells measured; the solid blocks within these histograms show neurons that contain HRP reaction product and that are presumed to be mainly X cells on the left and Y cells on the right. Open arrows indicate the mean values for total populations (essentially the same on the two sides), and solid arrows the means for HRP-labeled cells. The slight difference in overall distribution on the two sides is probably due to sampling variations. (C to F) Kitten MD1, subjected to right monocular deprivation. Solid histograms show the data for HRP-labeled cells alone, again presumed X cells on the left (C and E) and Y cells on the right (D and F). Results are given separately for the undeprived pair of laminae (left A1 and right A) and the deprived pair (left A and right A1). Since the overall distribution and mean cell size were similar in the two laminae of each pair, data for unlabeled cells are omitted for clarity. Ordinates are expressed as percentages, and the number in each sample is indicated.

# DISPLAY 2000 WORD PROCESSOR

by

Donald Hofford
Data Dynamics Services Limited

## DISPLAY 2000

The Display 2000 is a straightforward but very sophisticated Word Processor.

It is quick, simple and extremely cost-effective. The quality of print is first-class. A great number of these machines have been installed world-wide.

The DISPLAY 2000 is a Word Processor, but it has many optional extras. One of these options is the communications option.

## COMMUNICATIONS OPTION

The Communications Option allows a Display 2000 to exchange information with another Display 2000, a computer system, a terminal, or any device with RS232 asynchronous protocol. These systems may be located either within the building where the Display 2000 is, or in distant places connected by telephone.

When the COMMUNICATIONS OPTION is used to exchange documents between Display 2000 equipped offices, the capability is often termed 'electronic mail' because completed documents can be sent from one office to another in minutes rather than days. Document delivery time can be reduced as dramatically as the time from first draft to final revision.

Documents which might be transmitted from a business, professional, or government office are letters, mailing lists, reports, memoranda, legal papers, news bulletins, variable information for form-filling, and other types of documents associated with offices where typing and secretarial services are required.

When the communications option is used to exchange documents between a Display 2000 and a computer, the Display 2000 serves a dual role and eliminates the need for a teletype-like terminal. Files created and edited as documents on a Display 2000 can be transmitted to a host computer; also, files from a host computer can be transmitted to the Display 2000, where they are stored as documents for subsequent printing or editing.

After the operator 'signs on' to a host computer, a 'conversational' or interactive exchange with the computer can take place on a character by character basis. The operator uses the keyboard to enter information for immediate transmission to the computer; the computer's messages and responses are displayed and printed on the Display 2000. Alternatively, the operator can initiate document transmission from (or reception to) the disc or page memory. This is referred to as 'block transmit' and 'block receive'. Any document drafted can be transmitted if the document is currently available on a disk or in page memory.

With the COMMUNICATIONS OPTION, a special communications PCB is installed inside the electronic module. This internally installed communications board utilizes the electronic module's circuitry. A modem or acoustic coupler (not supplied with the communications option) is connected to the back of the electronic module to provide an interface with the telephone line. For special applications, direct cables to a site within the same building may be used. When the communications disk is inserted in the electronic module, the Display 2000 can function as a terminal to a computer system or another device by emulating the communications capabilities of an RS232 interfaced terminal. The standard protocol used is asynchronous ASCII.

DISCUSSION

*Question: G. van Slype, Bureau Marcel van Dijk*

What is the cost of the Data Dynamics equipment with the telecommunications option?

*Reply: D. Hofford, Data Dynamics Services Ltd.*

The basic cost of the equipment is £ 5,500 plus an extra £ 1,500 for the telecommunications option, making £ 7,000 in all.

# TELETEX TERMINALS IN THE ARTEMIS ENVIRONMENT

by

F. Schaefer
Siemens AG

## ARTEMIS - A NEW SERVICE

This presentation describes a viable approach and suitable terminal equipment - for the remote ordering, retrieval and print-out of texts within the constraints of ARTEMIS. The service, being public, utilizes national and international communication links (conduits) between users, providers and host computers which subscribe to this service.

A user-service considerations will be:

- The availability of sufficient content(s)
- Service speed between user and host
- Quality of the output
- Total cost of the service comprising:
  - terminal equipment
  - communication link (conduit)
  - DATA (content)

It is assumed that valuable data on matters of economy, law, science, technologies and so forth will be stored in numerous host computers throughout the European Community. Such data - the content - is electronically transmittable and is therefore more readily and speedily available to all current and a much greater potential of prospective users.

Potential users however will insist that the service includes a recommendation for suitable terminal equipment, which is a reasonable request if the service is to "get off the ground". This means that any equipment included in the service concept of ARTEMIS, fulfills a certain degree of standardization.

Terminal equipment for the following two types of standardized services are, at this point in time, under consideration:

- facsimile and
- teletex.

Paramount is the suitability of the terminal equipment for operation in an office environment. Consequently, and to obtain the full benefit of the ARTEMIS service, ease of operation of the equipment by all office staff must be assured: SIEMENS AG, a well-established manufacturer of a wide range of text- and telecommunication equipment is pleased to present its proposal in serving the terminal requirements, particularly as it concerns teletex: CCITT recommendations define the international, worldwide TELETEX SERVICE. Yet MARKET FORCE determines the scope of local terminal functions which a manufacturer may provide.

We have for the past years researched text generation + consumption and the flow of text communication in various types of industries and departments and moreover, involved secretarial and other typing staff in obtaining a well-defined profile of a work station. Our research project is a continued effort, supervised independently and scientifically by two outstanding universities.

All findings to date have been embedded in our design concept and we recognize user acceptance at the work level to be a crucial key for the successful introduction of a text retrieval service. Users apply at least the following criteria:

- Function of modern office equipment
- Quiet printer for letter quality print-out
- Full set of alpha/numerics, symbols + diacritical signs
- Text correction and editing functions
- A sufficiently large, non-volatile storage
- Reliable, high-speed communication.

Also, operator interface with a new terminal should have as much identity with tried and proven typewriting equipment: The change-over to a new device should be as easy as possible.

For the operator: Limited new learning
Operator guidance
Enhancement of work environment
New steps must be easy to remember.

For management: Greater effectiveness of available personnel
No dependency on specialist personnel.

We address the office environment and today's technological state-of-the-art offers many new components. Our system architecture includes the functions of:

- A typewriter
- A memory typewriter
- A terminal for the teletex service
- A terminal suited to communicate with the well-known and proven worldwide telex service.

Further criteria are:

- Field upgradability of terminal equipment to include additional convenience and capabilities
- The ability to generate and print all characters, symbols and diacritical signs which constitute the teletex character repertoire.
  This is of particular importance for the print-out of requested content(s) resident in host computers outside national boundaries or stored in a foreign language understood by the user.

We understand the teletex service within the scope of ARTEMIS to be a memory-to-memory transmission of content.

It is also assumed that the user would have access to a directory service within ARTEMIS which would permit a local search for a particular content, irrespective of where the host containing such content may be located.

Legal questions might be one example where this could be of importance. Once the user decides to order a particular "content", the appropriate call- and order-information is entered into the memory of the user's terminal, together with any ordering instructions to the ARTEMIS service. The called host computer would service the order, checking for such elements as access authority, scope of permitted service, requested priority etc. Generally speaking, this type of operation is in application and execution somewhat similar to a remote job entry (RJE).

The recent change of the teletex transmission procedure to an HDLC-balanced mode will facilitate a conversational mode between user and host, but this capability must be examined in the light of both national and international telecommunication networks used for the ARTEMIS service.

Important to both, user and provider, is the method by which the terminal communicates with the outside world, and the convenience of local facilities to the operator.

A further consideration will be the interaction of such terminal equipment with other established services, such as facsimile and, at some time in the future, a combination of text and facsimile. We, as manufacturers, are putting our corporate resources to the task of providing suitable equipment for current and future requirements on time.

---

* Properties of the system are illustrated in the diagrams which follow.

DEMONSTRATION

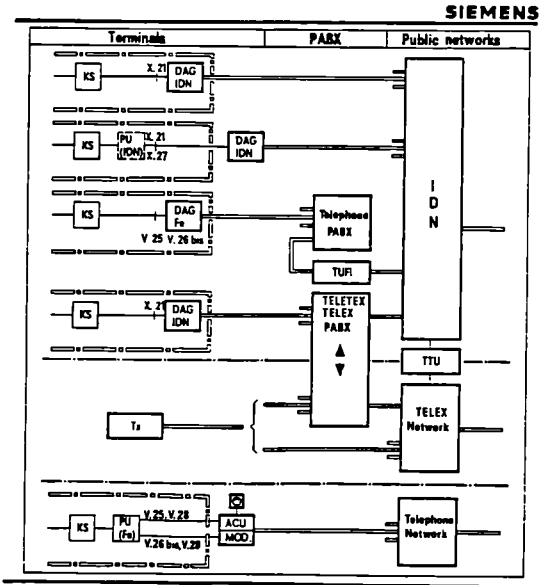
Two textstation T 4200 teletex machines were demonstrated, connected locally through a small PBX.

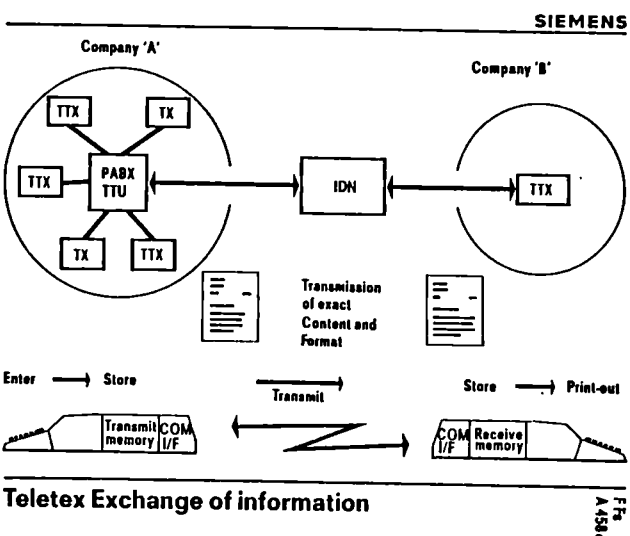
**SIEMENS**

| Number | Graphic characters |
|---|---|
| | **Letters** |
| 234 | aAáÁàÀâÂ . . . . œ Œ ø Ø . . . . . zZźŹżŻžŽ |
| | **Decimal digits** |
| 10 | 1 2 3 4 5 6 7 8 9 0 |
| | **Currency signs** |
| 5 | ¤ £ $ € ¥ |
| | **Punctuation marks** |
| 17 | ! ¡ " ' ( ) , _ – - . / : ; ?¿ ≪≫ |
| | **Arithmetic signs** |
| 13 | + – ± < = > ÷ x ² ³ ½ ¼ ¾ |
| | **Miscellaneous symbols** |
| 17 | # % & * @ [ ] / µ ° ª ª § ¶ · Ω _ |
| | **Diacritical marks without basic character** |
| 14 | ◌̀ ◌́ ◌̂ ◌̃ ◌̈ ◌̊ ◌̆ ◌̄ ◌̇ ◌̋ ◌̛ ◌̧ ◌̨ ◌̌ |
| 310 | |

**TELETEX-Service**
**Basic Graphic Character Repertoire**

KFs A 227e


SIEMENS
Terminals
PABX
Public networks
KS
X.21
DAG IDN
PU (IDN)
X.21 X.27
DAG Fe
V.25 V.26 bis
Telephone PABX
TUFI
I D N
TELETEX TELEX PABX
TTU
TELEX Network
Tx
PU (Fe)
V.25, V.28 V.26 bis, V.29
ACU MOD
Telephone Network
TELETEX
Network Structure
FFs B 2756


SIEMENS
Company 'A'
Company 'B'
TTX
TX
PABX TTU
IDN
Transmission of exact Content and Format
Enter
Store
Transmit
Store
Print-out
Transmit memory
COM I/F
COM I/F
Receive memory
Teletex Exchange of information
FFs A 458e

# MEGADOC: A DOCUMENT ARCHIVING SYSTEM BASED ON DIGITAL OPTICAL RECORDING

by

W. Hoekstra
Philips Data Systems

*Note*: This presentation was in two parts, the first dealing with digital optical recording and the second, a film showing how the existing laboratory megadoc system could be fitted into the office automation role. The following summarizes the main points in both presentations.

## DIGITAL OPTICAL RECORDING

The diode laser digital optical recording system, announced by Philips on the research level in 1979, uses a 12 inch disc formed from two glass substrates placed back-to-back in a sealed air-tight construction. The so-formed disc has a spiral groove that is regarded as the equivalent of 45,000 usable tracks. The disc is also divided into 198 sectors. Each track/sector combination is given an individual segment address. In this way segments can be found in random access mode. DOR is in principle an empty disc as are magnetic tapes and discs. DOR discs can be written by the user, however only once. In each segment the user may write 1,000 bits of information. Multiplying these numbers it is possible to store $5 \times 10^9$ bits per side; since the disc is double-sided we can store $10^{10}$ bits per disc.

If we store coded characters, each page will require about $4 \times 10^4$ bits. If however we store optically scanned data at the Group III facsimile standard of eight lines per millimeter, $4 \times 10^6$ picture elements will be produced per page, or $4 \times 10^6$ bits in black and white (see figure 1). Using data compression techniques we can reduce this by a factor of 10, so that on the average therefore we will require $4 \times 10^5$ bits to record a page. The factor of 10 difference between the storage requirements for coded characters and for facsimile is still a disadvantage, but may be less of a problem when we consider that in each digital optical disc we can store $10^{10}$ bits, i.e., 25,000 facsimile pages.

The disc is pregrooved, and the recording surface is totally protected: it is engraved and read through the glass substrate. The drive is now equipped with a diode laser, cheaper

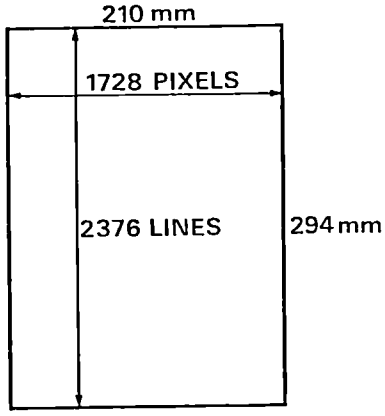
and more compact than the previous gas laser required up to a few years ago to engrave the disc. Engraving is carried out by so modulating the laser beam that a hole less than one micron in diameter is burnt in the sensitive layer; once engraved, the disc cannot be rewritten and so is suitable for archival purposes, retaining its properties for at least 10 years.

The recorder/playback system enables a record to be accessed with a mean random access time of 135 milliseconds; the very compact optical system weighing only 40 grams is mounted on an arm that is driven by a linear motor. The arm has an optical grating which brings the optics very quickly to within 50 tracks of that selected. Direct reading from the disc then enables rapid selection of the exact track.

The demonstration unit is set up to provide all the functions required in the fully automated office. Pages of documents are read into the system by a high resolution reader, held in a transfer memory, compressed, and recorded on a digital optical disc. Archival storage is provided by a juke-box unit with a total storage capacity of 64 Gigabytes with an access time of about 10 seconds. High resolution visual display units, wordprocessing terminals and hard copy printers are also included in the demonstration system. The separate parts of the system may be viewed as peripherals to a minicomputer which performs switching and control functions for them.

The transfer rate between peripherals is equivalent to about one A4 page per second. The demonstration system also includes an information retrieval capability, documents being indexed according to keywords and retrieved by a retrieval package in the document management software.

## A4-DOCUMENT




ALPHA NUMERICAL:

50 LINES x 80 CHARACTERS = 4 kBYTE

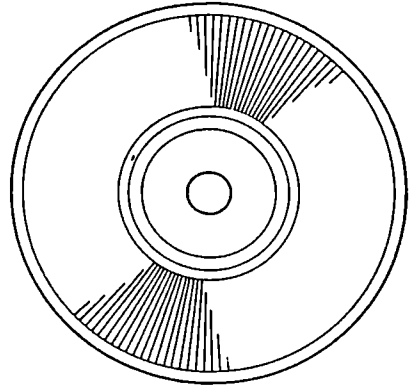
PICTORIAL:

2376 x 1728 PIXELS ≈ 500 kBYTE

MEGADOC-

Fig. 1

## 12" EXPERIMENTAL OPTICAL DISC (2-SIDED)



$0^{10}$ BITS/DISC

10.000 TRACKS/SIDE

128 SECTORS/TRACK

1 PICTORIAL A4 ≈ 32 TRACKS

| | |
|---|---|
| HIGH RES./WITHOUT COMPR. | 2.500 A4's/DISC |
| HIGH RES./WITH COMPR. | 25.000 A4's/DISC |
| STANDARD RES./WITH COMPR. | 50.000 A4's/DISC |
| ALPHA NUMERICAL | 500.000 A4's/DISC |

MEGADOC-

Fig. 2

# A PRESS INFORMATION SYSTEM GOING DIGITAL WITH HOMOGRAMS

by

(1) W. Schmitz-Esser
Gruner&Jahr

## INTRODUCTION

Since 1974 one of the most modern automated press information systems in the world has been operated by Gruner&Jahr publishers in Hamburg. Under rather extreme requirements as to capacity and response time, the microfilm part of this system has come up against certain barriers. This could be overcome by optical storage techniques.

To study this problem, a joint working group was set up in the early summer of this year, with Philips and Gruner&Jahr as partners. The findings are being presented here for the first time.

This presentation will deal with the requirements of the press information services department at Gruner&Jahr in relation to an optical disc system.

Gruner&Jahr publishers are one of the most important magazine producers in Germany with a wide spectrum of international activities.

Among their 12 publications, STERN magazine has a worldwide reputation. Taking all its activities together Gruner& Jahr represents a total of one million D-Marks in sales. Its magazines are well-known because of their high information quality. This is not without reason.

The stories prepared by our more than 600 reporters, correspondents and editors are backed-up by the work of about 70 documentalists. They regularly monitor no less than 160 national and international newspapers and magazines. They can provide reporters and editors with an almost complete record of

what has been written by them or other colleagues on any given topic, including text and photographs. So, at Gruner&Jahr, the librarian, or documentalist, as we call him, is a most important person.

The information department, however, not only services our own writers, but also those of the weekly national newspaper DIE ZEIT and those of ZEIT-Magazin. A duplicate of the databank system as run by Gruner&Jahr is in operation at Ringier & Co., Zurich, Switzerland's main magazine publishing house.

In the research department at our automated press library, requests are received from early morning till late at night. On average, 60 queries per day are received on all possible topics, and in the photo library we cope with about the same query volume. A modern query station consists of a CRT terminal with a keyboard, at which the documentalist places his query and receives the reference number of the searched document by the computer. Next to the terminal, there is an automated microfilm device, linked to the computer. Response times at the terminal amount to less than two seconds, a prerequisite for a successful interactive search. A Japanese computer of the NAS 7032 type is the heart of that system, and the search software is DSS (Daten-Sofortauskunfts-System) developed by IBBG, Munich. Together with an American back-up machine, down-time remains under two per cent. Response times at the microfilm screen are a little longer, all in all a little less than three seconds. We use American hardware of the Image Systems (ISI) type, in which the microfiches are stored in a carousel.

Another eight seconds are needed, however, if the documentalist wishes to produce a hard copy of the text shown at the screen. Since each search results in a "dossier" averaging 40 copies, 320 seconds are required for the completion of a standard search, i.e., more than five minutes are needed.

However, none of our documentalists will actually achieve a 40-copy-production in that time. Optical quality of the primary document varies greatly according to the state of the printed paper copy received in the morning by mail. This is why a copy from the film sometimes appears grey and washed: sometimes the copy is too pale, and the frame may not fit and must then be corrected manually. One rarely gets a good copy at the first attempt.

The copy is for one-way use only. It is not suitable for permanent storage, since it is on coated paper. Therefore, our requirements for an optical disc system (DOR) are:

- reproduction of all documents of even, good quality,
- immediate quality control at the screen of input of the scanned newspaper and magazine articles,
- possibility of electronic enhancement,
- electronic buffer storage of complete "dossiers" of homograms,
- quick "browsing" using a high-resolution screen at a speed of one to two seconds per page,

- a reproduction time of about eight seconds for paper copies would be acceptable, since the presence of the documentalist is not needed with the digital facsimile procedure (batch mode).

Despite the remarkably high quality of the microfilm hardware used, a certain amount of maintenance cannot be avoided. For all our 16 machines now in operation, a dedicated specialist is needed. This is why DOR should guarantee:

- very low degree of fallibility,
- installation in normal office environment,
- 98 per cent failure safety for the complete system, and no single down-time longer than 20 minutes,
- gradual degradation.

The advanced automated document retrieval in this press databank suffers one major disadvantage: A given document can only be accessed at the machine in which the respective fiche is stored. The databank now contains about 1.2 million pages, each as a single microfiche image. Therefore, during a search very often more than one machine must be searched, forcing the documentalist to "jump" from one machine to the other.

DOR should therefore enable:

- Access to the total collection from any given terminal, i.e.,
  - on 2 million texts from 10 terminals in 1985
  - on 3 million texts from 20 terminals in 1990.

An illustration of the present problems is examplified by the case of an editor of CAPITAC in Cologne. He requires copies from our information retrieval system. The following happens: The documentalist produces a hard copy for which, as I pointed out, he needs eight seconds per page. In a mirror mounted on the top of the microfilm machine he monitors the quality of the copy from his seat. He then proceeds with the set of copies to the facsimile machine, finds the telephone number and dials his partner in Cologne. He then passes the pages through the machine. Although he uses a facsimile machine of the CCITT group 3 class, we rarely can use the half-minute mode. For safe transmission of our newspaper and magazine articles in this advanced system, we normally require two minutes, under the detail mode. Although there are stack feeders, it is highly recommended that the operator stays by the machine monitoring the transmission of the whole batch to make sure that the texts arrive safely. All in all, three minutes per page is required; as we have already noted, the dossier will consist of about 40 pages. This is why less urgent material is shipped by surface mail. Urgent dossiers needed by DIE ZEIT at their Hamburg editorial office will sometimes be sent by taxi. For four out of every 10 searches in our press databank, the editor must receive the documents within less than half an hour of calling.

Thus, the following requirements of DOR may be derived:

- Production of a digital facsimile dossier and keeping it in a buffer store, to avoid the need for the presence of an operator or possibly even a well paid documentalist, during reproduction and transmission, and this should be line-compatible with CCITT group 3 standard,
- resolution of 8 x 8 lines/mm, according to this standard.

To deliver the dossiers to our own Gruner&Jahr main office building in Hamburg, a tube system or a mail forwarding system is generally used. Since there are not necessarily terminals at all possible delivery points, there is often need for an errand boy. With DOR at one's disposal, inhouse-delivery to end users with digital facsimile documents should be possible from the buffer store via broad-band circuits.

If all goes well, our documentalists could start working with the optical disc system in 1985. By that time the press databank will hold almost 2 million articles corresponding to about 3 million pages of A4-format.

Special attention must be paid therefore to the problem of how 3 million pages can be transmitted to the optical discs. Could we do this conversion from film?

The articles are present in two different reduction rates, partly 24X, partly 42X. In such a procedure there would be need of not only to transmit the homograms (frames) but also the pertinent reference numbers into both - the new facsimile as well as into the electronic housekeeping system.

We know there are digital conversion techniques for microfiches. What we do not know is whether the quality which can be obtained will meet the readability requirements.

There is another possibility; the conversion from paper, since all filmed documents are also being kept on paper. No decision has been taken so far on which method to adopt.

- In the case of a conversion from film there would be an additional requirement to the DOR system, that is an adequate procedure for readability control at the input immediately after the scanning of every single microfiche frame.

Therefore, these are the main requirements for the development of such a system as seen through the eyes of our press information bank.

(2) J.W. Klimbie
Philips Data Systems

In the past few months Philips and Gruner und Jahr have made a feasibility study in order to find a solution to the problems presented by Dr. Schmitz-Esser. My presentation will deal with the kind of solution we have worked out.

## DATA CAPTURE

Every newspaper cutting is scanned, line by line, at 200 lines per inch in both directions. According to the CCITT standards this yields 4 Mbits per A4 page. The scanning is done on black/white discrimination: grey tones and colours are neglected.

After scanning, a compression algorithm is applied on the 4 Mbit stream, giving a homogram of approximately 800 Kbits. Because the application requires fast response times, compression and decompression must be done in less than one second; this means that a special hardware solution must be found. To avoid heavy data flows in the internal channels of the configuration, we will apply compression/decompression outside the system itself. In this way, approximately 250,000 pages can be stored on one digital optical disc.

## STORAGE

The Gruner und Jahr archive will comprise by 1985, about two million pages, so about 100 optical discs are required to store all this data. We think we need two years to convert the current microfiche file into optical disc. The normal growth rate after this conversion is equal to the daily increment of newspaper cuttings.

As the journalists need a fast and reliable answer (the press cannot wait!), the system must be able to display, or to print every archived homogram within a few seconds. This means that the 100 discs must be stored in a juke-box designed to facilitate random access. Although the capture and mounting of a disc will take a finite time, the actual access time to a homogram is less than 500 milliseconds.

RETRIEVAL

The retrieval software on a large mainframe computer tells the archive system which homogram must be displayed on one of the 10 image display terminals. The selected item is sent to the image display, where the homogram is decompressed to its original length of 4 Mbits and is displayed on the screen.

A user-workstation consists of a keyboard plus display for the retrieval of individual items, together with a high resolution display of the image. The image display screen is a rather expensive piece of hardware. In addition to the necessary electronics (e.g., the decompression hardware) it contains a 4 Mbit memory, from which the picture is refreshed 50 - 60 times per second and sent to a very precise 2400 line deflection unit.

After the user has inspected the item, he may wish to make a hardcopy of this homogram. The printing can be done off-line via a central printer. We are also thinking of installing one small facsimile printer for every four image displays in order to provide immcdiate copies as necessary.

The total configuration will consist of an input module, several storage modules and the image displays and printers connected by a so-called datapipe. This datapipe allows for high bandwidth transport from module to module. This technology is rather new, especially in the 2 - 4 Mbits per second range, see for example the Ethernet proposal from Xerox, DEC and Intel. In the Gruner und Jahr application the input and storage modules will be located in the basement and the displays and printers will be located throughout the documentation department.

The quantities to be processed in 1985 are:

-- input 1,000 pages per day
-- storage 2 million pages
-- output 100 retrieval sessions
-- on average 40 pages are displayed
-- on average 25 pages are printed.

