

News, Trends and Comments

COMMENT

Is everything converging on Information?

"American communications appears to be the one field - ironically enough - that remains largely oblivious to the growing convergence of interest on theories of information structures and processing, communication, and control in virtually every other discipline". So says J.R. Beniger (Annenburg School of Communications, University of California, Los Angeles) in an article entitled "Information and Communication: the New Convergence" (Communications Research 15(2), 198-218, April 1988). He means, of course, inter-personal communication, not telecommunications.

In the previous year, Jeffrey Katzer (School of Information Studies, Syracuse University) was saying, with reference to the activities of Information Scientists in Europe, that "there have been calls for information science to deal more centrally with meaning and cognition....some have gone farther to suggest that the most nearly related and most useful of the social sciences might be the field of human communication". And later "Surprisingly there is little evidence that information scientists in Canada and the United States have heard what our colleagues (in Europe) have been saying about logical empiricism and the other confining assumptions we have inherited from our past" (Canadian J. Info. Sci 12(3/4), 15-30, 1987).

If the "evidence" means the absence of references in US articles to European articles, R.T. Bottle, writing in the current issue of the Journal of Information Science, considers that "ARIST (The Annual Review of Information Science and Technology) is, of course, well known for its nationalistic bias - otherwise known as DINPIA (Disregard If Not Published In America). Such bias has long been deplored by information scientists".

I would certainly need to know more about the relative volumes and merit of the US and UK papers published in this field before complaining about undue insularity, but this does not appear to be a factor in the convergence, or lack of it, between several disciplines which ought to be talking to each other. According to Beniger, Communication Theory (human not Shannon) has been left out of the converging Humanities, Semiotics, and Cognitive Science.

The authors central to this convergence are Chomsky, Wittgenstein, and Levi-Strauss.

Beniger's comments were triggered by a perusal of the "Handbook of Communication Science" (reviewed elsewhere in "News, Trends and Comments"). He laments the absence in this book of any key authors from the central focus of the new convergence, but "this must be blamed on the field of communication itself and not on the Handbook or its 38 authors. To find such a fault with a handbook, which by tradition reflects a field rather than leads it, would be to blame the messenger for bringing bad news".

Of more interest here is whether information science ought to be converging with the conglomerate just mentioned. According to Kater "Our field (information science) has been limited to a concern for the delivery of documents to scientists and engineers for the purpose of improving their decision-making and problem solving... what has been recommended is to add, as central to our endeavour, a more comprehensive consideration of meaning, intention, cognitive components of personality, and many other topics which have previously been viewed as more a part of the social-behavioral sciences than as integral to information science".

"Perhaps we can increase our scope... to identify and use newer conceptualizations which will enable us to engage in the study of user information behaviors... those of us engaged in the study of information users might do well to question the viability and usefulness of the current assumptions underlying information science and to consider communication variables for new approaches to the study of user behaviors".

Kater discusses some of the behavioural aspects requiring attention: "users may bring to the information system an incomplete understanding of their needs, further distorted by their preconceptions of what the system can provide... the more the system knows about users the more likely it will be able to respond to their needs... in a world of information overload, limited time, and inter-personal pressures it is difficult to achieve optimal rationality". For decision making, organisations "gather information and don't use it, ask for more and ignore it, make decisions first and look for the relevant information afterwards. Information from a decision-theory point of view is simply gossip".

Later Kater makes some positive proposals, for instance "with the availability of powerful work stations, it is now practical to consider organising a database subset according to a single users cognitive structure".

This general lack of inter-communication seems to be confirmed by studying the references of the publications mentioned. The Handbook lists nearly 3500 authors in its index which has to be some kind of record. Beniger cites 76 different authors and Kater 45. With a total of 3500, you would imagine that nobody could be missed, and yet 38 of Kater's references are absent from the Handbook. Kater and Beniger have only one reference in common. Such is the gulf between Information Science and Communication Science. Responding to the question posed in the title of this piece, there seems to be no convergence between studies about the supply of

information to people and studies about the exchange of information between them. This does seem to be rather odd.

