MANAGING THE INFORMATION ECONOMY

A report for

Policy Analysis & Programme Development

Department of Communications

Pacific Region

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COLLEEN BOURKE

MANAGING THE INFORMATION ECONOMY - A Report

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MANAGING THE INFORMATION ECONOMY

INTRODUCTION

This report has two purposes. It is to reflect the current level of interest and awareness in office automation in B.C. -- that is, the regional cast, characters, and their concerns. And it is to provide the reader with a general overview of this topic, its significance, and its relation to the Information Economy.

The report results from a three month investigation carried out Feb-May, 1982 to develop a regional programme for DOC in support of industrial development. As such, it is neither a comprehensive nor quantitative analysis, but an initiating inquiry.

It will be presented in four parts: first, a brief overview of the topic; then the programme rationale because it limited and directed the nature and scope of the investigation, third, the B.C. Scene - interests, resources, activities and people; and fourth, a review of recent books and publications.

PART I THE TOPIC

The application of communications technology to office automation means the instant electronic transmission of image, text, data and voice. It implies desk top terminals manned by executives, engineers and clerical staff, connected with each other.

The first step in office automation is likely to see these terminals situated in the same office but their local networks will, in many cases, access databases elsewhere. Messaging will also transcend the office environment, so that information flows, decisions, ownership, will be altered.

The ability to adapt and exploit the new technology will be significant to corporate profitability, will affect national interests and sovereignty, and will drastically alter employment relationships.

A further step may be the disintegration of the office as a physical space. Already, engineers have formed project design teams with geographically dispersed members. Sales, production and accounting, operating with the same data, are physically as well as functionally separate.

The transformation of the traditional office through information technology brings the benefits of the Information Economy closer to maximization and closer to home. It may introduce new sociotechnical systems, and drastically alter lifestyles.

For a more detailed description of the office of the future and its implications the reader is referred to Part IV, the Appendices and to the many excellent DOC publications such as The Office of the Future by Sharon Coates.

PART II - PROGRAM RATIONALE

The initiative for a programme on office automation was jointly developed by representatives of the provincial Ministry of Universities Science and Communications (MUSC) and regional staff of the federal Department of Communications (DOC). A significant motivation was the desire of both departments for productive cooperation.

The topic of office automation was chosen as one that would support the provincial objective for growth in high technology and the federal concern that Canada could suffer an enormous trade deficit if Office of the Future was not sustained by Canadian manufactured products and services. It was anticipated that a programme on this topic would stimulate the market for hardware and software providers in B.C. and thus increase the economic strength of these sectors.

Additional impetus was provided by the province's intention to implement interdepartment office communications systems, and by the recommendations of a provincially sponsored seminar on telecommunications that targetted the office as the first step in moving to the Information Economy, but added:

> "There is a need for a more effective exchange of views, ideas and manpower..."

To develop a programme for the exchange of views, ideas, manpower, more than 100 B.C. business executives were contacted. They represented different functional responsibilities and a cross section of business and industry.

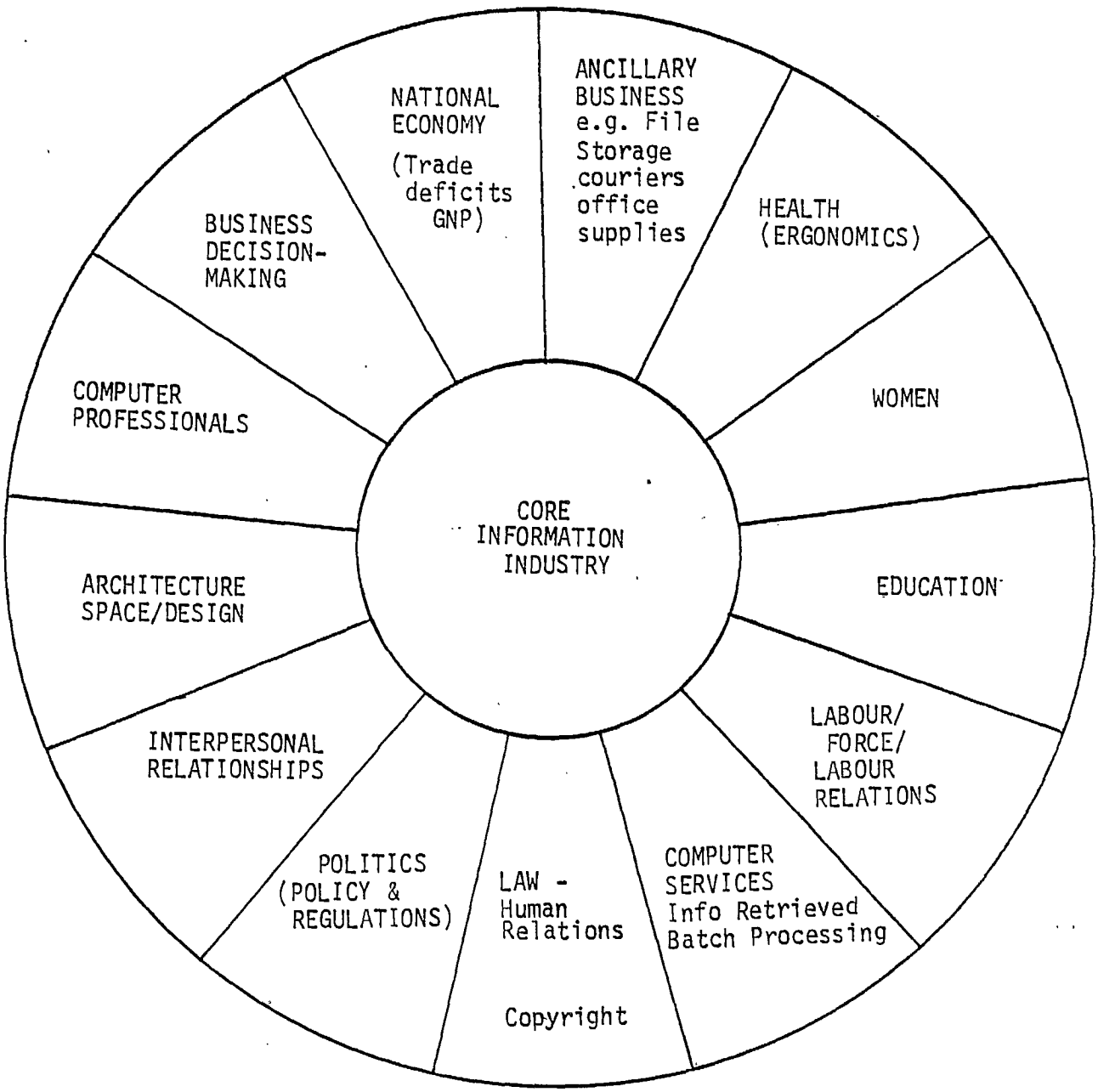
Additional interviews were conducted with data processing professionals, architects, health planners, academic researchers; labour researcher negotiators and elected leaders, educators, representatives of concerned women's groups, personnel officers and consultants, suppliers of office communications equipment and software, and some ancillary businesses such as direct mail, courier service, file storage, etc.

A draft of the programme announcement is reproduced as Appendix A.

Figure I identifies groups affected by The Information Industry. The investigation was directed to the outer ring.

Their responses gave direction to the regional programme and are the basis of Part III of this report.

FIGURE 1.


NATIONAL ECONOMY (Trade deficits GNP)
ANCILLARY BUSINESS e.g. File Storage couriers office supplies
HEALTH (ERGONOMICS)
WOMEN
EDUCATION
LABOUR/ FORCE/ LABOUR RELATIONS
COMPUTER SERVICES Info Retrieved Batch Processing
LAW - Human Relations
Copyright
POLITICS (POLICY & REGULATIONS)
INTERPERSONAL RELATIONSHIPS
ARCHITECTURE SPACE/DESIGN
COMPUTER PROFESSIONALS
BUSINESS DECISION-MAKING
CORE INFORMATION INDUSTRY

PART III - THE B.C. SCENE

1. Penetration of Office Technology

Although no quantitative assessment has been carried out, it is worth noting the nature of applications in B.C. There are very sophisticated applications in some firms, and almost total indifference in others.

B.C. Telephone Company (B.C. Tel) and Insurance Corporation of B.C. (ICBC) are reported to be among the most advanced in adopting new office communications systems. The provincial government is planning to electronically interconnect all their departments; the Health Planning Department of the City of Vancouver has communicating word processors in their 15 health units; sales of micros to business executives are strong; and there is a noticeable increase in phone-in computer bulletin boards in the city; but little evidence that office automation is a major thrust at the moment. However, there was a perceptible increase in awareness during the course of this investigation. A dramatic increase in adoption could be imminent.

In general, businesses which traditionally rely heavily on clerical labour, such as insurance, are well ahead of the resource-based B.C. firms, even though the latter have often a substantial investment in data processing. In at least two forestry companies, the data processing or systems development people are in departments separate from office management. Purchase of word processors, PABX and other office communications equipment is not, therefore, integrated with database management or decision-support.

This is not to say that communication technology is not used in forestry and mining companies. One has an interconnect between five mills and twenty-two sales offices, but the programmes to meet the company's information needs, and the equipment purchased, are responsibilities of computer people in response to the sales manager's request. They are oriented to timeliness of information and structured tasks and do not necessarily address labour efficiency. A consultant working in the field remarked: "There are very few senior executives in Canada who have a knowledge of information technology equal to, say, their general knowledge of taxes. And to manage any company today, whether the product is lumber or retail sales, you are really managing high technology." A systems manager also remarked wistfully, "It would be nice if senior management knew more of what is going on (in communications). They learn -- when we submit a good proposal to the steering committee we usually get full support, but if they were right with us from the start...."

In contrast, the Insurance Corporation of B.C. has established an office of Data Directions so that -- right from the start -- senior management can integrate and coordinate office equipment and processes with technological development.

The District of Surrey is increasing the terminals in their Municipal Hall and simultaneously introducing electronic messaging and filing, decision support models, and information retrieval for a growing number of departments and the public.

An office supply firm has bought software to maintain their customer's inventory control and produce requisitions, invoices and shipping bills as required. They believe the system gives them a desirable up-to-date image and will be truly effective when they no longer need to mail or deliver the requisitions for approval, but have them electronically appear in the customers office.

In retail sales and banking, certain BC firms are seriously preparing for residential interconnects. In each of these areas, the firms showing leadership are the ones who have already substituted electronics for paper in major portions of their operations.

It is common for small businesses - such as restaurants, doctors' offices - to maintain their inventory and accounts through timesharing computer service bureaus. They will likely add Office Automation products as service bureaus expand suitable offerings and applications. (At least one Vancouver service bureau is planning to offer word processor in the near future.)

Several small firms with entrepreneurial gusto are actively seeking a niche in Office of the Future. A direct mail house hopes to be the first licensee for a satellite channel to transmit data for the smaller clients they typically represent. An electronics distributor is trying to joint venture with a courier service. Many of these seem to be floundering between a product and a market, without a good hold on both.

The foregoing assessment of penetration and application is based on a few interviews with middle managers, mainly in data processing.

Considerable activity was also evident in the sale of equipment and programs to executives, but with little comprehension that this may change work patterns and work flows, connect with clerical functions or otherwise alter the office environment. Senior executives were eager to find out what the Information Economy would mean to them, but if asked of their interest in office automation, usually referred the interviewer to their office manager.

An attribute of office automation often overlooked at the executive level was that it blurs the distinction between data processing and clerical functions such as word processing-between information and a product. This has two effects: first, product automation is a cost-saving measure; second, information is a source of profitability. Where systems are implemented without top level participation they are likely to be used only for their cost-savings. The benefits of the integrated office - in terms of profitability - will be missed.

This seems to be the case in B.C. Perhaps economic downturn limits executive vision, or the exposure and responsibility of top management is inadequate in technological insight.

2. The Force that drives the Engine

In discussing the penetration of Office Automation on the B.C. Scene, Part III.1 gives an overview of where and how Office Automation is being implemented, and hints that receptivity is growing. This section addresses why.

The hardware manufacturers are the force that drives the engine. They are supported by an army of software, management, and personnel consultants scurrying for some action. Office automation is aggressively marketed as "Bringing new levels of Productivity", "Double your Office Productivity". See Appendix B for sample advertising.

Lead by International Corporations like Datapoint and Data General, battalions of salesmen are pushing the integrated office concept. Armed with glossy folders, demonstrators, and home-office backup, they make repeat calls, host hospitality suites at computer shows, service, and prepare bids and proposals for data processing and information managers. In B.C. as elsewhere their numbers are increasing.

Management Consultants have carved specialized niches for themselves in technical and behavioral areas: "Salary Guidelines and Compensation in the Automated Office"; "The Human Side of Word Processing", "Office Automation Feasibility Studies", "Preparing and Training Staff for Office Automation". Several firms in Vancouver have established departments of office technology, for example Peat Marwick Management Consultants, and DMR Associates. Some report that a significant and expanding part of their business is in this area, but their eagerness to explore contract possibilities does not indicate they are overworked.

These consultants are, however, well-equipped. Most are armed with the Booz Allen Hamilton and the Evans Research reports on office automation. Tripping from their lips are facts and figures regarding the percentage of phone calls completed on the first try (only 28%), effective typing rate (12-15 WPM words per minute, or approximately 25 double-spaced pages a day for a 70-80 wpm typist), expansion of filing (2 drawers per year per worker with paper costs increasing rapidly), capital investment per worker (approximately $25,000 per blue collar, $2,000 per clerical worker), allocation of management time (executives are only 60-75% productive as they could be), and the administrative budget (word processing addresses only 1% of the total office budget). At least one of these consultants has publicly predicted that there will be only four firms in office automation by the end of the 1980's : IBM, Wang, Xerox, and the Telephone Companies.

Like the hardware and software people and some service bureaus,these consultants contact middle management. Yet many middle managers were not using consultants - even when they were obviously spending a good deal of their time addressing the impact and use of office technology in their organization. Possibly the employers do not have a clear enough picture in their own mind to give direction: or consultants have not yet established their credibility in this area; this type of service is too recent to have penetrated the employer's market, or the capital expenditures are not large enough to attract executive interest.

A push to the executive level does exist although it is directed to the use of telecommunications and computer equipment independent of what is otherwise in the office. Several consultants and interactive service bureaus offer (and develop) modelling programmes and/or information retrieval from selected databases - often foreign. They tend to specialize in areas such as resource taxation, marketing, financial modelling, or investment portfolios and are servicing senior managers in each.

Some MIS and Information Retrieval specialists suggest that this is the way to true Office of the - Future - successful use by one person making others desire a similarily powerful tool. If timing and professional expertise are right, this <u>can</u> lead to an interconnected electronic office. If either the timing or the expertise is off, it leads to an expensive proliferation of incompatible and underused equipment. This is the reason given by several firms who have put a freeze on executive purchase of computing equipment pending development of an office automation strategy.

To summarize, at the operational level, there seems to be a broad range of services and assistance and considerable "push" to office automation in the Lower Mainland of B.C.

3. The Software Support

With a continuing short supply of programmers and rapidly increasing demand, software costs are increasing at almost the same rate as hardware costs are decreasing. An enormous backlog of programme requests exists in many businesses, and independent programmers have little difficulty finding well-paid jobs.

This situation has encouraged several B.C. firms to direct their efforts toward a mass market, and a viable software industry is developing.

The Basic Software Group is writing programmes for Northstar microcomputers of California and Sharp of Japan. Currently their expertise is directed toward the retail market, but they say their interest is not limited to this field.

GEAC, originally a Vancouver firm, now has offices internationally. They have specialized in programs for financial institutions.

The leadership of B.C. Systems Corporation and the Insurance Corporation of B.C. may be expected to develop marketable programmes as well as stimulating activity for many highly paid programming consultants.

Sydney Developments from Vancouver successfully raised capital last year by selling tax shelter investments to develop computer software.

Finning Tractor, a heavy equipment dealer, has a computer software subsidiary largely due to the efforts and imagination of one John Stark, an employee in their data processing department. Several of John's programmes - such as an incentive package and a taxation model - are applicable to other firms and have been adapted and sold through the subsidiary, but without a major sales initiative. John's latest work is a programme generator whereby nonprofessionals can develop their own programmes. This timely package will quite possibly be promoted by an international company as an aid to hardware sales.

The Government of British Columbia has initiated a study to assess future opportunities for growth of the B.C. Computer software industry. Sponsored by the Department of Regional Economic Expansion and the Ministry of Industry and Small Business Development, the study is to recommend specific areas to pursue growth in B.C.'s software industry, and specific actions for the public and private sector to support the software industry.

4. Technological Development.

Since the manufacturers and telecommunications carriers were not the primary target of the proposed regional DOC seminar, no in-depth contact with them was developed for this programme. However, the activity that did come to light is worth noting.

Impact Information Systems of Vancouver is probably the first in North America to offer integrated local area networking.

The Electronics Manufacturers' Association (EMA) has been reactivated under President Gordon English of Westronic. In number of employees and dollar volume their seventy-two members represent the majority of electronics manufacturers in B.C. Because of B.C.'s difficult terrain and reliance on remote resource industries, this group has traditionally focussed on telecommunications and specialized data processing rather than consumer goods.

But as well as the large well-known companies like AEL Microtel, Microtel Pacific, MacDonald Detwiller (MDA), Glenayre, Anatek and Cantel; a number of newer electronics manufacturers were found; Innovative Electronics who are launching an innovative microprossor 'Proteus' (see Appendix D); Innovative Video who have combined a computer and videorecorder; RMS Industrial Controls (supplying radio equipment to Toronto Transit); Integrated Communications (an encryption algorythm and electronic mail network (see Appendix D) and International Phasor Telecom, a Canadian based company with an encryption concept and proposal for an LSI chip factory in Vancouver. All the latter companies are marketing products now, anticipate increased sales, and have plans to expand both products and production. These are in addition to the established and the new products of the older firms, and to the custom manufacture of devices designed by consulting engineers.

5. Regional Issues, Regional Resources.

This section summarizes expressed interests in the broader social effects of office technology, the activities - if any - that result from these interests, and/or the resources that may be in place to address issues. ("Interests", "issues" and "concerns" are used interchangeably.) These effects are both technical considerations or philosophical.

- Education and Skills:

Though not necessarily ranked first in importance, education and training were most frequently identified as concerns and there is far more activity in this area than in any other. The scope of concern was also considerably broader than that directed to other issues. Education or skills training is seen as necessary to prevent female unemployment, support industry's need for technologists, business's requirements for professional employees, research development and teaching.

Formal education programs from Computer Science to word processing are over-subscribed, and cutbacks in education are likely to maintain a short supply of programming professionals for some time. This may encourage the adoption of office automation equipment with software that can be operated by semiprofessionals without programming experience.

Regional manufacturers of telecommunications equipment - who see the shortage of software professionals as a barrier to equipment sales - expressed an interest in meeting with college educators to alleviate this situation. No action appears underway in this regard.

Training of the semi-skilled is a topic that has generated more activity than has increasing the professional supply. Women's groups, labour, and continuing educators are developing programs in "computer literacy" and seeking ways and means of ensuring that the basic education to acquire semi-professional, semi-management skills is provided to women and older workers.

Some of the many activities in this area are at the UBC Centre for Continuing Education, where the C.E. Programme in Computer Sciences has expanded to offer programmes on office technology for journalists and small businessmen as well as computer professionals. A new programme area in "Communications Arts" has also been established. It is likely to impinge on some of the existing programmes but it is mandated to seek and teach opportunities to apply communications technology and will certainly expand the offerings of the UBC Centre.

Other post-secondary public educational bodies offer a variety of programmes for various levels of interest. For example: the B.C. Institute of Technology (BCIT) expects 2500 persons per year to take CE courses in "Practical Microcomputing" - These courses offer basic word processing, accounting and programming skills, and are attended by: ambitious clerical workers (the one in 120 who will be promoted?); supervisory level in firms who have computerized their accounting or some other function and want to be sure they are getting their money's worth; those who have a micro at home or work and want to develop better use of it.

Another 600 people, approximately, of a more senior management level, will attend the higher-priced, one and two day seminars on information technologies offered by BCIT's Training and Developing Centre. This is in addition to students in the formal certificate and diploma stream who will be entering employment as information specialists.

Outside the educational institutions there is further activity at both the public and professional level.

The provincial Ministry of Labour is co-sponsoring the visit of Heather Menzies, author of "Women and the Chip", as part of a public awareness programme. The B.C. Federation of Labour organizes seminars for their member unions on how both labour and management can benefit from information technology. The Greater Vancouver Information and Referral Service (GVIRS) has received a grant to use Telidon Technology and personal computers with a community information, electronic messaging and an electronic mail service. Their data base includes training and job opportunities for women. Its educational aim is computer literacy.

Education, or professional development, for computer professionals focussed this spring on Office Automation for the 3 day conference and computer show sponsored by the Data Processing Management Association (DPMA) and Whitsed Publishing Ltd. Courses from the Canada Management Centre of AMA International are also offered regularly in Vancouver and are increasingly centered on Office Automation and Information Technology topics. Some of these are sponsored by International office equipment companies so that the latter's clients can attend without charge and acquire the interpersonal and/or organizational skills to effectively use the equipment being sold them. Finally, there is considerable demand from professional organization like Association of Record Management Administrators (ARMA) for guest speakers on office and communications Technology.

- Workforce:(Job Security, Health and Safety, Structural Unemployment)

Many of the concerns voiced by Labour Leaders quote Heather Menzies and therefore seem synonymous with those of spokepersons for Women's Interests.

According to the Director of Women's Programmes and Human Rights for the B.C. Federation of Labour, the labour movement has officially taken a position that information technology offers benefits to both management and labour. Labour's task is to negotiate the best deal for workers within that framework of mutual benefit. Some members of the labour movement, however, who view information technology as an aspect of political ideology, are more obdurate in their opposition, and members of two small, radical, women's groups are vociferous, adding health and safety issues to the debate. Whether this minority is tilting at windmills or advance heralds of a popular movement remains to be seen.

Statements by labour leaders regarding technological impact receive wide press coverage. (See Appendix D).

The federal Department of Labour has announced a committee to study technological advance.

- Organizational Structure

Some senior and middle managers already experiencing change want to know how to manage an organization with advanced communications technology: i.e. how to maximize effectiveness; who controls information and how to handle internal politics; what level has planning responsibility; where and in what numbers are other decision-makers in the organization; criteria for selecting, hiring, upgrading.

Those who brought up these questions seemed to be looking for experience to assist them. One had located a possible consultant in Toronto (Mary Baetz). All appeared to have done some reading on the topic; and all expressed a desire to meet and compare experience with others.

- Traffic and Space:

The senior planner of the Greater Vancouver Regional District (GVRD) wonders how traffic patterns may change and where new residential areas should locate if teams of people work from geographically separate locations; whether electronic office equipment will require more or less office space per person; whether downtown office space is overbuilt or underbuilt; how fast habits will change; what amenities may be needed for a dispersed work force.

The Greater Vancouver Regional District (GVRD) has commissioned a study of space requirments for new office equipment (See Appendix C for a partial reproduction). Their resource for this study was the IBI Group, a national firm located in Vancouver.

- Policy and Regulation:

Few people were aware of how information technology impacts national policy and regulation. One is an academic, Jean McNulty, who has specialized in comparative policy; another, Peter Gall, a lawyer associated with academia; and two: Geoff Bartlett, and John Stark, are old-timers in the data processing business who mentioned a) national defense policies; b) tariff regulation and ownership.

Those mentioned above are potential resource persons. No activity around policy and regulation was evident.

- General Philisophical Concerns:

Outside the business community, a noticeable shift was evident among the interests identified. Concern for the interpersonal, and for the personally expressive modes valued by the respondents was often voiced. These concerns, however, were never negative: Those that were less than positive were questioning, doubtful, perhaps even sorrowful in suggesting that life would be less exciting when the screen replaces the unexpected and exhilerating challenge of personal encounter. Many others, and they seemed to be those more familiar with communications technology, looked forward to new ways of interacting to improve relationships. Most assumed that the 'electronic cottage' would eventually prevail, that people would work from home, perhaps in extended families, geographically dispersed; and that work and play would be reunited; there would be greater leisure; more care and concern among those in immediate contact.

One of the fears expressed by several wary individuals was 'electronic fascism' (to use Toffler's encapsulation of the 'Brave New World' concept). When individuals relate to machinery, not people, and are totally dependent on external sources for their information, they may be manipulable. This was seen as a development to be guarded against rather than an inevitable conclusion.

In the same vein of civic or social control structures, several respondents enthused about how the availability of communications technology and the geographic freedom it would provide would also facilitate personal voting on many issues. They envisaged a more democratic, participative, and 'happy' body politic. This viewpoint was probably expressed most frequently by those who are already politically active.

A more immediate concern given emphasis by educators and planners, was that Canada could easily evolve a technological elite and a 'technopeasantry'. Identification of this issue in itself suggests activities to refute the possibility, and undoubtedly underlies much of the activity noted under 'Education and Skills'.

The School of Library Science at UBC prepares both librarians and archivists in sophisticated data retrieval and information search. Many of their graduates staff corporate libraries, and when organizations move to electronic file storage, the company librarian is frequently asked to assume responsibility for the data base. The School's corporate and government interface is quite extensive, and its influence should not be underestimated.

Three of the Library School's faculty were interviewed. All had a broad, thorough, and relevant perspective on the role of communications technology in business and society . The head archivist remarked that he had been struggling for three years with how to obtain historical source material in an electronic environment. If material can be controlled and altered he asks, "What will become of history? - The references that inform us and provide our roots?"

Some interviewees vaguely alluded to effects on physical health and well-being. Others wondered if electronic stimulation would have a physiological effect on 'thought processes'.

It should not be construed that these concerns were foremost in the daily lives of most interviewees, or even that the vaguely discerned possibilities are evident among most of the population. With the exception of the formation of a two-class society based on a technologically elite, these issues prompted little anxiety and only slight awareness.

6. Contacts.

The list that follows has been compiled from a larger list of those personally contacted regarding participation in a DOC, Pacific Region, seminar proposal. It has been altered by the inclusion of a few persons or companies not contacted but thought to be potential contributors, while some contacts have been omitted because discussions with them contributed little to the seminar topic. The larger list is on file at DOC, Vancouver.

CONTACTS

INVITATIONAL SEMINAR

- A -

ANATEK ELECTRONICS LTD.
240 Brookshank
Vancouver, B.C.

Mr. Alan Crawford

- B -

BASIC SOFTWARE GROUP

Keith Wales, Vice President and Director.
- See newspaper story. Basic is apparently doing extremely well on development and export of software.

BRINK HUDSON & LEFEVRE
700 West Pender Street
Vancouver, B.C.
V6C 1C1

Ms. Alix Granger, Vice President
- She is currently involved in own office project accessing US data bases for portfolio management & stock charts. Office integration of word processing, PABX, with computing capability also well under way, Alix lectures frequently to women's groups, gives investment course and is otherwise active in community.

B.C. FEDERATION OF LABOUR

David Rice, Legislature Director
- Discussed likely labour representation with him.

B.C. FEDERATION OF LABOUR - CLC
3110 Boundary Road
Burnaby, B.C.
V5M 4A4

Mike Kraemer, Secretary Treasurer
- Invitations to B.C. Federation employees should go through him.

B.C. INSTITUTE OF TECHNOLOGY
3700 Willingdon Avenue
Burnaby, B.C.
V5G 3H2

Dave Brousson, Dean Division of Continuing Education.
- A prominent, innovative and dynamic educational leader - attended provincial seminar on telecommunications.

B.C. GOVERNMENT EMPLOYEES UNION & NATIONAL ASSOCIATION OF PROVINCIAL GOVERNMENT UNIONS
2841 Riverside Drive
Ottawa, Ontario
K1V 8N4

- John Fryer, see clippings. Fryer quoted as demanding participation in labour study of technological impact of office communications technology.

BRITISH COLUMBIA SYSTEMS CORP. 1112 Fort Street Victoria, B.C. V8V 4V2	Don A. Alexander, President & CEO - Very articulate, well-informed, personable; quick to identify interconnectedness of issues, thinks there are lots of 'missing links' & his participation would be to interject a note of realism into proposed solutions ranging from graphics to managing market share.
B.C. SYSTEMS CORP. 1112 Fort Street Victoria, B.C. V8V 4V2	Chris Slade, Vice President - Product Planning. - Identified by Don Alexander, Slade is responsible for OA at B.C. Systems Corp.
B.C. TELEPHONE CO. LTD. 3777 Kingsway Burnaby, B.C.	Gordon MacFarlane, Chairman and CEO - Left message when he was out of town about purpose of seminar and asked who he thought should attend with VP's of other firms. Reply through secretary to invite C.G. Patterson.
B.C. TELEPHONE CO. LTD.	Colin Patterson, Vice President - Very interested in our proposed seminar which had been mentioned to him by Gordon MacFarlane, Chairman. Says he would like to meet John Quigley, help introduce him or anything else at any time. Personnally acquainted with Catherine Robertson as well.
B.C. TELEPHONE CO. LTD.	George Parton - Identified by several sources as well informed and interesting person responsible for taking B.C. Tel into future.
B.C. UTILITIES COMMISSION 1177 West Hastings Street Vancouver, B.C. V6E 2K3	Ms. Marie Taylor, Chairman - Not contacted. This Commission could be regulatory body for provincially controlled communication systems.