It must be understood that the technology including scanning operating at one page per second, the image displays and the datapipes, the digital optical discs in juke-boxes, and real-time data compression are entirely new. Today we are at the beginning of a learning curve, where prices are high and standards still remain to be set.

DISCUSSION

*Question: G. van Slype, Bureau Marcel van Dijk*

Although it is fully understood that the system is not yet on the market could Philips give us any idea of the cost of the individual components?

*Reply: W. Hoekstra, Philips Data Systems*

It is not easy to give a precise answer because the equipment is still in the development stage. While as of now, a user might have to pay between $ 250 and $ 300 for a disc to store 25,000 pages, we expect this price to fall below $ 100 in the second half of the 1980's. If you want to compare the price with other media such as microfiche, you should take into account the other factors entering into the cost-performance equation.

*Question: C. van de Weteringh, European Association of Information Services (EUSIDIC)*

Is the equipment compatible with other systems, or can it only operate with Philips hardware?

*Reply: W. Hoekstra, Philips Data Systems*

Although the compression technique is not exactly that of the CCITT standard, conversion outside the system should be quite easy. In the case of the disc itself, it is our aim to try and standardize this with similar products from other manufacturers when the time is ripe.

*Question: W.L. Renaud, chairman*

What is the reaction of personnel at Gruner&Jahr to working with these machines?

*Reply: W. Schmitz-Esser, Gruner&Jahr*

That is a problem area: when one is offering a technical solution to the staff one must ensure that the quality is good. We examined screen characteristics and document quality very carefully and we found that we could work well with this equipment. However we do not know yet whether, with the resolution obtainable, the documentalists will use the screen or go to hardcopy also obtainable rapidly from the printer. We think that the system makes life easier for the documentalist and the end user and we hope it will be accepted.

*Question: H.J. Ehlers, Ernst Klett Printing and Publishing*

Is it possible for Philips to copy this digital optical disc, as with a videodisc?

*Reply: W. Hoekstra, Philips Data Systems*

The two techniques are different: videodiscs now on the market are pressed one after the other and one can make as many as one likes from the master. The digital optical disc is written sequentially, and to copy it one must write it again on a blank, hole by hole. This will take about an hour per side.

*Question: W.F.C. Purser, Trinity College, Dublin*

If one wants to copy discs, could this be done by a station with 2 disc drives, and if so what is the cost of such a drive?

*Reply: W. Hoekstra, Philips Data Systems*

One can have as many drives as one likes, and the starting price in 1982 may be around $ 100,000: the price the year after may be half of that and so on depending on the volume of production.

*Question: R. Barnes, Elsevier Science Publishers B.V.*

Would Philips care to comment on the possibilities of selling parts of their system in quantity to other EDP manufacturers?

*Reply: W. Hoekstra, Philips Data Systems*

Yes, we are aiming to make certain parts of the system available to other manufacturers on an OEM basis, for example the disc and the disc drive and probably the high resolution display as well. As an example of the kind of price we would expect in 1985, the disc drive might be sold at an OEM price of around $ 10,000 per unit for an order of between 100 and 1000 units.

# THE NEW MODEL 9600 DIGITAL FACSIMILE TRANSCEIVER

by

P. de Paduwa
3M



3M presented the EXPRESS 9600 transceiver at the BUREAU 80 Show. This is capable of digital transmission in less than 30 seconds (A4 page).

This machine - which conforms to Group III standards, apart from having a particularly fast transmission speed, also possesses several other features:

-- It is a "duplex" copier: it can transmit and receive simultaneously.
-- The transmission can be programmed by an electronic clock.
-- The transmission can be started by remote control.
-- The copy is cut to the size of the original (from A6 to folio).
-- The continuous feed-in of originals is automatic for up to a maximum of 100 different originals.
-- Sorting of copies is automatic.
-- The machine incorporates on auto-call feature. Calls can be automatically repeated if necessary.
-- The speed of transmission is controlled automatically according to the quality of the telephone communication.

Several other control and coding functions are carried out by the 3M telecopier EXPRESS 9600.

All technical assistance is assured by the technical service of 3M. Such work is facilitated by an electronic detection system.

# THE IBM 6670 INFORMATION DISTRIBUTOR

by

C.G. Heerman
I B M

The IBM information distributor can provide a varied output using control panel instructions without the need for a special operator control language.

Some of the printing enhancements that the control panel entries can effect are:

** Adjust - to cause a ragged right-hand margin.

** Page Number - beginning with the second page of your document, the IBM Information Distributor will number pages at the bottom of each page.

** Duplex - for multiple page documents, you can save costs by printing on each side of the paper.

** Alternate Paper - selection of the alternate paper drawer, which may supply letterhead or colored paper, foil or offset material, or even labels.

Additional formatting and typestyle selections are possible through electronically stored formats or a simple operator language, OCL. These afford maximum capability to print almost any type of document, from the simple to the complex, with a minimum amount of operator training.

OPERATOR CONTROL LANGUAGE

The Information Distributor prints using a laser to image the photoconductor drum. Each page that is printed is an original, no matter how many sets are requested. Using information stored in the machine's memory and an Operator Control Language, maximum control over text formatting is obtained. For example

> from narrow columns of
> text, using justification and
> type style changes...

to multiple columns of data.

| Prior Year | Current Year | Population | Location East | Location West | Key Data |
|---|---|---|---|---|---|
| 1963 | 1972 | 4,824,123 | LNF | OMA | Codes 4.2, 86.0 |
| 1964 | 1972 | 23,710,448 | JTO | BMT | Codes 10.7, 11.0 |
| 1970 | 1973 | 920,571,522 | WZC | DSR | Codes 4.2, 31.0 |

TYPESTYLE CHANGES

The IBM Information Distributor has the capability of changing typestyles automatically as it is printing. Words can be emphasized with a bold type or italic; or for tables, printing can be in a 10 pitch typestyle for ease in reading.

Additionally, typestyle changes can be accomplished every word or every character, if desired. Typestyles can also be changed for lengthy complex tables or computer output.

ADDITIONAL FORMATTING FEATURES

Through the Operator Control Language, OCL, the IBM Information Distributor can produce line and page numbering, adjusted and justified text, margin and line text.

DISCUSSION

*Question: C. van de Weteringh, European Association of Information Services (EUSIDIC)*

What is the cost of the 3M equipment?

*Reply: P. de Paduwa, 3M*

The machine costs about BF 15,000 per month to hire, including all maintenance, etc. Prices do however vary by some 10% or 15% within Europe.

*Question: G. van Slype, Bureau Marcel van Dijk*

Can we also have the price of the IBM equipment?

*Reply: C.G. Heerman, IBM*

To hire the 6670 Information Distributor system costs BF 50,000 per month.

*Question: D. Raitt, ESTEC*

Does the 3M machine described produce colour and if not what is the likely timescale for such a development?

*Reply: P. de Paduwa, 3M*

On the question of transmitting and reproducing colour from colour, colour photocopying has been in existence at 3M for almost 10 years now but it is not a viable operation mainly on the grounds of maintenance problems.

# PROPOSAL FOR A MULTI-LINGUAL KEYBOARD AND SCREEN DEVICE, FACSIMILE RECEIVER AND PRINTER

by

J. Piolle
Centre de Recherches et d'Etudes Linguistiques (CREL-France)

This proposal is for equipment jointly developed by CREL, Le Centre Commun d'Etudes de Télédiffusion et Télécommunication (CCETT) and the Societé Thomson C.S.F.

It concerns:

1) A facsimile receiver
2) A multilingual, multigraphic dot-printer
3) A multilingual keyboard-and-screen device.

We have developed these devices using a combination of linguistics, informatics and telecommunications; in particular, we have developed software for typography, for telecommunications and multifunction codes for different languages and symbols.

FACSIMILE RECEIVER (CCITT standard T 30 with TGD options)

This is in the prototype stage and will be marketed within the next eighteen months at a price of FF 2500. The machine receives and prints multilingual character coded and/or facsimile coded data, with the possibility of mixing both within the same message, if required. It outputs facsimile coded data from an original paper copy and digitalizes, in character code, a graphic representation from an original paper copy for further use. The speed of reception is 2400 b/sec. It may also be used as a local copier.

MULTILINGUAL, MULTIGRAPHIC DOT-PRINTER

The present model of the printer operates with the terminal equipment to be described, but a stand-alone model will be available shortly. The cost per 100 pages is 6 FF.

MULTILINGUAL KEYBOARD-AND-SCREEN-DEVICE (CCITT standard T 30)
Cost 20,000 FF

This device accepts as input and outputs character coded and/or facsimile coded data, with the possibility of mixing both within the same message, if required. It can operate in a stand-alone mode or as a teletype-compatible device. It can operate in the scripts of all Latin-based languages, and can transliterate between all languages including Chinese. For example it is possible to write a poem in Chinese using a Latin alphabet keyboard; Cyrillic and Greek alphabets are provided. Mathematical and technical symbol capability will be developed, including all units of measurement and currency symbols. The equipment was successfully demonstrated using the telecommunications network.

# BRIEF TECHNICAL DESCRIPTION OF ELSAG FAX-TO-TEXT CONVERSION SYSTEM

by

M. Mosca
Elettronica San Giorgio
ELSAG S.p.A.

## 1. ELSAG BACKGROUND

Elettronica San Giorgio-ELSAG, an Italian Company of the IRI-STET Group, operates since 1970 for the research, development and production of advanced O.C.R. systems.

These systems are based on the EMMA* multi-processor, an original ELSAG design for real time solution of pattern recognition problems.

All recognition and data handling functions are implemented by software, thus providing a very high flexibility to fulfill present operational requirements as well as their evolution.

Up to now, the application areas covered by ELSAG systems are as follows:

a) automatic reading of postal addresses. These systems perform recognition of multifont and handwritten characters, and handle also low quality prints. Typical rate is 36.000 letters/hour;

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* Registered Mark. Patent Pending in several countries (e.g. U.S.A. - Great Britain - Australia).

b) automatic reading and storage on magnetic tape of information available on 35 mm films. The film transport and optical unit can handle up to 2.000 photograms/hour, while a high resolution printer/plotter is used for the display of unrecognized information;

c) automatic reading documents smaller than A4 pages. Multifont recognition and recovery of unrecognized characters by means of video terminals is used in these systems.

All these systems are based on the EMMA multiprocessor, an original ELSAG design and, nowadays, the most powerful computer system of this type produced on an industrial scale. A brief description of the EMMA architecture and characteristics is therefore provided in the following paragraph.

The name EMMA is an acronym for "Elaboratore Multi-Mini Associativo" (Associative Multi-Mini Processor). EMMA is a hierarchical multiprocessor system with no limit to top expansion since it can be configured with any number of computer "families"; each family can house up to 128 processing units, so that the computing power of the system is practically unlimited.

The memory, too, has practically no superior limit, since each family, in its maximal configuration, can store up to two megawords of 16 bits each.

The peculiar features of the EMMA multiprocessor system are:

- total hardware-software modularity
- system's architecture particularly oriented towards structured programming and design
- fault tolerance, that is the capability for a controlled degradation in case of hardware failures.

## 2. ARCHITECTURE OF THE EMMA MULITPROCESSOR

The EMMA architecture is based on a system of monobus structures, each controlled by a Data Exchange Coordinator (DEC). Each structure is a family of minicomputers, which are served by the DEC in "daisy chain" and can exchange data both with members of the same family and of other families. Such an organization implies a hierarchical structuring of the system, with the processors at the lowest level; next comes the "superprocessor", that is the families themselves. At the apex of the structure, above the system of families, stands the Monitor, a minicomputer whose task is that of performing the service functions of the system and to establish the links to the standard peripheral units.

In order to eliminate some problems both of electric nature and related to data exchange, the structure of EMMA is a little more complex than this: for example, as shown in fig. 1, the families are also connected to subfamilies.

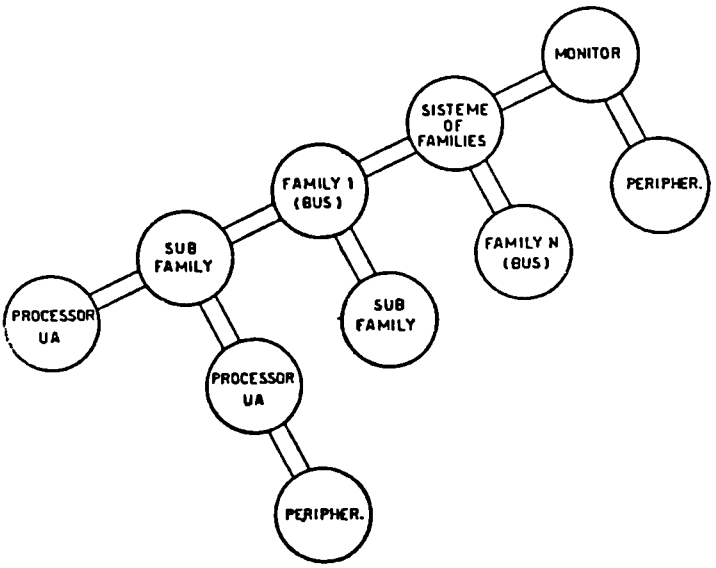


Figure 1 : EMMA STRUCTURE

The peripheral units can be connected either to a specific miniprocessor or to a family bus.

Three basic modules are used throughout the EMMA system. They are:

- the associative unit (UA)
- the memory module (MEM)
- the data exchange coordinator (DEC).

Each module is physically made up from a printed circuit board with about 140 integrated circuits of the middle and large scale integration technology.

The associative units (UA) are totally autonomous programmable miniprocessors.

Besides a standard set of an arithmetic logic and branch instructions similar to that of the majority of mini-computers, two instructions are available which allow to perform in a very short time an associative search on the memory.

The memory modules (MEM) have a memory capability from 4k to 32k words of 16 bits and are of the dual port kind: one towards the system bus and the other towards the UA (memory bus).

The organization of a typical EMMA family is shown in fig. 2.

A number of on-line diagnostic functions are distributed within the computer families. These functions are designed to watch over the regular execution of the process. In case a failure is detected in one module, a system reconfiguration action can be performed, namely a new assignment of tasks,

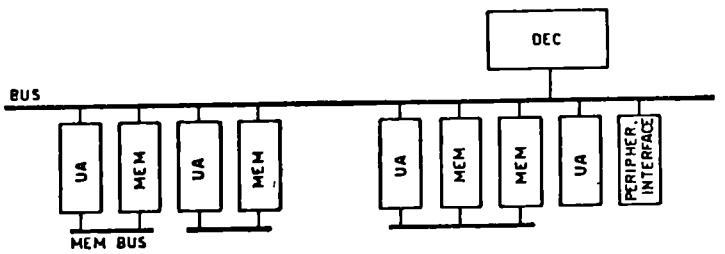


Figure 2 : EMMA'S BUS ORGANIZATION

in such a way that the faulty module is isolated and performance degradation is kept to a minimum.

## 3. SCOPE AND PERFORMANCE OF THE SYSTEM

The proposed system has the specific purpose of converting digitalized documents to telex coded format and storing them in data bases attached to the host computer. The system input is the data string provided by FAX transmitter of Group III, compressed according to CCITT standards (Modified Huffman Code) and delivered by the telefax network.

These data are converted by means of advanced character recognition techniques to a codified format suitable for telex machines. It allows a substantial compression of the informatio to be stored and transmitted later on. The codified text is recorded on a magnetic tape and from there it can enter the central computer and can be sent overnight via telex network to the user's receiver.

This system pursues the following aims:

- low cost for storing-and-forwarding of texts
- extension to the existing telex subscribers,
- the ability to receive documents originated by facsimile transmission.

The data string of the documents must be captured from an A 4 page scanned at:

- 8 lines per millimetre, horizontally
- 7,7 lines per millimetre, vertically

and compressed by using MHC code or other advanced techniques.

The content of the documents, suitable for this system, must be a text only as shown on document type 4 of CCITT facsimile set, (no figures, graphs or sketches are allowed).

The main performance of the system is:

- Input : 6 A4 pages/minute (each page 2000 char. or 200 characters/second;
- Recognition : mulitfont;
- Process control: 2 video-coding terminals (These allow to control the characteristics of the input text and correct the unreadable characters);
- Communications lines: 8-16 lines, 4.800 baud (The system can run up to 12 lines simultaneously transmitting at full load).

The operator at the video coding terminal can enter specific data of the input text as format and character font in order to increase the recognition performance.

The layout of the system is shown in the following fig. 3.

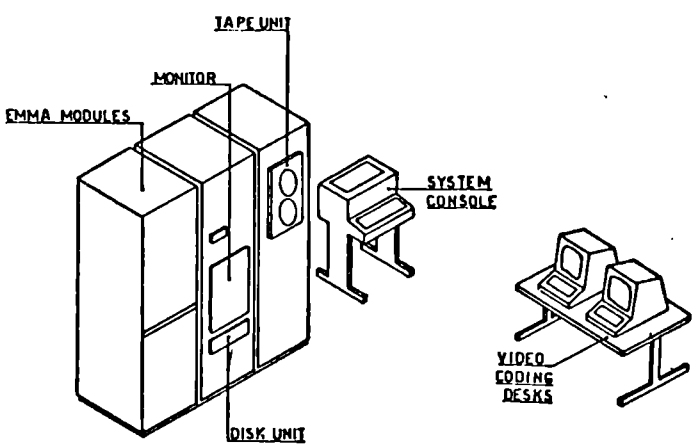


Figure 3 : SYSTEM LAYOUT

## 4. SYSTEM CONFIGURATION

The system is based on ELSAG's multiprocessor EMMA configurated as follows:

a) one minicomputer acting as a coordinator of all system functions (monitor) and interfaced to:
   - 8-16 telecomm lines, 2.400-4.800 bauds
   - magnetic disk unit
   - typewriter
   - magnetic tape unit

b) one EMMA's family with the following modules:
   - two control units for the video-coding terminals
   - one set of processors devoted to the recognition process of text characters.

The block diagram of the system is shown in the following fig. 4.

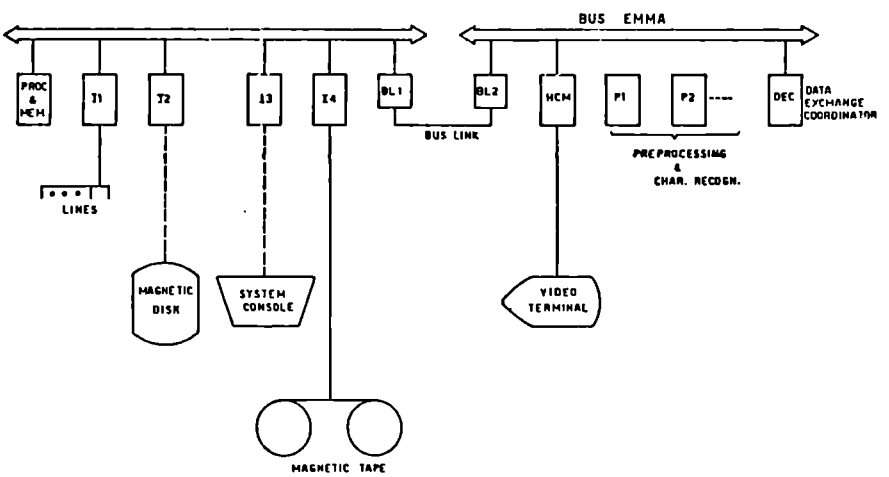


Figure 4 : BLOCK DIAGRAMM

## 5. PROCESS DESCRIPTION

The process consists of two basic functions:
- first, to collect all the binary information, describing the image of the page and provided to the computer by FAX transmitter via telephone lines;
- second, to convert such information from the level of image description to the level of characters codified in a format suitable to a user's telex receiver. The computer output information is stored in a magnetic tape.

The process is split in several tasks performed by different processor modules.

The tasks are connected by means of a pipeline structure, while the sub-tasks inside each module are performed in parallel processing.

The functional block diagram of the entire process is shown in fig. 5. We point out the following functions:

- Section I : provides for the data input arriving from the lines. The module A) FAX RECEIVER manages the data stream, controlling the connection procedure between lines and computer, and the data entry from the facsimile terminals. There are so many virtual modules A as the lines to be interfaced with the system.

- Section II : controls the queue of messages to store into a magnetic disk. This module B) QUEUE CONTROL provides for collection and storage of the data sent from the input module. So that this module works like a buffer able to adapt the input load to the actual processing availability.

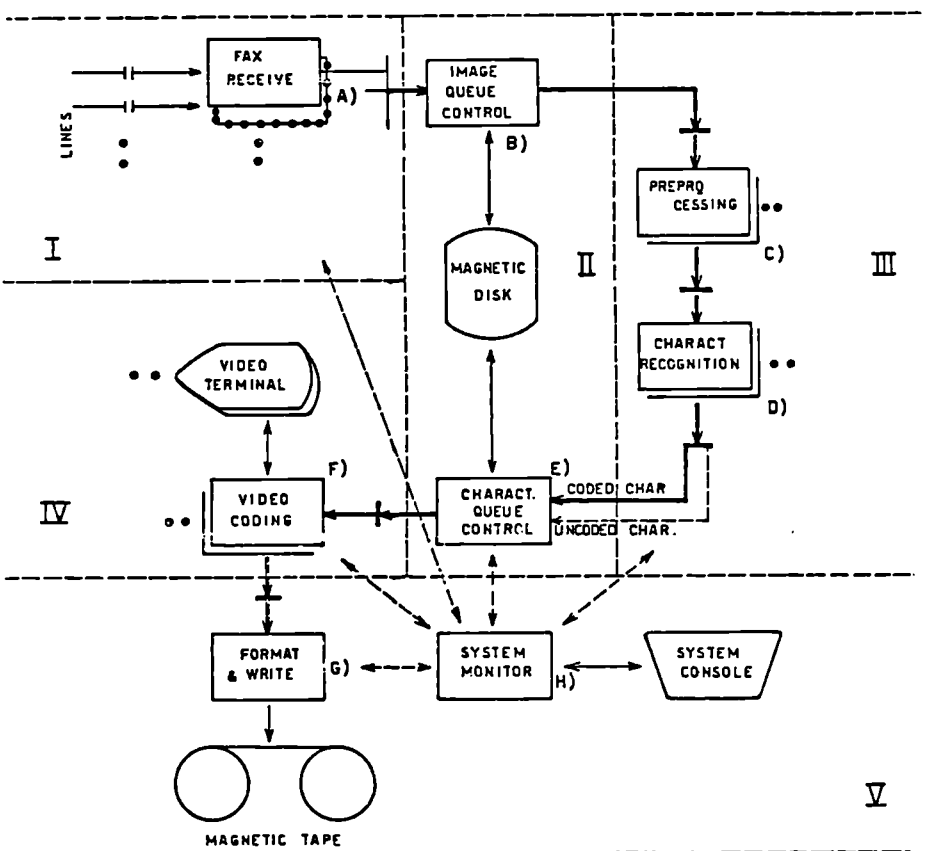


Figure 5 : PROCESS ORGANIZATION

- Section III: performs the conversion (recognition). This section is split into two sub-sections with two different tasks connected via pipeline. The first sub-section-module C) PREPROCESSING is able to segment the input pages into lines and, later on, into words and characters.

  The second sub-section-module D) RECOGNITION PROCESS provides for the recognition of the segmented characters.

  The maximum document handling capacity of the system is established by the quantity of modules C) and D) inserted in section III.

  These modules are repeated many times and they work in parallel.

  At the end of the recognition process all the characters recognized are coded and ready for the storage in a magnetic tape.

  The unrecognized characters are recovered using the video-coding subsystem.

  The module E) CHARACTER QUEUE CONTROL disconnects the recognition process from the video-coding sub-system, in order to make possible that the video-coding time of the operator is consistent with the processing time of the computer.

- Section IV : constitutes the video-coding stage. This section can include more than one module VIDEO CODING according to the number of terminals.

  When the process of section IV is accomplished all the text is recognized and codified, ready for the storage on a magnetic tape.

- Section V : performs the system monitor. The monitor is not directly involved in the recognition process but it acts like a coordinator of all functions, specific or secondary, which are necessary to achieve the full system performance.

  However, through the video coding terminal, the operator can enter the main characteristics of the text (leading parameters) as font type and text format.

  These parameters allow to optimize the process cycle either for mixed pages or batch pages.

# AUTOMATED RECORDS MANAGEMENT SYSTEM

by

A.R. Butcher
Altergo Services Limited

## INTRODUCTION

Altergo Services Limited is engaged in the office automation business, and is part of a large London-based international group. We have formed an association with a high technology US company, Teknekron Controls who have developed a part of the system to be described. The proposal is based on microfiche storage of the primary documents, and all the components in the proposal are available off-the-shelf today, and are already in daily operation by a number of users. Nevertheless, the system is essentially modular, so that full advantage could be taken of new technology as it becomes available: we are already studying the possibility of digital optical discs as a new storage medium.

The heart of the system proposed is an automated records management system, which is then interfaced with telecommunication software which organizes the data into digital packets for transmission across the network, from which it is passed to terminals for display or printing.

## THE SYSTEM IN OUTLINE

### Request Management

A request for a document will be initiated by a user terminal to a central computer. The central computer will pass the request to the Index (which may be in the central computer or another dedicated machine). The document will be located in the Index and a retrieval signal sent to the Storage Retrieval Scanning Modules.

## Storage and Retrieval of Microfiche

The SRSM device contains eight trays in four rows of two holding microfiche in precision slots. Tracking over each pair of trays is a precision carriage carrying a TCI charge couple device scanner camera, four scanner cameras per device. The carriage and camera are moved under control of a microcomputer capable of driving the carriage to a selected fiche, lifting the fiche to locate a row and frame and carrying out a scan of a frame at the equivalent of 200 dots per inch on the x axis and 200 lines per inch on the y axis creating an analogue signal which is converted to raster data giving a data image of the original document. An A4 document will give some 3 million pixels or digits of raster data of black and white image. The device is controlled by a microcomputer which receives retrieval requests, drives the carriage to locate the first fiche/frame and subsequent frames, operates the CCD camera and light source, and carries out the analogue/digital conversion.

Retrieval of the first page of a document takes 5 seconds with subsequent pages requiring 1 second on the average.

## The Videosystem Controller

The VSC receives retrieval signals from the Index, initiates retrieval and scanning, controls the analogue/digital conversion, control image enhancement and data compression, stores data on the image disc and initiates dispatch of data to the requesting mainframe computer or terminal. It is also proposed that a control terminal should be incorporated in each document supply system for quality control, input, etc.: this terminal is a hybrid device, able to communicate as a normal terminal to a mainframe or minicomputer, but also able to become a high resolution device for receiving the raster data for quality control.