SHORT REVIEWS OF BOOKS

Handbook of Communication Science Edited by Charles R. Berger and Steven H. Chaffee. Sage Publications, Newbury Park California and London. 1987. 946 pages. UK Price £49.95. ISBN 0-8039-2199-3.

Your interest in this book will depend on your feelings about the topic discussed under the above heading "Is everything converging on information?". According to one of the chapters in the book there are three dominating areas in recent communication research - the study of **Traits**, **Transindividual** approaches and **Cognitive/Interpretive** aspects. Traits are the predispositions of a person to initiate action or react to behaviour. Transindividualism is to do with relationships, groups, cultures etc., and Cognitive/Interpretive aspects cover a person's ability to interpret and communicate.

The book contains 38 chapters written by 35 American, 2 British, and one European - all academics. The eleven chapters describing "contexts of communication" provide the best clues as to why Communication Science could be of greater interest to Information Scientists. The chapter on "Communication Campaigns" summarises the work done in a variety of fields ranging from the campaign in China aimed at nothing less than "transforming thought patterns, class/power relationships and economic institutions" to very long campaigns such as the Stanford 18 year programme for heart disease prevention.

The discussion about Medical Information Systems in Chapter 22 "The Health Care Context" is of direct relevance to Information Providers who are concerned about utilisation. The literature on this subject is mainly about the obstacles and gateways to information diffusion among physicians. Research has begun on campaigns to "change attitudes, utilize mass media, and adjust computer hardware and software to accelerate acceptance, learning, and use of medical information systems within applied clinical settings".

A remarkable feature of this book is the index to over 3500 authors. Page-mentions per author are about 3, so the book must contain about 10,000 references. If you want to become immersed in the many aspects of human behaviour and communication it would be hard to imagine a better book.

Encyclopedia of Information Systems & Services (9th Edition). Volume 1: United States. Volume 2: International. Volume 3: Indexes. Edited by Amy Lucas. Gale Research Inc., Detroit, 1989. 2330 pages (total). ISBN 0-8103-2646-9 (Set). Price \$420 (Set)

Telecommunications Systems & Services Directory (3rd Edition). Edited by John Krol. Gale Research Inc., Detroit, 1988. 1116 pages. ISBN 0-8103-2345-1. Price \$285.

Computer Readable Databases (5th Edition). Edited by Kathleen Y.

Marcaccio. Gale Research Inc., Detroit, 1989. 1187 pages. ISBN 0-8103-2775-9. Price \$160.

It is not often that the UK Post Office arranges a special trip to deliver a publication carried in its own canvas mailbag. This was not an overdue Christmas present delayed by the effect of adverse winds on the Post Office's transatlantic sailing ships, but the **Encyclopedia** named above.

This has become a massive affair which now lists 1350 organisations in 70 countries and 2900 in the US which between them generate over 30,000 information products and services. The Master Index of no less than 860 pages lists organizations and services, followed by Database, Publication, Software, Function (classified), Personal Name, Geographic, and Subject indexes.

It is good to see a considerable improvement in international coverage but the number of entries per country still bears little relationship to the actual numbers of services available. The Geographic Index contains 81 pages for the US, England 10 pages, W.Germany 6, France 4, Japan 1.5, and Italy 1. Even so, Volume 2, the 535 page international listings volume, is far more comprehensive than most so-called international publications.

I noticed two other points of particular interest. Over 300 entries are now included in the CD-ROM and Optical Disk section of the Function Index. The Personal Names Index contains well over 4000 names. There is a lot of mobility in the information world and a current "Who is where now?" index should be rather useful.