BUTTEDAHL ASSOCIATES
330 - 1070 West Broadway
Vancouver, B.C.
V6H 1E7

Ms. Paz Buttedahl
- This Latina, PhD in Instructional Design, consultant to B.C. Tel's computer-based learning project, is a former TV producer and has been a member of international commissions and study groups on satellites, economic development, and cultural domination through communication.

- C -

CAMPBELL SHARP, AUDIT DEPARTMENT

Walter Dyke, Senior Partner
- Dyke thought OA was responsibility of Office Manager and referred to his partner in charge of personnel, equipment etc. In fact, Campbell Sharp getting quite heavily into computer auditing functions. Will have to look at securing access to databases in integrated office.

CEIC
P.O. Box 11145
1055 Georgia Street
Vancouver, B.C. V6E 2P8

Allan J. Cocksedge, Acting Director General
- Mr. Cocksedge agreed to represent CEIC.

CANADIAN FOREST PRODUCTS

J. Ron Longstaff, Executive Vice President
- Also Board Member Versatile Cornat, St. Paul's Hospital, Vancouver Art Gallery etc. Longstaff would like to be thinktank participant and get ideas for own company. Hopes we can reschedule at a time convenient to him.

CNCP TELECOMMUNICATIONS
175 Cordova Street
Vancouver, B.C.
V6B 1E3

Bill Green, Regional Director
- Says CNCP very interested in B.C. It is an important part of their business and they can offer national market to B.C. manufacturers. Also they service B.C. customers who need to communicate extra provincially. Says CNCP realizes product development cannot precede acceptance. Meeting of minds to establish what needs to be done is

CNCP (Cont'd)	very exciting.. Also CNCP recruits from VCC and BCIT and Interior Colleges and would like to talk to educators from those places; many CNCP customers have operators who are unionized so they are not adverse to participation of labour representatives. Depending on programme, head office might want to send eastern representative because Operations here are not current with national planning.
CANADIAN PACIFIC Windsor Station, Information Systems "A" Floor, P.O. Box 6042 Station "A" Montreal, Quebec H3C 3E4	Bill Ellis, Project Manager - Would be present - initially contacted by John Quigley because he has implemented large and sophisticated office communications programmes for C.P.
CANADIAN TELECONFERENCE NETWORK (Toronto based)	Larry Steinman They manage liaison, production and coordination between carriers and on-site management for point to point special events. Said they had several clients in Vancouver and several downtown hotels now equipped to handle video conference through switchboards.
CRTC Vancouver, B.C.	Peter MacDonald - Interested.
CANTEL ENGINEERING ASS. LTD. 402 West Pender Street Vancouiver, B.C.	Mark Lopianowki - Originally discussed seminar with Hal Halliday and Bill Thompson - met John Quigley years ago - looks forward to renewing acquaintance in future.
COMPUTECH CONSULTING CANADA LTD. 1177 West Hastings Street Vancouver, B.C. V6E 2K3	Grant Gisel, President - Gave presentation at DPMA Office Automation conference - not contacted personally but highly recommended by his peers.
COMPUTER COMMUNICATIONS GROUP (CCG)	David Hughes, General Manager - Discussed seminar concept with him but did not invite because went directly to B.C. Tel Chairman.

COMSHARE CANADA

Don Kellett
- (Also UK/USA affiliated) Selling access to specialized programmes and databases to executive management for decision support - mainly resource taxation models.

C.J. CONNAGHAN & ASSOCIATES LTD.
840 -789 West Pender Street
Vancouver, B.C.
V6C 1H2

C.J. Connaghan, President
- 20 years as labour negotiator in forestry, mining, steel - was V.P. Administration at UBC when word processors introduced; author of two books on labour in (1) Germany (1) Japan (most recent).

CORPORATE SYSTEMS DISTRICT OF SURREY
14245 - 56th Avenue
Surrey, B.C.
V3H 1S2

Ray Wiens, Director
- Was asked to speak on 'Managing the Information Resource' has done so frequently - a technological orientation to 'automation of unstructured tasks' etc., Surrey's municipal information system moving steadily to wider use and increasing sophistication.

COUNCIL OF FOREST INDUSTRIES OF B.C.

Alan Sinclair, Manager Public Relations
- Discussed possible participants from forest industry with him. He wonders how the new communications technologies will change the tools and functions of his profession.

- D -

DATA KEY
VAncouver, Edmonton, Calgary

Doug Walls
- Large service bureau, future market plans to streamline and integrate time-sharing with word processing for their customers.

DATEX SERVICES

Sid Treur
- International Director of DPMA.

DIRECT COMMUNICATIONS MARKETING (DCM)
1206 Hamilton Street
Vancouver, B.C.
V6B 1S2

Doug Close, President
- Small business, sharp guy, prepared to develop promotional expertise for electronic merchandising. Also, has applied for satellite transmission license to offer economies of scale in data transmission for multiple clients.

DISCOVERY PARKS INC.
57 - 200 Granville Street
Vancouver, B.C.
V6C 2S4

Harvey Kelsey, Vice President Technological Development
- Responsible for establishing Discovery Network linking Discovery Parks at Interior colleges to Discovery Parks at lower mainland university campuses. Also for promoting Discovery Club to provide business-persons with access to R & D and High technology.

DMR ASSOCIATES
295 - 601 West Cordova Street
Vancouver, B.C.
V6B 1G1

Phil Tinivetz, Managing Partner
- This Canadian Company with international contacts has a large OOTF consulting Section.

DTS SALES
1000 Beach Avenue
Vancouver, B.C.

Gordon Flack, General Manager (owner)
- B.C. owned company selling electronic scanners and cash registers in B.C. and Alberta. 75 employees, no second level management, unlikely to spare two days to attend seminar.

DUNHILL EMPLOYMENT AGENCY CONSULTANTS

John Tanton
- Feels that employment and personnel agencies intermediate supply and demand but mediate neither. Suggested companies ripe for office automation were Scott Paper, Finning Tractor.

- E -

EMPLOYEES COUNCIL OF B.C.
1130 - 800 West Pender Street
Vancouver, B.C.
V6C 2V6

William Hamilton, President (Former Postmaster General)

Bert Harwysh, Vice President, Personnel and Industrial Relations
- If Hamilton can't come, he would like to send Harwysh.

ELDEVCO ELECTRONIC DEVELOPMENT CORP.
526 - 666 Leg-in-Boot Square
Vancouver, B.C.
V5Z 4B3

William Thompson, President
- Lifelong involvement in development of electronic communications; different companies, different functional responsibilities, organized provincial seminar two years ago, well-connected with industry.

- F -

FINNING TRACTOR
555 Great Northern Way
Vancouver, B.C.
V5T 4L6

Vim Sood, President

Peter Vander Porter, Treasurer
- Though now suffering from the economic downturn, Finning has been an aggressive and expansionist company. It has a well-used and sophisticated system of communicating office technology as well as a large data processing department. The latter has developed software programs of considerable ingenuity which they have adapted for the US and marketed through a subsidiary. The most recent of these is a system whereby a computer can generate software programmes without direction from a data processing professional - a major innovation which may have significant impact in a time when escalation of software costs is predicted to equal the decline in hardware prices.

FIRST CITY TRUST COMPANY
1055 West Georgia St. Suite 1200
Vancouver, B.C.
V6E 3S6

Samuel Belzberg, President
- Not contacted personnally - selected because First City is aggressive, rapidly growing western financial institution (with surplus funds because they could not buy Canada Permanent.)

FRASER INSTITUTE
626 Bute Street
Vancouver, B.C.
V6E 3M2

Sally Pipes, Assistant Director
- (Economist) Although Fraser Institute has not studied office communications technology, she would be interested in informing herself through attendance. Also recently appoints to Credit Union Reserve Board.

GALL, PETER
Box 22
1120 - 1176 West Georgia Street
Vancouver, B.C.
V6E 4A2

Attorney
- Lectures at UBC Law School and SFU Communications Dept. on regulation; active in law practice in labour relations, background in human rights.

GANDALF DATA
(Regional Sales)

Ross Johnson, Lisle Kerr
- Offered use of multiplexers and modems for demonstration.

GEAC 102 - 2425 Quebec Street Vancouver, B.C. V5T 4L6	Andy Jaine, Vice President Financial Services - Interested. Please involve him in any future programmes.
GLENAYRE ELECTRONICS LIMITED 1551 Columbia Street Vancouver, B.C. V7J 1A3	- Not contacted.
GREATER VANCOUVER REGIONAL DISTRICT 2294 West 10th Avenue Vancouver, B.C. V6K 2H9	Peter George, Senior Associate - Interested in how office automation will effect traffic patterns, whether or not Vancouver is overbuilt for office space (see excerpt from IBI study for GVRD).
GREAT WEST STEEL	Hugh McGee, Chairman - One of those lesser-known expanding and interconnected little octopi, said he'd like to send his President and CEO Merv Schweitzer to our seminar.
- I -	
INNOVATIVE ELECTRONICS TECHNOLOGY LTD. 6993 A. Antrim Avenue Burnaby, B.C. V6B 4B3	T.Y. Kim, President - See new paper clipping, developed and marketing innovative microprocessors.
INSURANCE CORPORATION OF B.C. 1055 West Georgia Street Vancouver, B.C.	R.E. Henderson, Vice President - Would have been major speaker recommended by Prov. government. Both ICBC and Henderson personally are 'hot' on Office of the Future. ICBC has Data Directions department to coordinate and extend developments in communications technology; very advanced in computer technology. Handles some RCMP computer communications. ICBC has had severe labour problems at clerical level and is presently severely understaffed with computer professionals.

INTEGRATED COMMUNICATIONS
3rd Floor-134 Abbott Street
Vancouver, B.C.
V6B 2K4

As well as selling peripherals, fax & hardware/software packages for doctors & dentists, is negotiating with Loomis re. electronic mail - network using an encryption algorithum.

INTERACTIVE VIDEO INC.
522 West 28th Street
North Vancouver, B.C.

Allan Gough
- Ken Bell of the Province, Business page, suggested this is an exciting company. They have received some federal development funds to develop a micro-computer to control a VTR for replay, etc.

LABOUR CANADA
750 Cambie Street
Vancouver, B.C.
V6B 2P2

Bruce Dodd, Regional Director
- Would have attended and informed us that Labour Canada could provide telephone access to two computerized data banks (for public, unions, managers)
1. at the Canadian Centre for Occupational Safety & Health;
2. IRIS (Industrial Relations Information Service) for trends, cola clauses, etc.

LECKY PAPER
1198 Homer Street
Vancouver, B.C.
V6B 2X9

Barry Heselgrave, President
- Lecky is a conglomerate with holdings across Canada and New England comprising office supply firms, paper bag manufacturer, styrofoam cups, etc. Heselgrave astute business manager wanting to keep in touch with the way the world is moving.

FRED LONG
Solicitor for Patents
1030 West Georgia Street
Vancouver, B.C.
V6E 1Y3

- Also a participant in International Phasor Telecom.

- M -

MACDONALD & ASSOCIATE	John MacDonald - Not contacted directly
MACMILLAN BLOEDEL LIMITED 1075 West Georgia Street Vancouver, B.C. V6E 3C9	Hal Holden, Vice President - Communications - Holden was invited to represent both M & B and the PR function.
AEL MICROTEL 4664 Lougheed Hwy Burnaby, B.C. V5C 5T5	Terry Heenan, President - Spoke to him re proposed seminar. He was quite agreeable.
MICROTEL PACIFIC RESEARCH 105 - 4664 Lougheed Hwy. Burnaby, B.C. V5C 1T5	John Madden, President - Advised him that Mr. Quigley looked forward to having discussions with industry regarding their needs and how they may be assisted in meeting them.
MICROTEL PACIFIC RESEARCH	John Mele, Vice President Research & Development - He said if he spoke at seminar he would tell Canadians to 'pull up their socks - emulate Japanese agressiveness.
MURPHY STATIONERY	Mike Overholt, President - Spoke to manager Norm Hull - 2nd largest B.C. owned and operated office supplier with printing, furniture & supplies divisions. Using computer-generated hard copy for customer's inventory control (U.S. franchised programme). Company may be alert to expansion, new opportunities.
NATIONAL DATA CENTRE CORP. 181 West Pender Street Vancouver, B.C. V6B 1S6	Geoff Bartlett, - Contacted by Linda Johnston & Terry Tetreault. Geoff Bartlett has been in data-processing and computer Communications for 30 years, has great experience and overview to contribute.
NORTHWEST PHOTO RENTALS	Chester Ptaskinski - Spoke to him about equipment for video hook up. Apparently a company that has everything in equipment plus the technical expertise to connect and operate.

- O -

OFFICE & TECHNICAL EMPLOYEES UNION
LOCAL 378
950 Kingsway
Vancouver, B.C.
V5V 3C4

Fred Trotter, President
- Trotter is chief negotiating officer. Different locals of this union bargain for employees at two of B.C. major employers, ICBC and B.C. Hydro (ICBC heavily commited and advanced in Office of the Future technology.

ORGANIZATIONAL STRUCTURE
FROMKIN VANHORN HANDLEY
Toronto (416) 862-7050

Mary Baetz, Consultant
- (Not Contacted)
John Dickinson, Sandwell, says this firm doing interesting work in organizational structure and information technology.

- P -

JIM PATTISON GROUP
1600 - 1055 West Hastings
StreetVancouver, B.C.
V6E 2H2

Jim Whittle, Vice President
Marketing & Communications
- This conglomerate owns radio stations, computer service bureaus, car dealerships and is opening a bank in Switzerland.

PEAT MARWICK, CONSULTANTS

Bob Patterson, Senior Partner
- Deryl Stennet and Jo Hall report to him. PM has reasonably large business in office automation consulting. Patterson seemed pleasant by phone but said they were more into here-and-now systems than future. Hall & Stennet very contract oriented.

SOLANGE PINARD

Business agent.
- Office & Technical Employees Union 874-7311 (not contacted).

PLACER DEVELOPMENTS
1030 West Georgia Street
Vancouver, B.C.
V6E 2Y3

Howard Gougeon, Vice President
- Data processing and word processing (currently separate departments) report to him (Not contacted).

Harry Hemmingson, Office Manager
- Not contacted after discussing state of implementation with John Riley. Hemmingson responsible for PABX, word processing; Riley for Computer systems. Both report to same V.P.

PLACER DEVELOPMENTS

John Riley, Manager Systems & Procedures
- Interesting discussion with him on how internal politics are impediment to information economy., e.g. managers do not want senior management to have access to production records.

PREMIER COMMUNICATIONS
1090 West Georgia Street
Vancouver, B.C.
V6E 3Z2

George Fierheller, President & CEO
- Expected to be a major participant not directly informed or contacted re this proposal.

- R -

EDWIN REED & ASSOCIATES

Jim Stevenson, Management Consultant
- Works with middle and upper managers using micros to develop analytical tools for risk analysis, performance, acquisitions; also helping small companies to automate records, install word processors.

RMS INDUSTRIAL CONTROLS
70 Williams Avenue
Port Moody, B.C.
V3H 2R5

Harry Dunston, President
- Young brilliant aggressive. Bill Thompson says this young man would contribute brilliantly in any situation. RMS won contract to supply radio control equipment to Toronto Transit.

ROBERTSON CONSULTANTS LTD.
595 - 885 Dunsmuir Street
Vancouver, B.C.
V6C 1N8

Ms. Catherine Robertson, Owner
- This consultant does futures forecasting and long-range strategic planning of communication for major international organizations. Has lectured to local association of librarians on 'Is Information Public Property?' (relating to proprietary databases).

RONALDS FEDERATED (Evergreen Press)
790 - 1441 Creekside
Vancouver, B.C.
V6J 4V2

Tony Wallinger
- Ronalds Federated, owned by Bell Canada, operates a string of electronically sophisticated printing plants across Western Canada. For past 3 years Wallinger actively considering impacts and opportunities of communications technology - very interested in our proposed seminar - pleae advise of future events.

- S -

SCOTT PAPER LTD.
P.O. Box 3600
Vancouver, B.C.
V6B 3C9

Peter J. Peters, Group Vice-President
- Enthusiastic - wanted to look at programme to decide if he or a younger VP would be choice to guide Scott Paper to the Information Economy.

SIMON FRASER UNIVERSITY
Burnaby, B.C.
V5A 1S6

Dept. of Business Administration

Bill Wedley, Executive Programme
- Agreed to write computer programme for us (for agenda issues and evaluation).

Communications Department

Mrs. Jean McNulty
- Would contribute to discussion of comparative policy, cultural change through technology communications.

Engineering Programmes

Dr. Don George, Director
- This new department oriented to high tech development, George is apparently expert on "Wired City" concept, thinks he has met John Quigley and looks forward to renewing acquaintances and (see clipping).

SFU (Continuing Studies)

Labour Studies Programme

Clyde Lytle, Director
- Discussed likely labour representatives with him.

Management Programmes

Skip Tripplett, Director
- Enthusiastic, (because of level of participants) offered to co-sponsor, help.

H.A. SIMONS (International) Ltd.
425 Carrall Street
Vancouver, B.C.
V6B 2J6

Tom Routledge, Director Information Systems
- International Engineering firm, said he would like to attend. No senior VP's available that date. Russ Cumberland and Cathy Robertson both know him as pretty bright person.

- S -

STEPHENSON SMITH CORP.
Consultants
3rd. Floor, 800 West Pender Street
V6C 2B8

Bruce Smith
- Formerly VP Weldwood, Manager of Plywood Company too, in both cases introduced state of the art office technology.

Also working with clients to devise new sales and distribution strategies using their substantial investments in informational technology and personnel (e.g. electronic catalogues, etc.)

Mr. John Dickinson, Manager
Human resources
- says information technology already causing major changes in their organizational structure (other sources tell us Sandwell is putting together engineering design teams of three men in different countries). John says Sandwell keen to assess the interconnects, quality of life, and new socio-technical systems. These are immediate concerns which he wishes to asess.

SANDWELL & CO., LIMITED

Tarney Williams, President
- Selling tax-sheltered shares in software development Co. Left message re seminar and received one in return that "not interested at this time".

- T -

TELECOMMUNICATIONS WORKERS' UNION
5261 Lane Street
Burnaby, B.C.
V5H 4A6

Sid Shnaid, Research Officer
- Would have been panel respondant - disappointed, hopes we do something in future. (Likely to be a policically oriented discussant.)

TELESAT CANADA
333 River Road
Ottawa, Ontario
K1L 8B9

Brian Olson
- Had conversation with him re their interest in particating. After discussion with his director, he called back to say they would like to monitor to get feel for future needs and would send R.M. Lester, Vice-President, Business Development, provided the carriers were represented.

TIP TOP TAILORS

Chris Schwartz, General Manager
- Endorses CCG services in advertisements

- U -

UNIVERSITY OF BRITISH COLUMBIA

Ron Walkey
- Warm, intelligent, very perceptive and interested in our topic. Believes that any professional sensitized to built environment could contribute to and benefit from our proposed seminar.

School of Architecture

Library School

Basil Stuart Stubbs, Chairman, also Bibliography and Communication network for National Libraries.

- Very articulate, well informed, concerned and interested.

Peter Simons, Teacher Business Management to Libraries. Very keen -keep informed and involved if possible.

Archivists Programme
Library School

Terrence Eastwood -
- Would like to be involved in future programmes if possible.

UNIVERSITY OF BRITISH COLUMBIA Cont...

Advisory Council on Status of Women, Western Region Centre for Continuing Education 5997 Iona Drive Vancouver, B.C. V6T 2A4	Ms. Eileen Hendry, Vice President Western Region Advisory Council on the Status of Women - Informed and concerned about impact on Women's employment roles - well connected to women' action.
Centre for Continuing Education 5997 Iona Drive Vancouver, B.C. V6T 2A4	Jane Hutton, Program Director, Computer Science Phil Moir, Program Director, Communication Arts
Computer Sciences	Dr. Paul Gilmore, Chairman - Former I.B.M. Mathematician, recipient of NSERC grant for UBC to develop electronic mail system (Gilmore doing messaging part see Fowler). He says the seminar topic is an area he is trying to follow closely. Please keep him advised.
Centre for Continuing Education	Ms. Anne Ironside, Programme Director, Lifestyles & Women's Resources als Program Committee, Vanier Institute, Director, Canadian Association of Adult Education (CAAE). - Occasional consultant on women's access; active in GVIRS and PIP; planning long range programme, the Office of the Future starting with public awareness (Heather Menzies being brought to speak, article in Westworld). Then computer literacy for Women (GVIRS etc.) Then - Job Training opportunities and co-operation with labour movement. Finally job restructuring (men & women) and changing lifestyles.
Computing Centre	Mr. Alvin Fowler, Director - Also President of Computer Information Processing Society (CIPS), and co-recipient of NSERC grant. Said to be good speaker.

UNIVERSITY OF BRITISH COLUMBIA Cont...

Faculty of Medicine Vancouver, B.C. V6T 2A4	Victor Doray, Head Biomedical Illustration - A medical artist turned on 25 years ago to electronic communication for presenting technical information to medical students. Victor is now completing TV hook-up of five teaching hospitals in B.C., runs most innovative technical facility, also tops in creative instructional design. Generalist, philosopher, fine person - not invited.
UNIVERSITY OF VICTORIA Victoria, B.C. V8W 2Y2	Dr. Alex Bavelas Psychology Department - Psychologist, DOC grant to research behavioural effects of Office Automation looked forward to attending.

- V -

VANCOUVER CITY SAVINGS CREDIT UNION 515 West 10th. Avenue Vancouver, B.C.	Geoff Hook, CEO Frank Coffey, Mgr. of Operations - The most active and technologically advanced retail financial institution in lower mainland, entering home banking experiment with Premier Cablevision. Coffey very "keen" to hear about application in other businesses.
VANCOUVER HEALTH DEPARTMENT 1060 West 8th. Avenue Vancouver, B.C. V6H 1C4	Mr. Mal Weinstein Director of Health Planning - A psychologist, an interested observer of process, technique and behavior in health department's use of communicating word processors between units, with interest and responsibility for environmental health etc., very warm, reliable, and brilliant.
VANCOUVER & NEW WESTMINISTER NEWSPAPER GUILD	Paddy Lane - Has law degree, staff member of union which has experienced bitter technological dispute. Said by one person to be "pretty far Left".

THE VANCOUVER SUN
2250 Granville Street
Vancouver, B.C.
V6H 3G2

Mr. Clark Davey, Publisher
- Interested in attending.

VANCOUVER VOCAL INSTITUTE
675 West Hastings Street
Vancouver, B.C.
V6B 1N2

Dr. Marv Lamoureux
Dean of Instruction
- Bright, articulate, intense and dynamic.

VENTURES WEST CAPITAL LTD.
2238 Granville Square
200 Granville Street
Vancouver, B.C.
V6C 1S4

Mr. Michael Brown, President
- This enterpreneurial holding company seems to be well capitalized and has invested in both telecommunications development and video peripherals.

VIP COURIER

Barry Monkman, VIP
- Phoned him to ask if he expected communication technology to impact either his file storage or courier business. He did not convey great awareness or concern, but asked if they might be regulated by DOC rather than Motor Vehicles Act if they successfully adapt to electronic age.

- W -

WALKER, DAVE

Boardroom Executive Business Service Industries
- Working with AT & T and CNCP for AV and Word processor communication between 400 locations internationally- for finance, real estate. Says "Major psychological change from one-to-one (e.g. Secretary to boss) to teams. Managing change and changing attitudes is challenge of office of the future". Says we are 5 years behind.

WELDWOOD OF CANADA LTD.
1055 West Hastings Street
Vancouver, B.C.

Mr. Thomas Buell, President
- Also appointed to the Board of Placer Developments, - not contacted - but said to be very open and forward looking and would probably attend if other Presidents are doing so.

WELDWOOD (Continued)...	Mr. Colin Warner, Vice President Finance, and President of Vancouver Opera Association. Did not contact. Zatorsky (data processing reports to Warner. Ed Zatorsky, Director - Responsible for distributed data processing, electronic messaging, etc., between 5 mills and 22 sales offices using Data Point. Depressed lumber market currently curtails plans for further expansions. Says top management not yet aware, but President and VP's sit on DP Steering Committee so have learning experience that way. Ed thinks seminar for top level VERY good idea.
WAISMAN, DEWAR GROUT 500 Cardero Street Vancouver, B.C. V6G 2W6	Al Waisman, President - This architectural firm is designing the new B.C. Systems Corp. Building. Waisman looked forward to attending.
WALLACE, JACK	Retired R & D, Pacific Press, "Wired City" dilettente. Knowledgeable, warm and enthusiastic.
WESTRONIC ENGINEERING 7 West 7th. Avenue Vancouver, B.C. V5Y 1L4	Mr. Gordon English, President - Also president of Electronic Manufacturers Association of B.C.
WILL, HART	Faculty of Commerce & Business Administration - Recommended by Terry Tetreault
WOODWARDS 101 West Hastings Street Vancouver, B.C.	W.G. Forbes, Vice President Merchandising - Very agreeable. Discussed with him whether he or marketing manager should participate to contribute viewpoint on changes in retail selling and retail products (to service home-office communication systems). Woodwards is a profitable Western department store chain largely automated, participating in Premier Cablevisions interactive experiment.

IV. BOOK REPORTS:

The Employment Implications of Computers and Telecommunications Technology

National Policies and the Development of Automatic Data Processor

The Office of the Future - Communication and Computers

Report on Economic Analysis of Information Activities and the Role of Electronics and Telecommunications Technologies: Executive Summary

A Review of the Economic Implications of Canadian Transborder Data Flow

The Third Wave

Women and the Chip

Peitchinis, S.S. - The Employment Implications of Computers and Telecommunications Technology - Calgary, Alberta 1981

Funded by the Department of Communications, Labour Canada, and Employment Immigration Canada. This report claims fear of widespread unemployment because of computers and telecommunication is unfounded because:

1) Social services and structures to support the new technology are not in place.
2) Demand is not dependent on falling prices alone.
3) Increased clerical efficiency does not indicate increased efficiency in the office as a whole.

Furthermore, the negative employment effects experienced in mature industries is more than offset by positive employment in innovative and high technology firms. Total employment increases, although the labour mix requires more professional and semi-professional skills.

The author claims technological change stimulates economic activity which in turn increases demand for manpower. It is the failure of social adjustment processes that create unemployment as evidenced by simultaneous existence of unfilled job vacancies and growing numbers of those seeking work.

Some of the other interesting findings of Peitchinis research are:

- That staff of a computer facility seems to stabilize at around 100 workers. Beyond this point, output can be greatly increase with little additional labour.
- That adoption of the new technologies is pushed by a shortage of reliable manpower rather than by desire for increased efficiency.
- That the worker environment of the electronic office might be characterized as ".... a graveyard of silence: telephones do not ring, people do not talk, typewriters do not clang.... the unaccustomed tend to either want to scream or to whisper."

This report contains case studies of how implementation was carried out in different dirms with varying success (i.e. acceptability) and with what benefits, e.g. better decisions. It gives an excellent review of office technologies and includes an extensive, partially bibliography.

Two of the significant conclusions of The Employment Implications of Computers and Telecommunications Technology are that general economic activity, rather than new technology, is the critical issue effecting manpower; and that at present, the development and implementation of electronic office technology has had no major impact on office employment.

May 1982

Robinson PR & Shakleton LA, National Policies and the Development of Automatic Data Processing. Department of Communications March 1979.

Comparing and contrasting the development of automatic data processing (ADP) in six countries (five market and one planned economy), this report finds increasing emphasis and attention to the introduction of "Informatics". They attribute this partly to concern for national sovereignty and a fear that foreign legislation will intrude on domestic process; partly to realization that computer/communications technology leads to fundamental social change, and partly to concern that advanced technology may dictate policy decisions.

Among the six nations compared, the authors found the most significant factor for active development of new technologies was national size and wealth. The U.S., with its greater effective market, was far ahead of the others in computer/communications development. But elsewhere in the report the authors acknowledge the impetus given to U.S. computer/communications technology by government defense contracts. Whether they say so or not, this action by government must certainly have influenced both supply and demand.

In further reviewing government use the authors note that Canada is the only one of the six nations studied that has made no attempt to promote national computer equipment or software. And they say a fundamental question regarding policy is whether it should be reactive, that is based on past events and existing problems, or proactive - based on future impacts and opportunities.

As to labour-related issues, the authors of this report disagree with those who claim computerization does not lead to layoffs. Such arguments, they say, ignore the fact that computers make new jobs unnecessary. This lack of job creation has a particularly adverse effect on young people entering the job market. They also note that there is insufficient information on the increase or decrease in job satisfaction, and on possibly negative effects such as eyestrain.