## Digitalization of Material

All original documents will be filmed at 48x reduction on microfiche. Filming may be done either by traditional Step and Repeat Cameras or by our Scanners to disc and output as images via a Raster COM Unit manufactured by NCR and marketed currently by Rank Xerox. The latter is faster and at higher cost.

## Transmission and Reception

Software to convert the raster data into packets, and to restore it at the receiving end will be developed. Printed output at the users site can be obtained by a standard printer of the PANAFAX type, with a VDU if desired.

# A REMOTE ACCESS INFORMATION RETRIEVAL SYSTEM

WRITTEN CONTRIBUTION FOLLOWING AN ORAL PRESENTATION

by

K. E. Groves
Antone Systems Limited

## SUMMARY

This report explains the philosophy behind information retrieval systems as applied to the current "state of the art" technology. In particular the types of questions which must be asked before designing a system are enumerated together with the impact these questions have on the configuration. An assessment is given of the competing types of hardware techniques which are available and the reasons given for the choice of film as the main store over the alternative digital facsimile. The ASTRA system is described in some detail emphasising that it is based upon a "soft copy" image produced on ultra high resolution television with hard copy as an option. The main film store has the capacity of four million A4 documents, any image of which is available as a soft copy within 5 seconds.

## INTRODUCTION

In considering the details of hardware and software in automatic and computerised information retrieval systems, it is necessary to investigate what are the questions which are likely to be asked of a system, what are the basic parameters of the information contained in the system and what are the fundamental functions performed within and by the system. It is assumed that information is required in the form most suitable for human beings, i.e., pages; in this report, the words 'pages' and 'documents' are synonymous.

INFORMATION STRUCTURE

It is assumed that the information can be located in a remote store in page or document form, and can be retrieved in a few seconds on demand from the user. Referring to Fig. 1, the structure of the information is defined by the following parametres.

Search Factor

Any system can have two basic types of question asked of it.

a. Direct Enquiry - a direct enquiry is defined as one where the exact nature of the enquiry is known and the actual documents required can be specified completely. Feeding in the document identification will, by computer selection, find the necessary pages and present them to the enquirer.

b. Rejection Enquiry - a rejection enquiry is one where neither the subject nor the documents can be completely specified, and hence a broad selection of pages must

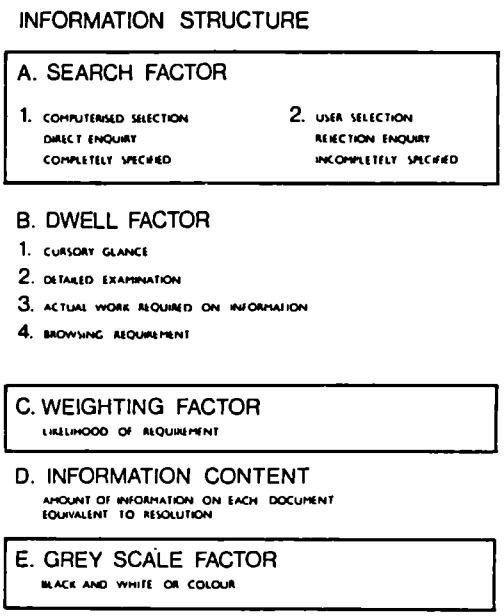


Fig. 1

be presented to the enquirer until he finds the information he requires, but the "rejection" of unwanted documents can be carried out in a very short space of time. This type of enquiry is much more common than the Direct Enquiry type. It is obvious that, in many cases, the failure to be able to specify the required documents can be attributed to inadequate indexing or inadequate research by the enquirer but, usually, cost effectiveness precludes a better organized index or system.

Dwell Factor

a. Cursory Glance - in some applications it is only necessary to have the document visible for a few seconds in order to extract, or confirm, a particular piece of information or to decide whether to reject the document itself.

b. Detailed Examination - The document is required to be on view for some considerable time and this might well put some constraints on the configuration of the system. In particular the document must be easily viewed.

c. Actual Work Required on the Information - this type of requirement would need hard copy.

d. Browsing Requirement - in which a number of documents are required to be read into a buffer file and continually referred to at random. This will have an influence on the time taken, to satisfy a user requirements, but might well be modified by the answers to a, b, and c above.

Weighting Factor

This is a measure of the likelihood of a document being required by a user. In theory, all documents can be given a weighting factor, but it might well be that the weighting factor will vary during the life of a document; in general the likelihood reduces to almost nil after a period. This factor could make it necessary to purge a store periodically of all redundant documents, as it is clearly inefficient to overload a dynamic store with documents, which are unlikely to be required. The result of this requirement can significantly alter the philosophy used in designing the system, especially in the structure of the main store, and the index software.

Information Content

We require to measure the amount of information contained in a document related to its size. This is equivalent to resolution, but it is convenient to measure the number of characters

which could be written along the longer dimension of the usable area of the document. If there is no print, then resolution must be determined by measuring the width of the smallest limb, pattern or object and/or the minimum distance between adjacent similar limbs, patterns or objects. This must also be related to the longer dimension of the document. It must be emphasized, that it is readability and not necessarily resolution which is required by the user, who will seldom require a perfect, undistorted copy of a document, provided the ease of reading is not degraded.

Grey Scale Factor

Well over 90% of applications have documents which contain information in black and white, particularly for prints, drawings and diagrams: colour is stored as shades of grey. For this type of document contrast is at least as important as resolution for readability; some loss of resolution can be accepted but seldom much loss of contrast. Coloured documents, where the information is in the colour, present a completely different problem but resolution can be reduced considerably without undue loss of information.

## THE USER TERMINAL

User studies have stressed the importance of the characteristics of a user terminal in systems acceptability. Further, market investigations showed that the majority of users employ the rejection type of enquiry and hence a cursory glance combined with a detailed examination of the final selection is required. Browsing is frequently needed with a hard copy output not mandatory. A soft copy, on a screen, contributes significantly to the efficiency of a remote retrieval system, with hard copy restricted to those documents definitely required. Frequently, the soft copy precludes the production of hard copy: in many applications it can be proved that the cost of the system can be recovered in a matter of months by the saving in hard copy costs.

Other results from the market investigation showed that the majority of demand was for A4 sized documents but, however, with a significant number of potential customers requiring the retrieval of larger documents, up to AO size in the case of drawings. The reproduction of the actual format of the document was also mandatory in a large number of applications particularly in the case of drawings. Demand for colour and photographs was minimal.

Soft copy being convenient to many users, a form of television seems the obvious choice for a user terminal. User acceptability is well established and technical sophistication is high. It is possible to integrate television techniques

into the information retrieval systems of the future. Thus a user terminal will be a television monitor with resolution matched to the application, and as it is only just possible to resolve an A4 document, with type at 10 characters to the inch on 625 line television, line frequencies above this are being used. These higher bandwidth monitors will also receive 625 line TV however, and hence are compatible with ordinary CCTV and Broadcast TV. Hard copy facilities may be shared between a number of terminals.

## BASIC FUNCTIONS OF THE SYSTEM

Other system features may be dependent on the application but for the reasons stated the input and output to the system must be analogue. The user terminal will display an analogue picture; it is also clear that the whole system could consist of analogue components, performing the other three basic functions in an information retrieval system. These basic functions are the storage of information, its manipulation and its transmission. Figure 2 shows that these can exist either as analogue or digital forms, each form can be converted to the other at an interface.

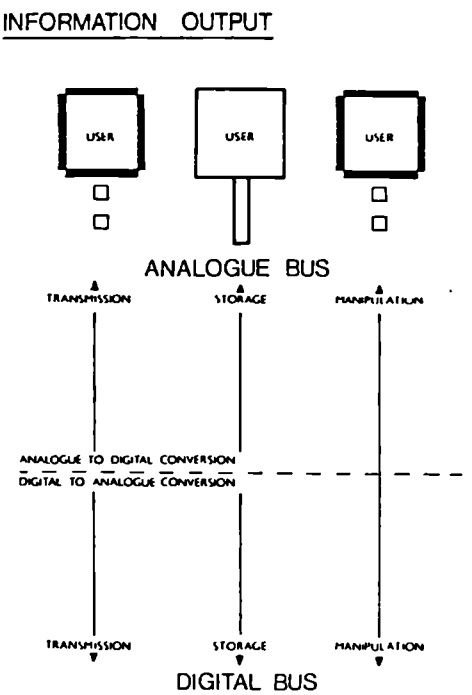


Fig. 2

In general, it is far more efficient, from a bandwidth point of view, to use analogue methods but signal to noise is a major limitation. Hence digital techniques have evolved to a point where all functions in a system can be carried out at digital signal levels except for the final display. This is not to say however, that therefore digital techniques MUST be used regardless. An efficient system should use that which is best from both techniques and should also be flexible enough to be able to change from one to the other if technology advances.

## Storage of Information

In particular, the storage of information can be undertaken in either an analogue or a digital form and the choice between them should be carefully considered for any particular application. Besides paper, the major analogue media is film of which microfilm is used as the generic term covering all forms of storage of documents on film, whether it be microfiche, ultrafilm or roll film.

The current technique of digital storage uses magnetic materials, although there are many new ideas being developed. Any comparison which can be made must however be between film and magnetic materials although this will change some time in the future. Analogue techniques are also being developed, dry processes for film in particular, and this development could make a very significant advance in information storage. An assessment of the advantages and disadvantages of film and magnetic materials follows.

## Film Versus Digital Storage

It is assumed that in most efficient information retrieval systems, documents are wanted in their original format and the digital storage will be carried out at digital facsimile level (pixels) rather than coded character level.

### a. Advantages of Microfilm

The techniques of producing high quality microfilm are well proven and all the problems are known together with the solutions. While we have less experience of problems involved in the new digital storage techniques, it seems certain that storage of pixels representing some hundreds of thousands of documents will be expensive and difficult. The advantages of microfilm may be summarized:

i) Extremely stable - in fact it is very difficult to destroy.

ii) The costs are known exactly through experience over many years.
iii) Housekeeping problems are well known and relatively easy to overcome.
iv) The resolution is extremely high and grey scale is easily accommodated.
v) The costs of reproduction, once the filming has been undertaken, are low and insensitive to inflation.
vi) It is human-compatible, and can be readily interfaced with small manual systems, a very large number of which will continue to exist side by side with large automated systems; it is much less sensitive to system failures however caused.

b. Advantages of Digital Storage

The advantages of digital storage are:

i) It is compatible with computer systems in all respects, but the resolution of standard VDU's is insufficient to display normal A4 documents. However, high resolution, 2200 line displays are now available using the ASTRA system.
ii) It is much easier to purge unwanted documents from a digital store than from a microfilm store but the housekeeping problems of this operation are not yet fully understood.
iii) The manipulation of pages within the store is easy and follows standard computer disc procedure. In particular the off-loading from one store to another is easy (for example creating buffer files for browsing).

c. Disadvantages of Microfilm

Disadvantages of Microfilm are enumerated below, and some of the methods of overcoming these disadvantages are outlined.

i) Processing is wet and, in computer terms, lengthy.
ii) The development of microfilm viewing and ancillary equipment has been lamentable and almost no rapid retrieval systems exist. Microfilm has the reputation of being only of use in archival situations and the principal uses are seen as being in the very cheap end of the market. As with microfilm, all digital storage systems currently in use rely upon mechanical devices and there is no reason why film-based retrieval mechanisms cannot be made just as reliable as digital equivalents. In addition film has the added benefit of being much less easily damaged and has a substantially longer life.

iii) Microfilm is difficult to purge of unwanted documents and hence can build up considerable redundancy. A method has been developed in the ASTRA System which goes some way to alleviate this problem.

iv) The process of filming and subsequent developing is difficult to control from a contrast point of view and the quality of the images is sometimes difficult to maintain. Digitally-based techniques have been developed to improve the situation.

d. Disadvantages of Digital Storage

Disadvantages of digital facsimile storage are as follows:

i) Because high-resolution facsimile data is expensive to store, the method is not yet economic. Input devices suitable for larger documents are also expensive.

ii) It is not human-compatible in that it requires a complicated machine to convert to an analogue display. It cannot be used outside this or a similar environment.

iii) There has been little practical experience with fully operational systems to date; hardware and software may still require further development, and operating and housekeeping problems are insufficiently known. Present information on the cost of capture does not show that these costs are in any way comparable with those for microfilming

iv) Information can easily be lost or corrupted in magnetic stores: insufficient information is available to assess the performance of the newer non-magnetic media in this respect.

Manipulation of Information

The techniques of manipulation of data in a computer system are well known and occur essentially at character level, although "packets" of characters are usually manipulated in magnetic disc applications. In information retrieval system terms these "packets" are pages and in the digital facsimile context are actual documents represented as pixels. As one of the features of film is its durability, it is difficult, except by crude manual means, to manipulate document images on microfilm. If the images are converted to high resolution digital facsimile, then fresh film can be generated if the output of the digital facsimile is connected to the equivalent of a COM camera. The ASTRA System uses these techniques and hence, effectively, manipulates documents on film in a similar fashion to computer systems but obviously on a much longer time scale. This relative slowness of operation does not preclude using this very powerful tool in the organization of a dynamic film store, and goes some way to minimising one of the shortcomings of microfilm.

It is clear from the above description that even if film is used as the main store, the manipulation of information within a system is carried out exclusively in a digital form, except as a purely manual operation with pieces of film.

### Transmission of Information

Information can be transmitted in various forms on paper, film, digital or video but in the present context we need consider only digital and video methods. Both require a direct link between transmitter and receiver and in this context, an electro-magnetic wave link is considered as a direct link. The all-important feature of the link is the bandwidth, which may vary from telephone to optical frequencies. Together with this bandwidth limitation is the signal to noise-level and cost, determining the method of transmission. The higher the bandwidth the greater the efficiency, usually at the expense of signal to noise, and cost. Analogue video represents the most efficient means of transmission and in many instances it is possible to transmit a document as a video signal. The direct link has to be a high bandwidth line and in general coax cable is required (or satellite communication). The provision of coax cable over long distances is not yet freely available and hence one must use telephone-bandwidth lines. Transmission over these lines is far superior if digital techniques are used. In general, in a practical system, a combination of digital and video transmission techniques will be used, the actual configuration being determined by the economics, including any requirement for integration with an existing computer or video system.

## THE ASTRA INFORMATION RETRIEVAL SYSTEM

### General Introduction

The ASTRA system has been developed using the current technology. It is fully modular and any module can be replaced at a later stage as the technology develops.

The input to the system starts from documents, although the system can be adapted to deal with film as the input medium. The input operation provides for documents to be appropriately placed in a rapid-access store, and for the corresponding computer and physical address to be added to the computer index. If the documents are already held on film it is unlikely that this film is suitable for a rapid-access system and hence a conversion would be necessary.

There is overwhelming evidence that film represents the most economical method of mass storage of documents and hence, for the time being, this is used as the main store in the ASTRA system. A document digitalizing station is used in the input section and hence if it subsequently were proved that digital facsimile stores were economically viable then the system could be easily reconfigured.

System Description

Referring to Fig. 3, the various functions of the ASTRA System can be described as follows:

a. Input

Documents are filmed, either through a standard commercially-available microfilm camera, or they are digitalized in digital facsimile mode before being presented to the ASTRA COM type camera. This camera has both a writing CRT, as in COM equipment, and an ordinary optical paper filming station. The digitalized document is presented on the CRT and filmed in the usual fashion. Image processing techniques are used to enhance the image especially from a contrast point of view. The philosophy behind using these digital techniques is that the user is interested in rapid retrieval of readable information rather than a total perfection of stored documents, and hence any distortions introduced by the CRT can be tolerated, provided that they do not detract from the ease of assimilating information. With the image processing techniques of contrast enhancement the documents can become more readable despite a small loss in resolution. At the time of document input the indexing terminals feed the index information to the ASTRA controller, which is either a mini- or micro-computer. The index store is usually either a hard disc or a floppy depending once again on the application. The computer also controls the camera input station, the page selection and the demands from the remote user terminals.

b. Film Library

From the input station film can be given, either to the (archival) film library, or, directly to the microfilm storage and retrieval system. A film library is necessary for those applications where a two tier storage is required due to the existence of documents of greatly varying weightin factors. In general, it is inefficient to keep unlikely-to-be-wanted documents in a dynamic, rapid retrieval store. The ASTRA system provides a method of updating the dynamic store from the film library. In practice the microfilm conversion scanner under computer control raises new film for introducing to the rapid retrieval file from the film library. The original film is scanned in digital facsimile mode and reproduced via the ASTRA COM style camera as described before. Typically, fresh film can be produced at the rate of 2500 new frames per hour and hence a new dynamic store can be raised in a comparatively short space of time.

c. Automatic Microfilm Storage and Retrieval Unit

This unit uses 105 mm roll film in its standard form, which is in reality uncut microfiche, and hence all the well known techniques associated with fiche can be used. The

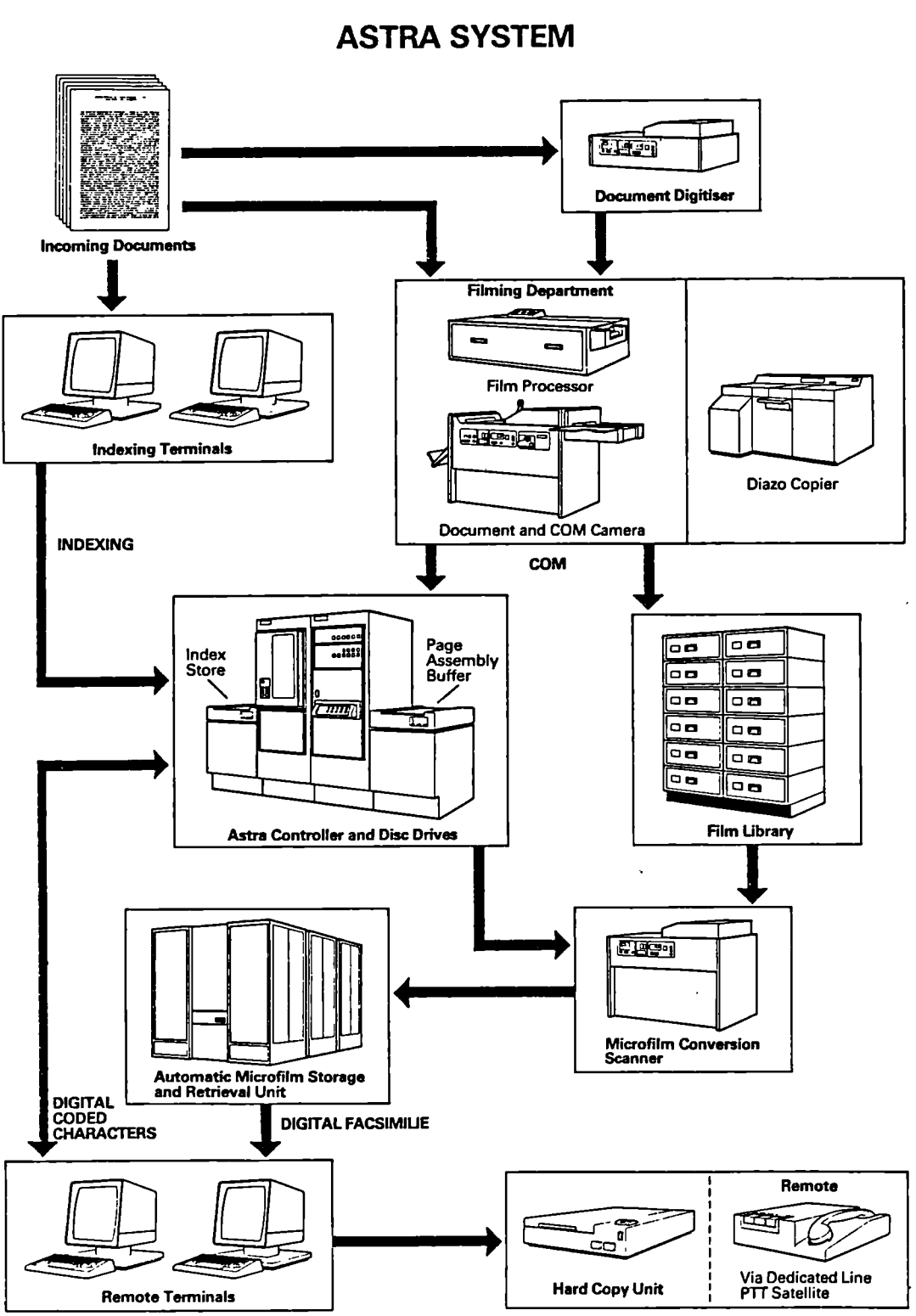
ASTRA SYSTEM
Incoming Documents
Document Digitiser
Filming Department
Film Processor
Document and COM Camera
Diazo Copier
Indexing Terminals
INDEXING
COM
Index Store
Page Assembly Buffer
Astra Controller and Disc Drives
Film Library
Automatic Microfilm Storage and Retrieval Unit
Microfilm Conversion Scanner
DIGITAL CODED CHARACTERS
DIGITAL FACSIMILIE
Remote Terminals
Hard Copy Unit
Remote
Via Dedicated Line PTT Satellite

Fig. 3

film is held in cassettes, each one of which can contain up to 250,000 A4 documents on 300 feet of film. The largest store contains 16 of these cassettes and hence has the capacity for 4 million A4 documents. The retrieval time to any document is 5 seconds from demand via the controller. The image on the film is presented to a CCD scanner which in turn feeds the user terminal or the page assembly buffer with a digital facsimile signal of 1500 by 2200 pixels (3.4 Mbits in computer terms).

d. User Terminals

The standard terminal has a CRT working in the portrait mode (as opposed to the normal landscape mode of ordinary TV) with a line structure of 2200 lines and a horizontal resolution of 1500 pixels. The video bandwidth is 120 MHz and the keyboard has normal V24 interface to the computer. The user interrogates the computer index in order to identify the desired document or documents and in this mode the terminal acts as a standard VDU. Upon demand from the user, via the keyboard or other devices such as rolling ball or light pen, the documents from the main store are selected and placed on a hard disc in the computer system, the page assembly buffer. This buffer can assemble a number of documents, either for one user in a browsing application, or for more than one user, but cannot, due to bandwidth limitations, refresh the user terminal display. The disc unloads one document to the matrix buffer store, associated with each user terminal, for subsequent display. This matrix buffer store has the desired 3.4 Mbit capacity and has the necessary output bandwidth to refresh the display at TV frequencies. This transfer from main store to display takes place in approximately one second, and a number of terminals can be connected to the system, the number being limited by communication problems in the computer. The distance of the remote terminal from the main store is also limited only by the communication problems but mainly by the bandwidth limitations of the transmission lines.

e. Hard Copy Units

Hard copy can be obtained either via a facsimile unit or off the video via a video hard copy printer. Both can be remote if necessary but with the same limitations of transmission line bandwidth.

DISCUSSION

*Question: B. Stern, Elsevier Science Publishers*

Is the retrieval unit presented by Altergo Services Ltd. a modification from the original carousel unit, and is it still

under development?

*Reply: A.R. Butcher, Altergo Services Ltd.*

The carousel system mentioned by Mr. Stern has indeed been modified by us and is in service in a number of applications. Its capacity is however limited and mainly for that reason we are not now selling it. The system proposed employs a new device, the SRSM, primarily designed for the U.S. Army personnel record system with a much larger capacity. One videosystem's controller can handle 8 SRSMs giving the whole system a capacity of about 32 million pages. I should emphasize that the SRSM is fully operational.

*Question: J.R.U. Page, IIASA, Laxenburg*

We saw this morning that the main problem with facsimile systems was likely to be the high cost of transmission of the large number of bits generated. Since delivery systems based on micrographics will also have to transmit in facsimile mode, is there any indication that transmission cost can be significantly offset by reduced costs of capture and storage?

*Reply: A.R. Butcher, Altergo Services Ltd.*

Microfiche costs are known but advanced digital storage systems have not yet been developed to the point at which costs can be compared. In the area of transmission, we ought to be able to save something like an order of magnitude in the number of bits required per page: perhaps reducing this to about 300,000 bits per page.

*Reply: K.E. Groves, Antone Systems Ltd.*

Cost of capture of data is likely to be very similar in both micrographic and digital systems, but this is not necessarily true for verification of the data: in the micrographic case this is very simple and cheap. The same is true for housekeeping costs and of course the costs of copying microform are very low indeed.

# FUTURE OFFICE ENVIRONMENT IN THE CONTEXT OF ARTEMIS

by

N. Blake
Rank Xerox Ltd.

The workshop is an opportunity for people to cross-check opinions, to highlight areas of concern and interest, and hopefully to arrive at decisions on implementation. We would like to share our views with you rather than to propose items of equipment.

## THE ARTEMIS REPORT

Obviously this is no place to review this very comprehensive and stimulating document: we would like however to look at some of the main challenges arising within it, as we see them. First, we see the main problem as not one of technology but of management and cost effectiveness. Secondly, it seems to be necessary to provide a critical mass for the kinds of services described in ARTEMIS. We also believe that there is a major challenge in the evolution of a project like ARTEMIS: there is no one-time solution. ARTEMIS must be capable of absorbing many changing technologies and adapting itself to many trade-offs as it grows. The standardization problem is clearly very important: standards which we may decide on today, may be totally inappropriate in the environment of five to ten years hence.

While the need for quality has been stressed, I am not happy that the trade-off between quality, resolution, speed and the other factors contributing to it has been fully evaluated in the workshop. Quality costs money and how much are you prepared to pay? Another cost problem has already been highlighted, that of telecommunications costs: ARTEMIS may depend upon renegotiation of tariff structures with the PTTs. Telecommunications charges may take on a wholly new significance

in the environment of an oil-constrained economy during the next five to ten years.

While it may be necessary to take a short term decision that Group III facsimile is the best point of departure, in my view we will eventually have to move to higher resolution in order to obtain something nearer the quality of printed publications. That will probably lead us to hybrid services, using a variety of document files and delivery systems.

Today I believe we are preoccupied with word and text processing systems, because they are both available and cost effective.

## OFFICE ENVIRONMENT

In today's offices we can see a variety of free standing equipment: facsimile terminals, copiers, computer terminals, and message systems such as telex and so on. Current office systems are somewhat fragmented: each equipment item fulfills a useful function but these functions are not integrated. I believe the user is now looking towards some sort of integration of these functions. We believe that an important trend is the evolution of multi-function workstations. Further, we are looking towards workstations which can access shared resources, for example, datafiles or an electronic printing system. This again points to the need for greater flexibility and interconnection between the devices which we will find in the office environment. Text and image will have to be integrated in the definition of a document, but why not be able to annotate a document by voice? Digitized speech is a perfectly admissible element of a complete document transaction.