The **Telecommunications Systems & Services Directory** brings together what is now a very large diverse collection of entities such as teleconferencing services, regulatory bodies, training organizations, telecom law specialists, Electronic Funds Transfer (EFT) services, and many others. The 50% expansion of this edition reflects the worldwide activities released by de-regulatory processes.

This publication may well be unique for its coverage, but once again international coverage must somehow be improved - an expensive and time consuming process. The UK Office of Telecommunications (OFTEL) is not listed and there are only four entries under Japan although there are many very large organizations providing services well known in telecom circles in that country.

Obviously the very rapidly changing telecom scene presents severe problems. For example the booming Electronic Data Interchange (EDI) services do not rate a section among Function/Services although in that section the longer established Cellular Radio, Electronic Mail, and Videotex services appear.

The doubling in size of **Computer Readable Databases** reflects growth since the publication of the last edition in 1985. The task of covering this field was first undertaken by Martha Williams in 1975. It has now reached such a scale that this edition is the first which has had to be undertaken by a professional directory publisher. Williams is continuing to be associated with it.

In an interesting preface, Williams provides some statistics showing that 1982/3 was the take-off period for databases. In 1982

there were about 800 containing about 280 million records from which 7.5 million searches were conducted. The 1988 figures are 4042, 2255 million, and 26.48 million respectively. It is not clear whether or not all these statistics relate only to US databases. The figure for searches relates only to searches on "major US systems".

The major database producing countries are the US with 2696, England (or should this be the UK?) with 304, Canada 268, Germany 171, France 167, and Australia with 105. Database files were by-products of tapes generated by the producers of printed scientific indexes. However the occupational need/price equation is such that purpose-designed business information databases were able to succeed from scratch. The major categories of today's databases are Business with 44% of the total, Science, Technology, and Engineering with 29%, followed some way behind by Social Sciences, Health & Life Sciences, Law, and News, each with about 10%. Note, however, that over half the total are in the general area of the sciences.

CD-ROM: Fundamentals to applications. Edited by Charles Oppenheim. Butterworths, London, 1988. 308 pages. ISBN 0-408-00746-X. Price £45.

Charles Oppenheim has done a commendable job in persuading authors to produce a set of chapters which take the reader through the various steps implied in the title of the book. The result is a kind of CD-ROM handbook. The 13 chapters range from a general introduction to system arrangements, user interfaces and CD-ROM/CD-I technology, to possible applications, and some actual applications.

Most of the authors provide no information for further reading - in fact only three chapters contain any references; one has five, another six, but the chapter by Mastroddi reviewing CEC (European Commission)-sponsored CD-ROM projects contains 35, and they appear to be well chosen. There is a chapter by Oppenheim about sources of information and a good index. Obviously this book should be on hand for anyone in the CD-ROM publishing business, and should be available for reference in appropriate libraries.

As a long-time sceptical student of technological forecasting I was amused by the projections quoted by Mastroddi. The forecast for the number of CD-ROM drives worldwide in 1990 is 14,000 according to Quarry Hill (1984) but 534,000 according to Link (1986). CD-ROM revenues are expected to be \$US 1.2 Billion by 1992 according to Market Intelligence Research (1986), but \$US 3.28 Billion by Link (1986). I am reminded of the British Post Office's 1979 forecast for 40,000 viewdata receivers by the end of that same year, and one million by 1985. The actual numbers were 2000 and 60,000 respectively.

Chapters 8 "ADONIS: the story so far" by Barrie Stern and Robert Campbell taken in conjunction with Chapter 9 "Publishing on CD-ROM: some financial principles and market considerations" by the same authors, and "Pergamon and CD-ROM: a case study" by Christine Baldwin, are interesting. People who develop new products do not usually describe the ups and downs of their project so that others may benefit from their experiences. Here are two exceptions.