Regarding the education and training of EDP professionals they note that Hungary has an "academy", an organization where membership is limited to the "best" systems analysts, programmers and other technologists, and they suggest this might be a useful device for encouraging improved professional standards in ADP.

Regarding the consumer interface with ADP they say that it is the psychology rather than the technology that retards application.

The report also includes a table summarizing policy and practice for each of the six nations on eight significant points.

Although written three years ago, this report impresses one with its thoughtful and far-reaching summaries.

May 1982

Uhlig Ronald P. Farber David J. and Bain James H. - The Office of the Future - Communication and Computers. - North-Holland Publishing Co., - Amsterdam - New York - Oxford, 1979.

This very thorough book might be subtitled "All you ever wanted to know about Office of the Future". Divided into three parts: "Uses of Computers in the Office of the Future"; "Technological Imperatives"; and "Impacts of Office Automation"; it gives detailed economic analyses, descriptions, definitions, tables, photos, often references historical development, and explains the underlying technologies and their application. Furthermore, it manages to be state-of-the-art even three years after its writing on matters from policy through software to social effect, and shows a better than average understanding of office functions as well as procedures. For example, it discusses the planning process and how ideas are generated.

The book methodically examines where and how each process may be automated, just as it systematically explains Large Scale Integration (LSI), Very Large Scale Integration (VLSI), and the significance of the digital channel.

Because so much - from the technical to the behavioural - is packed between the covers, Office of the Future is an invaluable reference book but slow reading for the layman. An example of the technical detail is "Leverage of Payoff-Benefit Based on Labour Costs", one of four areas studied to see which impacts will have the largest effects on labour and costs for the smallest increment of change. Naturally, the book must first identify the potential benefits and project both the costs and limitations of communications technologies.

After summarizing the impacts on groups, organizations, individuals and society, the authors propose that future law should require that "all technological innovation and implementation be accompanied by a human impact statement for the preservation of the quality of work". The cost of monitoring such regulation for Office of the Future is about the only detail the book omits.

May 1982

Serafini, Shirley - Report on Economic Analysis of Information Activities and the Role of Electronics and Telecommunications Technologies: Executive Summary: 17 pages, Communications Economics Branch, DOC. Ottawa.
Serafini outlines how the postwar growth in demand for information was supplied by increases in female participation in occupations of low productivity. Since information represents an increasing share of total labour activity, overall economic productivity therefore declines.

Looking to the future, and distinguishing between information capital and information labour, she sees new technologies making information activity more productive and as it does so, reducing demands for other inputs such as capital, energy, space and primarily labour. She says the increasing demand for information will prevent lay-offs, but that females concentrated in certain occupations; lower-skilled, and older workers may be at risk. She recommends a framework for labour-management consultation and appropriate education systems to minimize friction.

Another significant future change is that, since much information is publically rather than privately assembled, access to information may depend on political considerations rather than economics or user purchaser-power.

Serafini says economic growth attributed to information technology will be restrained if diffusion is too slow for significant growth in real incomes, or too fast -- magnifying displacement and creating more goods and services than can be absorbed.

The paper warns that international competition makes it essential that productivity gains be realized from new technologies, and that delay will increase unemployment and reduce the standard of living for the employed who will support the unemployed. To avoid this dislocation, the paper recommends a strategy of economic, structural and social programs to take advantage of the technology by devising new products and services to improve production. Regarding firm and industry structures, Serafini concludes that reducing the costs of managing, through information technology, may increase the size of the firm and centralize and consolidate decision-making. This would benefit multinationals and the consequence may be an erosion of national sovereignty.

Other structural forces lower the level of industry concentration and blur the distinction between telecommunications and data processing. Traditional definitions of monopoly and competition may have to be reassessed and new regulating mechanisms may have to be developed.

Addressing the impact of information technology on developing nations, Serafini acknowledges that the gap between rich and poor may widen.

In conclusion the paper recommends international cooperation for information gathering and analysis, policy development, and action on the issues and changes with which all developed and developing countries will have to deal.

Price Waterhouse Management Consultants, A Review of the Economic Implications of Canadian Transborder Data Flow - Department of Communications February 1981

This report reviews external and internal studies on transborder data flow (TBDF) provided by the Canadian Department of Communications. It gives an overview of economic issues, analyses the growth of computer/communications in Canada and the forecasting methodology, and recommends and identifies the scope and design of additional research required for policy development.

The report questions the popular assumption that corporate activity and management will move to foreign head offices because of the centralized decision making encouraged by computer/communications technology. It finds little evidence to support the speculation that such activities occur at the expense of subsidiaries and host countries, but acknowledges that studies to date have been merely exploratory.

After analysing the causes for the growth of transborder data flow, the report finds TBDF will likely accelerate and concludes that there is cause for concern and need for government policy.

May 1982

Toffler Alvin, The Third Wave - Bantam Books, New York - 1981

Toffler preceds his work with a Carlos Fuentes quote which asks, in part, "Are we dying or being born?". The Third Wave suggests a new civilization is being born, and that it is a painful, protracted and difficult birth.

The scope of this work is enormous as Toffler relates social values, family formation, religion, production and distribution of goods, institutions and political beliefs to waves of change. Each wave forces new statements, and fosters new concepts about the civilization it evolves. The First Wave was the agricultural civilization where land was the basis of the economy, birth the measure of status and privileges, and toiling poverty the lot of most people. The Second Wave is the industrial civilization where the principles of standardization, specialization, synchronization, concentration and maximization are applied to business, politics, socialization and personal lives. Describing the system that emerges, he coins the term 'indust-reality'. Most of the world is now experiencing the Second Wave's 'indust-reality', but the leading edge of a third wave is upon us.

Analysing the force of the Third Wave, Toffler finds it opposes most 'indust-reality'. The Third Wave is less dependent on time, mass markets or massproduction. Electronically automated continuous flow processes lead to custom production for diversified markets. Communication replaces transportation and, for more and more processes, information is the raw material. Decentralization rather than concentration is the developing framework, and encourages do-it-yourself or 'prosumerism' over the consumerism of specialization and large scale. New energy sources and new technologies facilitate and motivate the Third Wave. Wholistic systems supplant 'piecemeal' approaches.

Toffler believes that the Third Wave world may be more personalized and more community oriented, and that the nation states of the Second Wave may crumble and be replaced by independent networks and a planetary consciousness.

There are no models for roles and relationships, forms of government, or economic well-being in the Third Wave, and attempts to force the emerging trends into old models cause chaos and discontent. If change is suppressed, even greater confusion, conflict and violence may emerge.

But Toffler is optimistic. Although the Third Wave is characterized by computer communications, he pays only passing notice to the possibility of electronic fascism. He argues for a broadened democracy encompassing minority power, semi-direct democracy, and decision division, and says:-

> "If we begin now, we and our children can take part in the exciting reconstruction not merely of our obsolete political structures, but of civilization itself".

Menzies, Heather, Women and the Chip
Institute for Research on Public Policy, Montreal, 1981

Menzie's book deals with Informatics -- the marriage of computers and telecommunications -- and the projected impact of this technology on clerical employment for Canadian women. She finds that by 1990 there could be one million women out of work if their participation and the numbers seeking entry employment in clerical professions remain constant. Furthermore, she says that the skills gap between automated occupations and other work may be so wide that many women will be unemployable.

Because 60% of women work because they have to, loss of their earnings could increase the number of Canadian families living below the poverty level by 50%.

In developing her projections, Menzies reviews the development and application of Informatics in Canada. She notes that when introduced by computer professionals the télématique approach is favoured, that is the central, multifunction electronic utility emphasizing systems and processes for decisionmakers. With télématique, productivity gains are faster than with the privatique approach. Privatique features independent loci, less connection to external databases and therefore less reliance on telecommunications, and is generally favoured by administrators who see information as an end in itself. Télématique seems to be becoming the predominant form in Canada. It is creating new job funtions, generally more specialized.

Rapid growth in productivity causes job loss in subtle ways: vacant positions are not filled, part-time hours are cut back, lateral transfers occur. There is astonishingly little promotion to the new enriched positions from clerical ranks, according to Menzies. She also identifies an indirect effect that may have great significance in its effect on employment. Companies that have not automated will lose business! She cites the example of an automated supermarket which is drawing from a larger market area at the expense of its non-automated competitors; and banks who are adding business services for clients and replacing the service firms that formerly met these needs.

Women and the Chip is based on four case studies on industries with heavy concentrations on female clerical employees. Summaries of these cases are the basis for the employment projections.

Noting that "Canadian women are on a collision course between their continuing concentration in clerical occupations and industry's apparently diminishing requirements in that line of work." Menzies urges federal and provincial government action to prevent severe structural unemployment which would seriously disrupt Canada's social and economic stability, and she concludes with proposals for several initiatives that should be immediately undertaken.

APPENDIX -A-

Managing the Information Economy - Issues and Opportunities for British Comumbia.

Through new office communications technology, the Information Economy is invading the boardroom. Instant transmission of voice, text, data and graphics restructures the work force and the organization. It may introduce new sociotechnical systems, and drastically alter lifestyles.

We are enclosing a fact sheet which maps the route to the Office of the Future. If B.C. business is to remain competitive, the use of Office Communications technology is imperative. But the consequences are neither inevitable nor inalterable.

Office communications technology creates enormous and exciting business opportunities for British Columbia. In technology - hardware, software, and problem-solving skills, innovative B.C. companies and individuals have sparked new development.

More is possible, but only with some consensus on priority issues and willingness, among those whose lives and workplaces will be affected, to work together on resolving issues.

At the Harrison, June 1-3, you will join experts in telecommunications,data processing experienced users of office communications systems, those who have combined vision and opportunity in various business and industrial applications, and representatives of labour, education, health care, social planning, government, and academic research. Among who have confirmed their participation are - Don Alexander, President of B.C. Systems Corporation, Bert Harwysh, Vice President of the Employers Council, Tony Wallinger, Corporate Planning Director, Ronalds Federated, and Bill Ellis of Canadian Pacific, (who managed the most extensive and complete office communication project yet to be installed in Canada). A briefing book to be mailed one week prior to the seminar will identify all the participants and include brief biographical sketches as well as factual data and background material relating to office communications.

The seminar will commence with an overview of office communications technology and the implications, globally, nationally, and at the corporate level, but participants themselves will identify the issues important in British Columbia.

..../2

Not incidentally, we realize that useful personal contacts may be made in the relaxed and pleasant surroundings of The Harrison. Part of Wednesday evening and Thursday afternoon will be free so that participants may arrange private meetings if desired.

On the final day, a workshop session will being together the discussion topics and shape them into strategic action plans for British Columbia. We look forward to your participation.

APPENDIX - B -

SAMPLE ADVERTISING

INTEGRATED COMMUNICATION SYSTEMS INC. (ICSI) is in the process of raising funds for the purposes of:-

1. Developing a National Electronic Mail Network as outlined in the attached documents.

2. Developing and Marketing of Encryption software.

3. Developing, researching and marketing general business software.

4. Acquiring Fixed Assets.

5. Expanding the trading base.

The funds will be raised in two phases.

PHASE ONE - $400,000

The PHASE ONE monies will be used for points 2-5 above plus implementation of the Vancouver hub and further systems and market development relating to point one above.

PHASE TWO - $3,000,000 - 4,000,000

For the emplacement and marketing to customers of a ten city mail network aimed, initially, at the FAX market.

PHASE TWO financing will be by way of:-

a) A public offering through the V.S.E.
(This option will not be considered until there is a significant improvement in the market for straight issues of common shares.)

b) Conversion of ordinary shares into shares of an existing company listed on the V.S.E.
(This option is currently under consideration.)

c) A joint venture with a major company which would become the network's principal customer and contribute to the funding.
(This option has been under negotiation for several months but no agreement has been finalized.)

OR

IET
Innovative Electronics Technology Ltd.

6993 A Antrim Avenue, Burnaby, B.C., Canada V5J 4M5
Phone: (604) 430-5166
Mailing Address: P.O. Box 5188, Vancouver, B.C. V6B 4B3

PROTEUS™: A NON-TECHNICAL ANNOUNCEMENT

INNOVATIVE ELECTRONICS TECHNOLOGY LTD. introduces PROTEUS*. PROTEUS* is a 16-bit microcomputer system - the "bit" being the basic "building block" of a computer. In the main, 8-bit machines have formed the core of the small computer market to date. Obviously, twice as many "bits" means an increase in the speed of computation, and an increase in the amount of data that can be handled. PROTEUS*, as small and compact as it is, provides such advantages.

IET's design actually places two computers in one box. The importance of this is that the two-in-one resulting module can perform two tasks at once. One computer is assigned to handling operations which have nothing to do with the problems being solved. These "housekeeping" duties (as they are known) would normally produce quite a slowdown in the speed with which answers are produced. With PROTEUS*, however, while one computer is handling these "housekeeping" duties, the other computer can devote all its energy to the important computational needs of the user. This produces, therefore, an extremely fast computer.

And PROTEUS* has other advantages. Its two-in-one design is powerful enough to handle two users (or people) simultaneously. But, it can handle more by linking the modules together. While each module is essentially an entire computer in its own right, the unique design allows for a number of modules to be linked together and to work in cooperation with each other. Thus, as more people are added to the system, the number of modules is simply increased, and no matter how many people are using the computer at any one time, there is no visible slowdown in response time. Also, and equally important, two or more modules sharing a task can arrive at an answer much more quickly than one computer can by itself.

PROTEUS* is extremely small - only 15 x 20 cm. - which means that it can effectively be plugged into an existing home computer to provide up to a tenfold increase in speed, without the need of buying a separate and expensive 16-bit system. In this respect, PROTEUS* is a boon for non-office computer users.

With its extremely small size, high speed and low cost, PROTEUS* is destined to have a major impact on the small computer market as PROTEUS* continues to create new and exciting applications for itself.

DOUBLE YOUR OFFICE PRODUCTIVITY.

Everyone knows that word processors can double the output of a typist. Lexitron word processors do even more. They improve the productivity of dozens of non-typing jobs as well. File storage and retrieval. Record processing. Sending messages over communications lines. Creating typeset documents. Revising and printing texts. And tapping computer processors and data bases. Anyone in your office can master an inexpensive Lexitron V.T. word processor in just hours. Get one or a dozen today. It starts you on the road to the automated office of tomorrow. Call your local Lexitron representative.

WHERE MODERN WP BEGAN ... MODERN WP IS GOING.

Circle No. 185 on Reader Service Card.

Information On Demand

To survive in a competitive environment, you've got to have concise, accurate information when you need it. *Inc. Information Service* will help you meet the challenge. We find *practical* answers to tough questions, and at a price small businesses can afford. Our information sources include computer databases and major libraries as well as experts on virtually every topic. *Our research scope is worldwide.*

Our Repertoire of Services:

- market research worldwide
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- identification of experts
- research on any discrete topic
- information on mergers/ acquisitions
- investigation of companies
- review of new technologies
- quick briefing service
- monitoring of federal/ state legislation
- stock market research
- competitor analysis

In addition, we offer the exclusive *IncScan* service. *IncScan* is an exciting subscription service designed to meet your company's strategic information needs. Each month you will receive a *custom designed* business intelligence report to keep you abreast of key information affecting your business.

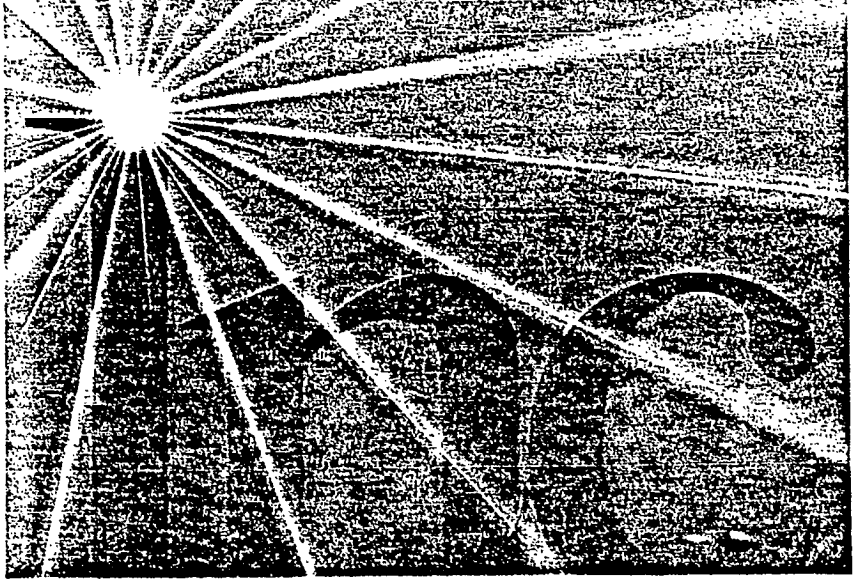
Examples of Topics We Can Research:

- cable television
- executive compensation
- robotics
- solar energy
- real estate management
- synthetic fuels development
- hazardous waste disposal
- fiber optics
- medical technology
- telecommunications systems
- computer hardware and software systems
- genetic engineering
- space technology
- the electronic office
- artificial intelligence
- military hardware

What you know can help you. And fortunately, everything you need to know is just a phone call away. Find out how *Inc. Information Service* and *IncScan* can contribute to the success of *your* business. We've prepared a free brochure explaining this valuable service.

Call now, **617-227-4700.** Find out what you've been missing.

Inc.
Information Service
38 Commercial Wharf
Boston, Ma. 02110



Circle No. 373 on Reader Service Card.

B.C. COMPUTER AND OFFICE AUTOMATION SHOW

CONCURRENT WITH

Data Processing Management Association, Canada,
Vancouver's

"UPDATE 82" CONFERENCE

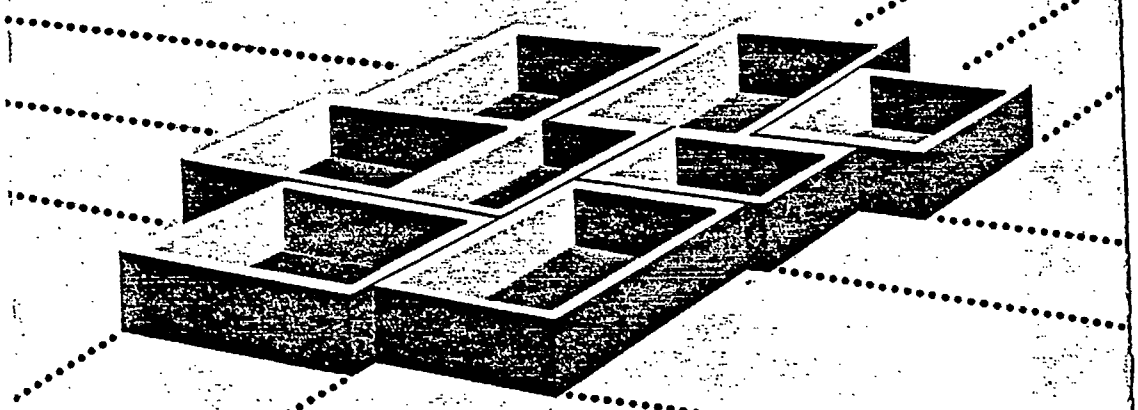
CO-SPONSORED BY
DATA PROCESSING MANAGEMENT ASSOCIATION, CANADA
VANCOUVER CHAPTER
&
WHITSED PUBLISHING LIMITED

SHOW: THE HYATT REGENCY HOTEL
CONCURRENT CONFERENCE: HOTEL VANCOUVER
FEBRUARY 10 & 11, WED & THURS., 1982

SHOW TIMES: 11:00 A.M. to 7 P.M. both days
CONFERENCES: 8:30-4:30 both days

A New Course from CMC!

INTEGRATED OFFICE SYSTEMS: PLANNING AND IMPLEMENTATION



Find out how to put today's advanced technology to work in your office . . . boosting productivity . . . increasing effectiveness . . . and improving employee morale

Toronto/June 7-9
Vancouver/June 21-23

Canadian Management Center of AMA/International

APPENDIX – C –

EXCERPT FROM IBI REPORT TO THE

GREATER VANCOUVER REGIONAL DISTRICT

The most significant coming trend in electronic technology will be the gradual merging of telecommunications and data processing, a meld that by the year 2000 will have profoundly affected many aspects of our daily lives.

There is not yet a generally accepted name in English for this development. But the French, precise in their language, have come up with a term - "telematique" - to suggest a marriage of telecommunications networks with data processing. Perhaps information teleprocessing will come to convey the idea of communicating and acting on knowledge from a distance.

Whatever it is labelled, the process has the potential to impact significantly on the home and workplace. At the heart of this trend will be inexpensive computer power and ever-increasing memory capacity provided by semi-conductor technology.

Electronics in the form of dedicated intelligence will be everywhere - in home entertainment, appliances, automobiles, airports, highways, offices, banks, stores, factories, hospitals, schools and, of course, in space. Prodigious strides have already been made along these lines, but the sheer volume of information processed, stored and transmitted in the future will be mind-boggling.

The world, then, is entering what one industry researcher terms the "era of computational plenty". But to exploit this new wealth further, advances will have to be made.

The computer-communications marriage will narrow the distance between work and home. This trend is less a matter of the office moving into the home than of extended electronic offices that executives will be able to take about with them.

At this time, there appears to be little inclination to transfer the office in total into the home even if the technology to do so is available. There may be some interest in the next decades in cutting business travel to reduce energy consumption, in which case audio/video conferences will increase. Commuting to and from work may be cut to save fuel - the availability of on-screen, face to face interchanges allowing this to be done.

In the factory, productivity and the quality of products are lagging. "Automation" has always been the knee-jerk proposal to solve this problem but most products (as opposed to processes) do not lend themselves well to automation as we know it today.

The office is now being targeted in the same way as the factory. The gains made in the factory coupled with the increasing office costs and lagging productivity have encouraged efforts at reshaping the office. Office staffs in the western industrialized countries are estimated to have grown by 45% though overall work forces have increased only 6%. According to one study, 51% of the American work force may be grouped in the white collar category now, up from 42% in 1958. The Canadian statistics should not be very different.

Raising the productivity of the office worker will involve the application of a wide variety of computer-communications:

- word processing	:	the use of computer software to produce and amend documents
- voice response systems	:	computer-generated voice messages to pass information
- voice recognition systems	:	methods of converting voice patterns to permit, for example, automatic dictation to typewriters
- paperless administration	:	the transmission and storage of all data by computer without paper files
- electronic mail	:	the long-distance electronic transmission of documents
- electronic funds transfer	:	the transaction of banking services through automatic tellers and electronic transfers
- access to data networks	:	the availability of information from data banks via terminals
- teleshopping	:	the use of TV and cable systems to permit shopping from the home
- computer-assisted instruction	:	the use of computers for training
- remote medical consultation	:	the use of computers to assist in diagnosis
- telerecreation	:	video-games, TV and music cassettes, etc.

The significance of these technologies for Vancouver have been assessed by qualitatively judging their impact for each of the major industries located in the downtown area. Exhibit 10 lists the

EXHIBIT 10

Impact of Technology on Major Industry Groupings

SIC Code	Type of Business Type	Downtown Peninsula Employees (000's)	. Word Processing	. Voice Response	. Voice Recognition	. Paperless Admin.	. Electronic Mail	. Electronic Funds Transfer	. Access to Data Networks	. Teleshopping	. Computer Assisted Instruction	. Remote Medical Consultation	. Telerecreation
521-599	Retail Trade	15							-				
701-799	Services to People	14											
401-499	Transportation, utilities	14			+								
601-699	Finance, insurance, real estate	13		+			-						
191-399	Manufacturing	12											
501-519	Wholesale trade	9											
891-899	Services to Business	5		+									
001-189	Primary industry, construction	5		+									
801-809	Medical services	5								-			
811-819	Legal Services	3		+									
821-869	Educational, social services	3									-		
900-999	Government, administration	3		+									

\+ indicates more space per worker
\- indicates less space per worker

APPENDIX - D -

BRITISH COLUMBIA TECHNOLOGY

NEWS CLIPS AND RELEASES

Common language for computers urged

By PAUL MUSGROVE

A University of British Columbia computer scientist has called for standardization in the computer industry to eliminate waste that he says results from existing computers speaking different languages.

Al Fowler, director of the university's computing centre and president of the Canadian Information Processing Society, said non-standard systems are costing businesses "billions of dollars annually" in unnecessary duplication of software and the generation of special programs designed merely to allow two dissimilar machines to communicate with one another.

Fowler said in an interview that problems arise because different machines use different operating systems.

A program or a programming language written for use on one operating system will not run on another operating system.

"Right now there is a tremendous variety (of machines and operating systems) and (variety) is the mechanics for making you stay with them (the manufacturers)," Fowler said.

This, he said, leaves a businessman who has outgrown his present computer with a nasty problem if the manufacturer of his present machine either does not make a larger machine or has not allowed software to be "upwards compatible" — transportable to a larger machine.

In such a case, Fowler said, the businessman is faced with the unsavory options of either scrapping all his present business software and starting over, or hiring a software engineer to write a program to allow his software to run on a different machine.

Either option, he stressed, costs thousands of dollars and would not be necessary if operating systems and programming languages were standardized.

"The cost to the western economy is enormous — billions of dollars a year."

Fowler said resistance to standardization comes not only from manufacturers using non-standardized operating systems as a means of avoiding competition, but from computer scientists themselves.

"There is something endemic in people who design computers that says they have to do things their way," Fowler said.

"If somebody else did it, it's not good enough."

Fowler said there are some 4,500 computer specialists in the CIPS, "representing the best computer minds in the country", and for the most part employed by large corporations on the level of B.C. Hydro, ICBC and Imperial Oil, who "are so myopic they say, 'Who cares about standards?'"

One of the problems, Fowler said, is that computer software engineers "are having so much fun doing our own thing and companies are not waking up to what is in fact happening."

"Basically we are inventing new programming languages and operating systems each year.

"People who design operating systems are not interested in things like accounting," Fowler said.

"Not one in 10 out here (UBC) understands anything about accounting. There are, for example, a lot of fundamental problems involved in payroll (writing payroll systems) but you wouldn't find one of them who'd touch a payroll (program) with a 10-foot pole."

MICROCHIPS POSE 'THREAT TO JOBS'

The threat of microchip technology on information processing jobs should not be regarded as another "women's issue," warns a new study.

The loss of scores of jobs in the service sector will also be disastrous for men and children living in an economy where a second income earner is a growing necessity, according to Women and the Chip, written by Heather Menzies of Ottawa for the Institute For Research and Public Policy.

In 1979 a report commissioned by the National Council of Welfare found that 60 per cent of Canadian women are working out of necessity. These women are either living alone, acting as sole breadwinner for their family, or they are married to someone earning less than $10,000 a year.

In nearly 50 per cent of cases in which both husband and wife work, the combined income is less than $15,000. And it has been argued that the number of Canadian families living below the poverty line would jump by 50 per cent if the wife were not working.

Those figures acquire new meaning considering that about 80 per cent of all working women in 1980 were employed in the service sector — exactly the area where electronic technologies are expected to have their greatest impact.

About 50 per cent of all work in this sector involves information handling. One-third of all women re-entering the work force between 1976 and 1979 found jobs in clerical occupations.

Women workers, fearing their jobs will soon by eliminated, are pushing their unions to press for job retraining, says Bernice Kirk, B.C. secretary for the Canadian Union of Public Employees.

"Our members are beginning to worry about the microchip; especially our library workers who see new machines coming in two years down the road that will replace them," Kirk said Wednesday. "We feel our people should be retrained and this should be negotiated with full funding by the employer."

The Menzies paper agrees that women in exposed industries must be trained to get out of them and find work in new jobs created by rapidly advancing information technology.

The Menzies study found that in the coming decade there could be work for only one-half to two-thirds of the potential number of women seeking employment as bank tellers, cashiers and clerks.

SFU to train engineer 'leaders'

By GLEN SCHAEFER

Microscopic organic miners, machines that build machines and computers that design computers are some of the areas to be explored by future graduates of an exclusive engineering science program at Simon Fraser University.

Tom Calvert and Donald George have prepared the plan for the program, and say they hope to have it operating by September, 1983. Calvert said the program will graduate about 75 students a year when it reaches full capacity.

"There will be nothing like it in Canada. It will be a relatively small program, producing a relatively small number of high-technology engineers. It will be very specialized," said Calvert, dean of interdisciplinary studies at SFU.

The SFU senate and board of governors both endorsed the engineering science program in February and it now awaits approval from the Universities Council of B.C.

Plans for the engineering science program came out of a March, 1981, decision by the UCBC awarding the University of Victoria the job of starting B.C.'s second engineering faculty.

That decision also recommended that SFU, which had also sought an engineering faculty, propose an engineering science program to complement high-technology research.

George, SFU director of engineering, said the program will pioneer new technologies. "It's a program oriented towards new areas of technology that have just come up or are going to come up."

George lists three areas of concentration for students in the program:

- Chemical processing and biotechnology.
- Automation, process control and robotics.
- Communications, computing and electronics.