## HUMAN FACTORS

Office systems of the future will have to avoid some of the pitfalls resulting from the introduction of computers in the early 60's. We must avoid the creation of a cadre of specialists as necessary intermediaries and interpreters between ordinary human beings and these so-called exotic systems. Today, there are not enough computer specialists, and we must bring about a situation in which these systems can be installed, understood and used by ordinary, non-specialist people.

## STRATEGIES

Most of our customers are now looking for some kind of a long term strategy, in which they can plan how to implement the new systems. They are looking for simple complexity, but not for a solution which chains them forever to a single supplier. They are looking for gains in productivity, and in this respect we should be considering more carefully the costs of the various components of an information transaction.

We have already discussed technology, and I do not think we need do more than emphasize that technology is at a turning point today. Some of the technologies we have heard about are at the point of becoming realizable and cost effective: the things which will distinguish tomorrow's equipment from the text-oriented systems of today will be what takes place on the screen, and the degree to which systems are interconnected.

Looking at the fundamentals, we find that the growth of hardcopy is now between 10% and 15% per year: we are being swamped with paper, and this mostly involves copies from paper itself. As time goes on, we will find that hardcopy is being increasingly made from electronic originals. The interesting question is how steeply will the curve rise: obviously however, people will continue to use paper for some long time to come. Another point which we should consider is how to handle soft instead of hard originals: for this we need a communications infrastructure. For outside communications we must rely on the PTTs, but within an enterprise it is possible to provide local area networks which link together a number of devices. In Rank Xerox we have made a commitment to Ethernet which is our own local area network.

## CONCLUSIONS

To summarize, in our view ARTEMIS must be designed for change: there is no one-time solution, and the system must be designed to accommodate the introduction of new technologies as they occur. User habits will also change. However, for ARTEMIS, we should aim at one-time document capture; it will be highly undesirable, for example, to find out that in a few years time we needed to re-digitize documents by reason of a change in resolution requirements. We also think that local area networks within an establishment will become an increasingly important part of the office systems environment, and this will provide new opportunities for ARTEMIS-like systems. Local area networks will encourage resource sharing (for example, electronic printers and copiers), and these will be able to fulfill ARTEMIS functions in addition to their primary role.

We will find, I believe, immense problems in implementing standards for the electronic, or "soft" document: the standardization problems are more difficult by an order of magnitude than those faced up to now, and manufacturers may not therefore be able to wait for the due processes of consultation to come up with standard solutions. I would also like to emphasize the importance of designing workstations to be operated by ordinary people with the minimum of training. The cost differential between "dumb" and "smart" workstations is already beginning to narrow and we must ensure that we use some of the added intelligence to make it easier for ordinary people to operate these devices.

THE DEMONSTRATION

The ALTO workstation is an experimental research tool, based on 1973 technology, to explore the facilities which a powerful, personal computer could bring to a user. In particular, a full graphic screen, and a unique processor design has opened up new horizons in ease of use.

The purpose of the very modest demonstration is to show what is already possible. These notes are representative of what could be said today by Xerox if ALTO and its associated electronic printers, files and communications management were a commercial product. It is not a commercial product nor will it b but the "Xerox Document System" is available and demonstrable tod

ALTO allows the user to become his own editor, designer, composer, printer and publisher. The System combines advanced word processing, laser printing, information storage and retrieval, and communications capabilities. Major functions could be provided to a group of workstations by central units known as servers. Editing features in the workstation include multiple type faces and fonts; automatic tab-setting, justification, centering and margin control; and optional reverse (white-on-black) display. A user can create simple graphics and integrate them with text at the workstation. The system has extensive formatting capabilities. One of the most impressive is "style sheets" - formatting instructions developed by users that provide automatic layout and typography for documents. Once developed, a style sheet can be quickly accessed by any operator. Other normally complex tasks, such as footnoting, page and line numbering, and the compilation of indexes and tables of contents, are also automatic. The workstation's display screen can be divided into two or more "windows" for simultaneous display and editing of more than one document, or more than one section of a document, and passages can be moved from one window to another. The printer can also function as a copier; it is a modified Xerox 5400. Printing resolution is sharp - 147,000 dots to the square inch - and is virtually of offset quality.

Material from different documents at different locations can be integrated into a single document. A document can be sent from any workstation to any file server. A document can be directed to any number of users simultaneously.

The system enables true resource sharing by a range of users through their workstations. The local area communications system, Ethernet, links the workstations, files and printers within a building, to build an interactive working community. It assumes documents will not be restricted to text or limited graphics, but will one day need to accommodate high quality pictorial information. ALTO is the tool which Xerox has used to explore the frontiers of this concept.

# SESSION III

## PANEL I

## ELECTRONIC DELIVERY OF PRIMARY DOCUMENTS- TECHNICAL OPTIONS AND ECONOMICS

P.T. KIRSTEIN
CHAIRMAN

# ASSESSMENT OF THE CONCLUSIONS OF THE ARTEMIS REPORT IN THE LIGHT OF THE PROPOSALS RECEIVED

by

(1) A.R.D. Norman
Cabinet Office
Central Policy Review Staff
Seconded from A.D. Little Inc.

It is not for me to review what has been presented and demonstrated; from what we have heard it is clear that the technology that ARTEMIS requires exists today. I would like to remind you about the ARTEMIS concept. It is not a collection of technology, it is not even a system, it is a marketplace; it is a common carrier, it is a club, it is a place where information providers and information users can come together. It is tied together like all the best gentlemens' clubs, by rules and by standards that all who wish to enter are prepared to obey. But it is an international club and so how do we make a harmonious community against the background of very different legal concepts and ideas which exist among us.

Thus we must consider how we can harmonize and create the standards and the protocols that we need. If we consider a graphic representation of the ARTEMIS functions as in Fig. 1, it is not the boxes representing these functions which matter from this point of view: where arrows are shown, these indicate the places at which standards and interfaces are to be found. You may do what you like on your side of an arrow - on your side of an interface - provided that the man on the other side has no idea what you are doing because he cannot tell from the information that crosses the interface. However, what crosses the interface conforms to standards and those are the standards that determine the ARTEMIS system.

For example, as a publisher or information provider, you have direct relationship with authors and editors, but you are no longer the compositor if you are going to communicate with your readers in teletex format. You are the compositor if you are going to communicate in facsimile, but you are not the printer, and nor are you in control of the printer, or the

INTERFACES REQUIRING STANDARDS

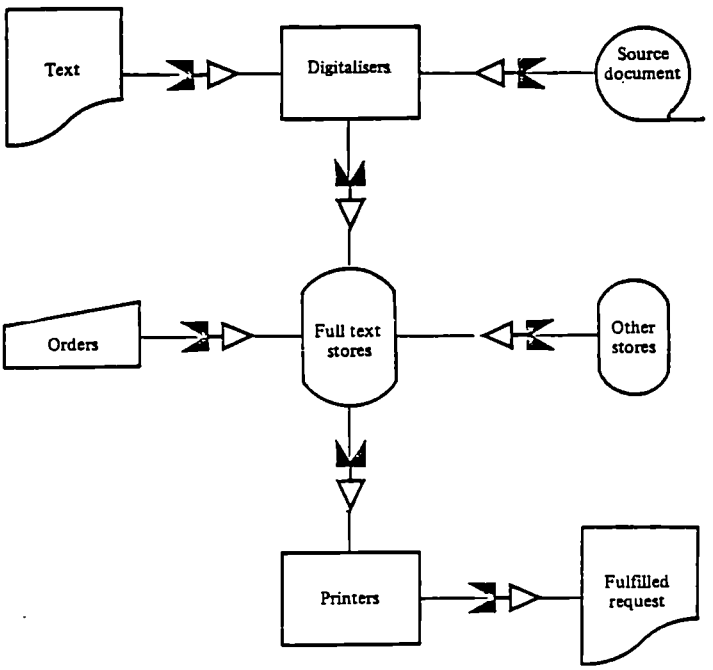


Fig. 1

binder, or indeed of the reader. Before Guttenberg it has been a habit of those who wish to publish to try to control the conduit in order to control the content. It was Guttenberg's new technology that threatened the clerical monopoly. It offered to publish the bible in the vernacular which meant that ordinary people incapable of reading Latin would be able to have access to the information. I do not need to go into the revolution which resulted.

There are different methods of storage, different methods of digitalization, and these are a matter for information providers and their hosts. They can do what they like: they can start from microfilms if they wish. Microfilm incidentally was not covered in the ARTEMIS report because we dealt with document digitalization and document teletransmission: we saw therefore microfilm as a very important and valuable input but it is not a digital technology and was therefore not within our

terms of reference. However, the value of microfilm as a starting point for such a system will be clear in a later presentation. It is up to the information providers and the hosts who start from microfilm to decide whether they will discard the digital version each time microfilm is converted or whether they will store it to be reused later. It is also up to the information providers and the hosts to determine the resolution of the facsimile images they intend to store, but they must remember that the resolution of the facsimile images that they will deliver is determined by the standards of the ARTEMIS system.

It is also a matter for information providers and hosts to determine the storage medium to be used: they can employ digital optical discs if and when they turn out to be economic. But they can also work from magnetic tapes, or if they must, from paper tapes, for all that it matters to ARTEMIS. As to the methods of input for texts for document delivery it is up to the information provider whether this is as a byproduct of his electronic publishing business, or he uses optical character recognition or rekeyboards the text. But what crosses the interface must be independent of the input method, and this includes the bibliographic reference. ARTEMIS as you remember is the goddess of the hunt, and let us hope that she will be the goddess of the successful hunt when it comes to finding references and delivering the appropriate full texts.

I would ask the information providers to compete on price, on quality of information, on the value of knowledge but please do not try to compete on the quality of printing because the whole market will be maximized if you use the terminals which are available at minimum cost and those terminals are the ones which people have already acquired for other purposes and will therefore be able to use at marginal cost.

(2) J. Thomas
Commission of the European Communities

One of the conclusions of the ARTEMIS report is that ARTEMIS is technically feasible and this seems to be confirmed by what we heard yesterday. More questionable at the moment is its economic viability; this is perhaps mainly dependent on the transmission and the terminal costs. In these areas there are perhaps too many options.

Another problem is that we have little idea what customers really want, or perhaps what they will be prepared to put up with. Also, we do not know what they would be prepared to pay, for what quality and for what facilities. In this concept facilities will include speed of delivery, and the ability to browse a previewed document before ordering a print.

We will deal with transmission costs later. Tariffs are however dependent on volume; references have been made yesterday to both coded characters and facsimile differing by an order of magnitude in the volume of bits needed. In fact, in my view, there is a whole spectrum of data volumes in terms of bits per page, depending on coding methods. At the low end of this spectrum there is simple teletex coding, requiring perhaps some 40,000 - 50,000 bits per page: at the other extreme there is Group III facsimile, which without compression and ignoring later extensions with improved gray scales and colour, will require something of the order of 4 million bits.

In between, there are interesting possibilities: for example, multiple coded character sets which must involve more bits in shifting from one character set to another. Dynamically redefinable character sets were briefly mentioned and there is a possibility of different forms of compressed facsimile. We also heard about the ability to perform character recognition

on facsimile data; this could be a factor in reducing the data volume. In my view this is another form of data compression, not a totally successful method of format conversion.

The problem is whether the aim is to reproduce as faithfully as possible a printed page, possibly including several type fonts, diagrams, half-tones, colours, etc., or is it merely to reproduce characters and symbols as carriers for words and ideas. There is probably a place, and a cost, for both.

Another factor is that almost all of the system elements described are at some point in digital form, and therefore susceptible to digital processing. There are important differences however in this respect. Coded character systems will permit subsequent processing in a textual way, for example, string searching by the use of keywords and perhaps ultimately automatic machine translation. In digital facsimile, aside from the possibility of character recognition, processing in terms of compression and picture enhancement, etc. is possible. In the longer term we may well have to look to publishers to produce documents using multiple coded character sets resulting from in-house typesetting. Even then some form of facsimile or vector definition would still be needed.

I think that the approaches taken by Pergamon and Agfa-Gevaert, for example, are basically correct, in planning to handle a mixture of both facsimile and coded characters. There is however a danger that every time a new character set is needed this would require a redefinition and an amendment to user terminals, for example, in terms of a new read-only memory. Probably therefore, the only long term solution is that of dynamically redefinable character sets. This leads me to the question of standards. New standards are undoubtedly needed, but again in some respects there are already too many standards. Some are often not known. Some are conveniently ignored. There are coding standards already for video text and teletex which are not entirely compatible, and there are additional standards for facsimile. Moreover, in the coded character area for example, ISO standards already exist for extended character sets and some 40 extended sets have already been registered, including at least four for Greek. What we really need is a standard that combines both teletex and facsimile and possibly standards to combine print fonts with the coded character sets. Nevertheless, these problems can be solved and I think that the most significant problems are not technical but those which the next panel will address.

# DO MICROFORMS HAVE A FUTURE IN ELECTRONIC DOCUMENT DELIVERY?

by

C. Goulard
Informascience, CNRS

This is a vast subject; during the presentations in Session II, we heard, from a number of speakers, about what the future will bring us, but often it concerned only the future. I noted that, in some cases, in neither the presentations nor the demonstrations were the reference documents in the call for proposals mentioned, i.e., the extracts from Science and Nature. Be that as it may, I would like to analyze the different steps which are involved in remote access to original documents, as seen from the user's point of view, and, in particular, the possible methods of storage to be utilized. Some possible choices in the creation of a database of original documents are:

-- total digitalization of all texts and their storage on magnetic media
-- a combination of informatics and micrographic techniques,
-- in which individual microforms are located by searching a digitalized index,
-- to store a digital version of the text on a digital optical disc.

It should be noted that digitalization by facsimile methods, while very rapid, requires a large number of bits per page, and is therefore expensive, particularly if high resolution is required. Nobody discussed the problem of the possible degeneration of document records stored on magnetic media.

Let us look at the possible advantages of micrographic storage in comparison to storage on magnetic media:

-- stability over time
-- good image quality

-- lower costs of capture and storage, ranging from a ratio of 1 to 20, to perhaps 1 to 100,
-- lower storage volume
-- lower access costs.

Particular advantages of magnetic media are:

-- direct and rapid access by telecommunications network
-- new investments will mostly not be required, since existing facilities can be used.

We should also consider the various possibilities in accessing the actual document:

-- the use of a visual display screen to receive digitalized copies of the document; high resolution will be required, and transformation and enlargement of the original characters may be necessary, so that an original document page may be represented by the equivalent of several pages on the screen,
-- the use of a facsimile receiver to produce paper copies,
-- the legibility of these copies may not be guaranteed in every case, even if Group III standards are used.
-- the use of microfiche or microforms delivered by post: transmission delays will be longer than in the case of electronic delivery. Shortly, teletransmission of microforms will become possible, but here again we face the same problems of legibility as in facsimile methods,
-- storage by digital optical disc, providing low cost storage with long term stability. Reading of stored records may require high resolution terminals, perhaps capable of a resolution of 2,000 lines.

Turning now to micrographic techniques which rival purely digital methods of storing and transmission, we should consider spooled microfilm with optical or binary coding. Alternatively, microfiche may be used with semi- or fully-automatic access methods, in association with digital retrieval systems. There are some interesting French developments in this area.

For the fully automatic retrieval of microfilm, the first step is to identify the frame(s) by means of the digital index, followed by retrieval and viewing of the actual frame(s) and its automatic replacement. In the case of microfiche, retrieval can be by coding of the actual fiches themselves, or by use of a digital index.

In conclusion, I believe that the combination of digital techniques using magnetic media and micrographic storage in the form of microform or microfiche will be the best solution for the next five years for the storage and transmission of scientific and technical documents, for users with both small and large demands.

# COMPARISON OF COSTS IN PROPOSALS AND IN ARTEMIS ESTIMATES

by

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## PROBLEMS IN COMPARING COSTS

Comparisons of costs for the various elements involved in document digitalization and teletransmission given as estimates in the ARTEMIS report and those quoted in the proposals are difficult. The breakdown of total costs is not identical, so that the figures quoted are not always for identical functions.

Cost details covering the complete operations of document capture and storage on the one hand and costs of fulfilling an order on the other, can perhaps be derived from the Pergamon and CSI/CIGL proposals, but not from others. This is because costs, where given for other proposals relate only to individual items of equipment, and not to functions. Theoretically one could derive a cost for digitalization by taking the rental cost of a terminal having this capacity and making assumptions about throughput and operating and overhead costs, but there is little realism in so doing.

### Differences in Activity Levels - Scale Functions

A further difficulty is the effect of scale. ARTEMIS figures for throughput were based on certain assumptions relating to text database size (10 million pages), number of pages digitalized per year (1 million) and request rate (5 million pages per year). These assumptions relate to what the authors considered to be a level of activity in a fully operational situation. The CSI/CIGL presentation was essentially geared to the requirements of a possible pilot project for which a database size of one million (compared with 10 million assumed for ARTEMIS) was specified. Further, the illustrative specification

for the pilot project, specified a request rate of 2 millions page per year. On the other hand hand , CSI/CIGL propose a digitaliz tion rate of 1 million pages in six months, as opposed to one million per year assumed for ARTEMIS. In the case of the Pergamon proposal only unit costs for capture and storage are given, not related to a specific throughput, although from other evidence it is clear that a much lower level of digitalization is assumed (11,000 pages by coded characters and 5,000 illustrations).

The degree to which unit costs per function are affected by scale functions, such as levels of throughput, cannot be directly assessed, but in any case simple comparisons of the figures quoted for capture, storage and fulfillment may be misleading for the reasons already discussed.

DOCUMENT CAPTURE AND STORAGE

The ARTEMIS estimate included collection and assembly, computer costs or scanning costs, editing, indexing and loading. Maximum and minimum ranges are quoted for coded characters as a by-product of text preparation, and by OCR. The resulting cost figures range very widely, e.g., from 0.1 to 0.7 ECUs per page for coded characters and from 0.05 to 0.7 ECUs for facsimile.

The only comparable data from the CSI/CIGL proposal relate to the cost of preparation and digitalization of the data file, i.e., about 0.1 ECU per page. For Pergamon, costs of about 1.6 ECU per page are quoted for keyboarding, but how much of this cost should be allocated to document delivery and how much to composition of the printed page is an open question. In any case, 2-3 pages per 10 page article will require the CSI image scanner.

Thus, although there is very little relevant data to be obtained from the proposals, it would appear that at least in the case of CSI/CIGL costs per page for digitalization are at the lower end of the range suggested in the ARTEMIS report.

COST PER PAGE REQUESTED

These costs in the ARTEMIS report are based on amortisation of the capital cost of a large fulfillment centre, hardware and software maintenance, general operating costs and overheads. Annual costs are then divided by the throughput assumed: one million pages per annum equally divided between coded characters and facsimile resulting in an average cost per page of 0.05 ECUs (not including telecommunications charges or user costs). There are no comparable cost data which can be derived from the Pergamon proposal, since capital and operating costs are not given. CSI/CIGL quote a total operating cost of some 12 million BF per year for the delivery of 2 million pages, i.e., 6 BF per page, or 0.15 ECU as compared with 0.06 ECU per facsimile page under ARTEMIS assumptions.

PRINTING COSTS

The ARTEMIs report quotes printing costs varying between 0.06 and 0.02 ECUs for Teletex and 0.35 to 0.10 ECUs for facsimile, not including telecommunications charges. Telecommunications costs given in the report range from 0.05 to 0.10 ECUs per Teletex page and 0.20 to 0.50 ECUs for facsimile.

The ARTEMIS report derives cost per page by making assumptions about the number of pages required by small and large users (of the order of 1,000 to 10,000 pages per year respectively). In comparing user costs as indicated in the proposals with ARTEMIS, it is not necessary however to make assumptions about throughput, since comparisons can be made based on equipment costs.

| | TELETEX | FACSIMILE |
|---|---|---|
| ARTEMIS | 2,000 to 10,000 ECU (purchase) | 400 ECU p. month (rental) |
| DATA DYNAMICS | 10,500 ECU (purchase) | |
| PERGAMON | 1,800 ECU (purchase - no printer) | |
| IBM | 1,250 ECU p. month (rental) | |
| 3M | | 380 ECU p. month (rental) |
| SIEMENS | 8,000 to 10,000 ECU (purchase) | |
| CREL | 3,500 ECU (purchase) | 430 ECU (purchase) |

It should be noted that the terminals (character and facsimile) of which prices are quoted differ widely in their functions. For example, the IBM 6670 printer cannot be compared with a word processor terminal such as that offered by Siemens or Data Dynamics. On the whole however, the costs are within the ARTEMIS estimates.

# AVAILABILITY OF SATELLITES FOR DOCUMENT DELIVERY

by

S. Hanell
European Space Agency

The present state of the development of communications satellite systems promises that a new era in the evolution of telecommunications in Europe is approaching rapidly. The first operational system, the European Communications Satellite system (ECS) will be launched in 1982 followed by the French domestic system TELECOM 1 in 1983. TELECOM and ECS, as originally conceived, have different objectives. ECS is aimed at providing capacity for international telephone traffic and television distribution (Eurovision signals) between large national earth stations, while TELECOM will offer specialized satellite services to domestic French users, using modest earth stations located close to the premises of the users. In view of the growing interest in specialized satellite services in Europe at large EUTELSAT has decided to add repeaters similar to those of the TELECOM satellites in the payloads of the ECS satellites. Because of the closeness of the launch of the first ECS satellite in February 1982, the specialized repeaters of ECS can only be introduced in the second flight model planned to be launched in the autumn of 1982.

One may of course ask how the early introduction of specialized satellite systems in Europe concerns the development of document delivery and retrieval systems. The answer to the question is in fact already given in part at least by yesterdays presentations. Equipment and imaginative systems directly suitable or adaptable to an open document delivery service in Europe and capable of operating with digital speeds covering the megabits per second range appear to be, if not state-of-the-art, in a state of development that promises that the systems can be made available to document delivery services within the next few years.

In fact the specialized satellites offer an ideal medium for data transmission systems such as a document delivery system. For example, the high speed digital satellite link is well suited to match requirements of efficient transfer of long data messages such as the digital records of document pages. In addition the volume of traffic in a future open document delivery network in Europe will probably be such that only the satellite link can provide the necessary capacity in conjunction with a flexibility and versatility required of the system.

Two types of system can be expected to become available in Europe to document delivery services, perhaps in the next two or three years. The first involves community or city earth stations mainly intended to serve interenterprise traffic. The stations will be located probably in major cities or business centres in Europe. The applications of this system will support the development of office automation systems and as such they will be very closely related to document delivery applications. Users will be connected to the earth stations via wide-band terrestrial local links which could be cables, or more probably optical fibre lines. A point of specific interest for the document delivery system is that the satellite channels are used to complement the terrestrial data network. The user performs his search on a bibliographic database via the terrestrial data network: once he has obtained his references to primary documents he will order the documents over the terrestrial network. However, because of the size of the data message corresponding to the document texts, these are transmitted via the satellite link to a community earth station located in the vicinity of the user; possibly the document could be forwarded to the user from these earth stations via a document fulfillment centre or there might be a local mail service or a local electronic delivery of the document involved.

There is another possibility: in this a community earth station is used to transmit the text of the document from the document database to the user's premises. The user is equipped with a small fairly low-cost receive-only earth station and the bit rate he receives can easily be adjusted to the user terminal requirements. The remaining functions in this system are identical to those of the first system.

# WHICH PTT TARIFFS CAN BE EXPECTED, FAVOURABLE FOR ARTEMIS?

by

J. Thomas
Commission of the European Communities

The question of tariffs is difficult: reference has been made to the use of Euronet for document delivery. There is perhaps a possibility of bulk discounts in Euronet, but the PTT's will not agree to that at the moment. There are however precedents: for example, Die Bundespost offers a bulk discount in Germany.

Bulk discount possibilities may not however be relevant in trying to bridge the gap between the cost of the low volume of coded character transmission and the high volume of facsimile, even with compression. The cost of transmission via Euronet is such a significant element in the overall cost that a 10%, a 20%, or even a 50% discount by the PTTs would not represent a significant reduction in the overall cost. We should perhaps be thinking of alternative means of transmission.

In the case of satellite transmission, we do not have a very good idea at the moment on what the tariffs might be. In looking at other possibilities it may be that even a normal international telephone circuit with 4800 or 9600 half duplex modems would probably work out cheaper than Euronet even with a bulk discount. This is because document delivery is a large one-way transmission not ideally suited to a packet network.

We could look at not only satellites but an interesting new area not yet referred to; this is television broadcasting: a method of encoding data with the video signal on the lines of the CEFAX and ORACLE systems might be considered. Further, the coding method used in the French DIDON system is very flexible and it allows the use of the whole band for data transmission. This could provide a six megabit bandwidth, more than in the case of some satellites.

Again we have no idea at the moment what the costs might be. We must however study all these alternatives to use of the network.

# QUESTIONS FROM A POTENTIAL USER

by

D. Raitt
ESTEC , European Space Agency

A potential user of an electronic document delivery system will not concern himself with the technicalities of how the documents - articles, papers, reports - he needs are digitised, stored and transmitted. He may not even be bothered about where the store is located, nor will he care greatly about copyright problems. He will be much more concerned with how fast, how conveniently and how cheaply he can get a copy of what he wants. What a potential user will want to know, then, are answers to the following questions:

- to whom must I place my request?
- how must I do it?
- what are the chances of my request being fulfilled?
- how much will the service cost and how do I pay?
- what equipment do I need to receive the documents?
- and how much will that cost?
- what will the quality be like?

The user will want to request documents in a convenient way involving a minimum of administration, bibliographic checking and form filling. He wants to be sure as well that the centre to which he sends his request will have a better than average chance of fulfilling it - quickly. In the event of non-fulfillment a fast negative response is just as important. Since we are considering an electronic document delivery system, then the user needs to be able to receive the document preferably on his existing equipment (terminal, printer, fax machine) at a time convenient to him and with a quality dependent on the context - high for graphics and pictures; lower for text. Costs will play an important role - costs of installing any receive equipment and costs for the service which may vary depending on whether it is rush or normal. Convenience in

paying will also be required such as deposit accounts rather than prepayment or fiddling with coupons.