Unfortunately space precludes a discussion about both so I will take chapters 8 & 9 about ADONIS. The history and reasoning behind the project is discussed, financial constraints are described (a topic which very rarely gets an airing), and some information about the operations and results of the trial follow. The objectives are to test a service for the provision of articles direct from the publishers to document supply centres in different countries by periodically providing them with the full text contents of over 200 biomedical journals on a CD-ROM. Such a service would, among other things, enable publishers to control revenue which may otherwise be denied them from photocopying.

It's always interesting to hear about ideas which are ahead of their time. The idea of relaying ADONIS data to remote laser printers by satellite transmission came up during the project - prompted by IBM's excursion into the arena, with others, with its Satellite Business System (SBS). In 1985 the remnants of SBS were sold to MCI, an American communications company. SBS obtained only about 20 corporate customers but cost the IBM consortium \$1.3 billion to set up.

The section in the ADONIS chapter about this idea concludes with a comment about the abandonment of a similar system - the European APOLLO satellite relay project - because "the sheer speed of transmission capability exceeds the known market needs". This difficulty might be alleviated by using a slower channel which is the result of sub-dividing a faster one. For more about whether such a sub-division might give rise to cost-effective services, see another part of News, Trends & Comments.

Annual Review of Information Science and Technology. Volume 23. Edited by M.E. Williams. Elsevier Science Publishers, Amsterdam (for ASIS), 1988. 361 pages. \$79.50, Dfl 225. ISBN 0-444-70543-0.

This publication follows its usual practice - that is it covers a range of topics considered to be of current interest in three main sections: Planning Systems & Services, (this year "The US Government as a Publisher", "Information Policy Issues in Science & Technology", and "Information Marketing for Libraries"), Basic Techniques and Technology ("Optical Disks & CD-ROM Publishing and Access", "Quality Control in Online Databases" and "Psychometric Measurement and Information Retrieval") and Applications ("Information Systems and the Law", "Office Automation", and "Information and Information Technology Management").

Each chapter is very fully referenced, there is an exceptionally good index, and finally there is a cumulated keyword and author index to all 23 volumes.

I always think that ARIST is a most useful book. Perhaps Chapter 9 - "Information and Information Technology Management" by Marianne Broadbent and Michael Koenig, is the most interesting chapter. The strategic use of IT and the competitive advantage that may accrue to the user is a topic which is currently receiving a lot of attention. Absurd claims were made for Management Information Systems (MIS); when they could not be substantiated MIS fell into

disrepute to be followed by Decision Support Systems (DSS) which fared a bit better, but which have been displaced or merged into today's Information Resources Management aimed at providing strategic advantage. It is this area which receives most attention. The prime sources of information about it are listed here and the chapter provides an excellent starting point for those who would like to explore further.

It has been suggested that ARIST should be called "The Annual Review of American Information Science & Technology". In this volume, out of the 70 references in the Chapter "Information Policy Issues in Science and Technology" 69 are to US sources; the chapter is about US policy only. In the Chapter "Office Automation" (in fact a worldwide trend) 54 out of the 61 references are to US sources. The section "Office Work" starts with "It has long been clear that most U.S. workers..." and continues with US experiences. The only foreign mentions are to Swedish work on VDU health problems, and to Mumford's work in the UK on human problems during system implementation.

Does ARIST purport to be an "International" review? This could be implied from the stated objective in the preface: "The purpose of ARIST is to describe and appraise activities and trends in the field of information science and technology" - presumably meaning everywhere.

On the other hand perhaps a high percentage of the world's activities in this field above some arbitrary level of importance are pursued in the US so that ARIST is simply reflecting this reality. Europeans would dispute this, but sometimes a sour grapes attitude is evident. How much foreign work is described in English language journals, mostly American, because the foreign authors know that only then will they reach a wide readership? How much of a language barrier is there for ARIST authors checking the literature and is there much important work reported in foreign language journals which is denied to them because they can't or won't read them? Does any really significant foreign work go unreported in ARIST?