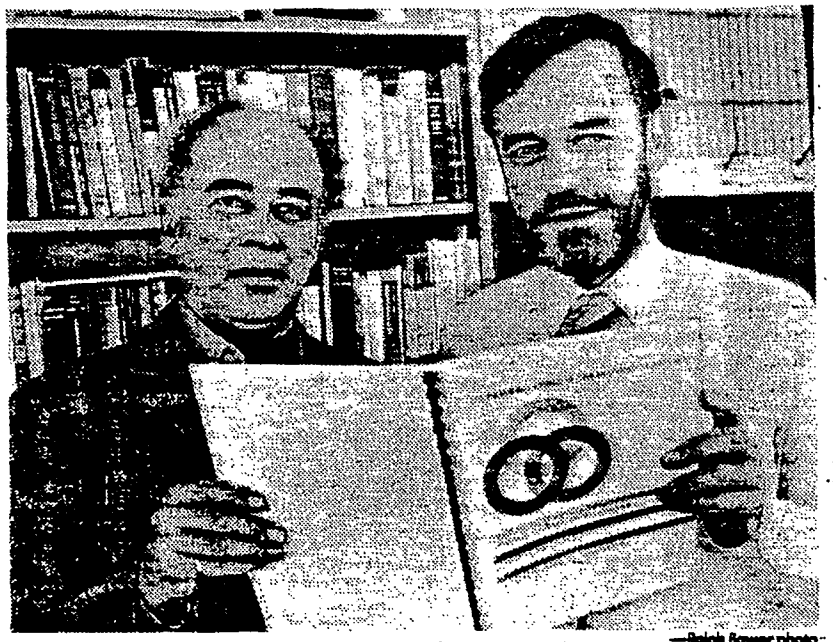
He said the program will start with a budget of about $500,000 and three professors. During a 10-year period, the program will be developed to a full capacity of 20 professors at an annual cost George estimates at $4 million.

Biotechnology has only recently begun to play a role in engineering, said George. "One of the major applications of biotechnology is the design and use of bacteria to do jobs that were previously done mechanically or chemically."

He said biology is joining traditional sciences such as chemistry and physics as part of engineering resulting in breakthroughs such as the recent development of a bacteria which leeches iron from raw ore.

Engineering scientists must now develop means to use that bacteria effectively in industry, he added.

George said few existing university engineering programs have the link with biology planned for the SFU program.



—Ralph Bower photo

NEW PROGRAM . . . Donald George, Tom Calvert

[redacted] creation of newly developed bacteria that can chemically break oil down as another potentially useful biotechnical development.

Biotechnology is not a new science but more intensive research into the field has been initiated during the past several years, Calvert said. "It's the technology used in brewing. It's not new but we understand it a lot better now."

Robotics and automation will be another critical area of the program, Calvert and George said.

North American industry has to become less labor-intensive if it is to compete on world markets, George said.

"People are spending their lives putting rear wheels on Chevrolets. There is a fight to the death going on right now because North America is falling behind and failing to compete." George said industry in other areas of the world, notably Japan, are taking over the dominant position in many manufacturing fields, including electronics and automobiles.

Calvert said robots are nothing new to the popular consciousness because many robots are at work around us right now. "A sophisticated example is a 747 airplane. It can fly itself and, if we trust it, it could land itself."

Calvert said another example of robotics at work is the Cominco zinc plant in Trail where a computer runs a large crane. Calvert called the highly automated plant a robot factory.

"Robots are nothing magical and everyone in North America today agrees we should develop them if our industry is to remain competitive."

He said the program's computer element will be aimed at designing and applying computers to special uses. He said a tool used often in designing computers is other computers.

Calvert said the program will aim at producing imaginative leaders in these new technologies, not just "nuts and bolts" engineers. "We want to produce people who would be able to conceive of new uses for these technologies. Our heavy orientation to research and development will produce people who will be on the leading edge."

Warren Snyder of Microtel Pacific Research wrote the programs used in the computer-assisted design of integrated circuits. Superimposed on the photograph of Snyder is a small part of the design layout for an integrated circuit.

on the potentially more hazardous path of hardware development.

The most impressive, from a size point of view, is the announcement during the week that Microtel Pacific Research is establishing a research and development facility at Simon Fraser University.

On a smaller scale, but equally impressive, is the Proteus microcomputer being developed by Innovative Electronics Technology Ltd. at Burnaby.

Both efforts indicate the type of development that may be viable in Vancouver, given the right sort of encouragement.

And if software development can be encouraged as well, Vancouver may well earn the right to call itself Silicon Valley North.

New Microtel centre

Vancouver Province March 21/82

a look into the future

Microtel Pacific Research's electronics research and development centre, which it is establishing at Simon Fraser University, is like a peek into the future.

But Microtel president Dr. John Madden believes such a centre is the key to the survival of Microtel and other western Canada companies deeply involved in the electronics industry.

Their main concern is the ability to design and test customized microelectronic circuits.

Fifteen years ago just putting one circuit on a section of silicon was considered an achievement. But the technology developed rapidly through the early '70s and made possible the development of integrated circuits — chips — containing thousands of circuits.

In one swoop electronic designers were able to use one chip to replace thousands of transistors, resistors and capacitors, the mainstays of the electronic engineer.

Now that's not good enough. Engineers want to be able to combine several chips into one in order to increase reliability, facilitate maintenance and reduce size and cost.

Until recently a major constraint in such proposals was the cost of designing the multifunction packages.

To understand why, you have to realize that the designers are not merely drawing circuit diagrams showing individual components. They are designing templates for etching and overlaying the silicon so that when connected to the appropriate power supplies, the silicon becomes a transistor in one part, a resistor in another and a capacitor in a third area.

A typical microcelectronic circuit may contain tens of thousands of components, all of which will fit on to a piece of silicon no bigger than a half a centimetre (two-tenths of an inch) square.

Design has become a tedious, lengthy and expensive procedure and frequently has prevented small manufacturers from entertaining any thoughts of optimizing their multi-chip circuits on to one chip.

Microtel now has established what will become the building block of its Pacific Microelectronics Centre.

Using a technique known as computer-aided design, it is developing a method of allowing designers to draw in a day what used to take several days or even weeks.

The major advantage of the system is its ability to repeat the same circuit over and over again and to store such drawings in its memory.

The potential is substantial. Perhaps a manufacturer wants to incorporate some memory, some computer logic and a clock circuit on one chip.

From the computer's memory he calls out a standard design for each circuit and more or less instructs the computer to put them altogether.

Then he might want to try to incorporate some other circuitry on the same chip. To the original design he can add more component "cells" from the memory and build up the chip as desired.

The result could be that, with a fraction of the work, one designer may be able to produce several different experimental chips.

This is significant.

From the design stage to a wafer of silicon containing test examples of the chips is usually a $20,000 process. If there are any mistakes, the designer can only pay the bill, go back to the drawing board and begin again.

Using computer-assisted drafting, one test run could incorporate as many as 100 different experimental chip designs, with the actual manufacturing bill still $20,000.

That reduces the manufacturing cost of each chip in the experimental or design stage to as little as $200.

Microtel also intends to offer testing facilities for newly developed chips and the result could be substantially reduced cost to B.C. manufacturers wanting to customize their circuits and offer them in an increasingly competitive world electronics market.

Broadcaster raps CRTC regulations

Vancouver Province March 22/82

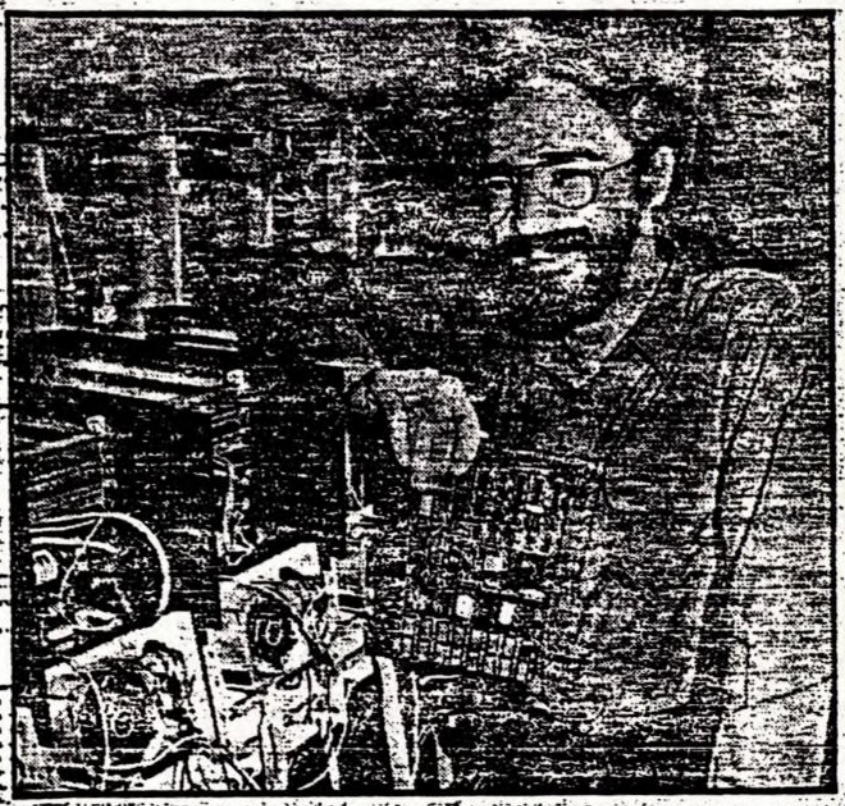
HULL, Que. (CP) — There used to be a time when radio listeners could phone their favorite station and request a song be played. But the 1975 FM radio regulations put an end to that, a Toronto broadcast executive said Friday.

"The host or announcer can no longer select his own music," said John Graham, chairman of Rogers Radio Broadcasting Ltd. "It used to be you could have request programs — that can only take place if we get at least 48 hours' notice."

The Canadian Radio-television and Telecommunications Commission regulations are so complex radio programmers have to plan it all, leaving no room for flexibility, Graham told public hearings into a review of radio policy which ended Friday after four days.

He was one of several private broadcasters who came to support the Canadian Association of Broadcasters, which is asking the CRTC for a better break.

PROTEUS



—Province photo by Peter Hulbert

Peter Luckham of Innovative Electronics Technology holds the printed circuit board which contains the Proteus computer. Behind him are several assembled computers awaiting testing in the Burnaby headquarters of IET.

IET bases its future on microcomputer

By KEN BELL
Business Editor

A fledgling company in Burnaby is doing something that's not supposed to be able to happen in Canada — it's building a microcomputer and hopes to sell it to the world.

The company is Innovative Electronics Technology Ltd., a privately financed company which is basing its future on the success or failure of its Proteus computer.

The IET Proteus is a new entry into a market which is notoriously unforgiving of failures but rewards successes richly.

more users, all of whom will enjoy the same basic efficiency as provided by the two-user system.

This is significant for multi-user systems. Typically the biggest cost in a microcomputer system is the mass memory system, normally a "hard-disk" drive which can cost several times more than each of the individual computer terminals.

Until now the normal microcomputer multi-user approach provides only one or two central processors to do all the work, irrespective of how many users there are.

Proteus (Cont'd)

Only seven or eight years ago the Apple microcomputer was launched on to an unsuspecting world as a shoe-string venture in California.

Sales of Apple computers in 1981 topped $300 million and in 1982 they are expected to reach as high as $600 million.

Can Proteus survive? IET president T. Y. Kim and its designer, Peter Luckham, both believe it will.

The reason is that Luckham has apparently solved one of the major problems of microcomputers

ability to expand the system economically and efficiently.

The project began three years ago when Kim, who had a background in Honeywell computers, outlined several basic concepts of what he would like to see in a microcomputer.

Included among the criteria was the need for the basic computer to be quite small and to be extremely efficient.

He added the requirement that it had to be expandable easily and cheaply.

Luckham was employed to design the computer, and now the company is almost ready to market it.

The Proteus appears to have met all of the criteria that Kim laid down.

It is small — the computer and enough memory to hold 128,000 characters of storage fits on a printed circuit board 15 cm by 20 cm. (5.9 by 7.8 inches).

It is efficient — two users can be at work using the same computer board and their relative efficiency is reduced by a factor of only a few percentage points.

And it is expandable. The system can grow in two-user steps to 64 or...

Alternatively, each new user must have virtually a complete microcomputer system.

The first approach soon peters out of computing power and users end up waiting unacceptably long periods for the processor to get to their task.

The second approach ultimately becomes cluttered and expensive.

With the Proteus approach, however, each pair of users gets at least a 50 per cent share of a powerful Z8000 microprocessor and new users can be added virtually with-

out limits.

Currently IET is looking for customers around the world to buy the Proteus. It is particularly optimistic about the possibility of selling 200 of the microcomputers to a West German company.

Kim says that at present the Proteus is being manufactured in Burnaby. The printed circuit boards are manufactured in eastern Canada but the addition of components, soldering and testing is proceeding here.

The testing is rigorous — each Proteus undergoes a bench test and then is placed in an oven at 70 degrees Celsius (158F) for 96 hours for further tests.

While marketing of the Proteus continues, other IET staff members are working on the development of the software systems which will optimize the adoption of the microcomputer by small business.

Kim is not sure whether ultimately the Proteus will be manufactured in large numbers in B.C. because of the high labor costs involved.

But he is sure that Vancouver is an ideal city in which computer design, marketing and software support can take place.

UBC team working on electronic mail

By GLEN SCHAEFER

Cheap, efficient electronic mail will be in common use within 15 years, making a dinosaur out of conventional mail, a University of B.C. computer scientist says.

"I would be very surprised if in 10 or 15 years one used the post office for sending anything other than parcels. We're heading for the day when everyone will be using electronic mail, and I don't think it's that far down the road. It's cheaper and more efficient than sending tons of paper on great big airplanes," [redacted] said.

Fowler, director of UBC's computing centre, recently got a $70,000 grant from the Natural Sciences and Engineering Research Council to design a system for transmitting and receiving mail by computer. He says the cost of introducing such a system is becoming more viable as postage costs increase.

UBC currently exchanges mail with a group of universities and companies through the Michigan Terminal System at a cost of about 50 cents per "packet" of information. Fowler says that cost will look better as post office prices increase.

The problem, he adds, is to develop a system that ultimately would permit people with home computers to send and receive mail. UBC currently has access to Datapac, a communications system run by Canadian telephone companies, and the system he is working on is designed to enable computer scientists to use it as a mail system.

Design work on the system started in November and will take a year, after which the computing centre will apply for another grant to implement the system for use by university computing centres throughout Canada, Fowler says.

If his design is implemented — at a cost Fowler estimates at between $200,000 and $300,000 — it will later be expanded to serve the whole university community and could ultimately be used by the general public.

Fowler says part of the design process will be to decide how much of an electronic mail system to implement, and what features to include. Addressing a letter, for example, would be virtually obsolete with electronic mail, he says.

"In an electronic mail system, the address sort of disappears," Fowler says. "With electronic mail, we don't particularly care where the recipient is." He adds that identifying the recipient will be all that is required to get mail through the system.

Fowler says the computing centre started at UBC about 10 years ago with only a few terminals. Now 800 terminals are in use throughout the campus, and that's what he calls the raw system for sending electronic mail.

Fowler's work on a design for a computer mail system will involve experimenting with programs and writing computer codes for testing. Much of the work will be to design a general program that is adaptable to all computers in Canada, he adds.

He says computer mail will make information available to people wherever they happen to be, as long as they have access to a computer terminal. "One thing I'd love to do is sit at a computer terminal in Newfoundland and see if I've got any mail in Vancouver."

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Job wipeouts by technology alarming unions

Vancouver Sun March 20 1982

OTTAWA (CP) — Workers are in a desperate race against time to protect their jobs amid signs that advances in technology are increasing dramatically, says a national union leader.

Sophisticated word processors, industrial robots and computer cash registers that keep accounting records, maintain inventory and order new stock "translates into lost jobs," John Fryer said Friday in an interview.

Fryer, president of the 240,000-member National Union of Provincial Government Employees, said workers will have to fight to strengthen collective agreements to ensure they are protected against rapid technological change.

In a three-day conference beginning Sunday, the union will study ways to improve collective agreements, deal with health issues and change restrictive federal laws which make it difficult to raise the question of technological change at the bargaining table.

"Within our own union, the working lives of 120,000 will be affected," Fryer said. "I'm not saying they will all lose their jobs but they will need protection."

Many unprotected

A recent report by the Canadian Centre for Policy Alternatives said that so-called microtechnology will bring great benefits "but unless preventive collective action is taken, these costs will be borne by workers."

The report said that only one-third of the work force currently belongs to a union, leaving the majority of workers "without any legal means to exert even minimal control over technological change."

It recommended Ottawa remove the mass of legislative hurdles preventing thousands of Canadians from forming unions.

The impact of word processors, video display terminals, electronic mail mini-computers and electronic robots is already being felt and some union analysts say 1.5 million jobs could be lost to automation in the next decade.

In Europe, where office automation is more advanced, there are alarming statistics about job loss, a union background paper says.

- A French report warns that 30 per cent of the jobs of clerical banking and insurance industry workers in France will be lost in 10 years.
- Siemans, a German electronics firm, estimates that by 1990 about 40 per cent of present office work will be automated. German trade unions estimate two million jobs could be lost.
- The Federation of Commercial, Clerical and Technical Employees estimates that office employment could fall by 25 per cent in Europe by 1990.

Now you can put a security guard in your computer

john tompkins

'TIS A WONDROUS world. You can now put a security guard to work on the inside of your computer. As I saw for myself in Vancouver last week, a product exists to protect software (computer intelligence) from thieves, spies nd other nefarious souls as uniformed men make hardware (the actual computers) safe.

The product in question is an information encoder-decoder; that is, it scrambles information in the computer so only those who know the code may comprehend it. The producers say the chances of breaking the codes are nearly impossible.

Carl Quale, the builder, says a hospital in southern California is using one to ensure no one "breaks into" its medical records when data from such are transmitted to the controls of word processors.

Quale, of Seattle, says Northern Telecommunications and the National Research Council in Canada are reviewing the product.

In the U.S., big Eastern computer firms are looking at it, he says.

If IBM has one of the limited production run, it may explain why the giant industrial is distributing material saying "information encryption" is the future for all good data systems (i.e., IBM is setting itself up as a customer).

It may be otherwise that IBM is setting itself up as a competitor, in which case Quale's few hundred may soon become IBM's few million.

What makes this pertinent is that the financial group offering to back the Seattle group is based in Vancouver.

I am unable, for fear of a nasty phone call from the Vancouver Stock Exchange, to mention the name of the Vancouver company (VSE-listed).

At deadline, the exchange had not approved the deal. However, I am able to comment on the invention.

A computer-data scrambler is a boggling enough device, but it is only one — and perhaps the least spectacular — of several devices that the inventors behind Quale have awaiting us.

I limit myself here to discussing the more spectacular. The origins of this (second) device lie in a 1960 article in Analog magazine by Alfred Pfanstiehl suggesting that a new mode of transmitting signals through the electromagnetic spectrum could provide communications security.

In the traditional schemes, the receiver can easily tune in to the transmitter — you need only know the station's frequency to catch the broadcast.

In the technology described by Pfanstiehl, both transmitter and receiver would use "white" noise, which has a range of frequencies. In a certain band (spectrum) it contains all frequencies.

In this scheme, called "spread spectrum," only those with the exact, synchronized code of frequencies could communicate.

Carl Nicolai, William Raike and E.L. Miller, the 'inventors behind Quale,' were so intrigued by the discussion (in a science fiction magazine), they set to work developing an application.

The result was a voice scrambler (encrypter, if you like), virtually unbeatable.

Attached to telephones, the scrambler would allow you to speak to someone in complete privacy.

At this point, spies come into the story.

After applying with the United States Department of Commerce for a patent, the Nicolai group learned the biggest spy outfit in the United States (the National Security Agency) was against it.

Instead of processing the patent,

TURN OVER →

the group received a Secrecy Order, courtesy of the NSA (appropriation $2 billion a year, compared with $750 million for the CIA and $584 million for the FBI).

The order is repeated here:

"You are hereby notified that your application (for a patent) has been found to contain subject matter, the unauthorized disclosure of which might be detrimental to the national security, and you are ordered in nowise to publish or disclose the invention or any material information with respect thereto . . . in any way to any person not cognizant of the invention prior to the date of the order . . ."

A year later, after considerable public debate in the United States, in which the group was rejoined by the media, civic libertarians and politicians (Senator Warren Magnussen of the State of Washington lobbied the NSA on their behalf), the group managed to get the NSA to rescind its order and have the patent granted.

They were able to meet a Canadian patent deadline with two hours to spare.

Significantly, the NSA has not revealed why it censored the development for a year. To their request for an explanation, Daniel Silver, then NSA general counsel, wrote: "As the reasons for concluding that disclosure would be detrimental to the national security are themselves classified information, unfortunately we cannot provide additional information on the basis of our conclusions."

It is no secret, however, that the United States military developed voice scrambler systems using spread-spectrum techniques in the early 1950s when they were used for Cold War spying against the Russians.

When the patent was granted, the New York Times' "Patent of the Week" feature gave it top billing.

Unquestionably when, subject to the approval of the Vancouver Stock Exchange, the product becomes the property of the public company, a public relations program will begin along the lines that if it was good enough for the NSA to ban, it must have a great deal going for it.

It should do well

Fryer attacks exclusion of labor from study group

Vancouver Sun March 24/82

OTTAWA (CP) — A union leader raked the federal government over the coals Tuesday for not including labor leaders on a committee recently set up to study technological advances the unions say could eliminate more than a million jobs for women by 1990.

John Fryer, president of the 230,000-member National Union of Provincial Government Employees, said the study "won't be worth the paper it's printed on" because those who will be most affected are not represented.

"What are a bunch of ... academics going to tell us about our jobs," John Fryer told Liberal MP John Evans, his party's representative on a panel at the union's conference on so-called micro-technology.

The federal study group was announced last week by Labor Minister Charles Caccia. It includes four academics and Ratna Ray, director of the federal department's women's bureau. The group will study research and hear submissions before reporting to the minister in six months.

Fryer warned Evans that unless governments negotiate technological change with unions, it will "force us to fight this thing all the way."

Fryer's comments got rousing approval from several hundred delegates on the final day of a three-day conference on technological growth.

The impact of word processors, video display terminals, electronic mail, mini-computers and electronic robots is already being felt and could displace as many as 1.5 million women by 1990, the conference was told this week.

Delegates told Evans, Progressive Conservative MP Walter Baker and New Democrat MP Simon de Jong that the study group is years late and by the time legislative changes are made, "90 per cent of working women are going to be at home."

The Office of the Future

Prison or Paradise?

by Don Mankin, Tora K. Bikson, and Barbara Gutek

The office of the future could be a place of unparalleled creativity and opportunity or a regimented prison. Technology will not determine the working atmosphere, though management will.

8:35 a.m., 1990 A.D.
The order processing department of a major department store chain:

Late for work, Frank sprints down the aisle between the rows of terminals already blinking brightly in response to the flying fingers of their more punctual operators. In a single motion, perfected by unintended practice, he logs onto his terminal as he slides into his chair.

2-13-90 8:38 A.M.
STATION 16-M-43X-0647
YOU ARE EIGHT MINUTES LATE. THIS IS THE FOURTH TIME THIS MONTH AND THE TWENTIETH TIME IN THIS SIX-MONTH PERFORMANCE REVIEW PERIOD.
SEE YOUR AREA SUPERVISOR AT THE BREAK.

"Damn," he mutters. "I'm in trouble now." The muscles in his lower back tighten. He winces as he reaches for the stack of order tickets in his in-basket. With a sigh he begins to work.

8:35 a.m.
An apartment in the same city:

Arlene wanders leisurely around her apartment, picking up the dishes from the night before, gathering her laundry, and generally straightening the place up.

"I don't have to meet with the new district supervisor until 2:00 this afternoon," she muses, "so I think I'll work here this morning."

She finishes cleaning the apartment, takes a brisk shower, and lingers over her breakfast and the morning paper. By 10:00, she is sitting in front of her home terminal and logging on.

2-13-90 10:00 A.M.
YOU HAVE TWO MESSAGES; ONE OF THEM IS URGENT. DO YOU WANT THEM NOW?

YES

FROM D. MARTINSON, URGENT (flashing in red)
THE MEETING WITH THE NEW DISTRICT SUPERVISOR HAS BEEN MOVED UP TO 1:00. CAN YOU MAKE IT?

FROM H. ROCKMAN
THERE IS A ROUGH DRAFT OF A SPEECH I HAVE TO GIVE TO A SALES MEETING TOMORROW IN YOUR IN-FILE. COULD YOU EDIT AND POLISH IT UP FOR ME?

After responding in the affirmative to Martinson, Arlene calls up the speech and starts to work.

ILLUSTRATIONS BY ANDRÉE DOWNIE

10:30 a.m.
The order processing department:

BREAKTIME
flashes on the screen, as Frank finishes processing the order in front of him.

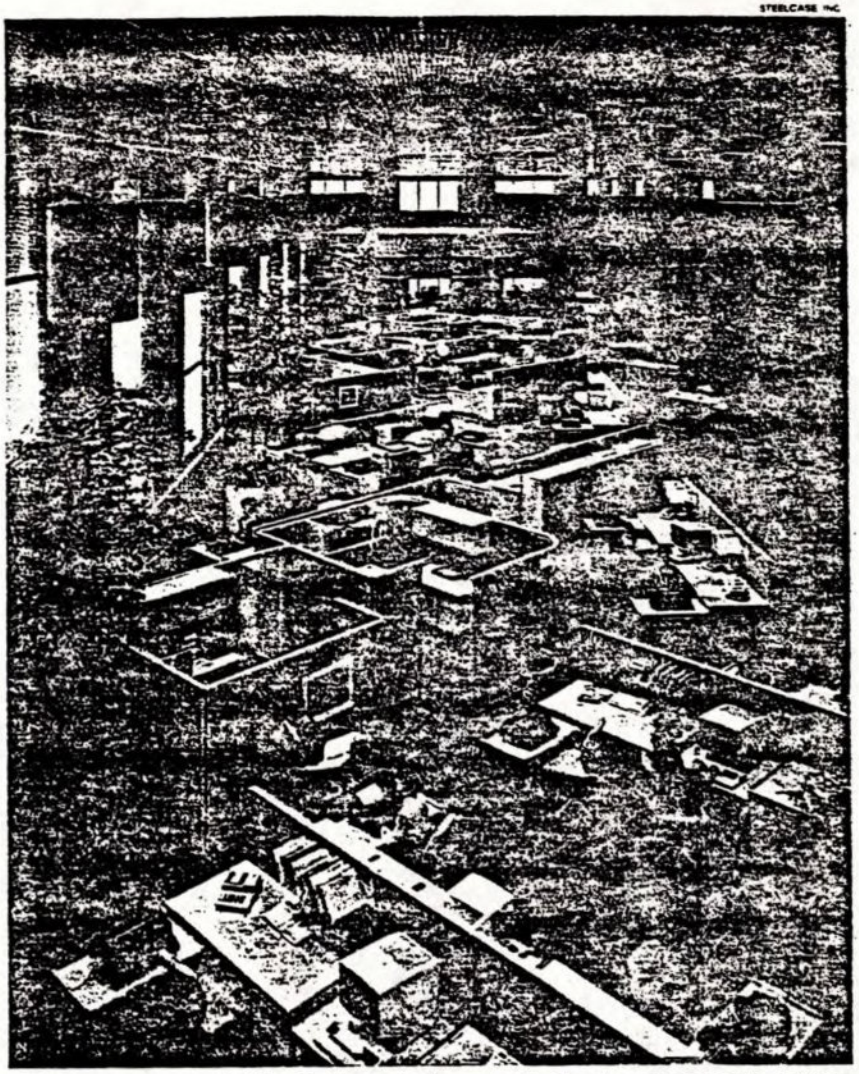
YOU PROCESSED 215 ORDERS AND MADE 5432 KEY STROKES IN THE LAST TWO HOURS. THIS COMPARES WITH YOUR AVERAGE FOR THE LAST SIX MONTHS OF 225 AND 5730, THE AVERAGE FOR YOUR WORK GROUP OF 246 AND 6308, AND THE PRODUCTION STANDARD SET AT 240 AND 6000. YOUR AREA SUPERVISOR IS WAITING TO SEE YOU.

The pain in his back intensifies as he rises from his chair and heads down the aisle to his supervisor's cubicle.

10:55 a.m.:

Still smarting from his supervisor's warning about his lagging job performance, Frank switches his fingers and eyes into their usual barely conscious and semiautomatic mode and returns to his favorite daydream. "There must be some way I can get into the operating system of this computer and really screw things up good." He grins at the thought.