Many existing document delivery systems are very cheap, very quick and good at checking missing bibliographic details. An electronic document delivery system will face strong competition from established traditional services. Even though the costs for electronic delivery and traditional delivery will be virtually identical and despite the fact that there will be a saving of a day or two in speed (mainly the postal delay), it may be that librarians and the like will be slow to convert simply because they are traditionalists for the most part and a day or two saving is not worth the hassle and cost of installing equipment unless it can be used for some other purposes.

# SERVICE OPTIONS

by

J.R.U. Page
International Institute for Applied Systems Analysis

I would like to echo what Neil Blake has said about not locking ARTEMIS into a technology soon to be replaced: he stressed that we should do everything to preserve technical flexibility so that we could take advantage of the developments in the automated office which are likely during the next few years. To this, I would like to add another dimension of flexibility which we ought to build into the system. There are a number of institutions and types of organizations which are going to be concerned with electronic document delivery: but just as we should avoid freezing the technology, we should also try to promote diversity in the way ARTEMIS is organized, so that we can take advantage of new service ideas which may result from different institutional arrangements.

If we consider service options in this light we might perhaps begin by looking at what options are open at the producers or publishers end of the business. As we have heard, at least two major scientific publishers are taking an active interest in this field, and are seeking cooperation, not only from other publishers but from other organizations in the document supply chain. Another option which has received a brief mention, is the idea of a service bureau operating in support of a number of publishers: existing document supply centres might provide such a service. While we should encourage all such steps in the direction of increased flexibility and diversity of services, we must avoid creating a Tower of Babel situation, in which the user will be lost among a number of competing but to a greater or lesser extent, incompatible systems. While in the longer term, we might look forward to a combination of standardization of computer composition systems between publishers, and something in the nature of the dynamically redefinable character set, to solve one set of problems,

and a unified Teletex/facsimile standard to solve another, we may not be able to wait for all this to happen. In the short term therefore the user may be faced with difficult operational problems in maintaining his options to get the best out of the systems and services he is offered.

The problems could be solved by removing them from the end-user and his librarian or information officer, allowing a broker-type intermediate document delivery service to take over. Such a service would receive documents from the supplier using a variety of sophisticated equipment, capable of dealing with various forms of coded character, hybrid or (medium and high resolution) facsimile systems. Individual documents would then be passed to end-users, using whatever facilities were convenient to them, including by-hand delivery. While this solution has its merits, it has considerable disadvantages: delivery will not be immediate, and this, in the user's eyes must detract from the service as a competitor to the photocopy services offered by existing highly efficient document supply centres. On the other hand, a combination of a practicable degree of standardization at the producer's end and the growing possibilities of cheap intelligent terminals at the receiving end, would suggest that we should keep the direct-to-end-user delivery option open as an integral ARTEMIS feature. We might need a black box somewhere in the system as a kind of translating device to provide compatibility: a common command set in reverse for document delivery.

Although it is clear that facsimile methods and coded character methods of document transmission differ by a factor of ten in the number of bits required per page, this difference may not be particularly relevant from the user's point of view of the service he obtains, except of course, to the extent that (as at present), facsimile is required to transmit "difficult" text and graphics. With current tariff systems, based on packet switched network operations designed for interactive traffic, bit-volume is the decisive factor in the bill paid by the user. In the document delivery case, it will be important to preserve the option of facsimile versus coded character transmission, and therefore, we should encourage the PTTs to introduce experimental tariffs which do not penalize users requiring the facsimile option. There are precedents for PTT tariffs in which volume of information transfer plays no part at all, and in the short and medium terms, I believe the maintenance of volume-dependent tariffs, rather than time-and-bandwidth-dependent charges will inhibit the user's options, but are also not in anybody's best interests, including the PTTs.

To sum up, we need to preserve both technical and organizational flexibility in the early implementation of ARTEMIS. This will involve us in practical and organizational problems, among which is the (unknown) time which must elapse before adequate standards for character and graphics representation, and the necessary resolution in the case of facsimile can be universally adopted. Meanwhile, the user must be able to choose what he needs from a variety of offerings, and he must be able to use inexpensive equipment, not solely dedicated to document

delivery, irrespective of the source of document supply. We must avoid creating an opportunity for monolithic monopolies in terms of a single-supplier-dominated system which determines what the user can receive, how he can receive it and the price he must pay, whether the basis for this is technical or otherwise.

Considering what we have heard so far, I think it would be very difficult to maintain that public bodies, such as the Commission, could entirely opt out of the situation. As yet, we have little knowledge of what the user really wants in this area, what are his relative priorities and what sort of service mix he expects. The elucidation and quantification of user need is an activity which, in my view, is a matter for collaboration between the information industry and the public sector. In addition, as we have already discussed, there are particular problems in standardization, in organizational matters, and in definition of a user terminal, which should be tackled if we are to ensure that a satisfactory range of service options is availabe.

# USING OPTICAL MASS STORAGE FOR A DECENTRALIZED SCIENTIFIC INFORMATION SYSTEM*

(written contribution** following an oral presentation
by K. Haefner
Universitaet Bremen)

## THE BASIC CONCEPT

Technical demands for scientific and technical publications can be satisfied in the eighties in two alternative ways:

(a) Via telecommunication systems and online computer access as planned in the ARTEMIS concept (1) or
(b) via copying databases as well as primary publications more or less completely on inexpensive optical mass storage and distributing those periodically to subscribers which read the relevant information selectively with an appropriate reading device.

Both approaches are felt to be technically feasible within the next years (2). Which one will be the best and most user-oriented has yet to be shown.

This note describes activities for specifying the second solution within our project "Pilotanwendung optischer Massenspeicher fuer dezentralen Informationszugang" (POMDI). It is planned to develop a prototype system and to run a pilot project later on studying economy, user acceptance and practical issues.

* Supported by Bundesministerium fuer Forschung und Technologie, Bonn.

** By A. Hasekamp, Philips Data Systems, Apeldoorn, Holland; H.E. Seelbach, KTS-Informationssysteme, Munchen, Germany; and C. v. Consbruch, Fachinformationszentrum Energie, Physik, Mathematik GmbH, Kernforschungszentrum, Karlsruhe, Germany.

## INFORMATION FLOW IN THE DECENTRALIZED SCIENTIFIC INFORMATION SYSTEM

The basic idea is shown in figure 1. Publishers, database providers, and other institutions provide their information to the "Fachinformationszentren" which organize information in digital or video format and compile it properly. From this information pool copies on optical mass storage are made in appropriate numbers and distributed periodically by mail to the end users. There the optical mass storage can be used either:

(a) with a read only device allowing only access to primary information or
(b) with a device allowing for retrieval from the database as well as reading primary information or
(c) by a more complex device allowing retrieval, reading and recording of new documents.

Users will choose the device most appropriate to their own needs. The isolated scientist will prefer the first system, smaller research institutions will use the second type and larger technical and research institutions will acquire the last type, allowing them to store their own documents.

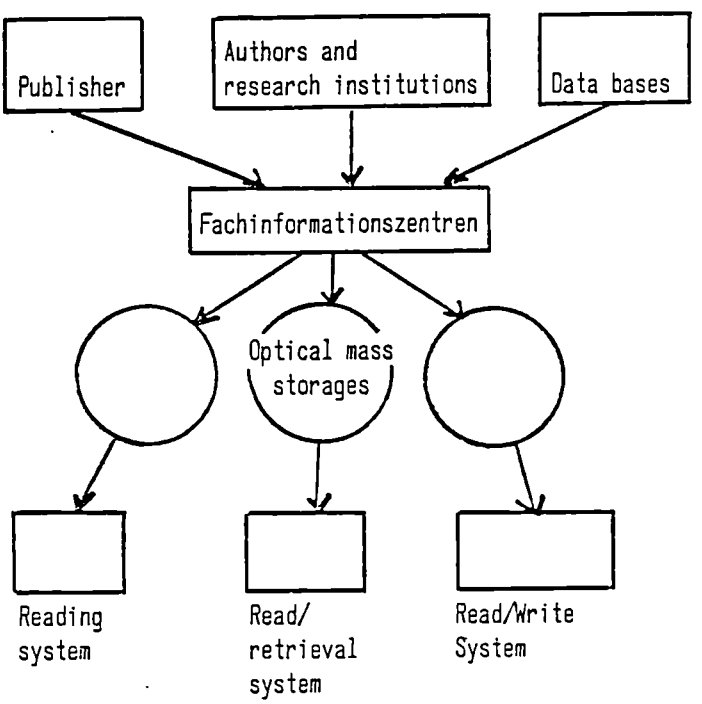



Fig. 1: Information flow in the decentralized information access system

Figure 2 A-C shows the basic hardware components of the reading devices. Retrieval will be supported by a modified DOMESTIC system (3).

## ADVANTAGES OF THE PROPOSED SOLUTION

Comparing the proposed concept with ARTEMIS the following advantages seem to be evident:

(a) Usually no telecommunication is needed,
(b) retrieval and access to primary information can be carried out in complete privacy,
(c) combined retrieval and full text browsing is always possible since documents and databases are available simultaneously, and
(d) clear cut copyright solutions and a straightforward user fee policy can be realized since all information comes from a single authorized information provider, the "Fachinformationszentrum."

## PRESENT STATUS

At present the technology of the system components are being studied. This will result in a complete specification of the system, in spring 1981. A prototype is not likely to be available before 1983, allowing for first trials. A pilot implementation will probably be in operation in 1984. .

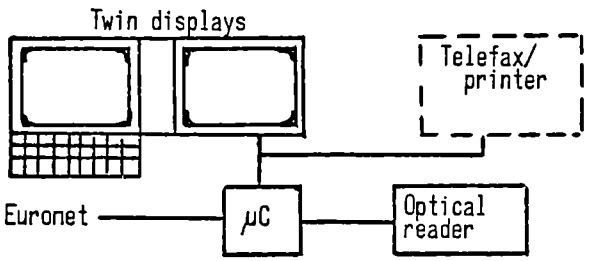
There are still problems of representing alphanumeric, alphagraphic, and pictorial information in digital form. These problems must however also be solved for ARTEMIS.

## REFERENCES

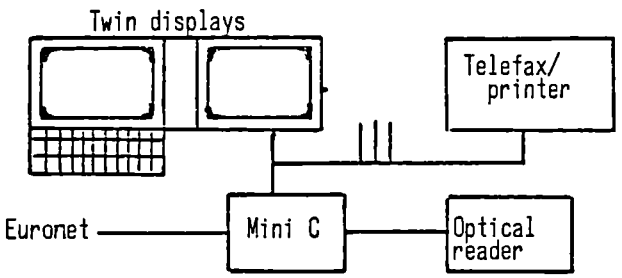
(1) Arthur D. Little: ARTEMIS. Report to Directorate General of the Commission of the European Communities. April 1980.

(2) A detailed discussion of the balance of centralized and decentralized information access systems for the end users can be found in Haefner, K.: Der "Grosse Bruder"--Chancen und Gefahren fuer eine informierte Gesellschaft. ECON, Dusseldorf, 1980.

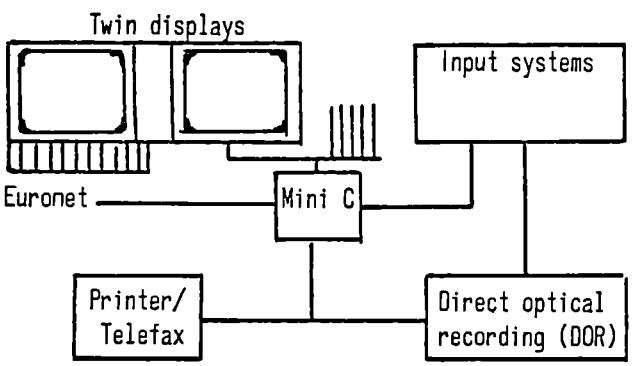
(3) DOMESTIC is a software product of KTS-Informationssysteme, Munchen, Germany.




(A) Reading system




(B) Reading and retrieval system




(C) Reading, retrieval, and storing system

Fig. 2: User's system for information access

## DISCUSSION

*R. Clough, ICI Ltd., Agricultural Division*

I would like to address the question of the cost of coded character output and the difficulty of standardization in this area. A simple daisy-wheel printer can cope with about 96 characters, sufficient for most administrative purposes: doubling this capability will allow one to deal with most scientific character requirements. A publisher might require 800 to 900 characters to give his products a pleasing and appropriate appearance, and he will also need to cater for different type fonts. Even in a simple case, there will be the additional problem of formatting instructions to define the shape of the text as it arrives on the receiving device. My premise is that as one moves from the simple case to more complex cases, costs must escalate very rapidly and the difficulties of achieving standardization between different systems become very great, so there is little prospect of achieving this in a reasonable time. My question to members of the panel is to what extent will new technology flatten out this cost curve?

*A.R.D. Norman, Central Policy Review Staff*

This question was raised during the presentation of the ARTEMIS report; we felt that we should not allow the best to be the enemy of the good, and if we were going to wait for the best to be available, we would never get started at all. Therefore, we recommended that we should start small, cheap and simple, using what standards were already available. Getting agreement on advanced standards is itself a very expensive and time-consuming operation.

*R. Maxwell, Pergamon Press Ltd.*

The answer to Mr. Clough is plainly no. Fully automatic type setting methods able to deal with very complex character sets and type fonts will remain complex and expensive and there is virtually no prospect of reducing these to the cost levels of daisy-wheel printers.

*N. Mark, Statsbiblioteket, Universitetsparken, Aarhus*

I find that the ARTEMIS report overestimates the expected use of a document delivery service, and that in particular it overestimates the need for a quick document delivery service. Many users are satisfied with delivery of the requested material within a week or two, and I am convinced that if the users are given the choice, the majority of them will prefer a free of charge loan through the existing interlibrary loan system to a day to day delivery, for which they have to pay.

In certain cases, e.g., when some kinds of "grey" material are involved, it may be difficult and often takes a long time to get a copy. In such cases, an electronic delivery service will be of great interest to the users.

To conclude, I suggest further investigations of the users' needs in an electronic document delivery service. It must be taken into consideration, that the major part of the document delivery today is given as free of charge loans. Moreover, I recommend that the library organizations in the member countries should be involved in these investigations.

*G. Morganti, SIP*

In my view ARTEMIS is one of our first opportunitries to bring together those concerned in distributing digitized textual information. The three partners are the telecommunications industry, the information industry and the terminal equipment manufacturers: to make it work requires that all three partners operate together. For electronic document delivery, we have to ensure that the partners work hand in hand to give the user the most economic system possible which will have some chance of market success. It is important to keep the user always in mind and for this reason we should look more closely at systems which deliver documents direct to the end-user. We should also not forget the publishers' requirements. Finally, we must become involved with standardization and this means the telecommunications world as well as the terminal manufacturers.

*D. Borrey, Corrèlative Systems International*

We, in collaboration with CIGL and Pergamon, were among the few who were able to give a price for a full service. We at CSI have some experience of the market: there is a market, but at a price. We have found that clients will pay for the

sort of services that can be provided if the information transfered has sufficient added value to justify this price. We, like all the other equipment manufacturers, have to decide whether we can supply equipment at a price the market will bear: two years from now the pressure of an expanding market may enable us to push the prices down, and then we can probably afford to go to other, cheaper applications. But as of today I can guarantee you that there are people willing to pay the current prices for value-added information delivered immediately or in one hour or in five hours. What we should do now in document delivery is to go ahead and give EURONET users the possibility to get documents at a satisfactory price. We should not worry too much about terminal costs: they are bound to come down. Secondly, it is not possible today to manufacture equipment at a price which will be economic for single dedicated applications. Manufacturers should therefore design equipments to meet a number of uses. For example, word processing stations with a graphic memory make very good document delivery terminals, so we should also be looking at integrating word processing terminals with facsimile, and taking advantage of whatever equipment potential users already have.

*R. Barrett, School of Engineering, Hatfield Polytechnic*

The title of this panel should have perhaps included acceptability as well as economics, and in this connection I would like to refer to the points stressed by Mr. Page in his remarks on the need to establish user reaction to these systems. We at Hatfield, with support from the British Library have been operating an experiment in which users can be directly supplied with document copies following a bibliographic search. This is currently based on a microfiche document file, and perhaps later we will be able to use optical discs. We have been collecting data on the reactions of users (the scientific staff, librarians and students), and it is clear that the acceptability of these systems is largely a function of the interest shown by users, particularly librarians, in what the system can do to help them in their work. I think it is important for the Commission to help organize and support trials designed to establish user reaction on a wider scale.

WRITTEN CONTRIBUTIONS

*D. Balabanov, United Nations Economic Commission for Europe*

Many speakers have observed that users' terminals will not be 100 per cent devoted to the receipt of full text documents from host computers. They will also be used for satisfying user needs in processing what might be termed "office documents" - such as purchase orders, invoices, correspondence and other paperwork that cannot be avoided in the day-to-day activities of any enterprise.

For this purpose terminals must have the capability to produce and receive the complete text of such documents. During this Workshop, many comments have been made on the manner in which different characters and simple graphics could be reproduced on present and future facsimile and teletex terminals, but this presents no problem in the processing of office documents. In that context, another problem arises - which is far too little known and discussed - that is, the technical problem referred to in facsimile as the "guaranteed reproducible area".

As early as 1963, the United Nations Economic Commission for Europe was recommended a Layout Key for Trade Documents by an intergovernmental Working Party on trade facilitation. Since then, this standard has developed into the United Nations Layout Key for Trade Documents on the basis of which a United Nations system of aligned international trade documents has been built, and many national series of aligned trade documents have been established. The system now comprises more than eighty international model forms recommended for use by 16 international organizations representing different spheres of business and transport activities. Many of these model forms are included as mandatory features of international (transport) Conventions.

Worldwide acceptance of the system is reflected also in the fact that ISO used the Layout Key as a basis for its international standard ISO 3535, "Forms design sheet and layout chart", and for draft proposals for two international standards: ISO/DP 6422, "Layout Key for trade documents"; and ISO/DP 6423, "Invoice Layout Key" - which will soon become full international standards.

Trade documents are therefore increasingly frequently based on these standards. In practical terms, this means that an A.4-size document can allow a very limited loss area due to margins - namely, not more than 20 mm on the left, 10 mm at the top, 7 mm on the right, and 7.6 mm at the bottom of the document.

Although it appears that Group III facsimile machines and teletex terminals, would generally allow this area to be reproduced, it is at present not requiredto do so; the recommendations adopted by the VII Plenary Assembly of CCITT in November 1980 specify a lesser guaranteed reproducible area than the one required for an A.4 format document based on United Nations and ISO standards.

This means that a terminal which fully complies with the CCITT standards might not be suitable for transmitting office documents - at least not standardized trade and transport documents.

In fact, among the limited number of very advanced machines which were demonstrated at this Workshop, at least one has the lost top margin twice as large as can be permitted for the trade documents - resulting in the loss of the first 3 to 5 lines of the document, containing its title and number, the name of the sender and other basic information.

Therefore, users would be well advised when ordering a terminal to pay attention to the very important factor of the reproducible area in order to avoid the frustration of acquiring a terminal with only limited usefulness.

The following advice should be given to producers: if you want to sell your terminals to a wider range of enterprises, do not neglect the requirements for the reproducible area in ISO standard 3535 and in the United Nations System of Aligned Trade Documents.

*A. Horder, The National Reprographic Centre for Documentation*

It would appear that clarification is needed as to what the word archival means in the context of ARTEMIS and as to the requirements in respect of storage life of the different stores in the system.

In the ARTEMIS report it is stated that "all suitable storage devices in the range $10^9$ to $10^{15}$ bits are classified in data processing usage as archival" (page 33). This is not the understanding of the word in the world of the archivist where archival means "permanent" or "for ever"*. A digital optical disc presented at the workshop is described as "currently having an archival lifetime of more than 10 years". This is not archival in the sense of the word as used by the archivist.

In this connection it is unfortunate that the use of microforms for on-line storage was discounted by the ARTEMIS report (see appendices to ARTEMIS report page 34). As the presentations from Altergo and Antone Systems showed, microforms are currently being used in a number of on-line document delivery systems and others are in the process of development. Microforms are capable of providing on-line archival storage using the word in the archivist's sense and - unlike most other optical storage media - they are available now.

*I.A. Galbraith, Mackintosh Consultants Company Ltd., Communications & Information Systems Division*

USER NEEDS

It would be unfortunate if the Commission were to embark on a pilot project without assessing the needs of a target set of users. Any service which uses technology to solve real user problems stands much greater chance of success. If the Commission wishes to exert a real influence on market developments, it would be more appropriate and useful if it were to investigate or commission research into the real needs of users before investing in what might risk being irrelevant projects. Among the questions which need urgently to be addressed are:

- Who are the potential users of an electronic delivery service for primary documents?
- What are their real needs now?
- How do these needs vary among different users?
- How will these needs change in future?
- How many users of each type are there?
- How many of these users are likely to utilize a new service?

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* see e.g., Dialogue on Standards: Archival Permanence, Journal of Micrographics, 9(4), 193-194 (1976).

IMAGE QUALITY AND RESOLUTION

The Group III facsimile standard does not provide adequate resolution for many document images. It will not, for example, resolve footnotes in a document (e.g. four point type). For storing document images, a resolution of at least 300 dots per inch (12 dots per millimeter) is desirable. This may require using a document scanner with even higher resolution to avoid the problem of Moiré fringing. A Group III facsimile scanner is of limited real use where arbitrary documents are concerned.

Group III facsimile receivers may be satisfactory for many applications, but an over-emphasis on their use may be a 'red herring' to some extent, since the installed base in Western Europe is only a few thousand.

The Commission should work towards ensuring that an enhanced teletex standard, possibly incorporating the Group IV facsimile standard, will allow transmission in standardized form of much higher resolution images than Group III. The potential exists within the teletex standard to allow this.

For document display a 2,000 line VDU will be essential, and will allow soft copy of similar quality to Group III facsimile hard copy. Such displays could be produced at low cost if the market were big enough, though a major component of system costs will be the large refresh memory required.

TELECOMMUNICATIONS

For browsing/skimming through a document, a response time of under one second per page is desirable (as is possible with conventional documents). This implies a transmission rate of around 1 megabit per second. Thus any service that involves remote access browsing to page images will probably not be viable for many years.

STORAGE MEDIA

There has been a tendancy to dismiss micrographics but several important points should be noted:

- Direct-Read-After-Write (DRAW) microfilm materials are being developed which offer the possibility of greatly improved and automatic quality control.

- Digital information can be stored on micrographics media, and so mixed direct (analogue) image and digital informat could be mixed on the same medium.

There is an overlap between conventional micrographic media and optical disc technology. For example, you can already buy silver halide optical discs. And for long archival life silver halide is likely to remain the optimum material for most of the 1980's.

WORD PROCESSOR/TELETEX

High quality ink-jet printers costing little more than daisywheel printers will be available in the early 1980's; alternatively, laser printers may be shared by several word processors or teletex terminals. These non-impact printers will be sold initially with an emphasis on their being silent but they will also provide multi-font and graphics capabilities. It would be appropriate for the Commission to encourage the development of the teletex standard to accommodate the capabilities of these 'text-and-graphics' products.

*D.I. Raitt, European Space Agency*

I think that the figures for the number of pages an average centre might wish to receive were too high - by maybe a factor of 10. Taking ESTEC as an average library we would probably only have a demand for some 50 pages/night maximum whereas the figures quoted were 2000 pages (teletex) or 500 fax/night.

COSTS PER PAGE

I have looked at the costs per page for traditional document deliveries from CNES, BLL, ESA and DelftTH, and compared these to some US prices for deliveries (of photocopies). The charges varied roughly between $0.20 and $0.45 with another grouping around $1/page. For deliveries within 24 hours, surcharges are payable, perhaps around $5 to $7.

According to the A.D. Little report over-night delivery at reduced PTT rates will give similar costs. Now the Intelpost service via satellite from Toronto to New York/Washington enables the counter collection of an A4 sheet within one hour for only $5.

This indicates that new technology can compete favourably with traditional methods. The SBS Satellite is expected to save its users between $2 million and $20 million/year in the long term from their current spending of $85 million/year on mail/travel/data processing. And still on satellites - it does of course cost the same to phone the USA from Europe whether the link is established by cable or by satellite.

STANDARDS

Everybody wants standards, it may be observed that the USA has not yet defined standards for videotex because the technology is developing so rapidly that standards have the effect of freezing it at a given time.

I & D REQUIREMENTS VERSUS OFFICE AUTOMATION

I think the Commission has a role to play in deciding whether the industry should concentrate on the I & D area or whether it should include the office/business area. The conference was confusing in this respect, although some of the problems are the same. I believe that user needs must be taken into consideration at an early stage and that meetings should be sponsored by the CEC between users, equipment manufacturers, service suppliers etc. to avoid the situation you have at present in the terminal market. Here, it seems to me, that terminal manufacturers have production lines set up and just churn out terminals giving features which are convenient to them to make. For example - as a user I need a terminal with a video output (for monitors), a non-erasable small memory to store my EURONET passwords (to avoid me typing out thousands of characters each time), multiple speed settings (e.g, 300, 1200/1200, 1200/75, 2400, etc.) - but can I find one?

# SESSION III

## PANEL 2

## ELECTRONIC PUBLISHING - THE CHALLENGE

C.C. LEAMY
CHAIRMAN

# IMPACT OF NEW TECHNOLOGIES ON PUBLISHING

*C.C. Leamy, The British Library;*
*Chairman of the Task Force on Document Delivery*

One of the reasons for the Task Force's caution in this area is our view that the market for information and the publishing market itself are extremely complex. There is not a direct parallel between the ARTEMIS and EURONET concepts: in the case of EURONET, there was a market waiting for the kind of services which the technology could bring. We are not clear that there is a market waiting for ARTEMIS; further, in the case of EURONET there were rather few organizations and institutions which had to be involved in the detail planning, while in the publishing and information provision area, there are many interests which need to be involved. Under these circumstances, it is probably very unwise to try to select one particular technology. This workshop should therefore try to provide users, producers and information suppliers with an opportunity to reflect on all the possible technologies: it may be that several will succeed rather than one, and in this respect, it has already been pointed out that the main driving force is more likely to be provided by office automation requirements than those of document delivery as such.

# DEFINITION OF "ELECTRONIC PUBLISHING"

by

H. Collier
Learned Information (Europe) Ltd.

I have been asked to give an introduction to Electronic Publishing and to give you some idea of what I think Electronic Publishing is about.