I do not know the answers to these questions, but what I do know is that insularity, if that it be, is not an exclusively ARIST or American phenomena. Browsing through a one thousand page collection of papers published in Europe entitled "Pathways to the Information Society" I note that references in the paper "Future facilities in Digital Networks" by T. Arita et al from NTT are to Japanese work only, and that in the following paper "Packet-switched communication services in the ISDN" by V. Frantzen of Siemens, the references are to German authors only. In both cases the volume of important US work in progress is very large.

Is there perhaps a convention that an author of what appears to be, or is, a review paper, is not obliged to state in its title that the paper is about the state of the art in his or her country only?

TRENDS**Satellites and document delivery - a down to earth look at up in the sky systems.**

The idea of transmitting page data to be printed remotely has been around for many years. Early document delivery experiments by facsimile as a possible replacement for sending photocopies by post were carried out in 1966 and have continued intermittently ever since.

The European Commission, with others, initiated the Article Procurement with Online Local Ordering system (APOLLO) system in 1983. The idea was to transmit page data from several agencies via the Eutelsat SMS transponder (Eutelsat is a consortium controlling certain European satellites and a transponder is a send/receive relay unit on board a satellite) to an unlimited number of "small, low-cost, receive-only, earth stations"^{1,2}.

As mentioned in connection with the ADONIS project in the Book Reviews section, the notion of relaying article pages by the APOLLO system was not pursued, according to the authors, because "the sheer speed of transmission capacity exceeds the market needs". A better way of addressing this problem is to ask the question "Would it be a viable proposition for a data-wholesaler to lease an available but costly high speed satellite channel, divide it into a number of low speed channels, and retail them at costs/speeds to individual organisations/users at an acceptable price? At this time there would seem to be little point in considering exotic methods of data transmission, given the nature and volume of the document delivery business, unless this kind of approach is adopted. It is not so much a matter of sheer speed as of re-packaging a system to meet market needs.

There are signs that ideas of this kind are emerging, if not quite in the over-simplified manner just suggested.

One way of doing it would be for a Telecommunications Retailing Agency (TRA) to set up a two-way interactive VSAT (Very Small Aperture Terminal) network comprising small ground stations, and a hub ground station to which one or more host computers owned by information providers are connected. The TRA leases all or part of a satellite transponder's capacity from a satellite operator; such channels are now available for leasing in the US and Europe.

The hub station transmits data to the transponder which relays it to any required number of small ground stations. Any ground station can relay to the hub for requesting data, or possibly to search a database. The arrangement calls for ground station-to-hub traffic control typically using an RA/TDMA (Random Access/Time Division Multiple Access) system; the ground stations "compete" for burst-transmission time-slots on the same communication channel. Readers who are familiar with LANs (Local Area Networks) will recognize this technique.

An alternative simpler and less expensive method would be for the TRA to set up a facility to which information provider's host

computers are connected, and from which a connection is made to a television station already transmitting entertainment programmes on a Direct Broadcast Satellite (DBS) TV channel. The TRA arranges to lease a data channel on the TV sub-carrier - in effect it uses spare capacity in the radiated TV signal as if it were a separate communication channel. Small receiving ground stations consist of a dish aerial (antenna), receiving electronics, control and decoder unit - probably on a microcomputer plug-in board - and a printer. Requests for data are sent to an information provider through another channel e.g. a telephone line. The dish and "front end" of a ground station use the same parts as are used by entertainment TV DBS receivers.

Both these arrangements are technically possible; the economic feasibility depends on some minimum traffic volume and on channel costs. In the VSAT system, say the TRA leases part of a transponder's bandwidth permitting data rates of about 1.5 Megabits per second (Mbps). Theoretically this could convey over 16,000 8 Mbit high resolution pages per day containing text, equations, diagrams, figures, etc., - more than the requirements of most information providers. A practical, engineered, system would not operate as fast as this theoretical maximum.