2:10 p.m.
The district sales office of a major supermarket chain:



Creating an automated office that is productive and satisfying to workers requires attention to details large and small—from general characteristics of the organization to specific human factors. The design of the office of this insurance company, for example, includes attention not only to arranging work stations to conform with the efficient flow of work from desk to desk, but also to lighting: light does not glare on terminal screens, and everyone has access to the windows.

Arlene leaves the meeting with a feeling of excitement. The new district supervisor wanted her and her co-workers, Dave Martinson, the sales manager of the Management Information Systems Department, and Lynn Gelles, the department's statistical programmer, to develop a new inventory and sales monitoring, forecasting, and analysis system. Her knowledge of the existing system, experience with the automated office technology, skill in setting up electronic files, and ability to manage the office work flow and day-to-day operations of her department make her an invaluable part of the project team.

The job will be difficult but she feels up to the challenge. She particularly likes the opportunity it offers her to exercise initiative, generate ideas of her own, and generally control her own work. The increased pay won't hurt, either. It is a far cry from the days just a few years ago—before they introduced office automation into her department—when she was just another secretary.

"I can't wait to tell Frank," she thinks.

Her face darkens for a moment, "I hope he's in the mood for the tenants' meeting tonight. He's been so depressed lately. Considering his lousy job, no wonder! Oh, well, maybe my news will cheer him up."

She hurries down the hall, almost at a run, to get to her office and start work on the new project.

5:00 p.m.
The order processing department:

Frank thinks he might have it—the scheme for sabotaging the entire office computer system. He doesn't even care if they could eventually figure out who was responsible. But he will have to wait until the next day to try it out because his backache is now unbearable—not to mention his splitting headache.

"I think I'll skip the tenants' meeting tonight with Arlene. Besides, it's a waste of time—there's no way we can hold off that rent increase. Where does she get the energy for

"The way the technology is used—and its impact on the lives of the workers—depends as much on management ideology as on the technology itself."

all of her community activities, anyway? She works even longer hours than I do." He shakes his head in bewilderment.

"I'll stay home tonight, instead, and watch that new soap—what's it called? *Cleveland?*"

Logging off the terminal, he gets up listlessly from his chair and walks slowly up the aisle to the exit.

• • •

MICRONET INC.

Workers in the showcase "paperless" office of Micronet, Inc., discuss the operation of an automated system. Training in the use of such systems can be important to the self-esteem and security of users, as well as to office productivity.

This scenario depicts two very different situations—in effect, two alternative futures existing side-by-side. They both feature essentially the same technology, at least in terms of the hardware; however, in Frank's job the technology is used to closely monitor human performance for the purpose of supervisory control, while in Arlene's it is a means for facilitating creativity, initiative, and employee self-management. In one situation, the technology is central to a subdivided, standardized, fractionated job; in the other, it expands the variety of tasks required and adds to the job's responsibility and autonomy. Frank's company features a tightly constrained work schedule, location, and pace, while Arlene's emphasizes flexibility and choice.

Flexible Futures

Are both these situations equally possible? Or is there something in the nature of information technology that makes one more likely than the other? Information processing tasks are less dependent on the location and rigid pacing of machinery and centralized energy sources than industrial manufacturing processes are. Consequently, automated office technology need not shape jobs and organizations in predetermined ways; a wide range of work situations is possible. The way the technology is used—and its impact on the lives of the workers—depends as much on management ideology as on the technology itself. The beliefs that managers hold about human nature will guide their decisions on automated systems, and the consequent impact of the technology on individuals and jobs will, in turn, tend to confirm their beliefs.

To create an automated office that is productive as well as a satisfying place to work, it is important to identify the features of organizations and technological systems that are associated with desirable workplaces. Recognizing the importance of these issues, the National Science Foundation recently awarded a grant to the authors, through the Rand Corporation, to examine the various processes by which computers are introduced into the office and the impact of these processes on the system's ultimate effectiveness. The processes can be quite complex, and four variables play a particularly important role in the choices that can lead to the two widely divergent workplaces experienced by Frank and Arlene:

1. **User Participation in Planning and Decision-Making.** The people who must work with the system will largely determine its success. The degree to which those whose jobs are affected by the new technology influence the design of the computer-mediated office may have a major impact on the overall effectiveness of the office system. Users can and have participated in the implementation process at many points, ranging from the initial assessment of their needs, through pre- and post-installation planning and training, to evaluation and recommendations concerning day-to-day operations of the office and assessment of the system's success.

2. **Training.** Inexperienced users typically do not have the skills and knowledge needed to operate the technology effectively—or even to accept it as a potentially helpful work tool. This presents a problem not only for office productivity but for the self-esteem, feelings of security, and general well-being of the users themselves. Without the needed skills, workers may feel threatened by the possibility of losing their jobs and may experience feelings of incompetence, loss of control, and stress. Training that helps users cope with the demands of the new technology would not only enhance the productivity of the system, but might also help alleviate some of their fears concerning technological change.

3. **Anticipation of Job Changes and New Uses.** One problem that inexperienced users may have with the new technology is difficulty in foreseeing how the technology will affect their jobs. Consequently, they

"Less formal organizations tend to be more open to innovation and therefore more likely to adopt office computer systems."

may be unprepared for the changes when they do occur, and go through an extended period of adjustment—accompanied by reduced productivity—while they learn how to operate the system and discover the new capabilities that it makes possible. Any help the users can be given in anticipating the impact of the technology on their jobs should help to enhance the overall effectiveness of the system.

4. Adaptive System and Organizational Change. Training and anticipation of job changes can be viewed as an adaptation of the user to the technology and the needs of the organization. It is also important to keep in mind that the other side of the coin—the adaptation of the office computer system and the organization to the needs of users—can have a major impact on the system's ultimate success and the satisfaction of the workers. For example, employees may regard constant on-line monitoring of computer system use as unwarranted and relentless surveillance of their work behavior. This monitoring capability could be eliminated in response to workers' concerns and needs.

The characteristics of the systems themselves can also influence the kind of work situation resulting from automation. Two properties, "habitability" and "extensibility," are particularly important in this regard. Habitability is also referred to as "user friendliness"—how well the system can accommodate individuals whose formal training has not included programming, data processing, or other activities requiring computer use. For instance, a system may deal with user error simply by shutting off (low habitability) or by helping correct the error (high habitability). Extensibility is the degree to which the user can extend the capability of the system by programming new features and routines or by adding new devices. It represents the system's potential for adaptive change by its users. Decisions made during the implementation process will determine how much of this potential is realized. Because of the support they provide the user, both highly habitable and extensible systems may be ultimately more productive.

Of course, characteristics of the organization, such as its level of formality, centralization, and specialization, will also affect how the automated office functions.

Formalization. Some organizations carefully describe the specific authority, responsibility, duties, and procedures to be followed for each job, and may also monitor employees' behavior to ensure compliance. Others have loosely defined rules and do not carefully regulate work behavior.

Less formal organizations tend to be more open to innovation and therefore more likely to adopt new office computer systems. However, once a decision has been made to adopt a system, more formal structures—reflecting singleness of purpose and norms of behavior—may be required for effective implementation.

Centralization (the degree to which power is concentrated in an organization). Decentralized organizations, as in the case of less formal organizations, are typically more accepting of new ideas and innovations. A decentralized structure may help with the implementation by increasing employee participation and consequent commitment to making the system work effectively.

Specialization (the division of labor into specialized functions and tasks). The research on job enrichment and quality of work life suggests that combining tasks into natural units of work, rather than breaking them down into highly discrete specialized fragments, can enhance employee motivation and satisfaction.

Toward Greater Productivity and Job Satisfaction

Typically, the reason for examining the variables we have described is to discover their impact on traditional organizational goals—productivity, satisfaction, absenteeism, and turnover. Their impact may not stop here, however, since recent research suggests that one factor that underlies many of these variables—autonomy and control—might significantly influence the health and social and political attitudes and behavior of workers. For example, in a series of studies of the Swedish male labor force, Robert Karasek of Columbia University found that workers whose jobs were characterized by heavy work loads and low control over their work were most inclined to exhibit symptoms of depression, cardiovascular disease, and mortality. The workers with the lowest probability of illness and death were those with moderate work loads combined with high levels of control over their work. Karasek also found a relationship between autonomy on the job and active social, political, and leisure pursuits.

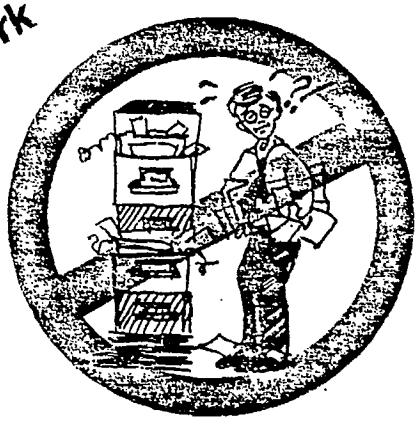
These research results suggest that the same implementation processes, systems characteristics and organizational structures, policies, and job designs that promote productivity may also have a highly beneficial effect on mental and physical health and political behavior. If so, then there is no reason—aside from ignorance, obstinance, or a desire to exercise coercive control—why the office of the future cannot be a change worthy of anticipation and acceptance rather than resistance and fear. It comes down to a question of enlightened choice.

About the Authors

Don Mankin and Barbara Gutek are resident research consultants at the Rand Corporation; Tora Bikson (right) is a senior social scientist at Rand. Mankin is also coordinator of the graduate program in organizational psychology at Antioch University, Los Angeles; Gutek is associate professor of psychology at Claremont Graduate School. They can be reached at the Rand Corporation, 1700 Main Street, Santa Monica, California 90406.

THE ELECTRONIC OFFICE

How It Will Change the Way You Work



As managers assemble the electronic systems of the "office of the future," they may well see office productivity shoot up. Here is a brief look at some of the time- and energy-saving innovations that will transform the office world.

by Marvin Kornbluh

Most businesses are finding it increasingly difficult to afford the traditional approach to office work, with its private secretaries, paper-clogged "in" and "out" boxes, cumbersome office mail, searching for files, and editing, correcting, and copying of documents. Consequently, a growing number of managers are considering major capital investments for their offices with an eye toward big savings in time and money.

Office productivity increased by only about 4% during the 1970s, while factory productivity, spurred by automation, rose 85% over the same decade, according to the best estimates of some experts. The investment in capital equipment per office worker has been far less than that for each manufacturing employee, with some specialists estimating only $5 to $10 spent per "white collar" worker for every $100 for a "blue collar" worker.

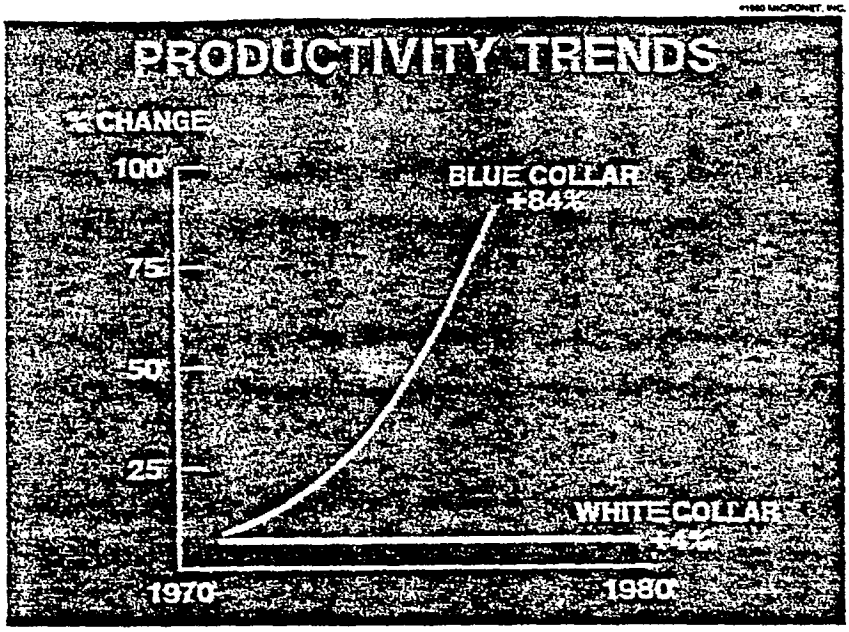
Offices are still largely labor-intensive, employing a large number of "knowledge" workers such as managers, administrators, accountants, programmers, personnel workers, attorneys, researchers, and engineers along with their clerical support staffs. These "office workers" spend most of their time absorbing or giving information—among themselves as well as with customers, clients, and vendors. More and more, they are being forced to cope with "information overload" in an increasingly complex world.

The "office of the future" will inevitably respond to these problems with technology that augments human potential by eliminating drudgery and monotonous routine and reducing the time dedicated to intra-organizational, overhead activities. Most communication will be carried out electronically, with significant reductions in the amount of labor expended.

The trend toward electronic storage and transmission of information is leading to what is variously known as the "paperless office," the "automated office," and the "office of the future." The expectation is large productivity gains in such office functions as:

- Typing written material.
- Proofing and editing typed material.
- Handling internal correspondence.
- Filing and retrieving reports.
- Doing research.
- Drafting original material.
- Scheduling meetings.
- Billing and accounting.
- Handling telephone calls.
- Copying material.
- Mailing material.

Over the next two decades, we can expect a wide range of sophisticated time- and labor-saving marvels to come on the office equipment market. Here's a look at tomorrow's office world. The components are reviewed here as separate entities, but there is considerable overlap among them in that one device may possess some of the capabilities of other systems.



Personal Desktop Terminals and Work Stations

In the next decade, most managers and other professionals will work with personal desktop computer terminals and well-designed, flexible work stations that make computer processing and data storage resources instantly and interactively available for compiling, interpreting, and analyzing information. They will come in many styles with all types of keyboards, video displays, and input-output media. All will be electronically comparable to the conventional four-drawer file.

Work stations will include software and memory facilities for the storage of both incoming and outgoing documents and correspondence, together with powerful automatic indexing and data management capabilities. Specific documents such as contracts, office reports, and purchase orders will be retrievable within a minute or so.

The equipment will be capable of "information tracking." This tracking entails quick checks into the status of requests for information and, when necessary, automatic reminders to those whose answers are tardy. Similarly, with proper programs, the systems will be able to check the spelling of words, keep a personal telephone directory, and maintain master and individual "calendars" of meetings, appointments, deadlines, and other time-sensitive events.

Intelligent Word Processors

Intelligent word processors manipulate, edit, and format text to facilitate the production of typed correspondence and reports. The editing and formatting will be performed via a display screen. Rough drafts and finished texts will be printed immediately at high speeds and locally or centrally stored. The word processor will also print documents that are prepared at a remote location and transmitted electronically.

The basic word processor will still contain a microprocessor "memory" and/or optical character recognition equipment, a keyboard, a printer, and a graphic display. Most will also have an interface to a data (computer-communications) network. All will have addresses for sending and receiving material.

Three categories of word processing will still exist:

1. Stand-alone units with display screens utilize microcomputers that can store items such as a full-hyphenation dictionary, proportionally space and justify typed or printed material, prepare dunning letters for overdue accounts carrying an itemized list of unpaid items, and automatically prepare and personalize other kinds of letters.

2. Clustered systems operate on either a "shared logic" or a "distributed logic" basis. In a "shared logic" system, a central processor or logic unit supports a number of remote input units and output terminals. With "distributed logic" systems, each component is endowed with its own intelligence and can operate semi-independently. Several employees will work simultaneously on a document, using a rich set of text editing and formatting capabilities. Operators will manipulate the files in the data base independently of one another but with a great deal of cross-referencing, if necessary.

3. Time-shared systems have remote terminals connected to a service bureau's computer and offer large amounts of storage. The only required investment is the purchase or rental of an appropriate terminal.

Electronic Mail

An electronic mail system is an alternative to postal service, private carriers, and intercompany mail delivery networks that carry mail physically. It transmits messages (letters, memos, contracts, voicegrams, mailgrams, telegrams) via an electronic communications network (telephone, wire, radio, cable TV, satellite). The system may incorporate various kinds of equipment, including message terminals, small computers, intelligent copiers, and word processors. There are essentially four variations of electronic mail.

1. Common carrier-based systems and public postal services are likely to provide document distribution. The U.S. Postal Service and private common carriers will probably offer next-day delivery through a domestic electronic message service.

2. Facsimile systems involve scanning a document in one location, converting that information into electronic pulses, and transmitting the pulses over a telephone line to a facsimile receiver at another location—at fast speeds—to reproduce the document.

3. Personalized computer-based message systems permit the user to access his incoming messages at his convenience, to dispose of them elec-

tronically, and to file, display, or pass them along as he sees fit.

4. Communicating word processing systems are word processors whose output, quality, and speed will be high and will eliminate the need to create hard copy; text will be transmitted just as it appears on a screen, and the systems will communicate with other computers, terminals, and word processors.

All of these variations will offer some, if not most, of the following services:

- Built-in levels of priority and confidentiality.
- Filing messages for later retrieval.
- Chaining messages together.
- Option of hard copy and messages displayed on a screen (soft copy).
- Multiple copies.
- Different type styles.
- Automatically addressing acknowledgements of messages back to original senders.
- Specification of multiple addresses.
- Sealing envelopes.

Teleconferencing

Managers and executives spend much of their time in meetings. While the telephone has traditionally been used for two-party conversations, many business meetings involve several people who may be at different locations. Teleconferencing means holding multiparty meetings over communications links connecting two or more sites. The use of the three major forms, including hybrid versions, will increase:

A telecopier can send or receive a typical one-page business letter in about a minute. This facsimile unit operates over ordinary telephone lines, automatically answers the phone, adjusts to the speed of the sending unit, and prints the message unattended.

1. Audio teleconferencing: The participants communicate by telephone (voice) and sometimes transmit graphic material using special equipment. Individual employees will set up conferences from their own desks without going through an operator, and conferees will talk in normal tones with their hands free, using high-quality "speaker phones."

2. Computer teleconferencing: The meeting participants communicate through computer terminals, and their statements and questions are stored in computer memory as a "continuing dialogue." Several individuals can speak (type) simultaneously and they can remain anonymous if desired. Participants in a computer teleconference will not need to be physically available at the same time; instead, they can enter messages on their terminals and read those of other participants at their convenience.

3. Video teleconferencing: A large number of remote groups directly communicate with one another through television images with sound. Individuals and groups will see each other on television monitors either in full motion with "zooming capability" or via the "freeze" or "still frame" technique. The moving pictures can be retained on videotapes or videodiscs for later reference and "hard copies" of still frames can be prepared.

Intelligent Telephones

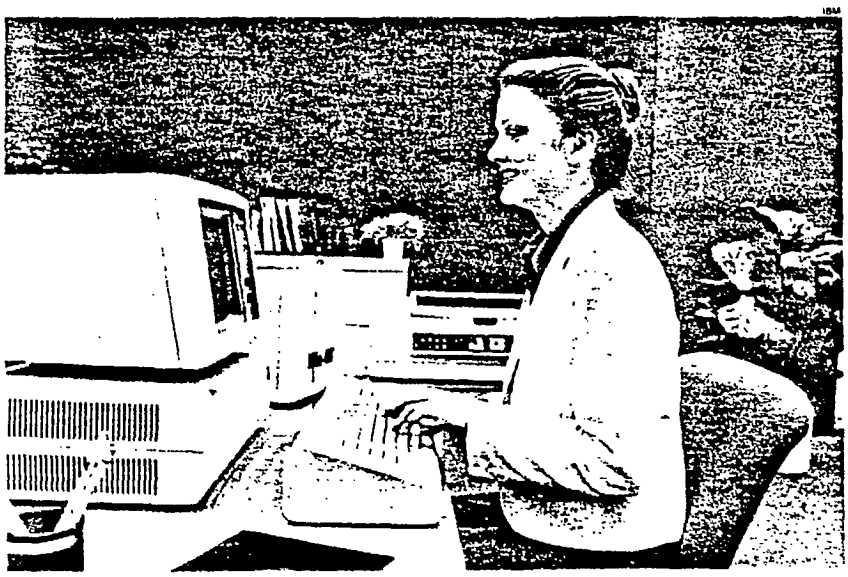
The 12-key pushbutton telephone will serve as a low-cost intelligent terminal with the addition of a "built-in" microprocessor. It may also have a slot for inserting a magnetic card, a simple device for receiving and storing data, a small display attachment that retrieves telephone numbers from memory and displays desired ones, and a timer that monitors and records call lengths.

A computer-based switchboard will automatically link office personnel performing various office functions and will be able to monitor and control security alarms, light, heat, air flow, and the flow of data, text, and messages. It will also have the capability to "look ahead" for busy phones; put a "do not disturb" on a phone; make collect, third party, and credit card calls without operator assistance; and screen calls so that only those from specified numbers can come through.

The use of the picture phone (which allows participants to see each other as they talk over the telephone) will increase substantially. Transmission costs will be greatly reduced while the picture speed and quality will be greatly improved.

Intelligent Communicating Copiers

Intelligent communicating copiers will be available to accept a wide var-



This word-processing system can check the spelling of about 50,000 common English words plus 500 special terms used in a firm's business. The text can be printed, stored, or sent as electronic mail.

iety of paper stock and perform good quality, rapid printing chores at moderate prices. They will be able to produce color, and enlarge and shrink copies. They will also have the capability to prepare original drafts from data sent by computers and word processors.

Word processors and computers will be connected to photocomposition equipment to eliminate any rekeying of data for volume printing. Inkjet printers will also interface with the word processors and computers. These are non-impact forms of printing where a jet of ink is shaped "electrostatically" to form text. A minimum of operator attention will be required to copy or print attractive brochures, reports, halftone photographs, pamphlets, booklets, and other message forms.

Optical Character Readers

Optical character readers (OCRs) will be able to scan a piece of paper, convert the information to digital form, then transfer it to the memory of a computer. Scanning evades keystroking of information and can include supplemental pictorial material. Text editing, facsimile reproduction, storage and retrieval, and printing can then be carried out on the stored information. One application of OCRs will be to scan and route mail and file material by converting paper messages to electronic media.

Micrographics

Micrographics involves the substitution of microforms (microfiche, microfilm) for paper in records storage. Its equipment includes a camera and may include a printer, a developer, and a duplicator. Microforms in such storage produce extraordinary space savings, permit rapid access to archived records, and last a long time.

Microforms can be produced directly as output from computers. They can be reformatted, updated, and converted into other media—including paper. They can be conveniently packaged in cartridges and cassettes, film jackets, operator cards, and microfiche. Microfiche is a 4" x 6" card-like piece of film containing 270 or more standard-size computer pages of information.

Managers will be able to carry microfiche home in an attache case outfit with a viewer and project information onto a curved screen built into its cover.

Electronic Blackboards

Messages written on electronic blackboards generate digital signals that are clearly, reliably, and quickly transmitted over telephone or other communications lines. An instructor or manager can write on the "pressure-sensitive" surface and

The Portable Office

For many employees, there will be no real reason to be physically present at a central location as long as they have ready access to data banks and communications systems. Electronic networks will enable workers to stay "plugged in" to the main office while they're at home, at remote branches, or on the road.

Telecommuting

With computer terminals available in the home or at dispersed suburban locations, some employees will not need to come into the main office on a daily basis; some may not need to come in for weeks at a time. This substitution of communications for travel is known as telecommuting.

High-level executives will head for a local branch office once or twice a week instead of making long commuting trips. Some typists will be able to work at home, receiving dictation by telephone or hand-written drafts by facsimile, then returning typed copy via communicating word processors. Handicapped persons who find it difficult to travel will benefit considerably.

Mobile Communications Links

Two-way radio facilities will be widely available in trains, cars, trucks, taxicabs, buses, and airplanes for individual users. Portable hand-held units will permit subscribers to communicate with other subscribers anywhere in the world—even while traveling. The links will operate via satellite and terrestrial-based networks. Executives will keep in touch with their offices continuously, despite being "on the move." These mobile communications links will have long-distance ranges and combine some of the advantages of the citizen's band radio and the telephone.

Radio Paging

A radio paging system makes it possible to contact individuals who are not sitting near a telephone. The individual hears a small, inconspicuous radio receiver or "beeper" that can signal with either an alarm tone or a spoken message. The new beepers will be smaller and less expensive and will supply different tone signals so that the subscribers can distinguish between various messages. The caller will be instructed to dial the subscriber's number and then add an extra digit to tell the subscriber whether to call the office, home, or car phone—or proceed directly to the office or some other place.

Electronic Briefcase

When this portable briefcase—about the size of one today—is open, one side will have a letter-sized screen of plastic across the bottom, equipped with the "touch sensitive" keys and controls of an electronic keyboard. The top two-thirds of the screen will display text, graphics, and video images. All of this will fit in a thin, removable cover. The other side of the case will contain the electronics, the memory slot of pre-programmed chips, and super-batteries to power the unit.

A small phone unit will also be available to communicate with a data network or to dictate material into storage. The rest of the lower part of the case will be empty—providing space for business cards, a sandwich, and extra video, text, or audio memory chips. There will also be a place for sensitized paper for making permanent copies from the screen.

thousands of miles away employees will not only be able to hear the lecture but also see what is written on the blackboard via a video screen.

A recorder of some sort can be connected at either end to capture and store the voice. Both voice and associated graphics can be replayed later at times convenient to both the sender and the receiver. Mistakes in writing can be corrected by a special blackboard eraser attached to the blackboard.

Computerized Training Devices

Small electronic units will be plugged into the antenna leads of conventional television sets. These units will contain interchangeable data storage devices along with a microcomputer and will connect with telecommunication links used by the organization. The television set will thus have access to libraries of computer-assisted instruction programs and data banks containing organized knowledge on thousands of topics. Specific programs and data can be selected and displayed on the television screen, including text, graphics, and still and moving pictures.

Voice Communications

The use of voice communications for data input to and data output from computer equipment will grow substantially, but it is likely to be expensive, require high maintenance, and be of only fair quality.

Voice communications input involves "speech recognition"—a capability for translating human speech into a form that computers can recognize. Microprocessors will tune the system to the accent, dialect, and regional word patterns of one specific individual. It will be possible to dictate inter-office memos into voice recognition units that will display the spoken words on a screen for immediate editing.

Voice output devices concern "speech synthesis" that takes data within the machine and converts them into intelligible synthetic speech. Such devices are convenient when an individual's hands and eyes are otherwise occupied—and, of course, would be of utmost utility to blind employees.

Speaker verification systems will formulate individual "speech prints"—much like fingerprints—to identify a speaker. These systems will be very useful in requesting confidential information over the telephone or from a computer.

MICRONET INC.

Inserting film into a microfiche reader. For long-term storage of relatively inactive files, microfiche is a money saver. The same amount of information that requires two "floppy disks" for a computer at a cost of $30 can be stored on microfiche for 30 cents.

Electronic Speech Compressors

An electronic speech compressor will be available to speed up rates of recorded speech without increasing the pitch. This avoids the "Donald Duck" sounds one commonly hears when an ordinary tape recording is run fast. The listener hears the person on reusable and inexpensive tape, talking faster but sounding much the same otherwise.

The device will produce speech rates of up to 500 words per minute, which is as fast as many people read. An executive can listen to a recording of a conference in less than half the time it would have taken to attend in person. An individual can play the device while traveling or at other times and places where reading might be inconvenient or impossible.

Integrating the Time and Labor Savers

While most office devices, equipment, and systems were originally conceived of as discrete and relatively independent developments, the office of the future will have numerous options for integrating them. Word processors will be linked to computers; computers will become enmeshed in telephones; optical character readers will be linked to facsimile equipment; personal desktop terminals will tie into electronic mail systems and micrographics capability.

The boundaries among the office technologies will become more and more blurred as the various components of the office become interconnected. Moreover, integration means more than placing machines side by side in a room. It means taking a management approach whereby the configuration, placement, and application of the office technology are dynamically controlled to meet the changing needs of the organization.

Numerous labor-saving benefits could stem from integrated office technology, such as:

1. Reduced "shadow functions": Shadow functions are the unforeseen, unpredictable, time-consuming activities associated with accomplishing tasks, such as misdialed numbers, busy signals, and the person to be contacted not being available.

2. Reduced number of interruptions: Meetings, conversations, and ongoing work need not be interrupted. Not only can "waiting times" be saved but also the time needed for individuals to return to their original activities.

3. Reduction of several steps in the communication process: Steps such as addressing, batching, dating, formatting, distributing, storing, and signing of documents can be performed automatically.

An automated office, in which all equipment is linked together for the efficient flow, storage, and retrieval of information. An out-of-town executive, using a telephone and a terminal, can feed material into the system or check an electronic "mailbox" for messages.

4. Reduction in the number of media transformations: Notes from meetings and phone calls may no longer need transformation from oral to written form. Changing the medium of the message may no longer be necessary, such as between handwriting and typewriting, computer storage and hard copy, and local copy and mailed copy.

The office of the future should not be viewed strictly as a means of overcoming existing technological limitations in the office. It should also be regarded as a restructuring of the thought processes and working methods of professional, managerial, and administrative persons as they perform their daily work in offices.

No pat formula exists for assisting organizations as they move toward the office of the future. Each firm must find its own way consistent with its markets, services, management activities and styles, size, mores, and past experiences with computers and telecommunications technology.