From the beginnings of time until the invention of the printing press in the fifteenth century, information was transmitted somewhat restrictively either by word of mouth or by means of handwritten messages. The printing press introduced in effect what was a revolution in the field of the transmission and the storage of facts, ideas and opinions. An enhancement of information storage and dissemination was added by such diverse recent developments as radio, microfilm, television and by records and tapes. The early 1970's saw the advent of the computer in this field of information storage and dissemination and, with the arrival of the computer, the new storage medium offered a new tool or dimension to "publishers".

I take "publishers" to be a body of people with an expertise in the identification of on-going information and a body of people who systematically compile the necessary information, package it in a form at a price acceptable to the marketplace and then arrange for its distribution. Traditionally, in the past, publishers always packaged the information they had assembled on paper and they then distributed this information via booksellers, journal agencies or on news-stalls.

With the advent of cheaper computer storage, efficient and automatic telecommunications and effective interactive software, publishers could now install their information on a computer somewhere-or indeed even on their own computers - and allow people to access their information electronically

using the telecommunication channels. Information thus made available need never go through a typesetting process.

Essentially, therefore, Electronic Publishing couples a user's terminal or access device to a store of information held on a computer somewhere using some form of electronic communication. Essential to the concept of Electronic Publishing are the access device, computer-store and electronic communication. The access device may be a terminal, a modified television receiver, a telex machine, a word-processing machine or indeed another computer. The store of computerised information may be references and abstracts, facts and figures or complete text. Electronic communication may be via telecommunication lines, via data networks, leased lines, or, at least in theory, radio waves. The information thus accessed may be available to anybody or available only to a restricted group, although the concept of "publishing" involves the concept of making something available to the public.

"Electronic Publishing" therefore involves all that we can sum up in terms of online retrieval, of videotex and teletex. I feel that far from being a threat to publishers the new possibilities opened up by Electronic Publishing provide a series of new possibilities for publishers to increase their flexibility and to apply their expertise in a variety of new areas. Traditionally, when a publisher received an item he evaluated its content to decide whether it was suitable as part of another book or symposia or whether indeed it could be included in a journal as a journal article. Now the publisher has a wider range of options - he could also evaluate whether the item is more suitable for adding to a computer store somewhere so that it may be retrieved by some electronic process.

To give an example of this, at Learned Information we publish a couple of journals in this field: Online Review and Electronic Publishing Review; starting with the news sections of both of these, in 1981 we will also make available the news information via a central computer store as well as in the printed form. This means that people who wish to access the news quickly or who wish to delve back into the news ultimately for the last few years, will have the choice of either thumbing through printed editions or of going directly to a computer using their own terminals and of retrieving the information themselves after having first conducted some searches to identif exactly what they want. In this way, Electronic Publishing gives the user a greater range of possibilities and it also adds new areas of possibility for the publisher.

I feel that in this short introduction with a specific example from our own company, I have probably given you enough to give you some flavour of what is meant by Electronic Publishing.

# WHY PERGAMON IS STUDYING DOCUMENT DELIVERY

by

R. Maxwell
Pergamon Press Limited

Until quite recently the main occupation of publishers of professional publications was encouragement of the authors and projects, the generation of a reputation for quality and timely publication, and the provision of adequate coverage in the chosen subject fields. These tasks are now however quite inadequate if publications are to play any significant role in the new services such as we are discussing at this Workshop. The habitual activities just described are intellectual pursuits which have not altered from the days of what was known as the gentleman publisher who provided an element of encouragement and patronage to his authors.

In that environment the problems of manufacturing and distribution were separated not only in attitude of mind but also often physically. Few publishers owned their own printing plants and certainly in the book area there was declining interest in the distribution process. As a result publishers were concentrating on the input end of the whole publishing process and mainly on the intellectual portion of that. Editors were chosen in that era for their knowledge of the subject area, their appreciation of events and trends in the field plus their knowledge of those people in the field who would make good authors, contributors or advisors to their journals.

This attitude in the past decade has made many publishers overlook the changes that have occurred in the field; many of these changes have been pioneered by what has been regarded as the "poor relation" of publishing - the secondary services.

Not for them was the glamour of announcing new research results, or issuing new titles, and often there was little if any profit in the provision of their services. No wonder that

primary publishers regarded the secondary services as necessary adjuncts to provide a central indexing service. After all that was all they did. They did not provide articles, their only role was to provide signposts to publisher's literature. So one can see how the pioneering efforts among the secondary services to produce computer-composed publications got scant attention. True, primary publishers were developing such systems and using them but there it stopped. There was no attempt to use these machine readable records for other services, while in the secondary services due to the comprehensive nature of their product plus the short record lengths, it was worth experimenting with on-line applications. Thus, while the publishers of secondary services were quick to appreciate the possibilities which computerisation could offer, primary publishers have been very slow to catch up.

## TODAY'S NEW CHALLENGE

Now as the technical scene has changed, with storage costs for machine records plummeting down, publishers and the secondary services now both realise that one phase of the development is over. The problem of identifying where material was published is solved. The problem now is "how to get the document". Publishers are beginning to realise that their role is not only to identify and commission material suitable for publication but also to ensure that it actually is available to the end reader or user.

Publishers must get back into all aspects of their task from origination to final delivery in whatever form, print or electronic. We at Pergamon are not only involved in the production of 300 technical journals, but in Pergamon-Infoline we have an on-line capability and we see electronic document delivery as a natural partner to these activities. That is why we are undertaking the development presented here. We intend to continue in this business, and look forward to making our contribution to solving the problems, not only by ourselves but in collaboration with any other organization that wishes to join with us. As you know we have very close links with VINITI, with whom we are also working in the document supply area.

# THE BIG PUBLISHER'S INVOLVEMENT IN DOCUMENT DELIVERY

by

Barrie T. Stern
Elsevier Science Publishers

For more than a year, Elsevier Science Publishers has been carrying out research into the problems of document delivery. As publishers of several hundred scientific periodicals, we feel that publishers have the best opportunity to make available their content. Results of a survey made earlier this year in collaboration with the British Library Lending Division provide accurate details of the volume of requests for each title. The mass storage of the whole of the primary text is now technically and economically feasible. Discussions have already commenced with a number of different equipment manufacturers in Europe and in North America with a view to establishing a pilot scheme in 1982-1983.

# HOW COULD SMALL AND MEDIUM SIZED PUBLISHERS ENTER THE ELECTRONIC MARKET

by

C. Bradley
The Publishers Association

I do not think it would be out of order if I were to stretch my terms of reference slightly. I think my job is not just to speak for small and medium size publishers but for all publishers, large and small, who may be affected by new technologies, but who decide for one reason or another not to become major operators of these new systems, as Pergamon Elsevier and numerous other firms, want to become operators. After all, given the large number of publishers that exist, not all can operate their own systems, however large they may be. So I would like to examine how they might be affected, and what the consequences may be for our society.

But first, I must emphasise I cannot make firm predictions. Over these two days, a great range of systems, and a wide variety of costs and time scale, have been set out for us. I would be very foolish to try to predict exactly what will happen to publishing, or when. But it is quite apparent that publishers will be seriously affected by these developments, and will have to adapt themselves. I would be surprised if they do not find new opportunities in them, and continue to perform the vital function in society they do today.

I am quite certain that, whatever developments occur, the actual provision of information will continue to be by a wide variety of means, and particularly by printed form, by photocopy, by facsimile transmission, and by digitalised electronic publishing. The exact balance will be determined by the requirements of the user for speed, convenience, and cheapness. The new technology we have seen will be, for some time at least, expensive and inconvenient. But let me list the problems for publishers and our society - before I express some thoughts on how they might be overcome.

The first, of course, arises from this very complexity of means of publication. For a long time to come, users are going to want both printed copies and electronic forms, and this will reduce the economies of scale in publishing and diminish the viability of publishers, and their ability to publish.

Secondly, the need of users to be able to refer to comprehensive databases, and the cost of setting these up, is likely to lead to a concentration of sources of supply, and so diminish the variety of information available. This may not sound very important, but a few minutes thought will show how much it matters.

Thirdly, - and this may sound contradictory - the new systems may diminish the quality of information, and the standards of selection, and so increase the already substantial cacophany of unselected information available to us. It may in fact reduce our ability to find what is good, what is important.

Together, these are serious threats to information provision as we know it, though I believe they can all be overcome. But I must emphasise how much these dangers will be increased if as a consequence of new technology the articles which have been selected and prepared for publication can be increasingly reproduced freely, without payment, so making original publication impossible, as photocopying now threatens. I know I am not supposed to mention the problem of rewarding the use of intellectual property, but it is a problem that faces the database owners as well as the originators of material, and who is going to put together the information on those marvellous files if they cannot protect its use? This is a central problem. The issue was described yesterday as "a quarrel." I challenge the use of this word. It seems to me a low word to use to describe the assertion of an essential human and social right, and, if information provision is to survive in this new era, then our society must find again the way to protect the output of human creativity.

The European Publishers Group put forward proposals for dealing with this issue to the Commission in June 1979. These proposals sought to find a balance between availability of information in the new systems and compensation to the owner of the information. We are still waiting to discuss these issues with the people seeking to use our information. But this is the vital issue.

The problem is, of course, a big one, but, to reduce it to manageable proportions, the prime need is to resolve it only with those who wish to reproduce information owned by others for a profit, or at least on a cost-recovery basis. That to me does not sound unreasonable, that those who seek to profit should pay a fair fee for the use.

But let me look at the opportunities as well. Here conventional publishers have some advantages. First, as has already been pointed out, publishers will increasingly use computers to

set type, and so - unless facsimile becomes the accepted form - they have an advantage in electronic publishing over anyone who has to re-keyboard information. Second, the new computer programmes offer the advantage over photocopying that they can record the use made of material. And third, for "demand" publishing to work at all, the materials needed have got to exist, in an accessible and attractive form. And that is what publishers are skilled at.

So, how do publishers take advantage of the new systems? There are many ways. They can package files of information. They can sell quality materials outright. They can employ the electronic publisher as their agent. They can license the use of their materials. They can store their information on videodiscs, tapes, or chips, and sell them as they do now. Using their skills as publishers to select what should go on these materials, which they can sell.

But there is an important alternative. In the United Kingdom, we are undertaking feasibility studies, to which a large number of publishers are contributing, into the possibility of establishing a co-operative database, which could be linked to Euronet. We propose to form a consortium of most major publishers, who would operate this database together, and our first feasibility study, being undertaken this time by PIRA, is to determine the size of the likely demand, the charges users would be prepared to pay, and the speed with which users want documents. We will then go on to a technical study, to assess the possible technical configurations, bearing in mind the need to have a flexible system. If these studies show that the demand is there, and that the system is technically feasible, there is no reason why such a system should not be established within the same sort of time scale as that proposed by Elsevier. All the major British publishers of technical, professional, and scientific information, are participating in this study, and the proposal has the great advantage that it would lead to a comprehensive database, thus meeting the needs of users, while retaining the independence of publishers, and indeed giving all publishers a chance to participate. But, as will be appreciated, the viability of such an operation depends again on the ability to protect the use of the information on the system. I think you will agree that this is an extremely important initiative, and offers the prospect of a very satisfactory means of achieving the Artemis goals.

# THE LIBRARIANS POINT OF VIEW WITH REGARD TO ELECTRONIC PUBLISHING

by

K-D. Lehmann
Stadt- und Universitaetsbibliothek
Frankfurt/Main, FRG

Libraries and the book trade are the principle institutions for the supply of literature. Libraries can be grouped according to their fields and types of users:

-- public libraries
-- scientific libraries
-- university libraries
-- special libraries (research, learned societies)

and since no single library can meet all demands, there exist, in addition to local and institutional libraries, national or supra-national lending libraries - organized either centralized or decentralized by specialization.

A tangible improvement in the supply of information (document discovery) has been achieved through the development of bibliographic on-line services. On the other hand the acquisition of documents which are not available in users' libraries is still cumbersome in several European countries. However, an organized system is now being instituted to incorporate libraries into networks with a common pool of information. Thus interactive library catalogue databases with location lists are created. These union catalogues allow the creation of on-line order systems and to link them with other information systems.

Electronic publishing, as presented in ARTEMIS, with a complete chain of storage, transfer and supply, provides other novel features, in particular the possibility of creating a direct connection from producer to user, something which was so far not possible. This is a decisive change through which the previous infrastructure may be either changed or eliminated.

There is no question that the delivery time from the author through the publisher to the user will be shortened. The general goal of an electronic publishing system includes distribution as well as production.

With regard to distribution there are a number of potential problems for libraries and users in the future:

-- free access to information and printed matter could be endangered by the use of only one technology
-- a privileged class of users able to pay for the new delivery services would be created
-- the user might lose the ability to choose his source and method of supply
-- the user might, through lack of choice, and insufficient knowledge of the possibilities become increasingly dependent on particular institutions
-- there will be a tendency to concentrate traffic in a few supplying institutions
-- dedicated hardware might be necessary
-- the possibility of browsing and obtaining insights from other disciplines, as part of normal library consultation might be lost
-- the higher costs might influence other criteria for production and distribution
-- difficulties with cost recovery will have to be faced
-- the local or institutional supply of printed literature might be markedly decreased.

This catalogue of problems might sound dramatic, but it shows the anxiety of librarians faced with new developments too closely governed by technology. If electronic publishing were not to decrease the present variety of media, but to offer an additional component in the field of delivery, i.e., if it is a marketing question, I would risk making the following prognosis from the librarian's view points:

Based on knowledge of the users and their reading habits, the types of publications used, and economic factors, it can be assumed that libraries would continue to be supplied with printed copies in the fields of "general literature supply" - leisure, amusement, professional education and improvement.

This view is based on the following factors:

-- physical appearance
-- graphic appearance
-- instructional effects
-- repeated access without technology.

The same would apply in the case of study and teaching functions of universities.

There will be improvements in this area through electronically stored catalogues and location lists, resulting in more rap supply of literature not held in-house. The same will apply to copies of documents held as microforms or in optical disc storag

In the supply of special research literature, which cannot be obtained locally and therefore must be borrowed, the technologies demonstrated at the workshop may result in new methods and innovation in the operation of database information systems. Abstracts will increasingly be stored along with the bibliographic information: this electronically stored text information permits relevance to be evaluated and assists pre-selection. Copies of the requested literature can then be delivered; here the system components - on-line order, facsimile transfer and microforms - must be considered.

Complete text storage and electronic transfer are only acceptable in limited areas: for documents containing hard facts, the actuality of which is important, and the graphic quality not decisive, and for reference material including encyclopedias, tables, etc.

SUMMARY


-- Alternative means of literature supply will be necessary in the future; speed, price, quality, area of use must be considered, but also we should bear in mind the difficulties of introducing new technology.
-- It is important to remember user behavior and his expectations; we must not forget the financial limitations faced by the average end-user.
-- The new technologies must be easily operable by the user; it must not be a system for technocrats.
-- New technologies must be marketable, i.e., they must meet user needs.
-- Standardization and compatibility must be taken into account, in both hardware and software areas, so that libraries and users are not forced to maintain a whole machine shop.
-- The introduction must be carried out with careful planning, so as not to damage the current infrastructure of libraries and the book trade, before the new technologies can gain the full confidence of users.

# ELECTRONIC PUBLISHING AND DOCUMENT DELIVERY ON DEMAND: WILL THEY BENEFIT THE USER?

by

Janne A. Hunter
Zentralbibliothek der Medizin
Koeln

For the user the idea of rapid delivery of documents by an ARTEMIS-like system is very attractive and it would be exciting to think it may be available in the near future. Users, however, have become sceptical of the promises of technologists: many years ago we heard that, very, very soon now we would have libraries microfilmed and computerised from top to bottom, everything instantly available at the push of a button. But this has somehow not happened to any great extent even yet. Certainly the developments in electronic publishing and in office automation, already well under way, seem to hold promise also for document delivery, so that this time round scepticism may turn out to be unjustified. The factor causing greatest uncertainty is of course the pricing of such services and the effect different prices will have on the size of the potential market. Scientists and doctors are currently prepared and seemingly content to wait up to around two weeks for many of their document requests; how often they would wish or need the documents delivered within say 24 hours and how much they are ready to pay for delivery at that speed is simply not known.

Aside from price, the market will be influenced by the quality of service and how easy and comfortable it is to use - its user friendliness. It would be a pity if these aspects were adversely affected by the application to document delivery, without due adaptation, of techniques and machines developed primarily for other purposes, namely electronic publishing or mail, office automation etc. We have seen this already with copying machines and online terminals developed for office use, where particular library and information retrieval requirements are often neglected.

Mr. Raitt has already summarised the kind of questions potential users of a delivery system would ask. I agree with what he said and would wish only to add some specific comments.

It is commendable that the end result seems likely to be hard copy; it has proven very difficult to persuade users to accept microfilm or microfiche and their acceptance of what would, according to this workshop, be a relatively expensive system will certainly be increased if it delivers documents on paper. Whatever conventions are adopted for document identification it is to be hoped that each page delivered will emerge clearly labelled with its source; this should apply also to electronically published journals. Too many problems have been caused in the past by publications where this was not done, so that the source of reprints and copies can be difficult or impossible to determine. It would be splendid if electronic publishing, with or without electronic delivery on demand, would lead to improved availability of the literature at present most difficult to obtain. Unfortunately attention seems concentrated almost exclusively on core journals, which are in any case widely distributed and quite readily accessible. The user has many more problems with less widely distributed journals or "grey" literature. It is to be hoped that these will not continue to be neglected by those applying electronic techniques. It is also to be hoped that publishers will retain the master copy of their electronically produced publications so that one will no longer be informed sadly that this or that is now out of print, sometimes very shortly after publication. This would be of great benefit however the hard copy is subsequently delivered.

Any electronic delivery system should be rather decentralized. There should certainly never be only one store offering a given publication; it would then require only one strike or accident in that store, or on the communications path to it, to deprive all users of access to it for what could be considerable periods of time. Furthermore, there is little enough money available for information retrieval and delivery and it seems illogical that an ever-increasing proportion of it should be spent purely on telecommunications. If transmission costs are to be distance-dependent then decentralised storage is one way to cut the overall costs; it may even be necessary for a financially viable system.

A vital component of any delivery scheme involving more than one centre is a holdings list or subscribers catalogue, kept well up to date and readily available. If a fully-fledged ARTEMIS ever developed one could endow it with an automatic location function to recommend the nearest store containing the document sought. Even if ARTEMIS never materialised, the development of such a location list Europe-wide and available in interactive form would do more than any other single development to speed up document delivery.

The system should be adaptable to new developments and compatible throughout, however decentralised. It would be absurd, and would reduce user acceptance and thus the market

size, if one needed different equipment to gain access to all stores one wished to use. There have been problems of this sort with online searching and these should be avoided in document delivery. One is also likely to gain more custom if the equipment is not specific to document delivery systems but is usable for other purposes also. The user-system interface, in terms of coding, ordering and accounting procedures, should be as simple and comfortable as possible. This is especially important if, as has been suggested, end-users should themselves use the system. If they are presented with the kind of electronic babel currently suffered by online searchers then user acceptance will be reduced to vanishing point. Whichever class of user one is seeking to attract however, one will be more successful if one produces a uniform and readily understandable command and administration system. It may be noted in passing that any such automated system allows a very complete accounting and should surely help to quell the wrangling over copyright and royalty payments.

Despite the obvious advantages of speedy delivery on demand, it would be regrettable if the increasing use of electronic techniques led to this being the only mode of access to documents. Users should also have a collection available at their place of work: browsing in journals or book is still of value and, as yet, still cheaper than browsing in databases.

Nevertheless, it would be most welcome if an ARTEMIS-type system proved both technically and financially feasible, as back-up to the collection on the user's home ground. The Commission has performed a major service in bringing the whole matter under discussion at this early stage in its development and enabling all interested parties to hear each other's views. We may hope that both electronic publishing and electronic document delivery will benefit thereby and that a useful and easily usable system, planned and implemented with its users well in mind, will be developed.

# COPYRIGHT IN RELATION TO NEW TECHNOLOGIES IN PUBLISHING

by

J.M. Gibb
Commission of the European Communities

I understand that the very word "copyright" was not to be uttered during this workshop. I wish to break this rule in order to make, very briefly, a few points which I consider to be relevant and which are based on the conclusions of a symposium held in November 1979 in Luxembourg on the "impact of new technologies on publishing"*.

On that occasion, the problems posed by copying were discussed in some detail, particular attention being paid to the losses suffered by publishers because of the widespread practice of photocopying. One can find the following statement in the proceedings of the symposium: "It could be said that the publishers of the written word have worse things coming to them. (If electronic media are used), will they not eventually be affected as much as the publishers of music on records and cassettes today?"

I wonder whether the pessimism which inspired those statements is really justified. It would be if the primary application of the electronic communication media was to bring best-selling novels into our homes. However, what we have seen and heard yesterday and today suggests that one of their most appealing features is the prospect they open up of bringing to the individual rapidly, in response to a specific request, the very documents he wants to consult at that particular time. If this is true, that is if the products offered by the industry using the electronic media are essentially to be of the "tailor-made" variety, straightforward copying becomes practically irrelevant.

This does not mean that those engaged in this industry will be able to relax and feel immune to piracy. Measures will

have to be taken, for instance, against the systematic "emptying" of databases and document stores, but I feel that the industry's best defence against this threat will be its ability to provide the kind of highly selective service which is inevitably well received in our pluralistic society.

* "The impact of new technologies on publishing" - ISBN 0-907150-09-8, Clive Bingley Ltd. & K.G. Saur Ltd., London WC1A 1NE, U.K.

"Die Auswirkungen neuer Technologien auf das Verlagswesen" - ISBN 3-598-10127-9, K.G. Saur Verlag, Postfach 711009, 8000 München 71.

"L'impact des techniques nouvelles sur l'industrie de l'edition" - ISBN 2-86294-052-6, K.G. Saur Editeur S.a.r.l. 38, rue de Bassano, F-75008 Paris.

## DISCUSSION

The chairman, in inviting discussion, pointed out that the workshop was now considering practical rather than technical issues. We had learnt that electronic publishing was an exciting new challenge, that for many publishers the exploitation of the new technology will be a matter of economic survival, but that they would have to go on fulfilling their traditional functions in marketing and packaging of information. We had also learnt that users would continue to want access to documents at the lowest possible costs with maximum flexibility. It will be a matter for publishers and libraries to ensure that the demands from the users and authors continue to be met.

*R. Maxwell, Pergamon Press Ltd.*

As I pointed out earlier, the secondary services have made the running in marketing computerized information products, but they cannot go further because of the copyright question; there is no way that they can organize the delivery of copies of original documents since the rights in these are vested in the primary publishers. So, it is up to the primary publishers to get down to it, and perhaps in cooperation with the secondary services, to provide document delivery services of the kind we have been discussing.

*K. Haefner, University of Bremen*

We are talking about electronic delivery services and the word electronic is somehow connected in our minds with networks and databases. In the long term perspective this is only a part of the changes we can expect in the next century. A basic common factor is the possibility of having information in digital form: there are then three ways we can go; first, we can use it in online systems, as for example in Viewdata: second, we can organize it on a remote, on-demand basis, for example by using telecommunications to obtain a facsimile or other type of copy. Thirdly, we could keep the material locally in mass storage, whether this is conventional computer storage or digital optical discs. It is important to compare these three future possibilities, and for scientific and technical information, my view is that, in the longer term, the future lies in a combination of the second and third methods, that is, a linking of remotely-stored demand systems and local mass storage systems directly available to the scientist end-user. There are two interesting technologies in mass storage; the first is the flat display now coming on the market in Japan, which allows one to record several different types of representation. This is particularly interesting for

entertainment, in which one can obtain a mixture of movies, audio and alphanumerical outputs. The second is the development of relatively cheap reading devices with an audio output; this may completely change the world of books and printed journals etc. However, the key to these future possibilities is the move to digital rather than analog representation, which allows one to choose all kinds of new output possibilities.

*W.F.C. Purser, Trinity College, Dublin*

I would like to say something about the role of the author in this: we have heard extensively from publishers and librarian but we are really concerned with the transfer of information from an author to an end-user. It may be that in the discussions so far we have tended to make the mistake of copying old systems on to new technology: we have assumed that there is a place for the publisher and the librarian in their traditional roles, but we should at least question this assumption. In scientific and technical information we are concerned with a rather limited population of authors which can be easily identified: authors could be allowed to enter what they wish to communicate directly on a database. Scientific authors are not particularly intereste in royalties (they get no income from their writing and may even have to pay for reprints), nor in copyright, since they are essentially concerned with easy and rapid dissemination to users who are probably themselves authors. It is technically quite feasible for a university author to key-in, edit and catalogue his article on a computer database, which can be accessed by any authorized user. All that one needs to add is some form of quality control, and this might not be too difficult in a university context. Since most universities and learned societies have adequate computer resources, and will wish to promote information exchange, information in these databanks would be freely available: the user would only have to pay telecommunications charges.

*P.L. Holmes, EUSIDIC*

Thanks to the activities of the Commission there has been a considerable interest in this whole area and EUSIDIC has sampled its membership to see how many would be prepared to help provide information on the whole question of user reaction to these new systems. Factual information is of course hard to come by and so one possible methodology is for EUSIDIC to inform users of what is possible, and then to collect information on their reaction to possible scenarios, concentrating on compatibility, user readiness to use the services, and the problems they have in locating sources. We hope that you will find EUSIDIC's work relevant to the problems we have been discussing.

*H.R. Collier, Learned Information Ltd.*

Electronic publishing and electronic document delivery are

not synonyms. Electronic publishing is something done by a publisher who chooses to publish his material in this way. Document delivery is related but a separate problem. Referring to what Mr. Purser has said I believe that such evidence as there is indicates that users do not want a multiplicity of systems, methods of access and access points: equally, as Janne Hunter has said, they do not want a totally centralized "big-brother" system, but the answer is not 200 to 300 peripheral systems.

*H.E. Jonas, Bundesministerium fuer Forschung und Technologie*

Going back to points made at the beginning of the workshop, I would like to look at whether there is some pressure on the state or public bodies to act and lead the way in this field, or whether initiatives from the private sector would be enough to undertake the necessary development and creation of the market. Taking the first hypothesis, we should then ask what are the objectives: two areas have been suggested, first the deliniation of user needs, and second, coordination between information suppliers and equipment manufacturers. If these are matters for the public sector, then how should the task be allocated as between national authorities and the Community? There are policy and financial problems to be considered also: the necessary investment to take advantage of these new technologies may be high, and for example, this may bar some libraries.