The use of data compression would increase the page rate, but because it is unlikely that the system could be organized so efficiently that page data is being transmitted all the time, fewer pages would be sent. If all the pages contain full-page colour or halftone illustrations the page rate would be reduced by eight or more times; the actual reduction rate would depend on the number of pages containing such illustrations and their percentage page occupancy.

For a two-way VSAT system the TRA would split up the bandwidth and sub-lease lower speed channels - say 10 for providers sending 800 pages per day, and 50 for those sending 160. The current cost in the US for leasing a whole "Ku band" transponder with a 54 MHz bandwidth theoretically capable of relaying at 108 Mbps is \$175,000 per month.

The actual cost per user in consequence of the agent's fractional use of the transponder (say a 1.5 Mbps channel), the cost of organising and maintaining the network of each separate sub-let data channel, and the cost of the user's equipment could quite possibly work out at less than the cost of an "all-terrestrial" operation³. This is provided that $n \times t$ - the number of users \times the volume of traffic per user - is large enough. The point is that this number, nt , is much smaller than it would have to be without the intervention of the TRA.

In the US the trend seems to be for the TRA to operate a "shared hub" capable of servicing up to 7000 VSAT stations to be used by people in different organizations. The emerging TRAs are AT&T, Hughes, and Contel ASC. One of the largest VSAT networks is being developed on behalf of American farmers by the American Farm Bureau Federation with a hub network managed by AT&T. It will be used for broadcast and VSAT to VSAT communications by "double hopping" - that is over the path VSAT - satellite - hub - satellite - VSAT. The Farm

Bureau is expected to assume the role of a retailer. It will have spare capacity which it hopes to make available to other organizations. Presumably the Bureau is forced to become a pseudo-TRA in order to bring down the charges per farm VSAT.

In a VSAT business scenario worked out by Chaktoborty³, inclusive of items like transponder charges, hub-costs, terminal costs, R&D, amortization, maintenance and profit, the cost per VSAT (which could service many users) per month is estimated at about \$340. The forecasts for VSATs in Europe are (of course) highly optimistic. CAP Scientific (London) believe that 40% of Eutelsat's transponders will be used by VSATs by 1994 with an installed base of 40,000 VSAT sites. By that time perhaps ISDN channels will be a competitive alternative.

In the simpler one-way system the information provider would receive orders via telephone or telex and The TRA would broadcast coded address and page data at to all ground stations which listen continuously. A station would be able to decode only those pages which bear its coded address.

The assumption so far is that existing technology and communications would be combined to provide a viable private network. But meanwhile public satellite services are evolving for general purpose data transport. Could any of these public services be adopted now, or in the near future for a one-way document delivery system at an acceptable price, well before the above scenario becomes feasible?

This question is particularly relevant for Europe since it is hard to imagine that anything like the American Farmer's network could be a proposition for many years for reasons of costs which will be discussed in a moment. As a matter of fact it's hard to imagine how the US system can be feasible unless the farmers are extraordinarily rich and thirsting for data.

British Telecom is now offering a one way broadcast service called SATSTAR which appears to be APOLLO by another name working at 64 Kbps. The rate for 8 Mbit pages would then theoretically be about 700 pages per day or 3500 with a 5:1 average compression ratio which should be achievable on average. The service as offered is intended to work on a DBS sub-carrier with "DBS front-end" receivers. The system costs ought to be as low as any other contender, and the sub-title of the service is "document delivery and file transfer system" so it is engineered specifically for the requirements under discussion here.

The order of price for a source station comprising a PC driving a small 64 Kbps transmitting ground station, inclusive of the sub-carrier channel costs, is £120,000 to £150,000 a year. This does not include the costs of information provision equipment - that is the host computer and its connection to the PC. The cost of each small receiving ground station is in the range of a few hundred up to £2000, presumably depending on production numbers. There appear to be some uncertainties about the dependency and reliability of the TV channel. To overcome these it would be necessary to lease a Eutelsat 64 Kbps channel. The transmitting ground station price would then be doubled.