This article is adapted from *How to Manage Financial Systems: An Executive's Guide to Planning, Implementing and Controlling Effective Services and Information in Financial Organizations* by Marvin Kornbluh. It is reprinted with permission of the publishers, Financial Managers Society for Savings Institutions, Inc., 111 East Wacker Drive, Chicago, Illinois 60601. The price is $34.95 postage paid (Chicago residents add 7% tax, all other Illinois residents add 6% tax).

The views expressed are solely those of the author and should not be attributed to the Congressional Research Service.

Another article drawn from Kornbluh's book appears in the March-April 1982 issue of the *World Future Society Bulletin*. Entitled "The Savings Institution of the Future: A Study in Systems Long-Range Planning for Business," the article presents a step-by-step plan for applying futures research to the practical operation of a modern business firm, using the example of a specialized financial institution.

About the Author

Marvin Kornbluh is a specialist in information science and futures research for the Congressional Research Service of the Library of Congress (Room 413, James Madison Building, Washington, D.C. 20540). He performs research and policy analysis concerning the role and impact of computers and telecommunications on various segments of society. Kornbluh will be a presenter at the World Future Society's Fourth General Assembly, "Communications and the Future," speaking on the office of the future and on computer literacy.

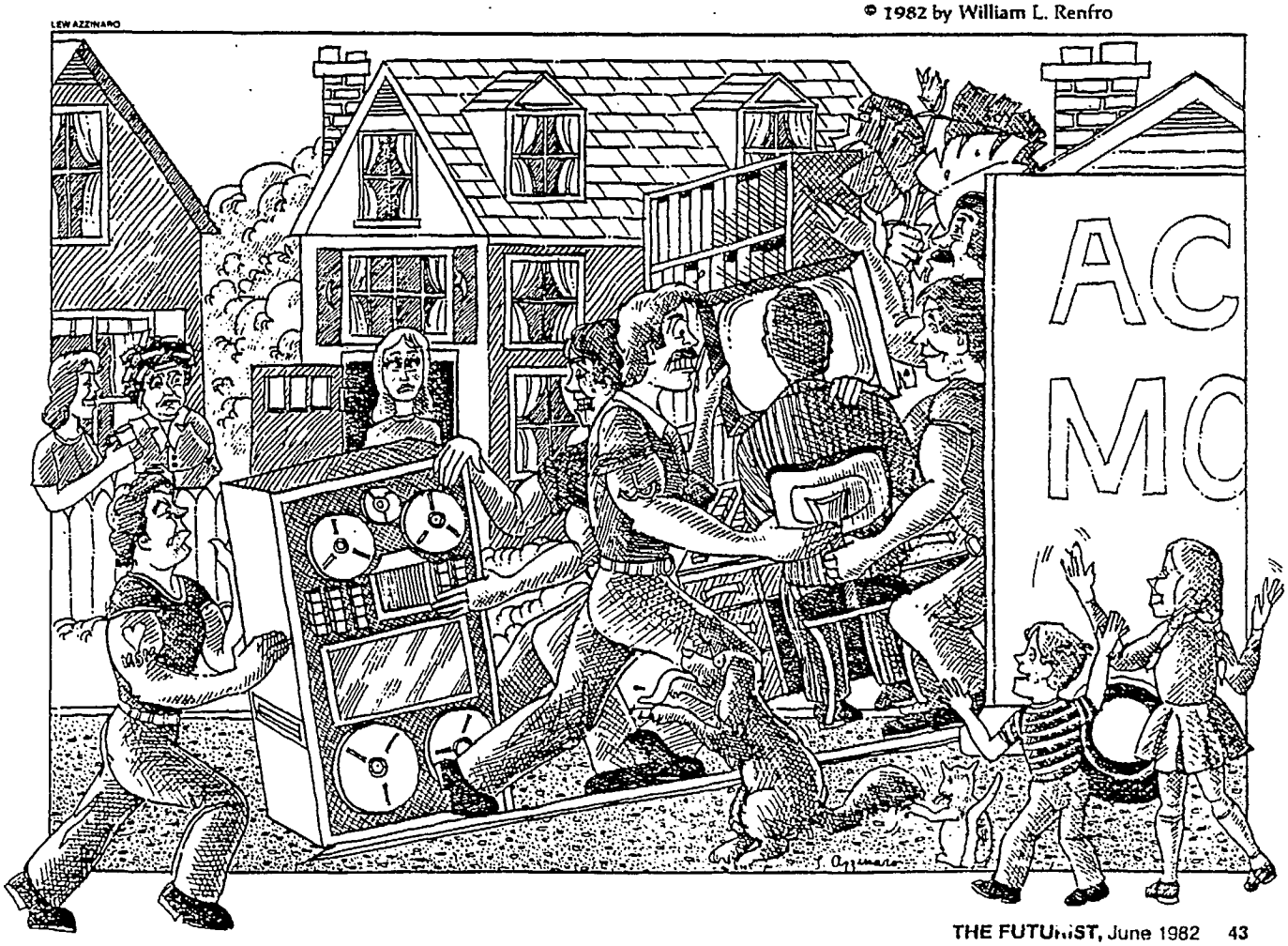
Second Thoughts on Moving the Office Home

The home office may free us of the daily commute to work, but we may be giving up a lot more than we gain.

by William L. Renfro

You missed the 7:15 again. Forced to drive to work, you get stuck in heavy traffic. As you finally trudge into the office, past the glowering boss, you say to your officemate, "Won't it be nice when this place is automated and we can stay home and do our work in peace and quiet on computers?"

An appealing thought, perhaps, but an office in the home is a place where few people will be spending time in the next few years. *Los Angeles Times* columnist Jack Smith thought his life's dream had come true when he was given permission to write his column at home. Relieved of the burden of commuting



to the office every day, he was free to work at his own pace.

Six weeks later, he had to return to the office temporarily because his granddaughter broke his typewriter. Once there, he discovered the rewards of office life that he had never appreciated: "the friendly faces, fresh in the morning; the clothes; the gossip; the flirtations; the benign conspiracies; lunch hour expeditions; the open forums on war and peace, Reaganomics, and the Rams quarterback controversy, none of which could be examined with such reckless spontaneity by anything canned for consumption on your home computer."

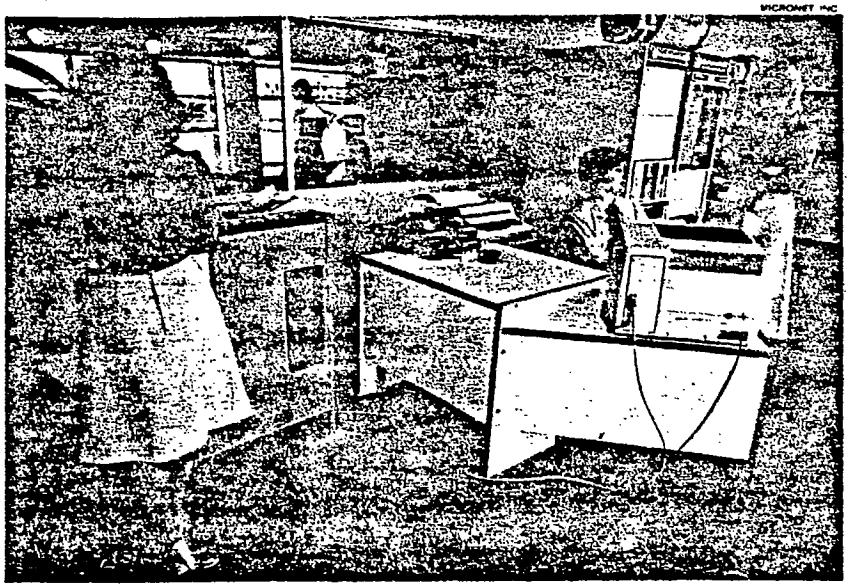
Smith felt rejuvenated when he came back to the office. His columns were richer. He had more ideas to work with. He recognized, as many home workers do, that he had been withering on the vine at home as though unwatered by contact with his colleagues. And he realized that he really came back to the office not just to write, but to renew his interaction with human life.

The Office: A Link to Society

If sociologists are concerned today about the sense of isolation, aloneness, and anomie in our society, then they should be sending up warning flares about the sociological disaster the home office could bring. One of the principal functions of work in America, author Studs Terkel claims, is "schmoozing"—achieving a sense of companionship and togetherness among workers as they chat about their lives and gripe about common problems—and this function may die in the home office. If our primary links to the larger society are through our fellow workers, we will have to build institutions that will maintain human contact when the office is moved home.

Working in an office with other people shifts our focus away from ourselves and toward a larger group. This provides our first key link with society. The office offers a sense of team spirit and participation in something larger than the individual.

The feeling of "we're all in it together" at the office provides a necessary ingredient for the discipline and sacrifice so important in getting the job done. Your coworkers provide incentives and support. Sure, you feel a little slow this morning, but the others will be at the office on time. You want to show them that you can do your part and support the group, so you make the effort. At home, there is no incentive, no reward, no sense of personal accomplishment for making the extra effort.



Workers chat in a "paperless office"—the fully automated office of Micronet, Inc., in Washington, D.C. Important social links provided by being at work will be lost when more people work at home, the author says.

"You can spend much more on energy to heat or cool your home all day than you do on commuting a few miles."

Being "At Work"

The mere process of going to the office also has an important function: Your commitment to "be at work" for the day requires no further effort. At home, you have to make that commitment to work after each little distraction—the dog, the mailman, the kids, the dinner, the thousands of "honey-do" projects that can consume eight hours of work time before you know it.

Being "at work" provides a ready excuse to avoid those thousands of little errands or activities demanding your time. At the office, it is easy to say, "No, I can't do that—I'm working," but at home it is a difficult, seemingly arbitrary, but necessary task. Many women writers who work at home have long complained of the constant interruptions by friends and neighbors who simply don't understand a home worker's "office hours."

The "imposed" routine of the office, of going to work, will have to be replaced by self-imposed discipline in the home office.

Even the notion that working at home saves a lot of money on the fuel it takes to commute back and forth is a delusion. You can spend much more on energy to heat or cool your home all day than you do on commuting a few miles.

And while we complain about the time lost in commuting, consider the many things we use commuting for: We plan our day, do some errands along the way, share thoughts with the car pool. The change of surroundings, the sense of going somewhere and of doing something are part of the role that commuting plays in our daily lives, according to research by General Motors. We feel a sense of closure, of completeness when we leave work and head for home at day's end.

The sense of being "at home" will also change without this transition between home and office that commuting provides. It will be much harder to leave the headaches of

"Home, that place where you feel absolute dominion over your environment, will for eight hours a day be dominated by some outside influence: Your 'castle' will be invaded by a boss calling to check up on your progress."

work back at the office, and families may suffer. Home, that place where you feel absolute dominion over your environment, will for eight hours a day be dominated by some outside influence: Your "castle" will be invaded by a boss calling to check up on your progress.

Career Barriers

One of the major problems of computers has always been their requirement of formality: Input has to enter through the keyboard in a specific way. In the language of information architects, this formality is a tremendous transaction barrier—something that makes computers hard to use. This kind of barrier means that the home worker will miss out on much of the informal communication that flows through an office.

Even the telephone, with its much lower barriers, does not permit the kind of accidental exchanges that happen in the hall, by the coffee pot, or at the copier. There is much more to communication between two people than the spoken word: There is eye contact, gesture, body language, inflection, tone, emotion. The computer, lacking these essential nonverbal elements of communication, is a barrier that the home worker must somehow overcome in order to sustain a relationship with the boss and with co-workers.

Studies conducted at IBM offices found that the contact between office workers decreases relative to the distance between their offices: Double the distance between two workers and you cut the communication between them by a factor of four. Move them a floor apart and you cut contact by 90%. In other words, "out of sight, out of mind." The implications for the career of the home worker are obvious: If the boss can't see how well you're doing and how hard you're working, he may soon forget you and pass over you at promotion time.

Employers of Home Workers

But the biggest impediment to the home office may be the resistance of employers. Since the home worker loses access to the shared equipment and supplies of the office—the files, the copier, the bulky reference volumes, and so on—his productivity will suffer. Although the worker may argue that these things are not absolutely essential every day for every task, the employer has put them in the office for a reason: They make it possible for more people to be more effective and productive in their work.

The lack of contact with the worker presents another problem to the employer. More than 10 years ago, my department in a large corporation had an internal phone dictation service. Executives could call

New York Times newsroom exudes spirit of teamwork. Workers strive to get their jobs done as part of group effort.

The Other Side:

What's Good About the Home Office

The nine-to-five, Monday through Friday routine can stifle productivity and creativity. Working at home saves time, money, and psyches, says this author, who practices what he preaches.

by John Applegath

Do you wonder how some people manage to get so much done in a day?

One answer may be that they don't waste time getting back and forth to their place of work every day, because they do their work at home. All those extra hours get used—for either work or pleasure.

Because my home serves as my office, I can be at work within 15 minutes of getting out of bed in the morning. Or I can wake up in the middle of the night with an idea and be at work in less than 5 minutes. Or because I don't have to appear someplace at some fixed time, I can spend the early morning hours in bed reading or watching Phil Donahue or enjoying my wife's good company, and ease into working when I'm ready for it.

If I work until midnight to meet some important deadline, I am not faced with a long drive home—or a wait for public transportation alone in the dark. I can simply leave that neat, finally finished project on the desk and walk upstairs to bed.

With the availability of small computers that can be plugged into immense data banks, word-processing equipment, and other devices, more and more people are setting up what Alvin Toffler calls the "electronic cottage."

The new cottage industries may be found in a handsome brownstone in Chicago's Lincoln Park, beside a swimming pool in a rambling house in Palo Alto or Vancouver, or in a log house in a remote rural area. A surprising number of business firms and other organizations whose address is given as a post-office box number are actually individuals or couples working at home.

Of course, "working at home" shouldn't always be taken literally. Some people do at least part of their work in unusual settings. On occasions, "home" is Central Park for a consultant who finds that she does her work better in the fresh air and sunshine.

Some of my own best ideas got written down at the beach, or while I was sitting over a leisurely cup of tea in a pleasant cafe. Flexibility of time and place is the major advantage to working at home.

Jane Marriott, in the restaurant consulting business with her husband, likes the convenience: "It's not taking the time to get dressed, getting in the car, driving to your office, answering your calls. There's a lot of time that we both would waste. We've had a lot of discussion about whether or not to get an office, even close by. We both like to be able to work at any hour, dressed in any way we want. It really works out for me. I just walk into the studio in a bathrobe, or I can do it in the evening. I have a lot of materials accessible."

Pat Lee, a consultant and special projects manager, likes the flexibility: "It means if you want to work on a rainy day for 12 hours, and spend 12 hours in the sun the next day, you can. If you feel like sitting in your chenille bathrobe at midnight writing an employee handbook, and you really get into it and want to stay up till 4:00 in the morning doing it, that's terrific. You go ahead and do it. If you get really hot on a wage-and-salary study on a Saturday morning and you want to work through a whole weekend in order to take off Monday and Tuesday, you do it."

Author Jessica Lipnack, who also works at home with her husband, likes the opportunities for parenting: "The reason we bought this house was because of its size. We wanted to work at home. We use the two front-parlor rooms, and we each have individual studies on the third floor. I like having my work nearby. I find that very gratifying. We had an office for a long time, so I've also had the experience of going out of the house to work.

"We both really enjoy it in relation to our small children, because we've had a lot of access to the kids—they're seven months and three years. I'm nursing the baby, so it's made it possible for me to be one of the rare women who can work and nurse. That's a big issue for a lot of people with infants. So that's been wonderful. Being able to see them on and off all day and make choices about spending time with them has been great. You know, if something came up . . . if I wanted to spend some time, or if Jeff wanted to take Miranda off on a bicycle or something, we can do all of those things, and that is terrific."

Adapted from *Working Free: Practical Alternatives to the 9 to 5 Job* by John Applegath (AMACOM, a division of American Management Associations, New York, June 1982, 202 pages, $13.95), which is available from the World Future Society Book Service (pre-payment required; please include $1.50 for postage and handling).

and control dictation recording equipment and get hard copy by inter-office mail within a few hours. But nobody trusted the privacy of the system for any important communication, and it was embarrassing to use such a fancy system for the minor memos. The result: The system didn't get used. This problem is compounded with the home worker. No responsible office manager will allow the free transmission to and from a worker's home of private, internal office communications, especially workers who are unknown, seldom (if ever) seen, and whose loyalty to the organization has not been established.

Certain economic and legal considerations that would have to be worked out with the home worker will make employers reluctant to give permission to employees who want to work at home. For example, the safety and security of expensive equipment kept in the home will be a difficult issue to settle. Jack Smith may pay the bill when his granddaughter breaks the typewriter, but not when a $10,000 communicating word processor goes on the blink. The home worker and the employer will have to settle questions of liability when, for example, thieves run off with the video display terminal, thinking they've stolen another television. Insurance and security systems will certainly add to the expense of the home office.

Many of the legal and economic issues could be resolved if the home worker were not an employee but an independent subcontractor who supplied his own equipment or leased it from the office or a third party. The government has been suspicious of such subcontractor relationships, however, and has made up a host of protective labor regulations. For example, the National Labor Relations Board has been arguing that women who knit wool hats in their homes for a Vermont company are employees and must be paid the minimum wage. The workers and the company involved have been arguing that the women are independent contractors who can set their own prices for their products and their time. Though this case has become a bit of a political football in the arguments over excessive government regulation, it could yet set an important precedent for the future of the home office.

"In the already cramped housing of today's young families, finding space for the home office will indeed be difficult."

Opportunity for the Homebound?

Home office enthusiasts like to point out that office technology will open opportunities in the labor force for people often excluded in the past. Housewives who have a few hours to spare while the kids are at school could use their time to add needed dollars to the household income. The telephone cable can do more to reduce barriers for the disabled than all the barrier-free environments that technology has to offer.

But disabled people may discover that this is a dubious opportunity. When they try to overcome barriers to take part in society, other people must always keep them in mind. But if we cannot see the disabled, the elderly, and the infirm and are not forced to deal with their special needs, then we as a society may very quickly forget about them.

People who are looking for a few hours' worth of work each day at home may find it difficult to obtain. The equipment necessary for the home office is only now becoming cost-effective for a 40-hour week. It would take four times as much investment in equipment to get the same productivity when the equipment is used only 10 hours a week. Not very practical when the prime interest rate is 17%.

The worker who must stay home because of children faces special problems. In the already cramped housing of today's young families, finding space for the home office will indeed be difficult. While the business may save a great deal in office space and, hence, rental costs, it is not clear that this savings can or will be shared with the home worker. If an agreement between a business and its home employees could be worked out, "rental" income in the form of higher salaries could of course help with a family's mortgage; however, zoning laws against converting residential into commercial property are likely to prohibit any such agreement.

The "opportunity" for homebound workers has a very important social cost. Though these workers are undoubtedly a productive addition to the labor force, they will be taking jobs away from the lower levels of

How to Work at Home

Here is a simple guide to keeping your sanity intact if you move your office home.

1. Get dressed. Being "at work" is a role you assume daily, so you should wear a costume that suits the part. Wear whatever you would normally wear to the office.

2. Set up office hours. Post the schedule on your office door or where family and friends can see it, and by your phone so you can remember to tell others. Practice saying, "I'll be at work from 9 to 5." And *be* there.

3. Get to work on time. Punctuality is important to maintaining a routine, so even if getting to work only involves a 20-foot walk down the hallway, make sure you're never late.

4. Quit on time, too. Don't linger over office headaches through dinner time. When office hours are over, take a walk around the block. You must find a way to leave the office behind you—literally.

5. See people. It's easy to become isolated from the rest of society when you spend 24 hours a day in your house. Incorporate a game of squash into your morning routine, or a trip to the grocery store or newsstand each afternoon. Meet the office gang at a local tavern after work, and join professional associations so that you can maintain your business contacts as well as your personal ones.

the office—jobs that have traditionally served as entry positions for lower-skilled workers. This could make the job market for the underprivileged and for the unemployed teenager even smaller. Hardly a desirable social development.

A Future for the Home Office?

Certainly there are specific kinds of work (such as computer programming and clerical tasks) that will easily be moved to the home. And perhaps the disabled, the infirm, and others who can now join the work force without the burden of commuting will not be forgotten by society. Institutions can be built that will substitute for the traditional office's function of maintaining workers' links to society. But these adjustments require social change, which is traditionally much slower than technological change. Evolutionary social change has yet to catch up with the revolutionary technological changes happening right now.

Perhaps this social change is what we are seeing in the electronic arcades of shopping centers: The office workers of tomorrow are learning to love the technology. Rick Roelke, a friend of mine who is a computer game addict, has played with these games since they were first available. Now, from his condominium in the woods of New Hampshire, he writes computer programs. He could well be a pioneer of the electronic cottage industry of the future.

When the Rick Roelkes become more numerous and gain sufficient experience, they may build their own informal links to society and never know the office. They may never feel the loss of Smith's office adventures or Terkel's schmoozing. But they will never know a part of the human experience.

The same great claims made almost 20 years ago for the revolutionary impact of computers are being made again today for the computer in the office at home. America has shown a great tendency to whip itself up into these great frenzies of excitement over revolutionary developments. In 1964, RCA announced the commercialization of its picture phone with an advertisement showing the Manhattan skyline and the question, "Is this still necessary?" Nearly 20 years later, Manhattan still is—but the picture phone never was.

Those of us who are weary of commuting may have become too excited about the prospect of the home office. Until we do our homework—that is, until we have thought out all the consequences of working at home—let's just keep going to work *outside* the home.

About the Author

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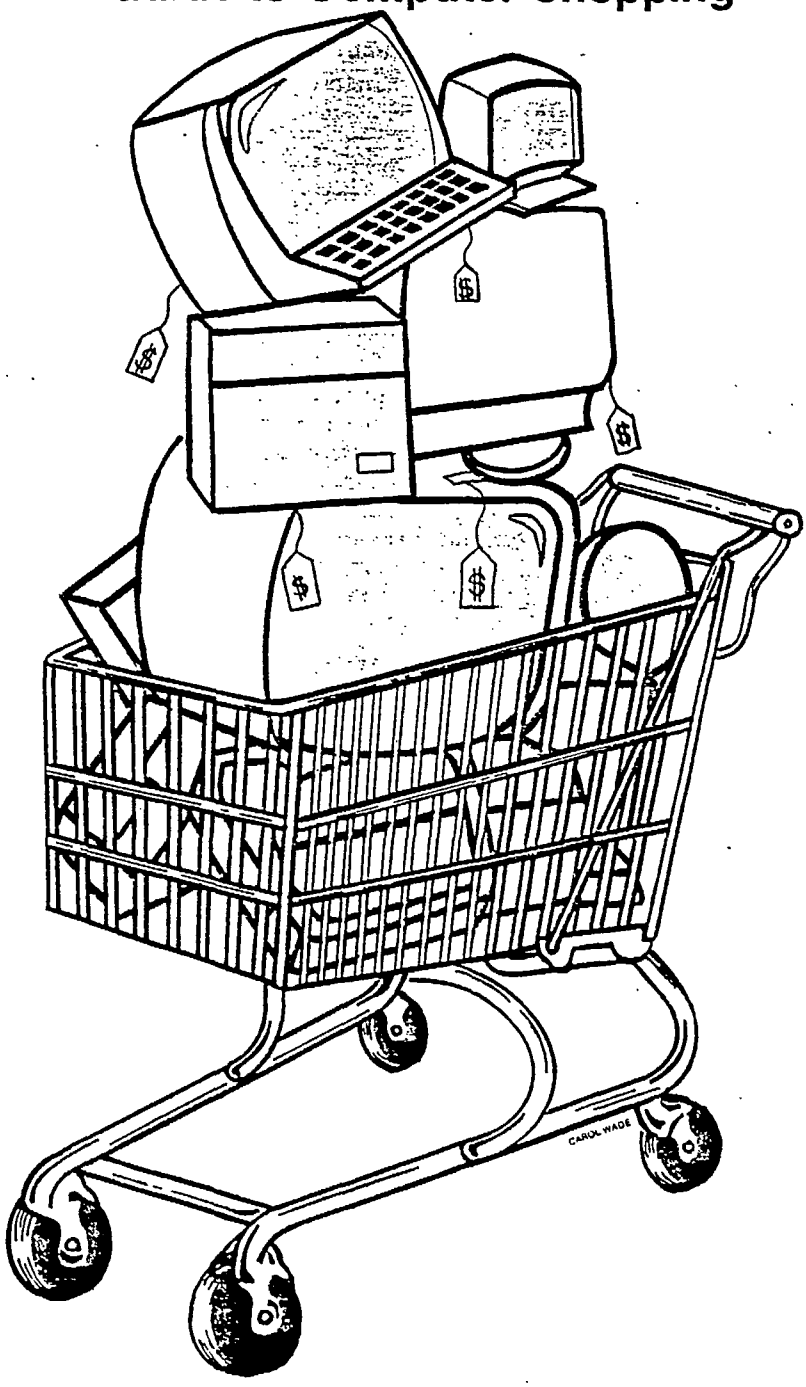
Bringing the Future into Your Office

A Guide to Computer Shopping



The fear of being left behind has become a strong motivation to automate offices, but shopping for a computer can be a harrowing experience. A telecommunications consultant tells how to make choosing a computer an easy part of building the office of the future.

by Dia L. Michels

In the computer field, prices fluctuate continually—and products change more frequently than car models. Salespeople often speak in what seems to be a foreign language. No wonder people find the task of automating an office to be confusing and overwhelming.

But shopping for a computer need not be a mysterious stumble through a dark maze. The process can be broken down into four steps. The first task is simply to learn about computers and understand what they can do. The second step is to identify the specific ways a computer can help you. The third step is to choose vendors and compare specific systems. And the final step is to weigh all the information and make your selection.

The World of Computers

In looking at how a computer can benefit you, you must know what it can and cannot do. Very simply, a computer can improve your productivity in three basic ways. First, it can do what you do now, only faster

and better. Tasks such as typing, preparing mailing lists, or alphabetizing files can be performed with great speed and accuracy. Second, a computer can extend the functions you perform now. Word-processing capabilities, for instance, mean that at the touch of a few buttons, the machine can proofread, cross-index, insert footnotes, and generate a table of contents. With accounting software, detailed cost analysis studies can be performed quickly with the same information that was put into the machine for other operations. Third, a computer can allow you to do *more* than you could do by yourself. Features such as electronic mail, access to large data bases, and the opportunity to hook up with national, international, and local networks expand the office beyond the traditional typewriter and file cabinet set-up.

If these features make a computer seem like a wise investment for your office, you'll want to become acquainted with the world of computers. Talk to people who already use one, ask what they like and don't like about it, then go over and play with it. Buy some computer journals at a newsstand and read both the articles and the ads. Pick up a computer dictionary at a bookstore and look up every word you don't know. Just as you wouldn't buy a car without knowing what "miles per gallon" means, don't buy a computer without knowing the basics.

Determine Your Needs

There are hundreds of computer dealers and thousands of software packages on the market. "The intelligent consumer will determine exactly what his or her needs are and then consider only those needs when looking at systems," says Bud Stolker, a consultant who teaches courses on computer literacy. "A computer is just a tool, so its usefulness will depend on how carefully its uses are matched with its capabilities."

People use computers in dramatically different ways. A chiropractor might use one to maintain patient records, prepare insurance forms, and generate monthly billing, while a small manufacturing plant might use its computer for inventory management and internal communications.

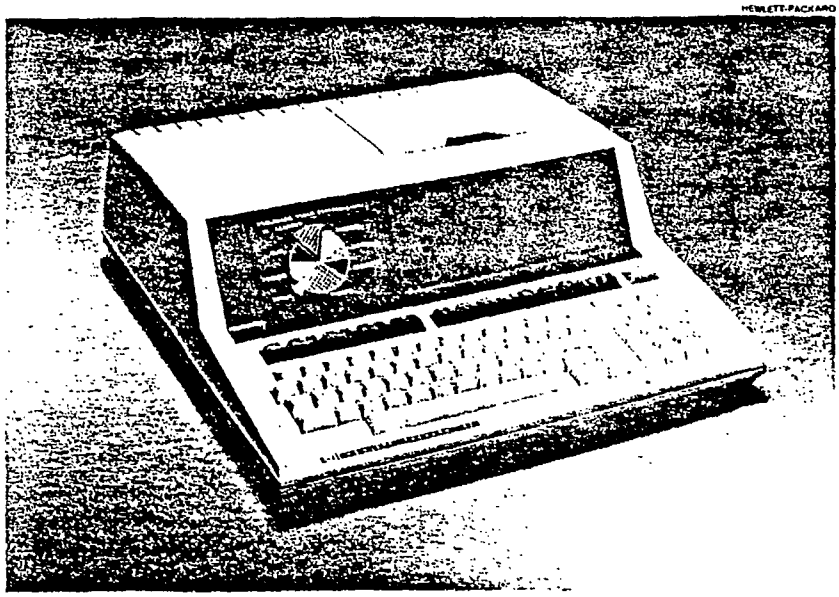
"Talk to people who already use a computer, ask what they like and don't like about it, then go over and play with it."