*The Chairman:*

In the ARTEMIS report it is stated that market forces alone will not bring ARTEMIS about and therefore there is a need for the public sector to become involved. Perhaps, as we have heard, there are alternatives to ARTEMIS which provide the same results without involving the telecommunications administrations. Perhaps the entrepreneurs on the panel might care to comment about the extent to which they think governments and the Commission ought to be helping to finance the start up of electronic publishing or document delivery services. Do the publishers and others need help or not?

*C. Bradley, The Publishers Association*

I do not believe that we agreed that a royalty solution was not a practicable way of solving the problem, but that, if publishers were to be able to continue to provide the services required by society, it was important to get the economics right. This does mean they need to be able to get a fair return for their work, and that their work should not be used by others without compensation.

Second, in reply to Mr. Purser, I really do not believe that the sort of authors' database he describes is feasible. He apparently hopes to be able to provide a free service, into which materials can be input freely and from which they can be reproduced at no charge. I just do not see how this sort of service can be provided without substantial investment, which he does not seem to have provided for, and inevitably costs will be involved in setting up the system, operating it, and in providing the necessary quality control. Indeed, the complexity of the marketing operation is greatly under-estimated by him. From our figures, over 80 per cent of our learned journals are sold to other countries. This could be done by satellite, but such marketing is a very expensive operation, but a highly desirable one.

Finally, we are asked about the role the Commission can play. May I suggest they have a vital role in helping to establish the new systems, but not to run them. Thus, help, financial and technical, is needed with research and development, and with the high costs involved in the acquisition of the initial equipment. We also need research into the environment in which publishing and bookselling should operate in the future. I hope the Commission may be able to help us with all of these.

*R. Maxwell, Pergamon Press Ltd.*

There is a very important role for the Commission in co-operation with learned societies and publishers in this area. We should not risk another fairlure, as in the development of software packages for complex databases, now exclusively a U.S. preserve, by neglecting to take an initiative at the European level. We at Pergamon are anxious to cooperate and intend to back this effort with our own money. Finally, in response to the comments on Mr. Purser's suggestions, I believe that we cannot afford to neglect the views of authors who must be brought fully into the consultations.

*H.R. Collier, Learned Information Ltd.*

I am not convinced that there is a viable role for the Commission or national governments except in helping to create a market and setting an example: we do not need more regulation and standardization from the public sector; the publishing and database industry is inventive and on the whole lucrative enough to respond to a market when a market is established.

*P.L. Holmes, EUSIDIC*

It is necessary to identify the potential danger in the Commission taking initiatives in this area in which there are so many interests. There is a danger in moving too quickly, in that if the Commission puts money into a system or small number

of systems, this may lead publishers to finance other developments in order to be able to compete. On the other hand, the role of the Commission in showing users what the equipment possibilities are, would be most useful in helping to create informed user opinion.

*P.T. Kirstein, Department of Computer Science, London University*

I think that while there is a lot to be said for Mr. Purser's suggestion, costs could be very expensive. The possibility of the electronic transfer of texts suggests that close groups of authors/users, communicating electronically, could take the place of the establishment of new highly specialized journals, providing a much more spontaneous channel of information transfer. Some kind of editorial policy and quality control mechanism is however an absolute necessity.

*H.J. Ehlers, Ernst Klett Printing and Publishing*

I want to stress the importance of the way the information was presented to the user, as being part of the information itself. Enough work has not been done in this area and perhaps the Commission could help.

*I.A. Galbraith, Mackintosh Consultants Company Ltd.*

In my view the Commission should fund market research studies, rather than pilot projects.

*The Chairman*

In concluding this panel, I would like to stress the point that quality control will still be necessary even if electronic means of information transfer are used. We should ensure that the opportunities offered by electronic publishing do not actually destroy the process which we are trying to encourage, i.e., the effective exchange of information. The parties now involved in this process will continue to be so involved: their roles might change, and also the interfaces between them, but the basic functions remain.

WRITTEN CONTRIBUTIONS

*G.M. Ahrenholz, Bayer A.G.*

The ARTEMIS study itself, together with the presentations and exhibitions at the workshop, indicate that the technical preconditions for the digitalization and teletransmission of documents already exist. Is there a market for such an undertaking? It is of course true that, following an online search, only part of the original literature to which references have been obtained can be delivered immediately from one's own library. However, experience is that users are content with this situation, and are ready to accept a delay in supplying the remainder of the documents. Some of the documents however cannot be found without months of searching, and some cannot be located at all. Such "difficult" documents may be classed as exotic literature, and presumably will not be supplied by electronic document delivery services. It may be that we here in Bayer AG are particularly fortunate in that we possess a large and effective scientific library; we are thus able to supply directly from stock about 75% of the references resulting from an online search. The time required for the user to study this portion of the literature will usually fill the gap until the arrival of the remainder. Further, the possibility of electronic document delivery will not allow us to cancel subscriptions to journals etc., since these provide for the day-to-day information needs of the scientific staff. From this point of view, it is doubtful whether electronic document delivery services will be sufficiently used. There is another major difficulty in the build up of such services: this concerns the lack of harmonization of the copyright legislation in the various countries: this problem was not a subject for discussion in the present workshop, and will be much more difficult to solve than remaining technical problems in digitalization, storage and teletransmission of documents.

*J. van Halm, Consultant, Netherlands*

Among the legal issues that did not get attention is "privacy". I want to emphasize the privacy problem when, as Mr. Bradley mentioned, publishers might improve their marketing based on the recorded use of information in electronic systems. Another issue that needs concern is the implications spectrum of Transborder Data Flow (TDF) and the guarantee of TDF.

*J. Tehnzen, Universitaetsbibliothek Hannover und Technische Informationsbibliothek*

The discussion at this workshop on electronic document delivery was mainly based on two positive statements:

-- Electronic or automatic document delivery is feasible and no more a technological problem.
-- There is a market for this new method of supply of scientific literature.

From a librarian's point of view both statements are unbased assumptions, compared with reality, at least for the time being and the immediate future.

TECHNOLOGICAL FEASIBILITY

My library, the "Technische Informationsbibliothek Hannover (TIB)" is always interested in new technologies to speed up the delivery of requested articles. At the annual Hannover Fair we have easy opportunity to test nearly all new developments in office technology with special library material. So I feel competent to say a word on

-- microforms, and
-- teletransmission from hardcopy.

In connection with the problem of a building without space for further acquisitions we had a thorough investigation into the problem of converting "hard copy to microform" (fiche or rollfilm). To convert all periodicals to microform would mean the filming of more than 300,000,000 pages. However, the problem is not so much the microfilming itself (20 years with a dozen cameras) but input to an index system to find a specific article, which is the reason for the existence of the library. This input would cost about half or even two thirds of the total sum of 60 to 90 million DM. The whole index problem was cheerfully neglected during the workshop.

The microfilming of only the new issues of all running periodicals means the conversion of "only" 9 to 10,000,000 pages annually. Applied to MEGADOC this means 360 to 400 videodiscs annually, price unknown but not low, plus indexing for retrieval, plus sufficient staff to avoid backlogs. All this in addition to constantly rising prices for a likewise constantly rising number of periodicals with generally down going budgets. This, I think, proves that any such ideas are, at least, economically unfeasible. Microfilm as a storage medium with subsequent picture transmission to fulfill single requests is no solution to the problem.

More hope may be credited to telefacsimile transmission from a hard copy original. However, even here some time will have to pass until a transmission according to library standards will be possible. This means

-- the need for direct scanning of the page to be transmitted. Library material generally consists of bound volumes or issues and not of loose leaves. Not even one machine available or exhibited at the Workshop was able to process anything but single sheets of paper. Not to mention sizes and formats of numerous periodicals not adhering to any standards. In this respect the Exhibition was a total failure and a real disappointment for me.
-- Everybody is waiting for CCITT Group III Standards for teletransmission. All machines available up to the 1980 Hannover Fair suffered severe losses in quality of the generally fine characters used in printed scientific journals. If first a Xerox copy was made which then was processed for transmission by a telecopier, the produced page was in most cases partly illegible.

My conclusion is that for immediate delivery of a document existing in a printed version only the development in facsimile transmission is worth attention. Neither libraries nor their users can afford to buy or to lease two machines, one for transmission of texts and one for graphics and pictures.

From this results the simple fact that we have to wait for this one new machine until it has become a natural installation outside libraries like the telephone. It is quite an absurd idea to believe that libraries can exert any pressure on industry to develop a machine suitable for library purposes. The small number of libraries do not constitute a market. We have tried, for example, to persuade several producers of copiers to adjust copiers to human beings, who want to sit at the copier and not to stand all the day. It was all in vain, present models sell so nicely without cost-increasing changes, was the answer.

THE MARKET FOR ONLINE DELIVERY OF SCIENTIFIC PAPERS

I cannot share Mr. Maxwell's belief in a market for such a super rush service. There are always single examples for urgent need of special data, but only very seldom for a complete scientific paper. Even when offered as a secondary service of material already available in a computer I cannot see a market with reasonable prices. I here agree completely with Mr. Russon (BLLD).

My opinion is based on experience with our well established special service for rush orders (TIB-Eilbestellungen): orders by telephone or telex with immediate processing so that the user receives the photocopies the next morning by ordinary letter mail nearly everywhere in the Federal Republic of Germany, thanks to the Deutsche Bundespost. In 1980 we got 3,620 requests of this kind.

In December 1979 we joined Lockheed's online ordering system DIALORDER. This service is called TIBORDER. Bibliographic details of the results of a search may be transferred by the user to an order file. Here we call up all orders marked TIBORDER for immediate processing and delivery per airmail all over the world. In spite of the fact that each DIALOG user has an information sheet with all details about this service and its conditions we got only 863 requests within 12 months. Of course, the prices for this service are higher than for the standard service. They are, however, not prohibitive.

With this service we made the quite unexpected experience that several foreign DIALOG users used TIBORDER only three to four times and then changed to the standard service with TIB order forms and delivery of photocopies by regular mail. Among these clients was even an Arab oil firm!

The number of about 4,300 rush orders annually compared with 375,000 standard orders hardly needs any explanation. It is a mere 1.15%.

I admire Mr. Maxwell's progressive spirit in proposing to offer online searching in complete scientific papers. However, being a librarian in a library with some 17,000 running periodicals produced by several thousand publishers I wonder whether they will all share the same computer and use the same software to assure a unified form of access to and the delivery of the larger part of all new papers. As a German proverb says: One swallow doesn't make a summer!

*K.W. Neubauer, Staatsbibliothek, Berlin*

I take it for granted that full text storage would only be considered for certain kinds of scientific literature, in particular, journal articles.

## USE AND COMPETITIVENESS

The use of full text databases would seem to be chiefly dependent on the price and scope of the services offered, i.e., speed, quantity of stored documentation, ease of retrieval and delivery. In conventional storage the libraries are and will remain responsible for full text storage: there will therefore be competition between libraries and the proposed full text systems of the ARTEMIS project; this competition will be much more pronounced and direct than that which already exists between libraries and publishers. On the other hand, there will be strong competition with the publishers since centrally stored texts, available everywhere at any time, will take the place of the classic distribution of texts which has so far been mainly through the publishing houses. With regard to the use of scientific information; the consumer prefers to have the required information and texts, with minimal redundancy and maximal completeness, easily accessible from his place of work. Under ideal conditions, ARTEMIS could unite, for certain users, all the demands placed upon libraries, bookdealers, and publishers in terms of rapid delivery of documents to the palce of work. This service would involve extra costs, resulting in the existence of a first and second class information supply service, where the "rich" would receive a first class service through ARTEMIS, and the "poor" would have to continue using libraries, unless the government were to finance the first class service as it does the majority of libraries. If the government were not to finance these databanks, and normal market prices had to be charged, I foresee industry, business and research organizations plus perhaps a very few private users as the mail clients.

## GOVERNMENT SUPPORT FOR THE ESTABLISHMENT OF ARTEMIS

In the ARTEMIS report, as well as during discussions in Luxembourg, it was repeatedly pointed out that ARTEMIS could not be developed solely on a commercial basis, i.e., full text databases are only feasible with government support. The government must first of all ask itself whether it is prepared to support the development of a capable, but expensive, first class service for a privileged group, as well as continuing to provide a free literature supply system for the general public. On the other hand, it must be decided what advantages an improved, speedier information service from ARTEMIS would bring for business, industry, and science, which would make government support worthwhile. It is my opinion that these questions can only be answered after a detailed, practical analysis is made of the make-up of the expected consumer population with regard to specific user benefits.

PREVENTION OF MARKET DOMINATION

Full text databases create an unprecedented concentration in the literature included. Whereas the classical form of publication is available from several locations - book stores, libraries - the convenient full text storage service would, if only from an economic view point, only be offered from a few locations, and transmitted by modern means to all other places in a region or continent. We can already see the effects of market-dominating information banks, and the dependence into which even whole countries can fall if they do not have such information banks at their disposal. The countries of the European Community in particular are under pressure in respect to the USA. This pressure could be further increased through full text storage. Since large, established firms have the greatest financial potential, they would appear most likely to be in the position of introducing this expensive technology. There is a danger that governments in promoting the development of these databases, will in the end support the market position of the large commercial information systems, by relieving them of their research costs and further promoting their concentration.

# SESSION IV

## THE NEXT STEPS

G. ANDERLA
CHAIRMAN

# THE NEXT STEPS

by

G. Anderla
Commission of the European Communities

One of the most interesting presentations was described as "a document delivery concept". This title was very well chosen, and we now have to consider how we move from the concept to a workable system. This will involve integrating the technologies into a complete service system, but we must also progress from an interesting conference theme, and guesswork about user needs, to developing the market as such. Mme. Dusoulier will be summing up the results of our very constructive two days of discussions and I do not propose to anticipate what she is going to say.

It seems clear that the next steps will involve the standards problem. As many of you pointed out, while many standards exist important elements are missing. An example is standards for extended character sets to be used by publishers as well as the text-processing equipment manufacturers. Another problem area may be in the integration of the technologies demonstrated into practical delivery systems.

We must also take steps in the harmonization of the user interface with the technology. It seems obvious that multi-purpose terminal equipment will be necessary if the user is to achieve reasonable economies. In addition to harmonization we need to maintain flexibility so that the user can take advantage of new developments without the need to change equipment and procedures.

Many of these problems can only be dealt with within a framework of test projects and it will be important to take early steps to decide on the number and nature of such tests.

Turning to the market the problem here is that at present there seems to be no way to predict its size, i.e., we do not know the relationships between cost, price, and the volume of use which can be generated. Here is another area in which we need to know much more about the user, and one of the important objectives of any test programme will be to establish the necessary data on user needs and reactions.

However it seems clear that ARTEMIS can only exist on a marginal cost basis, i.e., major investments in systems and equipment development are not likely to be made for electronic document delivery. Therefore, creation of the market must go hand in hand with electronic publishing and developments towards the fully automated office.

These considerations will be important in determining the next steps particularly in organization of test programmes. The Commission could, for example, actively encourage the formation of collaborative undertakings by publishers, equipment manufacturers and others engaged in the supply of documents.

We will of course need good advice in making the detailed decisions which will become necessary for future action in this area as a whole, and therefore we will need to seek the help of the document delivery Task Force in this respect.

In conclusion I would like to repeat what Mr. Appleyard said yesterday in opening this conference: the Commission itself will not operate a system nor provide a service but it will initiate actions to stimulate the market. The Commission will do its best in this respect, but of course no more than necessary to help the parties involved to create a market. So, clearly the next steps will also involve taking stock of the results of this conference: we will publish the proceedings which I think will be a valuable contribution not only to those of you who have actively participated but probably to many other people at large. Soon we should widen the area of consultation, working as usual via CIDST and its subordinate working groups and task forces. We will continue to supply a platform for meetings such as this one and perhaps for more specialized meetings if necessary, for example to help define standards, etc.

We could also institute a mini action plan within the next three-year period for the promotion of document delivery.

# CONCLUDING REMARKS ON THE DEMONSTRATION/WORKSHOP

by

Natalie Dusoulier
Interorganization Board for Information Systems

## INTRODUCTION

If the aim of this meeting was to establish an exchange of views on the interest, the possibilities and the problems associated with electronic document delivery, we can certainly conclude that the meeting was a success. The different view points, the solutions proposed, the disquiet of some in the face of a technological revolution which must affect one of the oldest documentary functions, have recalled, for some of us, the slightly feverish atmosphere accompanying the preparatory work for EURONET: that was almost ten years ago and EURONET was not even so named.

These two days certainly mark an important step in the work of the Community towards the improvement of information transfer, and although the content of the ARTEMIS report was not in itself much discussed, this document will undoubtedly remain one of the most important reference documents in electronic delivery of primary documents. The conclusions of the workshop can be divided into three parts. First, we were able more or less to agree on a number of points which could serve as the basis for future work; further we were able to identify some of the problems which we have to solve, and finally we have tried to identify the actions to be taken in searching for realistic solutions.

## AGREED POINTS

-- No one doubts that the need for rapid access to primary documents is an inseparable consequence of the provision of bibliographic references: the success of DIANE will depend on the efficacity of ARTEMIS,

-- digitalization and teletransmission of documents will meet the needs of users of host services, and seem, as of now technically and economically feasible,
-- the technologies necessary for the different functions in electronic document delivery exist already, and furthermore, are rapidly evolving.
-- some of the equipment necessary to carry out these functions at the required level of quality and at satisfactory speeds are already marketed, or will be soon available. The manufacturers are aware of user requirements, and are conscious of the environment in which these needs exist, in particular the diversity of users and intermediaries,
-- the diminution of the use of paper as a transmission medium is a probably inevitable phenomenon of which account must be taken. We will probably have to rethink the concept usually called "the documentary chain". Techniques of office automation will have an important effect, and will change our methods and habits. Those who are at present only occasional partners in this chain will become much more closely linked together in the entire documentary process. Publishers, database producers, librarians, information suppliers and distributors, and above all, users, will have to reconsider their role and their way of thinking in the new environment.

UNRESOLVED PROBLEMS

Although we were more or less agreed on the above points, there remain problems to be solved.

On the Organization Level

In reviewing the roles of all those in the documentary chain, we should not proceed too precipitately. Although office automation techniques must take their place in information transfer, we should not mix up the functions but try to make them evolve towards a common goal. We must keep in mind that the new environment should permit everybody to survive. Authors want to continue to write and be read: publishers want to publish and sell; secondary services want to continue to produce databases and sell them; distributors want to sell primary and secondary products; librarians not only want to store the documents but also to supply them; manufacturers want to create a viable market; and finally, users want to obtain documents in the simplest and cheapest way possible, rapidly and with good quality. An operating system can only perform satisfactorily if all those concerned play an active role rather than a defensive one.

On the Level of Documents Supply

Document identification is often done on a local and individual basis: it must be rethought in a more general and automated context. Location and archiving of documents in the framework of a network present problems which have not been resolved. The delay in providing documents from library stocks must be reduced if the costs of transmission are to be justified. The problems of associating of different methods for supplying different products from a single point, the products however originating from different sources, must be studied. The problems of copyright have to be reviewed and resolved, at least on the European level.

On the Level of Technology and Equipment

Although the appropriate technology and equipment already exist, the problems of their application in ARTEMIS must be reviewed in depth. Compatibility between items of equipment is important in an integrated system. The cost of equipment will remain a sensitive point for users, and manufacturers should bear this in mind. The quality of text, and the possibility of delivery of non-textual material remain important issues.

In general, we must try and avoid the problems of lack of familiarity which were encountered when computers were first introduced in the information transfer process, followed by word and text processing equipment.

WHAT CAN BE DONE AND WHAT MUST BE DONE

First of all it must be said that the meeting provided an excellent opportunity for making contacts. One should not leave it at that. Discussions must continue, and for this a platform at which all those involved in a new type of documentary chain can be brought in contact with each other, is indispensible. We must develop a long term strategy, bearing in mind that in the next ten years great changes will occur in the functions of all those concerned. These changes will have to be prepared by all of us together and, in this respect, the Commission will have a vital role to play.

The documentary problems must be analyzed and resolved more precisely in order to derive timely solutions very quickly; this should perhaps be done within the framework of one of the existing working groups. In particular:

-- on the level of document identification, we must do more work in the area of standard coding and numbering of documents,
-- on the level of document location it would be most useful to clear up work on union catalogues; electronic versions should be encouraged,
-- standardization of the presentation of documents should perhaps be encouraged, not only in the creation of standards but also in their applications.

On the level of equipment and techniques, compatibility problems must be identified, and both the CCITT and manufacturers must be made aware of the problems. Technical problems having been dealt with, it is now necessary to create a viable market for the equipment. For this, publishers must be made much more aware of the possibilities, and encouraged to start to exploit the potential market for the electronic distribution of documents. The transmission between traditional methods and totally automatic systems must be analyzed. On the management level it will be necessary to study how future systems can be merged with what exists at the present in such a manner that the user does not suffer.

One or more full scale trials will allow us to identify the detailed problems which have consequences on the operation of the system: they will allow us to evaluate actual costs, and to define the place of ARTEMIS in information transfer. In fact, we have not been able to view a fully operational electronic document delivery system at this workshop. The market depends upon what is offered, and users will not buy without seeing: one must show them an actual system.

Finally, we must tackle the general policy problems without delay, in particular that of copyright, which although not the subject of this meeting must remain in the forefront of our minds. Each of us has a role in the playing out of a scenario for the future. The Commission has a special role in providing platforms for study leading to a viable organization, in particular to motivate the development of common standards and procedures and legal solutions to common problems. Also the Commission should encourage the development of integrated systems and assist in their evaluation so that users could be made aware of their characteristics.

# SPECIAL SESSION

P.T. KIRSTEIN

CHAIRMAN

## INTRODUCTION - THE TOPICS DISCUSSED

*The Chairman*, opening the session, suggested that participants should try to cover some of the many interesting topics that had emerged during the meeting, but for which there had been insufficient time for thorough discussion. Some sort of agenda was however necessary and he suggested that two items had been insufficiently covered in the previous sessions. The first was the general question of what kinds of tests were necessary as the next stage in the project, with the possibility of extending this to a discussion of how they should be organized and by whom. Second, there was an important area in the relationship between electronic publishing and document delivery systems, and extended new services having the general character of message-switching, which had hardly been touched upon. This could have important consequences in the development of ARTEMIS, and could even possibly affect the design of any test pro-pramme. The Chairman then invited other suggestions for topics to be discussed.

*Mr. K. Haefner* pointed out that it had not been possible to get an impression of any timescale for ARTEMIS: he would like to see some discussion of what should happen and when.

*Mme. N. Dusoulier* pointed out that ARTEMIS would take time to establish and would not completely replace traditional document delivery practices: the tranistion problems which would have to be faced should therefore also be discussed.

Other suggestions were made by *Mr. I.A. Galbraith* who wanted to discuss the Group III facsimile standard, and *Mr. D. Borrey* who wished to know more of the Commission's plans for part-financing in the next steps.

## THE KINDS OF TESTS REQUIRED IN THE NEXT PHASE OF ARTEMIS

*Mr. A.R. Butcher* found that, as a technician, it was difficult to respond to the ARTEMIS report with a very specific plan of action. At the workshop, he thought that too many lines were being drawn: some wanted ARTEMIS to be a computer concept, others considered it a laser disc concept or even a microfiche concept. Another related point was the preoccupation with standards during the workshop; he suggested that in all these

areas the new possibilities opened up by microprocessor technology had not been fully realized. This technology would allow components of different systems to work together, and would provide bridges between different standards. He was therefore in favour of starting ARTEMIS with a number of different approaches: if the Commission had money for a test programme, it should spread this between a number of different technical approaches rather than wholly finance one.

*The Chairman*, while agreed that there should be more than one test, pointed out that each must reach a critical mass of users and institutions involved if the results were to be meaningful. The numbers of separate tests in the programme must therefore be limited.

*Mr. C. Vernimb*, in reply to questions on the possibilities for financing of tests by the Commission, said that the question was not so much whether there was money available; if a viable concept for a test programme was put forward, and if this was a cooperative venture, to which the partners themselves contributed, then money could be found. There was however a question of timing, since the necessary processes of consultation meant some delay.

*Mr. J. Page* considered that test programmes should if possible embrace the main technological options presented at the workshop, i.e., facsimile and coded character methods of digitalization including perhaps hybrid systems, micrographs and the satellite option for transmission.

*Mr. J.C. Gray* raised the question whether the test programme should be primarily investigatory (necessary for example if there were technical problems still in doubt), or operational. He believed that the test programme should not be oriented towards technological investigations, but rather, as had been emphasized in the discussion that morning, towards user requirements and reactions. He agreed that a range of technologies should be offered in the test programme, because it would be important to obtain data on user reaction to each.

*Mme. N. Dusoulier* agreed: while investigatory projects were necessary for future systems, we did not now want to organize tests to prove the technology or investigate equipment which already existed: what the test should show was whether the systems were workable in an operational environment. This included all the user aspects already discussed including how the user could locate a document. Another very important aspect of the test programme was to motivate the users: the creation of a market meant precisely that, and therefore the test programme could also be thought of as a series of fully operational demonstrations.

*Mr. D. Borrey* stressed that for a given test, we needed partners: an information provider, a computer systems operator, a manufacturer of equipment and a user group. In the two proposals with which his firm had been associated, two or three

of the partners were already involved. If technical manuals were selected as a type of literature to be provided on a test basis, why not ask ESA to provide a user population of sufficient size and having sufficient frequency of use. He believed that the Commission could help organize user groups for the test programme as a whole. He did not think that large amounts of public funding would be necessary to launch a meaningful test programme.

*Mr. I.A. Galbraith*, agreeing with the last two speakers, pointed out the importance of finding environments in which user requirements could be established (for example in ESA) and their reactions to the technical solutions offered by pilot projects observed. The user environment for the test should be representative of the larger market.

## THE MARKET FOR ARTEMIS

*Mr. C.R. Clough* considered that present methods of document delivery had not been overburdened by the results of online; moreover, online access was not sufficiently developed, even in the larger companies, to the point at which there were numerous terminals frequently in use by the end-user. There were two barriers to electronic browsing and document delivery: first there were too few terminals, and second the state-of-the-art in present online bibliographic searching. He did however think that the type of suggestion made by *Mr. K. Haefner* was a future possibility: secondary publications in electronic form distributed conventionally could be interrogated on personal computers.

*Mr. K. Haefner* suggested that ARTEMIS would not exist solely in a document delivery service: the standardization problems and so on would take years to solve, and by that time other methods of obtaining information might be current.