Remember that such a system has to compete with alternative

methods - e.g. obtaining a photocopy from the British Library. If BL became a provider the transmission part of the system could be grafted on to the back-end of existing BLDSC arrangements. Requested documents would need to be digitized and transmitted instead of being mailed. User reception arrangements might be communal - that is one receiver per several users. Currently BLDSC supply about 2.25M articles to UK, and 0.75M to foreign requestors each year.

The total extra BLDSC costs would be, say, £300,000 a year for a ground station and the Eutelsat SMS transponder channel, plus the fixed and variable costs of host computer, digitization⁴, storage, retrieval, despatch coding and associated overheads - totalling perhaps £1M a year, but hard to estimate since the percentage of users who would want to use the service instead of photocopying is unknown. As the percentage increased, 64 Kbps would be too slow so the channel cost would increase; all this certainly boils down to a pretty hefty premium per article, and I haven't got down to the question of user article-reproduction costs yet.

We in Europe are at a severe disadvantage compared with the US. Satellite channels are an important price component in the document delivery system mix; the typical charge in the US for the whole capacity of a Ku-band 54 MHz satellite transponder is \$2.1M annually. Fractions of the capacity are more expensive per bit. Hughes will lease a 1.5 Mbps data channel on a Galaxy satellite channel for about \$80,000 a year for trans-American use. The cost on a Eutelsat satellite is about \$400,000 per year for a trans-European 1.5 Mbit channel.

These figures may not be exactly comparable because satellite power and receiver characteristics strongly influence the operational bit rate. Satellite power is as important as bandwidth. As a very rough approximation for satellite transponders the bandwidth w in MHz equals the achievable bit rate r in MHz (theoretically $\max r = 2w$). However the actual bit rate achieved in a VSAT system may be considerably lower.

In the US the demand and the regulatory position are encouraging satellite services. Perhaps the most successful has been the service offered by the U.S. Equatorial Company, now broadcasting data for Reuters, Dow Jones, and the like, to a claimed 30,000 terminals via six transponders. Currently the company is leasing more transponders on the Hughes Galaxy Three satellite.

In Europe, and in the UK in particular, deregulatory activities are just starting to encourage specialised satellite services. Licences were granted in February 1989 to British Aerospace, British Satellite Broadcast Datavision, Electronic Data Systems, Maxwell Satellite Communications, Satellite Information Services, and Uplink. Applications are likely to be similar to established UK (spare capacity in terrestrial TV channel) services such as the BBC's Datacast and the IBA's Aircall systems. Bishopsgate Systems is acting as a facilities retailer for these systems, and users include Coral (betting shops), Horizon Holidays (Teletext), and the Halifax Building Society. Datacast is expected also to operate under the name "Eurocast" for across-Europe services via the Olympus satellite.

European regulatory policy for such services is in disarray. PanAmSat conducted an epic political struggle in order to get its satellite operational to offer competitive transatlantic services. The director general of Eutelsat is sure that PanAmSat is no threat. He is quoted as saying that "there is no chance that PanAmSat will even get permission to operate links within Europe".

This confidence is not misplaced. The current regulatory position is that Eutelsat will only negotiate with one customer per country (UK excepted) - the national telecoms authority middle-man - who offers satellite based facilities at (it is believed) a considerable profit. However the European Commission is creating a few leaks in this watertight situation.

In short, a one-way document delivery service using a terrestrial TV sub-carrier - the most inexpensive of its kind - could be launched right now. The channel cost would be lower than for a satellite TV or Eutelsat channel but total document delivery costs would be high - probably prohibitively high. For two-way systems the VSAT part alone would be very costly. The total document delivery costs would still be high even if in a TRA system there was so much other traffic that fixed costs could be spread over a large number of users. Thus even when the speed question is re-framed, as it was at the beginning of this article, it is hard to forecast when a viable service could become available even by using the most economically organised satellite system.

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