You'll want to develop your own list of requirements. This is often the most difficult step in the process of computer shopping. In the beginning stages, pick out the most essential elements. For example, a law firm might need a computer with letter-quality printing, manufactured by a company with nearby training facilities for the law firm's staff, and a system that can be expanded easily as the firm grows. A small retailer could be concerned with the size of the mailing list the machine can manipulate, its software for accounting and managing the payroll, and its capacity for inventory maintenance.

Once you've written down all the things you'd like the computer to do, rank them. Break your list down to three categories: "essential needs," "highly desirable needs," and "luxuries." "Essential needs" will contain all those features that you absolutely must have. These features are so important that you will not consider any vendor who cannot provide them. The "highly desirable needs" category will contain those features that are worth having but are not crucial. At this point, you must make trade-offs between price and availability: if a letter-quality printer costs too much, you may decide that draft quality will do. Finally, put everything else in the "luxuries" category and forget about them. It's easy to get sidetracked by luxuries that are exciting but that you can do without. Don't hand out any brownie points for features that are not crucial to your operations.

Shopping for a Seller

Before you can look at a system, you have to know where to look. There are several different ways and places in which to purchase a computer. There are walk-in general computer stores, which are sprouting up in major metropolitan areas. They provide a variety of systems and services under one roof. There are company stores or company sales representatives that sell only one product line. They will either come to you or have a storefront for explanations and demonstrations. Finally, there are mail-order houses, where you can buy a variety of products at low cost but where no hands-on practice or product servicing are offered.



A small personal computer can be ideal for business and technical professionals with relatively simple needs. This Hewlett-Packard computer features an integrated keyboard and display screen and can produce graphics.

A Glossary for the Computer Shopper

The computer marketplace is a world with a language of its own. This simple glossary will help you in your search for the right computer system for your office.

Bit: Contraction of "binary digit." The smallest amount of information that the computer recognizes, expressed as either one or zero (or on-off, yes-no, etc.).

Byte: A group of eight bits that make up one unit of information (typically a numeral or a letter of the alphabet).

Cathode Ray Tube (CRT): Generally refers to the screen or display component of some computers. Often used interchangeably with video display terminal (VDT), although they are not technically identical. Also called a monitor.

Central Processing Unit (CPU): The "brain" of the computer. The CPU controls the other parts; its electronic circuits decode, store, and carry out instructions.

Chip: A small silicon wafer that contains from a few dozen to tens of thousands of circuits for storing and processing information.

Circuit: Any closed-loop path along which electricity can flow. In a computer, circuits form a network of interconnected paths that open and close in response to coded signals.

Disk: A magnetic storage device used to record information in the form of binary digits. "Fixed," "hard," or "Winchester" disks can store and give quick access to large amounts of information but are expensive. The smaller, slower, but much less expensive "floppy" disks (also called "diskettes") of magnetically coated, somewhat flexible plastic are more commonly used—particularly for personal computers.

Hardware: The physical apparatus (boards, chips, circuits, nuts and bolts, etc.) of a computer as opposed to the set of instructions ("software") that directs the computer in its operations.

Interactive: A computer system that acknowledges and responds relatively quickly to user commands. Today, virtually all personal computer systems are interactive.

Language: Any of various codes—made up of characters or symbols—in which software can be prepared.

Memory: The portion of a computer that stores information. Synonymous with storage.

Microcomputer: A small computer that uses a microprocessor for its central processing unit.

Microprocessor: A single microelectronic chip containing all the elements of a central processing unit.

Modem: A peripheral device that allows a computer to communicate over telephone lines or other communication media.

Operating System: The basic software that supervises and controls the running of all other programs.

Peripheral: Any device connected to a computer, such as a CRT or printer.

Personal Computer: A microcomputer oriented to home use. It is usually less expensive, has graphics (often color), and can produce sounds. Newer personal computers can perform word processing and other business functions better than earlier models.

Printer: A peripheral device that converts signals into printed form. Printers may produce text or graphics of varying quality (e.g., letter or draft).

Program: A set of instructions directing the computer to perform a task. Also used as a verb meaning to compose such a set of instructions.

Random Access Memory (RAM): The chief memory of the computer, into which all information for storage and manipulation is entered.

Read Only Memory (ROM): Permanently stored information, usually programmed by the manufacturer and not accessible to the user. It is used to tell the central processing unit initial start-up instructions, to hold a specific computer language, or to store frequently used routines.

Software: The instructions that tell the computer's hardware what to do, i.e., the programs (including the operating system). Software can be written in a number of languages such as BASIC, Fortran, COBOL, and Pascal.

Terminal: A peripheral device with a visual display and, usually, a keyboard, thus allowing data to be output (as screen display) and input (through the keyboard). Terminals are graded as "dumb," "smart," or "intelligent," depending on their capacity to process information or to have their instructions modified using only the circuits built into their own hardware.

Video Display Terminal (VDT): See Cathode Ray Tube.

VisiCalc™: Business-oriented software package allowing automatic tabular calculations of subtotals and totals, available for many microcomputers.

Word Processor: A computer system (including peripherals) that has been specially designed to prepare, store, edit, and disseminate human-language texts. With the proper software, almost any computer system can be used as a word processor. Word processors normally include a video display terminal and a printer.

For further information, two good computer dictionaries are *The Penguin Dictionary of Microprocessors* by Anthony Chandor (Penguin, 1981, $5.95) and *The International Microcomputer Dictionary* (SYBEX Publishers, 1981, $3.95).

Mail-order should be seriously considered only by those who have considerable knowledge of computers and who are willing to install and maintain all the equipment themselves. One-product company vendors work well for people who know enough to know that the vendor has a product they are interested in and whose companies are large enough to command the vendor's attention. General computer stores are best for people who want to compare many different systems and buy from a full-service establishment.

When you know which vendors can give you what you need, call ahead and set up appointments. This lets them know that you are serious and that you want their undivided attention. Allow ample time. Proper computer research cannot be done in an hour. Take plenty of notes; you will be dealing with many details. Ask for a demonstration of every feature you are concerned about. Be wary of salespeople who hand you off to their assistants for the demonstration, for it shows that they're not comfortable operating the system they're selling. Don't be distracted by the information that the vendor volunteers: Concentrate on getting satisfactory answers to the questions on your list.

"Just as with cars, each option you add will cost more—hundreds of dollars more. A system decked out to do what you want could easily cost several times the base price."

If a salesperson tries to pressure you, remember—many work on straight commission, so the faster they can sell, the more money they can make, regardless of whether or not you get what you need. Buy nothing on the promise that new equipment or software is just about to be announced. Vendors are always on the verge of announcing some phenomenal new breakthrough. Even if this new equipment or software is delivered on time, you have no assurance that it will be of any real use to you.

Computers often have a very low

Determining Your Office Computer Requirements

To assess what you need from a computer, ask yourself this series of questions. Use the answers to establish your own list of requirements.

Word Processing

- What kind of word-processing applications do you have?
- How long do you expect your longest and shortest documents to be?
- How many documents do you anticipate creating in an average week?
- How many people should be trained to operate the system?
- How sophisticated will your applications be?

Printing

- What are your printing needs?
- Will you require letter-quality print? Draft quality? Graphics?
- How fast do you need to print?
- What is the maximum number of pages you might need to produce in a day?
- Will you need any special attachments such as paper or envelope feeders?

Office Set-Up

- Will you need more than one work station? How many within the first six months? Two years?
- Will each work station need to access the information in the other work stations?
- Will any terminals be moved or used when traveling?
- How important is the use of one vendor for future equipment purchases?

Software

- Will you be writing your own software?
- Are you planning on purchasing software from just your equipment distributor or from third-party vendors as well?
- How many computer languages will you want to be able to use?
- Will you want to alter preexisting software packages?
- Is the software you will need on the market now at an acceptable price?

Communications

- What types of communications capabilities will you require?
- Will you be communicating only during regular business hours?
- Do you want conferencing capabilities?
- What type of internal message system would you like?
- How many different types of systems are you likely to communicate with?
- Is communications something you can add with an equipment upgrade?
- How fast do you need to access information?

Data Bases

- Do you need data base creation and management capabilities?
- How many ways will you want to be able to access a file?
- How many entries do you anticipate needing to keep track of?

Auxiliary Memory

- Will you be able to manage your information on floppy disks or will you need the storage capacity of a fixed disk?
- How will you "back-up" files in case of a power or machine failure?
- Can you add a fixed disk to your machine easily?

Graphics

- If you will be using graphics, what kind of resolution do you need?
- How many colors do you want to be able to manipulate?
- Do you need a color printer? A color monitor?

base price, but further scrutiny will show that the "bargain" gives you little more than a box that plays games. Just as with cars, each option you add will cost more—hundreds of dollars more. A system decked out to do what you want could easily cost several times the base price.

Once you've found a product you're comfortable with, explore what kind of service is available for it. When you start using your computer, you'll soon realize how costly it can be to have it "down" for an afternoon, let alone a week. An on-site maintenance contract from the manufacturer can save a great deal of trouble. Find out how quickly the manufacturer can guarantee someone will be out to fix it. Other important points to consider are: whether both hardware and software are supported by the same people (the manufacturer or the vendor); whether you can get a maintenance contract if you combine equipment from several different vendors; and what happens to your contract if the manufacturer goes out of business. If you don't get a service contract, find out the hourly rates of various repair people, or get the names of people who have the same system and ask them how they handle service and support.

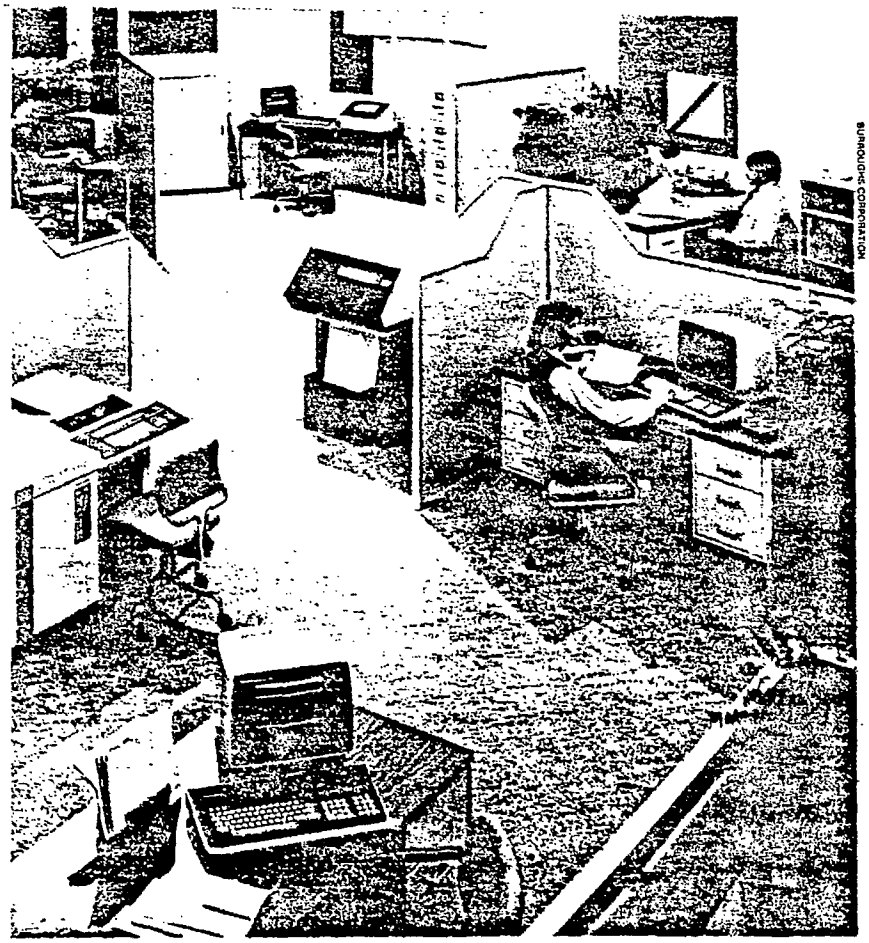
Be sure to ask the vendor about the training you'll need to learn to operate the system: whether they offer courses, whether they train you on-site, whether training and instructional materials are part of the purchase price, and how much it costs to have others trained at a later date. You should also find out how you will learn to operate more advanced software packages when you purchase them later and whether instructional materials are in easy-to-read English. Make sure there is a telephone number to call in case you have questions.

Making Your Decision

Once you've collected all this information from several acceptable vendors, weigh it. Consider what you need now for a functional set-up and what you can purchase later when you expand your capabilities. Compare all your options. If you're automating a small office, for example, you might have to choose between buying several computers that operate independently or buying several units that function off the same main computer. Make sure you compare fairly. If, for example, you look at one system that can only attach to a letter-quality printer when all you need is draft copy, adjust your figures to reflect the discrepancy. Weigh not only the price to get the system up and running now but also the price (including all upgrades) of a complete system you would like to grow into within a year. You might find a tremendous difference in the prices to upgrade various systems.

Look at only those features on your essential and highly desirable needs lists. You may need to revise your lists and visit vendors several times. Do not stop until you are completely satisfied with the information you've collected. Congratulations, you are now ready to select a vendor.

Buying a computer does not have to be difficult or confusing. There is no avoiding the amount of time that this purchase will require, but the time you invest before you buy is small compared with the hours and productivity you could lose sweating over the headaches of the wrong system. It is far more cost-effective to spend that extra time in the showroom than in trying to adapt your equipment to do something it wasn't supposed to do in the first place. Just as you wouldn't buy a convertible sports car to take the whole family on a winter camping trip, you wouldn't want to buy a computer that was perfect—for somebody else.



The number of work stations desired and the number of workers who will need training on the computer are two questions the office computer shopper should address.

About the Author

Dia L. Michels is a telecommunications research consultant. In addition to studying the impacts of new technologies, she teaches and lectures on a variety of communications topics. Her address is 1008 C Street, N.E., Washington, D.C. 20002.

APPENDIX - E -

DOC FACT SHEET

"OFFICE OF THE FUTURE"

FACT SHEET DOCUMENTATION

The Office of the Future

What is the office of the future?

The office of the future is an automated office, one in which electronic products and sophisticated communications terminals replace the electro-mechanical products which exist today. The products familiar in today's office — the typewriter, the photocopier, the filing cabinets stuffed with paper — are on their way out. They will be replaced by equipment which can perform a multitude of functions.

The communicating word processor, for example, is a forerunner of this new equipment. With it, a text can be typed into a computer memory and stored until recalled for corrections, additions or deletions. When the final text is completed, it can be printed locally or sent to another communicating word processor for display on a remote video screen. This technology exists now. It exists because the demands for improvements in office productivity are not being met with a typewriter, a filing cabinet, a photocopier and an existing message service — even with several clerks and secretaries running from one device to another. One communicating word processor can triple the output of a single typist.

With these kinds of productivity gains, new office products, services and systems are being introduced daily. The full force of the so-called information

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Government of Canada
Department of Communications

Information Services
300 Slater Street
Ottawa K1A 0C8
(613) 995-8185

Gouvernement du Canada
Ministère des Communications

Services d'information
300, rue Slater
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revolution probably will be felt in the office before anywhere else. Since half the North American labor force works in offices, the economic and social implications of the automated office are enormous and wide-ranging.

When the necessary elements are brought together, the office of the future will be seen as many different things: To Canadian industry, a means to remain internationally competitive; to a manager, a tool to streamline the decision-making process; to an office worker, a source of information, an electronic memory, a conduit for communications. To all office workers, including management, it will likely mean a need to develop keyboard skills, new attitudes and effective procedures.

Why automation?

Automation is no stranger to offices; it first appeared about 100 years ago in the form of the typewriter and the telephone. In the case of these two venerable examples, automation was welcomed because it made possible better and more efficient communications. The same is true for the hardware and systems that will, when taken together, form the office of the future.

The rationale behind automating the office is to improve the productivity and efficiency of the office, through the integration of various communications media. Communications — the generation and handling of documents, messages, data and images — now account for nearly two-thirds of office labor costs.

The integration of information processing and communications devices into multifunctional machines is to expected facilitate the transfer of information from one medium to another, to enable a more effective sharing of machine resources among the work force and to speed communications.

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An integration of existing technologies

The office of the future will likely be composed of four major electronic products. Their equivalents may be found in any present-day office. The telephone, the typewriter, the photocopying machine and the filing cabinet will all be superseded in the office of the future.

1) At the hub of the automated office is the "intelligent" Private Automatic Branch Exchange (PABX) as a resource shared by all workers. The "intelligent" PABX is a device that permits its users to switch, store and transmit voice, data, messages and images. It will handle dictation and perform a multitude of new functions.

2) The typewriter will be replaced by a keyboard video display terminal with myriad capabilities. In addition to doing everything a typewriter does, this terminal — which has been dubbed a multifunctional work station — will process data, text, pictures, documents and graphics. The work station will provide its users with electronic mail and document management, word processing, communications with other such work stations and access to computer data bases and data processing. The work station will also serve as a sophisticated calculator.

Such user-friendly and user-programmable devices are the primary instruments that will enable the office to be automated. It will allow the user to automate in an evolutionary manner by focussing on his or her most important problem first and by progressing into subsequent stages at his or her own pace.

The expected impact is a reduction in demand for single purpose devices such as data entry systems, stand-alone desk computers and word processors.

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3) The most revolutionary component of the office of the future will replace existing photocopying machines. The "intelligent" copier/printer integrates existing but distinct machines: an electro-optical scanning unit, a microprocessor, data storage device and laser printer. In combination with the microprocessor and data storage, the intelligent copier/printer has several functions. These include those of the heavy duty typing station, optical character reader and the unattended facsimile device. This latter capability permits, for example, the transmission and reception of electronic mail.

4) The most pressing need in today's office is to come to terms with the filing system. An effective filing and retrieval system could generate savings far in excess of those possible through the use of word processors. The problem is that the flexible, practical, reliable and secure document management system still awaits its invention. Considerable progress has been made by the National Research Council towards the development of such a system.

Who needs the office of the future?

The short answer is anybody who wants to stay competitive.

In the last 30 years, Canadian purchases of goods and services for the offices have increased 25 fold, reaching $6 billion in 1978, while office efficiency has declined. Over the same period, new jobs created in the office labor force have outpaced job creation in the total labor force by a factor of two. Annual national expenditures for white collar salaries and wages reached the $70 billion mark in 1978. In the banking and financial institutions, for example, office labor costs represent 90 per cent of total business costs; in the construction industry, 30 per cent.

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Steady improvements in office labor productivity are essential to bring spiralling office expenditures under control.

However, the present focus of productivity improvements on clerical functions will almost certainly be broadened to include administrators, professionals and managers. Increased productivity should have the effect of shifting human office activities into higher skilled work by automating repetitive and monotonous activities currently performed at every level of the organizational hierarchy.

A cost-effective application of office automation is expected to have a major impact on the competitive strength of the individual enterprise and, collectively, on the strength of our national economy.

Does office efficiency mean fewer jobs?

Office automation implies ultimately a complete restructuring of the work undertaken in the office, a redistribution of work between people and machines and a gradual disappearance of physical distance as a barrier to communications. Consequently, the nature of the work performed by the typical office worker, the role of the worker within the organization, and even the structure of the organization should be expected to change drastically during the 1980s.

Office automation, over time, will affect the jobs of 4.8 million Canadians, about half of the existing labor force, who now work in offices. But history shows that while the new tools of technology have displaced a number of people, the resulting opportunities for new job creation have outpaced the termination of jobs.

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Many employees are worried about office automation. Numerous strikes in recent times have resulted from the introduction of new automated equipment without adequate consultation with employees. User acceptance is the most critical factor in any form of automation. The results of past failures to consider human behavior in organizations are in evidence everywhere. People are and always will be the most important element in the office. The motivation, needs and attitudes of the office labor force must be understood before any attempt at automation is made.

One of the objectives of the Office Communications Systems program in the Department of Communications is to study the various impacts of office automation.

But the real "killer" of Canadian jobs is lost business opportunities. If Canadian entrepreneurs do not come together to design, produce and market products for the office of the future which are competitive in price, quality and performance to those made by other nations, industry will die and jobs will disappear.

How far in the future is the electronic office?

Multifunctional work stations, one of the four key elements in the office of the future, are expected to penetrate the Canadian market in significant numbers in this decade. In 1978, some 250,000 forerunners of these stations — word processors — were installed in Canada. It is estimated that, by 1985, there will be 500,000 work stations in offices throughout Canada; one million by 1990 and 2.5 million by 1995.

In the United States, the market for work stations is expected to be for about 28 million units by the early 1990s.

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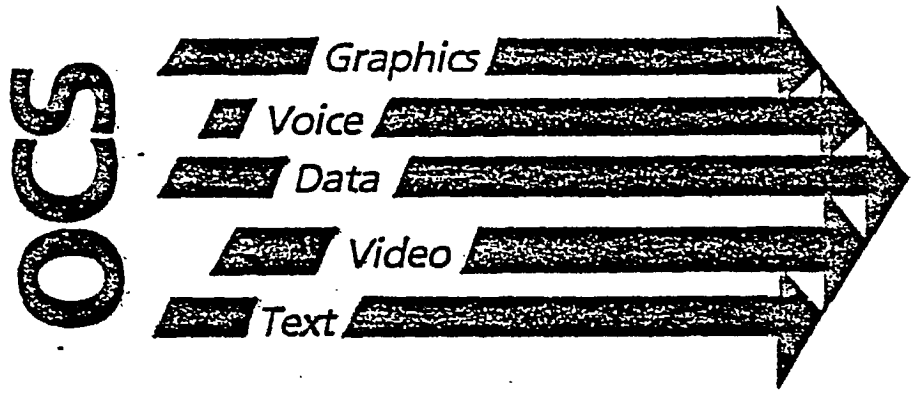
Almost every product or service identified for the office of the future is currently under development by Canadian-based firms in one way or another. The goal now is to translate Canadian technological leadership into sound commercial success, meaningful sales revenues, jobs, exports and profits.

Keeping Canada's offices of the future Canadian

It is desirable to have a Canadian-based industry to develop, produce and market office automation products and services which will be competitive in international markets. This will most likely be a hotly contested marketplace but the alternative to meeting this challenge will be a potential $4-5 billion trade deficit in electronic products in the mid 1980s and greater unemployment.

Canadian industry has already taken preliminary steps toward presenting an organized front to meet the challenges presented by this convergence of technology, and a number of Canadian companies are actively involved. In addition, the Canadian Advanced Technology Association (CATA), an association of rapidly growing, predominantly electronic, Canadian-owned high technology firms, is organizing its membership to respond to the office of the future opportunity.



Information Mobility through Electronics

Office Communications Systems Program

The industrial opportunity for more productive offices

Canada

OFFICE COMMUNICATIONS SYSTEMS PROGRAM

PRESENTATION TO REGIONAL INFORMATION

OFFICERS OF THE DEPARTMENT OF COMMUNICATIONS

AND FINANCIAL OFFICERS OF TRANSPORT CANADA

(June 23 and 29, respectively)

Presentation by:

E. F. Labelle
Chief
Coordination
Office Communications
Systems Program

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Systems Program

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Objectives of the OCS Program

To develop an Industrial capability in Canada for supplying Integrated Electronic Office Systems

By:

- Supporting Integrated Field trials
- Fostering research into Systems Behavioral and Productivity matters
- Conducting Public Awareness Program

Program Benefits

Canadian Industry

- Proven Canadian products and integrated systems

Federal Departments

- Productivity
- Experience

Canadian Economy

- Employment
- Productivity
- Exports
- Balance of Payments

Office Cost Perspective ($ Billions)

Type of Cost	1978	1985	1990
Office labour	$70	$80-90	$100-120
Purchases — goods and services	$6	$10-15	$18-24
Purchases as percentage of labour cost	8%	12-14%	16-24%

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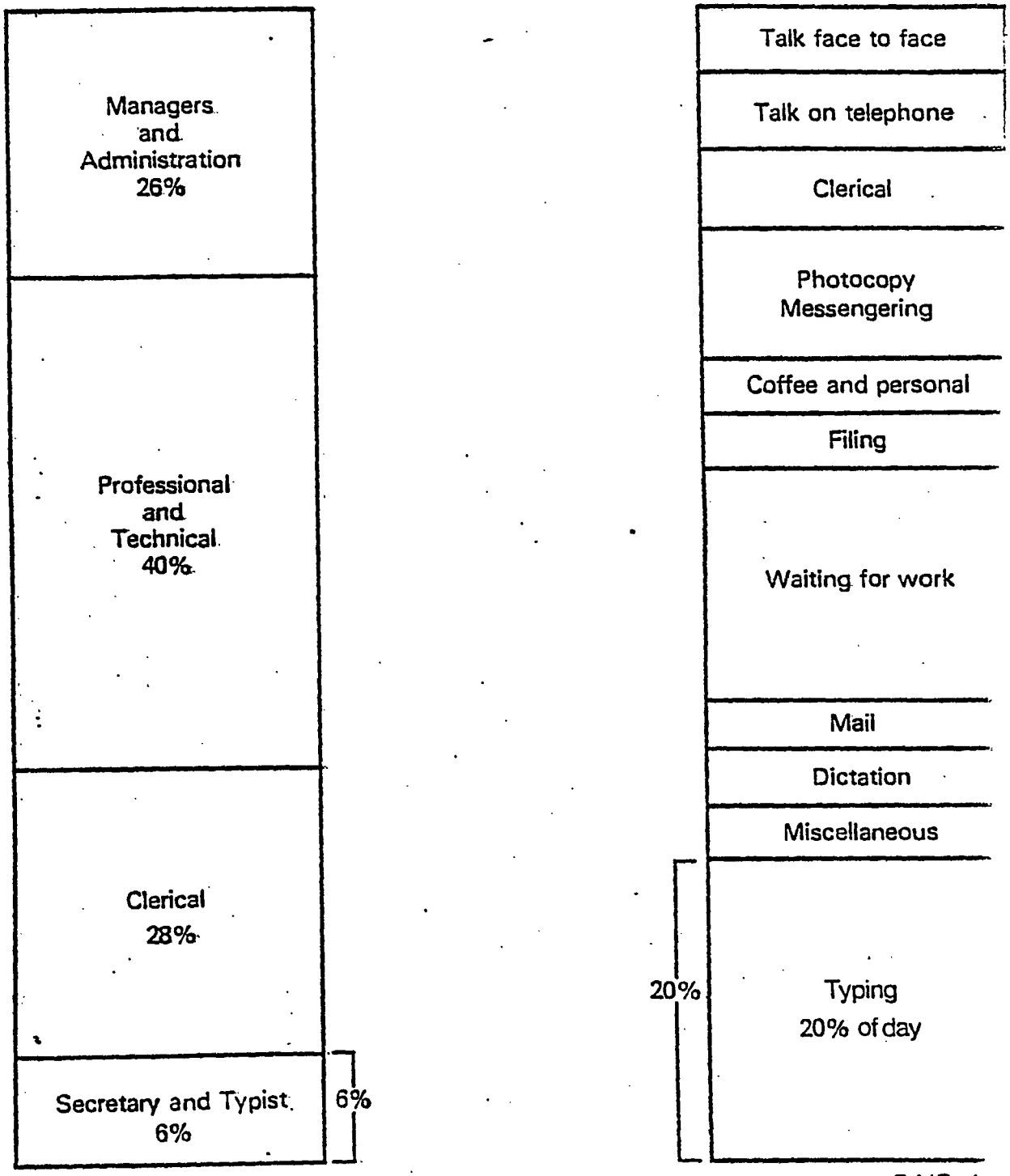
Perspective for the Office of the Future



BAIR, 1

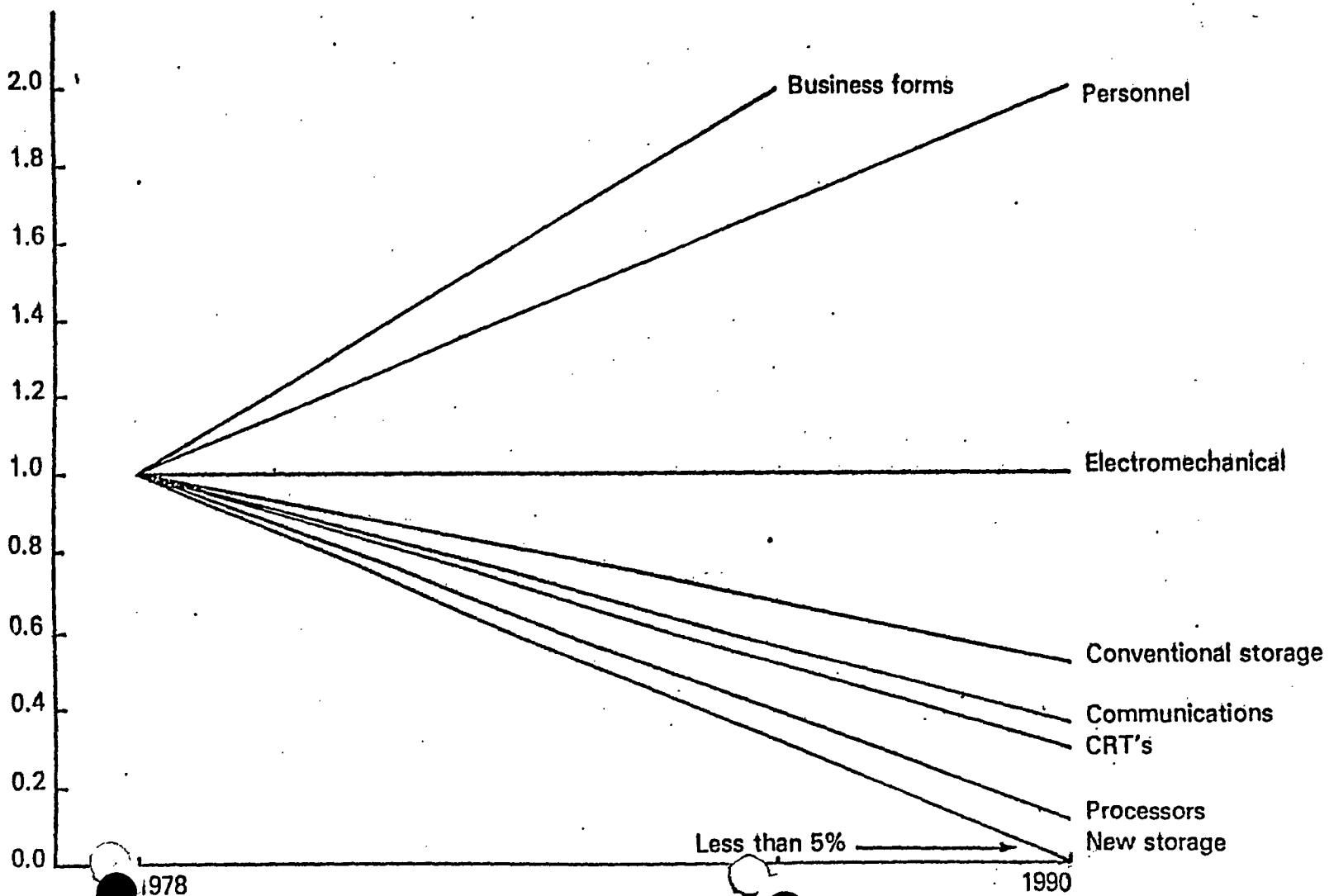
Canadian OCS Market 1978

— Preliminary Estimates —
($ Billion)

Computer equipment	.8
Software & services	.9
Office equipment	.6
Communications equipment	1.2
Office supplies	.6
Business telecommunications services	2.7
Business mail	.6
Courier services	.2
Less intersegment trade	(1.6)
	$6 Billion

Cost Trends 1978-1990

(Current cost = 1)



Office Productivity
— A vendor's viewpoint

Problem: During the last decade . . .