*Mr. A.R. Butcher*, disagreeing said that both CSI and his own firm had found there was a market for present delivery systems. These were largely stand-alone systems within one company or organization. ARTEMIS was a much more general concept, but the technology was just as applicable.

*Mr. J.C. Gray*, referring to earlier statements, suggested that there was no evidence yet which showed that online services increased the numbers of document requests, although future studies might throw more light on any such relationship. Requests from BLLD, which was responsible for 80% of the interlibrary loans and photocopying in the UK, had not risen since the widespread use of online began in 1976. It was possible that the market for document copies was reaching saturation in the UK, since the existing machinery was effective. There could be an absolute maximum level of demand, perhaps not dominated so

much by money as by the time users were prepared to devote to information acquisition. In the cases in which saturation had not been reached, online could of course result in increasing the level of demand, but in other cases, ARTEMIS would be competing with existing methods. Therefore, in any test programme, an important element would be to measure the degree to which the new services would persuade users to switch from traditional methods.

*The Chairman* observed that, while it was relatively inexpensive to add an electronic ordering facility to online searching, the problem to be examined in electronic document delivery was the degree to which the increased costs involved would meet a user response. In this, other factors could be important, for example, the relative speed and efficiency of the basic location and supply organization, the normal level of postal delays, etc.

In reply to a question by *the Chairman*, *Mr. R. Maxwell* was of the firm opinion that there was a need for a follow-on project. While he did not think there was much benefit in trying to guess what the situation might be in ten years' time, there was now an urgent need to meet an existing demand for documents. This was why Pergamon, in its negotiations with VINITI, had insisted on the supply of the original documents from VINITI, to avoid user frustration in not being able to obtain the documents referenced in an online search. Pergamon had not decided to go into electronic document delivery without knowing something of the increasing demand. Therefore, he wished to see the project enter its next stage, that of operational tests: Pergamon was very willing to cooperate with anybody in this field. He believed that *Mr. K. Haefner*'s anxiety that ARTEMIS would take on the characteristics of a large centralized system was unfounded. Many variations for the decentralization of the delivery services within ARTEMIS could be envisaged. Further, while Pergamon would continue the development of its system in any case, he considered it was necessary for the Commission to play a role in this whole area. The Commission had certain skills which were indispensible, and they could call international meetings such as the present workshop, and could thus obtain opinions from people to whom private industry would not necessarily have immediate access: the Commission could involve governments far faster.

In reply to a further question by *the Chairman*, *Mr. R. Maxwell* said that while he would not rule out financial help from the Commission in a test programme, this was not a precondition for Pergamon's participation: what was essential was the Commission's active collaboration.

*Mr. A.R.D. Norman* suggested that one main advantage of the value which the Commission could add to purely private enterprise in the area of new document delivery systems was to make private enterprise public. By this he meant that the Commission

could hold meetings at which providers and systems operators could discuss how technical requirements for access to their systems could be made more general. In this way, we could avoid the situation encountered earlier in the electronic data processing industry, known as "fencing", in which a major supplier could create a system of procedures, protocols and standards, which would prevent a user being able to use any other type of equipment. The Commission's task was therefore to assist in the build-up of an open system initially composed of a number of intersecting closed systems.

*Mr. A.C. Nicholas* suggested that we had to focus on how to improve life for the user, and how to strengthen information supply. Choosing technology was not an area in which governments and intergovernmental agencies had demonstrated great success in the past. We should therefore proceed indirectly so that the technology flowed from what users wanted and services which providers wanted to supply. It would be impracticable to try to create a central, all-encompassing service; instead, we should consider issuing a Call for Proposals which could be responded to by a number of organizations, each able to contribute some of the necessary funding, but because of the high risk nature of the project, these resources would be matched by Community funds. The Commission in return, could make conditions about compatibility with existing procedures and standards.

*Mr. K. Haefner* pointed out the difficulties of achieving a totally open system from the start: he welcomed the Pergamon initiative, which he regarded as a closed system, and said that the objective should ultimately be to merge closed systems into an open system. He favoured closed operational tests as a beginning. The chairman remarked that it had never been proposed that ARTEMIS should be a totally open system, in the sense that it included all hosts and all information. On the latter point, he referred to the added value concept previously noted as an ingredient in successful electronic document delivery. It would be important to identify information to which value would be added by ultra-rapid delivery, for example, patent information.

*Mr. D. Borrey* said that one of the objectives was to indicate the conditions under which an electronoc document delivery service could be viable; i.e., to show how the various types of organizations concerned might profitably enter the market. He thought that a test programme could be constructed in such a way that demand could be built up to the point at which services would be viable in themselves. His company like many others, was convinced there was a market but was uncertain about the extent of any gap between costs and the prices which could be charged. He was willing to take part of the risk, but considered that the gap between costs and prices should be initially met by public funds in the interests of getting the service started.

NEW SERVICES AND THEIR RELATION TO MESSAGE-SWITCHING

*Mr. A.R.D. Norman* said that ARTEMIS was conceived as a new conduit over which content could be delivered. This delivery could be from one to many (for example, document delivery), from one to one, i.e., electronic mail, or from one to many with time lags, which could be classified under the general heading of on-demand publishing, and from one to many on the basis of selective interests, i.e., on a common interest profile. The fact that all this could be done via the same conduit amounted to a new means of placing the author in contact with his readers. He did not believe that conventional market research techniques would help us discover which of these new possibilities was going to be the most important force in the market. The only way of proceeding therefore was to open the market to all those who wanted to try to provide such services, and allow those which found a user response to succeed. Answers to these questions could not be obtained without experiment. No forecasting technique had ever succeeded in predicting how new services would take off.

*The Chairman* observed that if we were going to discuss conduits and services in such a broad context, we could not avoid raising the whole question of the message-switching monopoly, the value of information and the appropriate charging methodoloy; in fact, this amounted to an examination of tariff policies for all kins of information transfer. This was an extremely wide issue: should it be raised in this context?

In reply *Mr. A.R.D. Norman* considered that we had no option but to raise that issue. It had already been raised in the United States, by the decision of the Federal Communications Commission to deregulate, and European governments were also looking at this issue. In Europe, the same tendency was evidenced by the proposals received for direct broadcast satellites, and for experiments on the Orbital Test Satellite: there would be wider possibilities for communication during this decade: we should accept that the methods of communication would change accordingly.

*Mr. K. Haefner* considered that, in this case we should start from what was already known: computer conferencing for example and the message-switching possibilities within a scientific community. Expanding such systems might be more beneficial than creating new systems, but in Europe we were prevented from doing this by high PTT tariffs. We should nevertheless try to build on such experiments as already existed.

In reply *the Chairman* instanced experimental computer teleconferencing activities going on in Germany, the UK, Sweden and France: this subject seemed to be well covered without involving the Commission.

*Mr. A.R.D. Norman* pointed out that the new services suggested had all been considered in the preparation of the ARTEMIS report: this had led to the conclusion that an open system was the only

appropriate solution for Europe, if we were to match the success of communications ventures in the USA, which under a different regime were there possible by private enterprise. In reply to a further question, *Mr. Norman* pointed out that an activity on a European scale was necessary in order to justify the users' investment in equipment to join the network. The possibility of providing access to valuable information on a special basis, for example, subscription plus item charges, was not ruled out in an open ARTEMIS system, which could accommodate closed user groups.

CONCLUSIONS

*The Chairman* concluded that those present were in favour of a test programme designed to establish user reaction to services based on different technologies, and invited concrete suggestions on what type of new services should form the subject of operational tests.

*Mr. R. Maxwell* proposed tests on the lines of the Pergamon/ Infoline proposal, suitably amended to include requirements of other institutional and governmental agencies.

*Mr. I.A. Galbraith* favoured the use of a combined facsimile and wordprocessing terminal on a development trial basis in the test programme.

*Mme. N. Dusoulier* and *Mr. J. Page* proposed that one of the tests should use micrographic storage techniques, perhaps with specific application to grey literature.

*Mr. J.C. Gray* considered that the document delivery Task Force should consider future action under a number of options, the storage option being an important one.

*Mr. R. Maxwell* thanked the Chairman for providing this opportunity for extended discussion. He felt that the ARTEMIS concept was right, and the Commission's involvement in it was also right; he looked forward to seeing a test programme being organized involving all interested institutions.

*ANNEX 1*

# POST WORKSHOP CONTRIBUTION BY PIRA, THE RESEARCH ASSOCIATION FOR THE PAPER AND BOARD, PRINTING AND PACKAGING INDUSTRIES, UK.

by

B. Blunden and Y. Gates

## INTRODUCTION

Pira intended originally to make a presentation at the Electronic Delivery of Primary Documents Workshop but subsequently withdrew as the specification and list of presenters suggested a preference for manufacturers or suppliers with specific product proposals.

Pira, as a research institute, cannot offer specific product solutions for document delivery. However, it does have experience of many of the relevant and related technologies and its purpose is the pursuit of research aimed at enabling conceptualization of systems and component development with particular reference to the euqipment manufacturer/publisher/user interfaces. After participation in the workshop, Pira offers this paper as a contribution to the work of the Luxembourg meeting.

## THE PROBLEM

By publishing the ARTEMIS report the Commission, through DG XIII, has focused attention on the problem of document delivery and stimulated awareness of the many changes, social and technological, likely to impact on the communications industries over the next two to three decades. Reduced to its ultimate findings, the ARTEMIS report suggests that if users who have located references through bibliographic databases and other means have a need to acquire the original documents, then this need can be met through an electronic document delivery service utilizing teletransmission. The report implies there are no significant technological barriers to the achievement of this

solution but that difficulties are likely to arise in the areas of systems conceptualization, social resistance, legislative (copyright) constraints and magnitude of investment.

Few people would disagree with the simplistic observation that there is an unfulfilled need for an improved means of primary document delivery. However, a distinction must be made between such a need and a significant market demand quantified in terms of volume, price and quality requirements. The ARTEMIS report concentrates on scientific and technical information but provides little evidence to support the view that at present a significant market demand exists for electronic document delivery services, demand in this context being defined as a user purchasing commitment of significant volume at a price level adequate to support a commercial document delivery service. Nor does it attempt to assess user preferences for particular modes of document delivery.

The report tends to reflect a viewpoint biased towards the distribution and delivery technologies, coupled with an emphasis on the role of public institutions (government, international agencies, PTTs etc.), rather than proceeding from the existing document delivery structure - namely authors/publishers/printers/booksellers/libraries/users. These observations are not criticisms of the study which properly draws attention to the macro-technological, -legislative and -economic implications of the information producing and using communities for the future. However, a balance is necessary in such conceptualization or there is a danger that ARTEMIS will appear as a solution for which there is no problem.

There is urgent need for public institutions at national and international level in the EEC to stimulate the introduction of information technology. However, the problem of primary document delivery will only be solved when a market balance exists between the cost of the system and circumstances which are acceptable in price characteristics capable of stimulating an adequate volume of demand. Such a situation cannot be brought into being either by legislative means or direct funding from national governments or agencies such as DG XIII.

The prime movers in the introduction of satisfactory document delivery systems are, and will continue to be, the private sector publishing/printing organizations, libraries and manufacturers of communications equipment. Naturally, public sector involvement through PTTs, standardization and injection of public funds to stimulate innovation will play an important role but this will be most effective if it is undertaken in response to initiatives from the private sector.

ARTEMIS is superbly stimulative in reminding us that information handling is likely to undergo a step change comparable to the introduction of printing in 1450. In the meantime authors will write; printers will print; publishers will publish; users will seek knowledge; and libraries will by and large fulfill a need. A realistic assessment is required to

guide transition from the present situation to the use of the new communications technologies in a socially acceptable fashion at an economically viable price, in a technologically workable way. It is in this area of practical implementation of systems for electronic delivery of primary documents that national research institutes, such as Pira, can make a contribution; perhaps more importantly they can contribute to the wider objective of the implementation of electronic publishing - of which document delivery is simply one part.

For the next five to ten years it is unlikely that full text electronic document delivery will play a significant role in the communication of scientific and technical information (in terms of volume and value) in comparison with the use of conventional means based on printing and reprography. An appreciation of the way in which primary document delivery will come into being may be obtained by assessing the various discrete stages involved in the communication of scientific and technical information. These stages are:

-- Text data capture, including authorship
-- Text and tonal image integration
-- Information storage, manipulation and distribution
-- Output techniques

In addition to the functional stages (listed above) involved in document generation, distribution and delivery, there is need for market research related to the user requirements and preference in information usage.

## TEXT DATA CAPTURE

A pre-requisite for document delivery services is that a document shall exist. Recent research by Pira (ref. 1: Pira/PPITB Ten Year Printing Technology Forecast) indicates that, due to the introduction of wordprocessors, bulk key stroking of text will move from the printer through the publishing sector into the hands of the originating author. Wordprocessing will continue to grow rapidly and become both cheaper and more sophisticated. This will expose the data capture end of printing or any other publishing mode to a large population of highly competent keyboard operators - typists or originating authors. The increasing sophistication of word processing technology, supported by advanced software and the demand for work by administrative personnel, will lead to the increasing distribution of key stroking and the diminution of the need for this function within a given industry sector. Developments in telecommunications such as the British Post Office System X will stimulate the remote capture of data, for subsequent processing in hard or soft copy form. This will lead to the photo-setter being perceived in many situations as an output device rather than a discrete technology area in its own right.

The early conversion of information into digital form for subsequent reproduction by printing will stimulate the use of

facsimile transmission. Considerable saving in transmission times will be achieved by using digital transmission. The use of facsimile will continue to grow in the newspaper industry, as well as in offices, and stimulate the exchange of information in digital format between organizations and between plants. This in turn will reinforce the trend already established towards distributed production units. The use of facsimile and distributed information through telecommunications will be further assisted by improvements in digital output devices, e.g., laser printers, ink jet printers and intelligent copiers. Ink jet and laser imaging will develop continuously over the next ten year period and it is probable that by the end of the period graphic arts quality reproduction, in both monochrome and colour, will be possible by such technologies. This will lead to the realization of on-demand distributed publishing of suitable text materials, a development not unimportant or unrelated to primary document delivery.

## TEXT-TONE INTEGRATION

The input to printing is increasingly coming to resemble a data processing operation. This trend will continue and both data prccessing and word processing will themselves merge. A manifestation of this trend is the tendency towards greater use of digital information in many areas of printing. Digital signals have greater immunity to interference and offer the possibility of merging text and tone (as well as voice and data). The integration of text and tone material is already technically feasible and commercially available. This technology will continue to grow rapidly and by the end of the next decade there will be wide use in larger printing establishment of integrated text and tone reproduction systems, including direct-to-plate exposure without intermediate photographic stages. Towards the end of this period integrated text and tone handling systems will also move down market and become available to in-plant users.

The trend towards the increasing use of direct entry phototypesetters will continue and there will be a growth in the use of on-line typesetting systems. Total electronic manipulation of text and tone and therefore total electronic composition will be widely used by the end of this decade. Electronic full page make-up will become standard and there will be growth in the use of remote portable terminals. Remote entry terminals, on-line systems and total electronic composition with full-page make-up, coupled with developments in software which enable the automation of an increasing number of typographic functions, will continue to move the initiative for data capture towards the author and de-skill the operation.

## ELECTRONIC JOURNAL

The trend in distributed publishing will be stimulative of the electronic journal concept. Increases in the costs of raw

materials and energy, delays in distribution, together with increasing difficulty in identifying and retrieving scientific information in hard copy form, will provide pressures which lead to the replacement of hard copy scientific information by electronically operated systems. As the comparative costs of printed journals inflate (and they are bound to continue to do so) so the cross-over points at which wholly electronic systems become economically feasible get nearer.

## MANAGEMENT SKILLS

The systems management skills for distributed data capture, text-tone integration and on-demand publishing will be found in the publishing and restructured printing sectors. The technologies will be different from those used today in conventional printing and publishing but the technical and commercial management skills demanded will be similar to those already developed by the existing industry. Despite the change in technology, there will still be a need for entrepreneurial skill to spot opportunity for the origination and capture of relevant information and the distribution of that material for profit by value adding by whichever publishing output mode is most appropriate. It is neither likely in terms of competence or desirable socially that this changed technology pattern should move the operation of publishing away from the private sector towards the public sector with the attendant risk of bureaucratic monopoly. Hence state intervention in such areas as document delivery must be responsive to the needs and aspiration of publishers.

## SPEECH INPUT AND RECOGNITION SYSTEMS

Looking beyond the next five years at the impact of changes arising from the dp/wp interface in data capture, it is likely that the new speech input and recognition technologies will play a part. In the not too distant future, speech input and recognition systems will allow direct data entry and communication between computers and people. When voice recognition with computers becomes widely available, the power of computers to perform numerical calculations and to store and manipulate information will be available to anyone who has access to a telephone line. Information handling and document production systems could benefit substantially from direct voice entry devices. In Europe, for example, something like half of all textual matter is originated by hand and re-processed by a typist. Dictation machines for originating text speed up the process of data capture approximately six times.

For computers, data input is an area where the use of speech input could bring considerable increases in speed - something which is greatly needed in view of the revolutionary developments in text output from computers, where 170 pages per minute can be produced by a laser electro-photographic copier, and ink jet printers can generate 2,000 characters per second.

The average rate of input for keyboarding is 60 words per minute. If speech input were used, this could rise to 150 wpm - productivity increase of 150% as well as a substantially simplified mode of data capture for authors. Over the next five to ten years we shall see the introduction of speech input systems linked to wordprocessors for correction routine purposes which will make the capture of material both for hard copy output and electronic manipulation possible by this means. (Ref. 2: Pira study - The Impact of Speech Input and Recognition Systems on the Communications Industries).

## SIMULATION LABORATORIES

To aid the conceptualization and implementation of practical systems for remote capture of text data, the integration of text and tone and the output of information in various hard and soft copy modes to meet user needs, Pira has introduced the concept of the "simulation laboratory". The first phase of this concept was the establishment of an electronic composition laboratory which is now operational. In this laboratory it is possible to simulate various electronic composition systems and study problems of data capture including interfacing with remote wordprocessor equipments etc.

The second phase is about to be implemented in the form of a colour communications laboratory where the most advanced colour reproduction equipment will be installed and particular emphasis placed on the assessment of digitized information processing and text/tone integration.

The third phase of this development programme relates to electronic publishing and it is planned to establish an electronic publishing laboratory supported by the private sector publishing community of Europe during 1981. The research undertaken in this centre will be highly relevant to the introduction of practical integrated systems of primary document delivery and undertaken in a way that assists the publisher to obtain a proper return on his investment.

## DATA STORAGE, MANIPULATION AND DISTRIBUTION

Pira, apart from carrying out research into printing and print substitution technologies, also runs its own bibliographic database and special library. The Institute is serving something over 1,000 industrial clients internationally and provides both hard and soft copy output including four abstracts journals issued monthly, many hundreds of special topic profiles regularly produced at two-weekly intervals, magnetic tapes and on-line services via Lockheed Dialog. The information for this service is entered via wordprocessors and transferred to a main frame computer externally. The production of the hard copy materials and soft copy products is taken from this single data entry process, including the typesetting for the abstracts journals. In addition to this bibliographic information,

statistical data is collected related to the industries served by Pira and more recently research has been carried out to investigate the feasibility of industry sector numeric data-banks, together with the systems requirement for integrating bibliographic and numeric database searching.

VIDEOTEX/VIEWDATA

Concurrent with this research a study has been made to assess the acceptability, effectiveness and costs of providing technical information to industrial management through viewdata/ videotex systems. (Ref. 3: Pira Evaluation of Viewdata for Information Dissemination; Reactions of Industrial Managers.)

The reason for looking at viewdata as a means of providing scientific and technical information to industry was to establish if it was a better method of dissemination than those used at present. Two sides of the same problem are apparent: users of information in industry have difficulties in obtaining it when they want it; and organizations such as Pira have to ensure that considerable information and knowledge built up over the years through research is made accessible. A need therefore exists for an up-datable system which can provide users with a readily available access point which will either provide the information required or a source for further information. How the industrial user of scientific and technical information requires the material to be presented must be investigated and taken into account in any debate on systems for primary document delivery. This problem is worthy of further consideration because there is some evidence to suggest that industrial personnel are equally or more interested in reformatted information than the acquisition of primary documentation.

In the Pira research viewdata's effectiveness as a method of making information more accessible to industry was examined by establishing a pilot database for the printing industry. This enabled a number of types of information to be presented in different ways. A sample of industrial users was then invited to use the database in order to give them firsthand experience in finding information and to enable them to give considered and informed comment.

The results of the research indicated that viewdata was a practical and effective way of providing factual information to users in industry. The experience of users was that it was easy to use and find what was required. If it was available with the information they required, they would not only use such a system but it would change the way they sought and obtained information. This limited research undertaken at Pira suggests that, concurrent with assessment of primary document delivery systems, it would be beneficial to undertake more research to assess the role of re-packaging primary information into forms more appropriate for direct application by the scientific and technical community in industry. Internationally linked videotex systems such as Prestel, Antiope, Bildschirmtext, if used

with editorial imagination, may significantly influence industrial scientific community.

OUTPUT TECHNIQUES

The increasing trend in printing to capture text and tonal material by conversion into digital form will change the balance between the new and conventional output techniques. At present the bulk of scientific and technical information is output in photo-typeset form prior to printing. Where individual documents are required to be retrieved and delivered it is usual to employ some form of photocopying.

The fact that an increasing amount of material will in future be captured in digital form, that storage costs will fall and techniques improve, will mean that photo-typesetting will be perceived as simply one mode of output to be used in conjunction with others according to user needs. It also suggests that there will be a requirement for on-demand output systems capable of offering at least a limited range of typographic quality images, preferably capable of utilizing the encoded typographic data available from the original record.

Such configurations raise some interesting questions as to the most appropriate organization to provide primary document delivery services if the original material is available for direct interrogation in digital form. The publisher may possess copyright and ownership of the original material and might utilize the available telecommunications systems to operate direct document delivery services. Alternatively, copies of the digital record could be supplied to document delivery services - libraries for example - on terms that would provide the publisher with some recompense for the use of his original material. Whatever the configuration of document delivery in this changed technological environment, the problem will remain of finding an adequate image output technology. Two obvious contenders for the solution to this problem are laser and ink jet printing.

Pira undertook one of the first international surveys of ink jet printing related to graphic arts in 1976. This study was undertaken in conjunction with Cambridge Consultants Limited, a subsidiary of Arthur D. Little and led to the publication of a second study concerned with the business of ink jet printing published in May 1979. One outcome of this work was the establishment in Europe of a high technology manufacturing company, namely Domino Printing Sciences Limited, dedicated to research, development and manufacturing of ink jet printer devices. (Ref. 4: Pira techno-economic study, The Business of Ink Jet Printing.)

The Pira research suggests that there are a number of non-impact technologies which might be appropriate to fulfill the requirements of graphic arts quality on-demand publishing. The main contenders would appear to be laser based non-impact printing, laserfax, electro-photographic printing, laser electro-

photographic printing, electrostatic printing, electrofax paper/ printing, electrolytic printing, electro-sensitive printing, electro-thermal printing, charge transfer printing, and ink jet printing. Ink jet printing is non-impact printing with the unique advantage that it is also non-contact. Ink jet technology may be categorized into continuous jet, intermittent jet, impulse jet, ion beam and large-scale jets - each technique has advantages and limitations making it more or less appropriate for a given application. There are about 20,000 ink jet printers in use around the world, over half of these in Japan.

Ink jet offers speed, silence and multiple fonts. It is therefore very much suited to the remote printing unit at the end of an electronic mail or other similar communications link. Ink jet printers are also beginning to emerge as output devices for facsimile. In Japan Toshiba has some 3,000 such machines installed and as the concept of colour facsimile emerges it would seem likely that this market will be dominated by ink jet output equipments. It also seems likely that ink jet technology will be applied to office page printers. While the technology is not yet fully developed for such devices the Mead Dijit system is in use for business forms printing and has an output speed of six times that of the laser electro-photographic devices. Ink jet is a one shot process, which is clean, and low in consumable cost.

It also seems reasonable to expect that ink jet colour plotters may soon have higher resolution versions enabling them to act as sample printers alongside graphic arts colour scanners. This development is a natural progression once the scanning process is digitized. There will be considerable problems of matching ink jets to simulate conventional printing inks used on printing presses, and there are still many problems to be overcome in achieving the graphic arts resolution image quality of about 1,000 points per inch. However, the international survey of laser and ink jet imaging by Pira suggests that the market requirement in word processing, page printing, facsimile and computer print-out, together with specialist needs such as proofing from digital colour scanners, will all add up to a research and development investment programme likely to offer a solution to the needs of document delivery services for acceptable typographic and tonal image quality output devices over the next decade.

## CONCLUSIONS

Few would disagree with the concept of document delivery by electronic means at some time in the future. DG XIII has played an invaluable role in stimulating interest in this topic through commissioning the study of a system for document digitalization and teletransmission by Arthur D. Little which has resulted in the ARTEMIS concept.

This paper suggests that ARTEMIS should be set in the context of developments taking place in publishing and printing

and that such developments will be one of the major determinants in bringing electronic document delivery into being.

More information is required about the real market demand for primary document delivery by the scientific and technical community. The subject is complex, particularly in the light of developments such as the use of videotex systems for "massaging" the existing scientific and technical literature. The UK Publishers Association has initiated and sponsored a study by Pira seeking quantification of the market demand for primary document delivery by users in the UK. The research being carried out by Pira on the need for document delivery, its studies related to videotex for scientific and technical information dissemination, as well as its projects related to ink jet printing and voice recognition, are all helping to build up a picture of the European marketplace, thus contributing to the development of the ARTEMIS concept in a commercially realistic environment.

This paper also suggests that the private sector publishing industry is an invaluable asset to Europe. ARTEMIS should be seen in the context of the existing industry infrastructure of printing and publishing. These sectors are the sources from which the majority of documents are generated and the industry sectors by which ARTEMIS concepts will need to be managed if they are to be commercially successful for the future.

Publishers, in order to adapt and exploit the new technology available, will require research and simulation laboratories capable of conceptualizing and developing integrated systems for electronic publishing and document delivery. It is the reason why Pira has created a simulation laboratory related to electronic publishing research in 1981. These facilities relate very closely to the initiative taken through DG XIII in conceptualizing ARTEMIS and should be seen as supportive resources to be exploited to bring ARTEMIS or similar concepts into being for the good of Europe, socially, industrially and scientifically

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