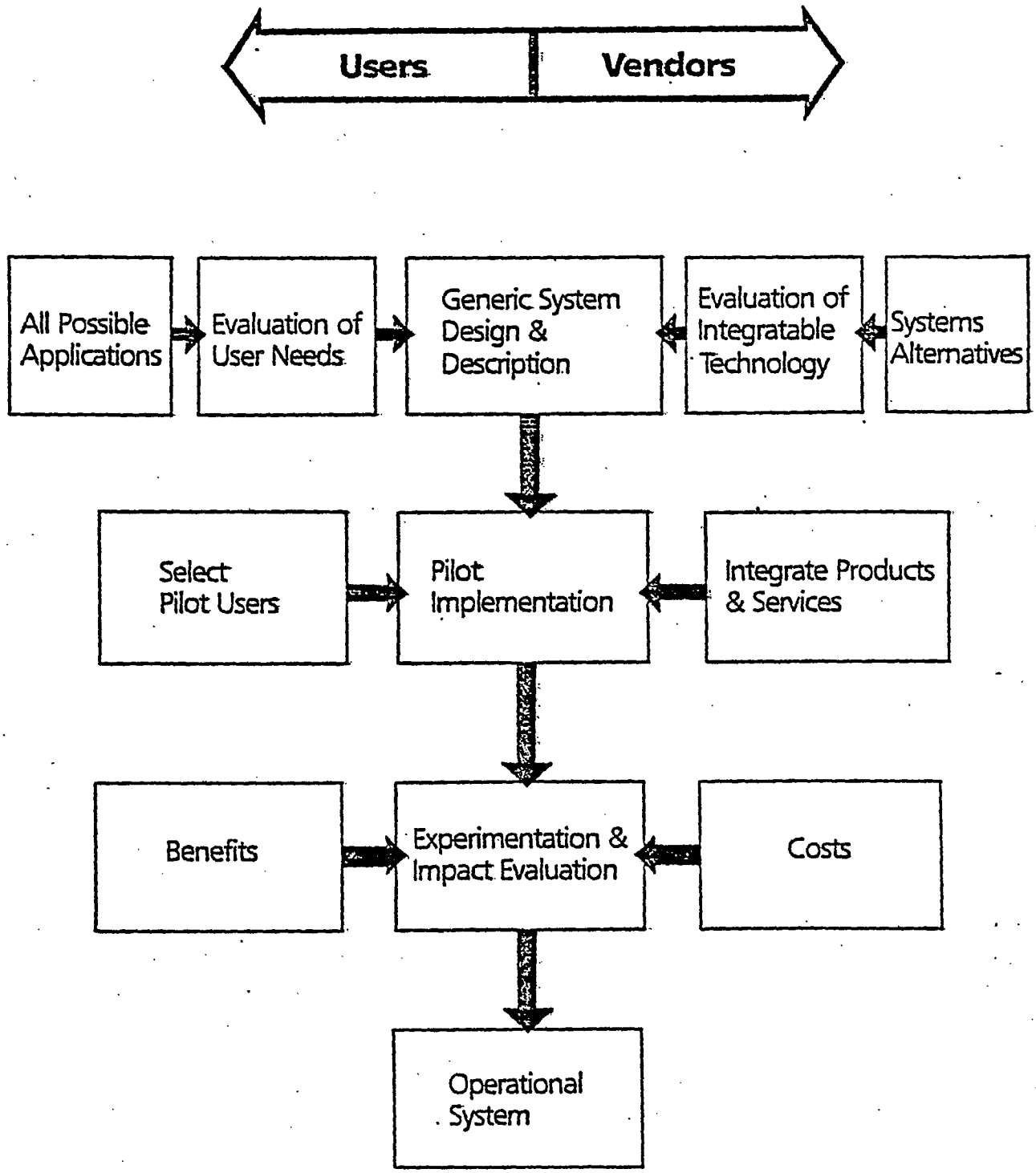
- — office costs doubled
- — office productivity increased 4% while
- — industrial productivity increased 90%

Reason: Capital equipment investment per worker

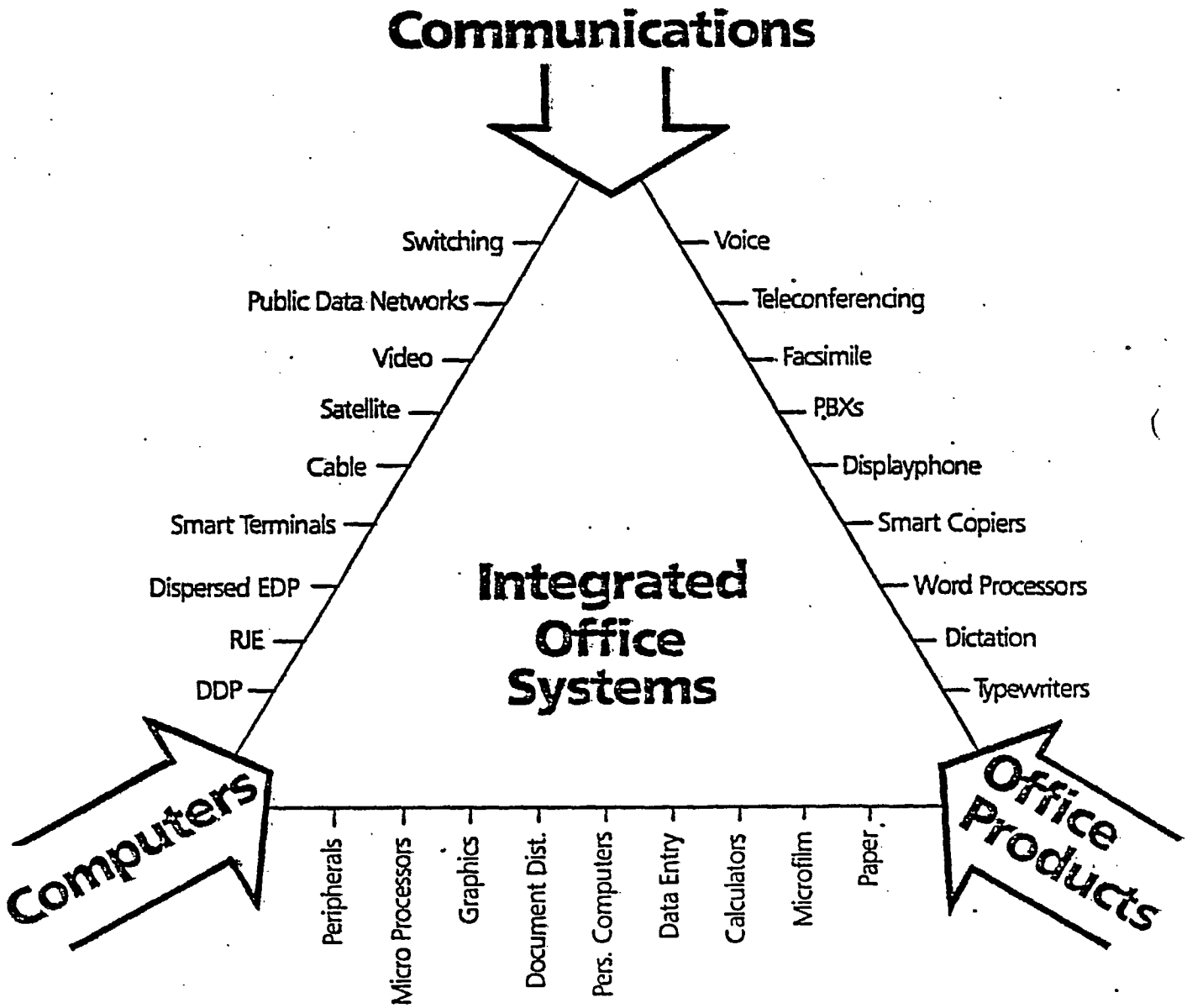
- — in agriculture $60,000
- — in manufacturing $32,000
- — in the office $2,300

Conclusion: Substitute labour by capital investments

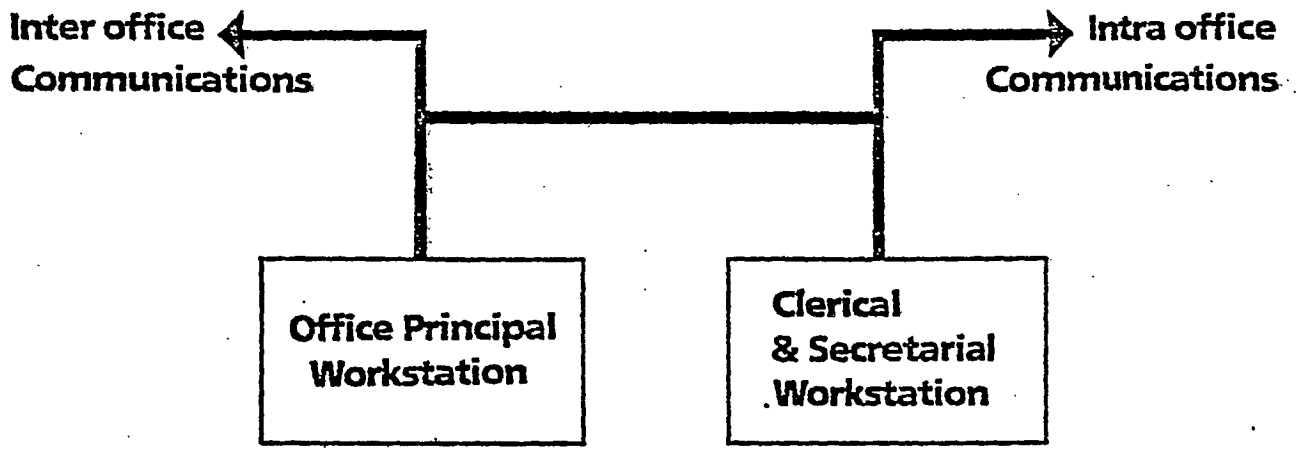
User Driven OICS Design Process



Converging Technologies



The Office Multifunction Workstations



Individual Functions

- Calendaring (Schedule MGMT)
- Tickler Files
- Personal Files & Library
- Information Verification
- Procedures & Manuals
- Access to Info/Data Bases
- Access to Structured Reports
- Teleconferencing

- Data Entry & Editing (Key Stroking)
- Word/Document Processing
- Document Distribution
- Hard Copies/Plotting
- Media Conversions
- Correspondence Control
- Forms Design
- Filing

Common or Shared Functions

- Send & Receive Electronic Mail
- "Free Mode" Search & Retrieval of Info
- Telephone Aids
- Electronic Chrono Files & Audits
- Learning Support
- Computation (Desk Calculator Functions)
- Archives
- Authorizations
- Security & Privacy
- Trouble Shooting
- Specialized Professional Tools

Functional Integration Sequence
(by Commercial Availability)

- Micro Processors

- Information Processing & Storage
- Communicating Word Processors
- PABX with Data

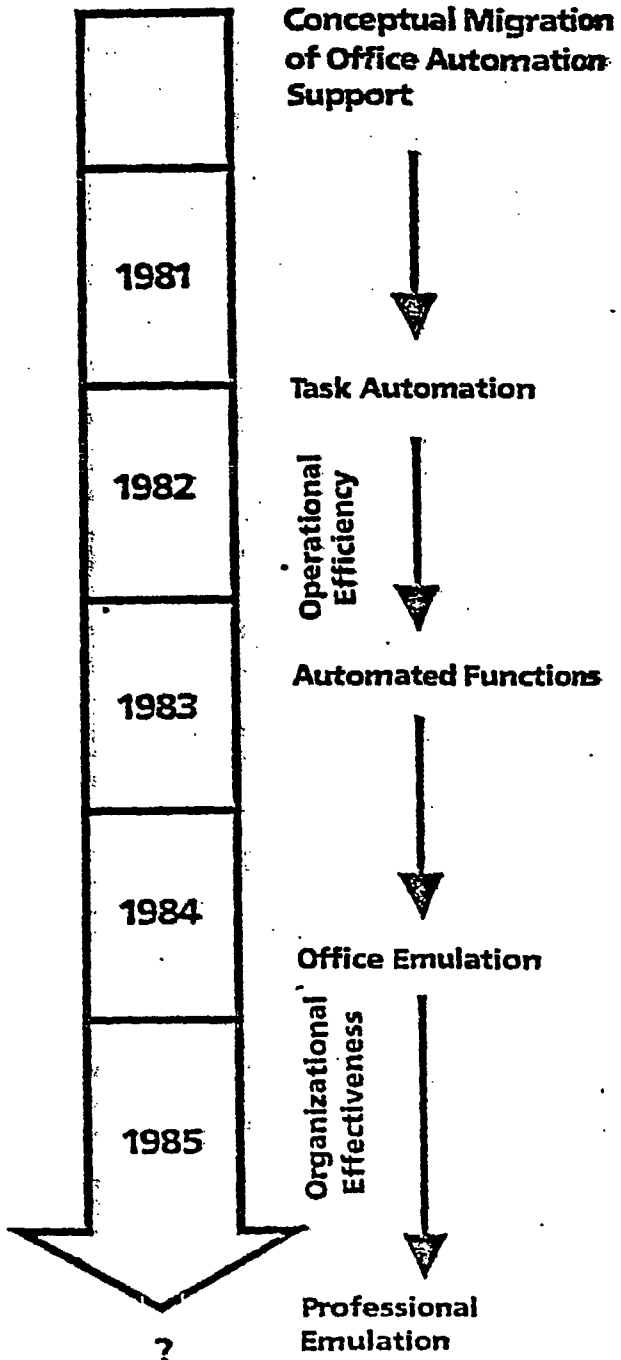
- Messaging/Electronic Mail
- Local Area Networks
- Intelligent Telephones

- E D P Networking
- Free Text Processing & Retrieval
- Voice Annotation & Storage

- Information Controller Switch
- Image Filing & Smart FAX
- Satellite Networks

- Speech Recognition (Segmented)
- Professional Work Stations
- Video Teleconferencing (Motion)

- Full Imaginal Systems
- Full Speech Recognition
- Automatic Translation



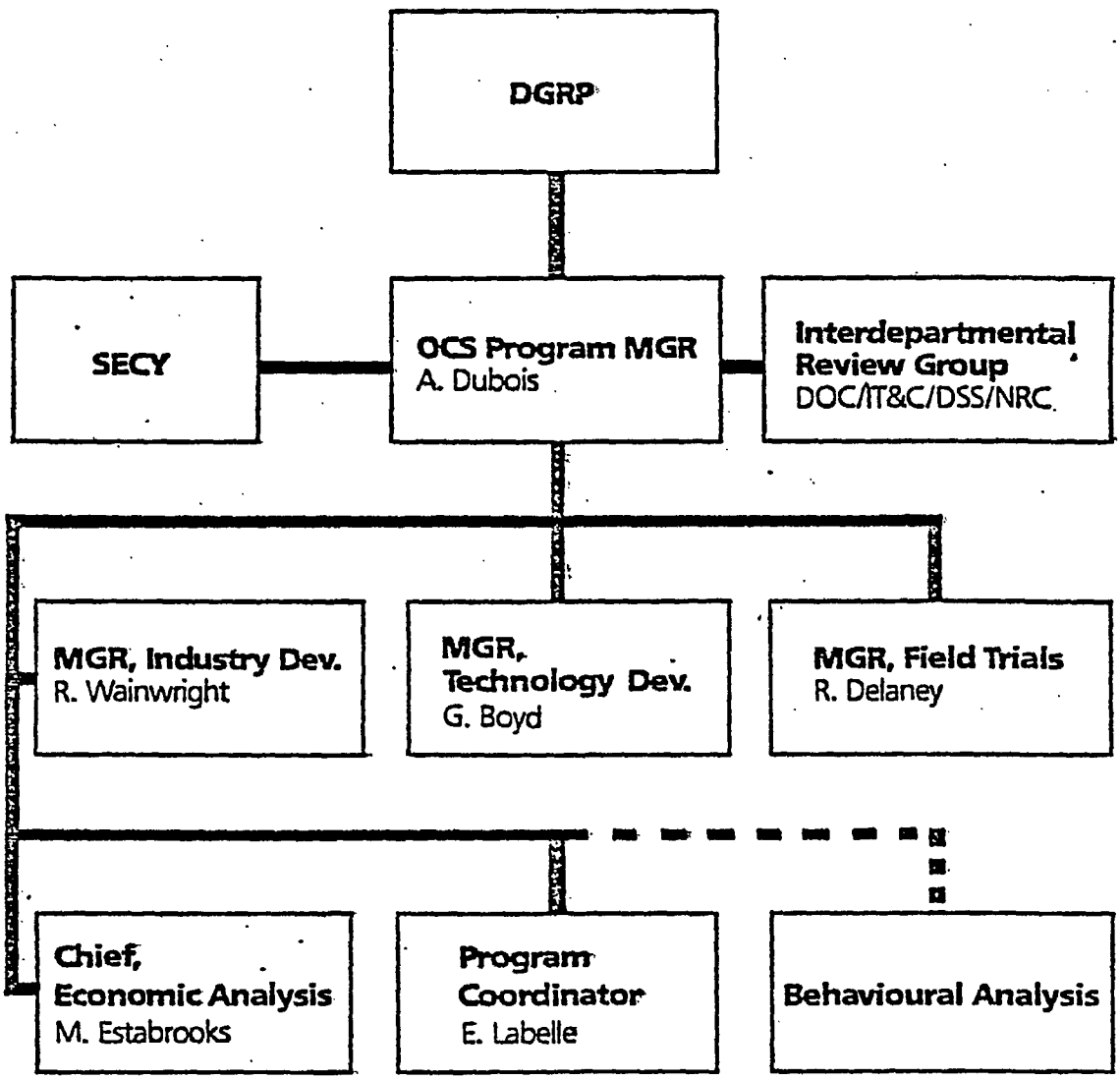
The Barriers to a Significant Canadian Market Presence

- Small domestic market (3% of world market)
- High market entry costs
- Significant market distortions caused by foreign governments
- Major gaps in the industrial infrastructure
- Difficulties in raising needed capital investments
- Tight skilled labour market
- Unprotected domestic market

Opportunities for a Significant Canadian Market Presence

- Canadian entrepreneurs, designers and workers are among the world leaders in technological capabilities
- Canada's telecommunications infrastructure is the most advanced in the world
- Canada's computer application development capabilities are at par with the U.S.A.
- Canadian entrepreneurs are successful exporters
- Government supports industrial development

OCS Organization



Key Industry Development Strategies

Reduce market entry costs for Canadian-based firms by encouraging:

- vertical cooperation
- horizontal competition

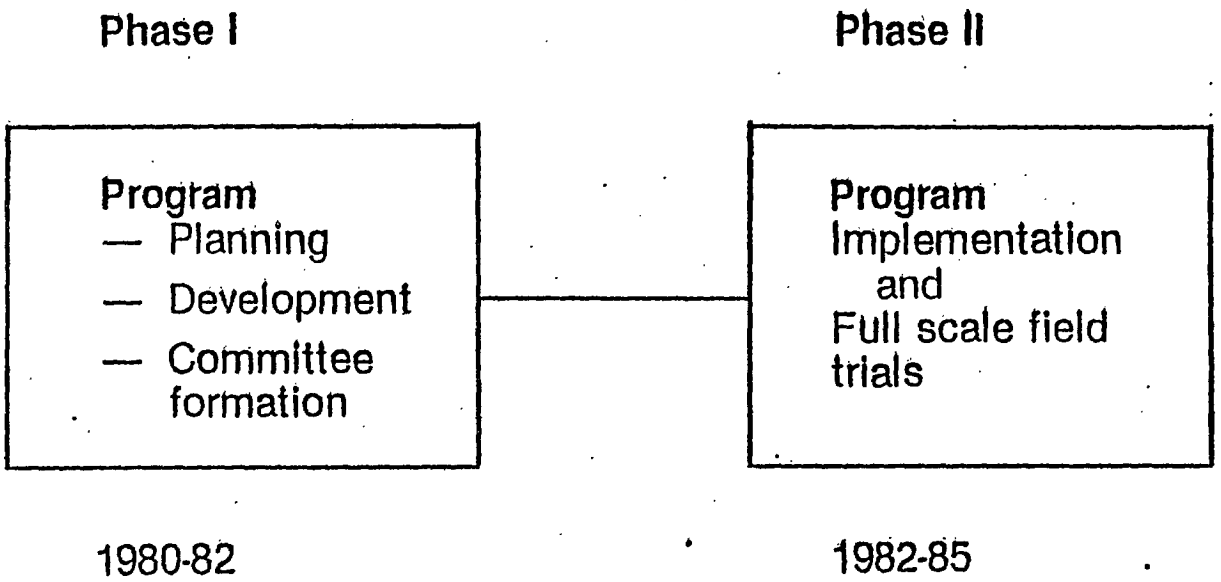
Achieve hardware compatibility and software portability through:

- industry-directed interface standards development

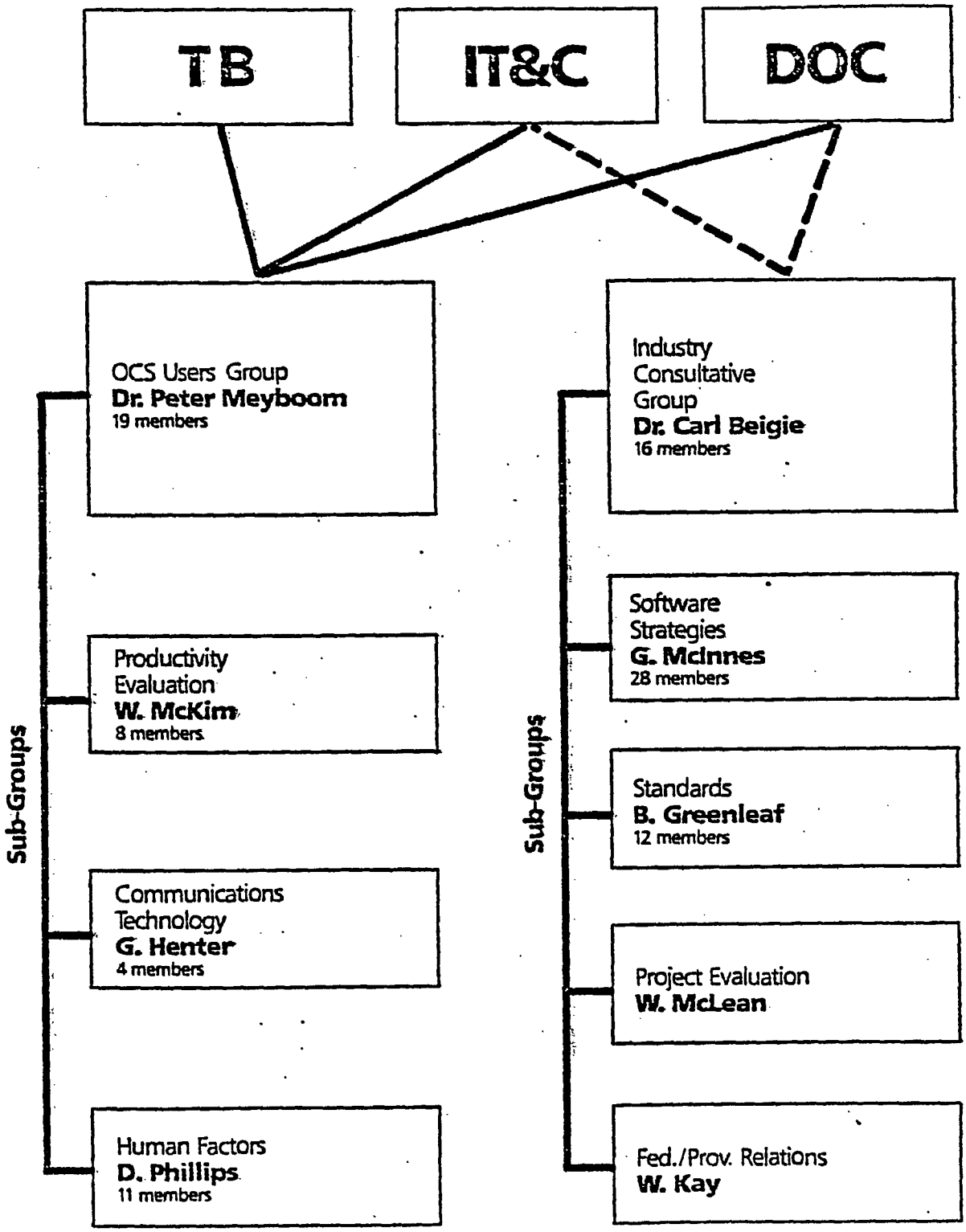
Reduce market risks through:

- government-sponsored field trials
- product demonstration centres

OCS Program Overview



OCS Committees



OCS Industry Proposals

	OCRA	BELL	OFFICE-SMITHS	SYSTEM-HOUSE
Supporting Partners	Gandalf CTRI NABU (Mitel) CNCP 3Cable Operators	Northern Telecom Bell Northern Research + Cdn Vendors	Officesmiths + NABU Hardware	Misc. Canadian Vendors
Total Cost ($ M)	9.8 to 18.2	12.4	~ 2.5	~ 3.0
DOC Portion ($ M)	2.2 to 3.2	3.4	~ 0.7	~ 2.0
Timing	4 Phases 4 Yrs	3 Phases 3 yrs	2 Phases 2 yrs	2 ½ yrs
Technology Approach	Cable + Telephone	Twisted Pair	Information Storage/ Retreival	PABX + Twisted Pair
Industrial Benefits	Very High	Negotiable	Medium to High	Medium to High
Ability to Market	High Risk	Low Risk	Medium Risk	Low Risk
Prospects for Cost Sharing	Good	Poor	Good	Good
Preferred Host Site	Large Department	Private User Crown Corp (Provinces ?)	Medium Department	Medium Department
Est. Contract Release (Host Site Selection by Apr./82)	Mid 82	Jun 82	Jun 82	Jun 82

Proposed Field Trials (Stage I)

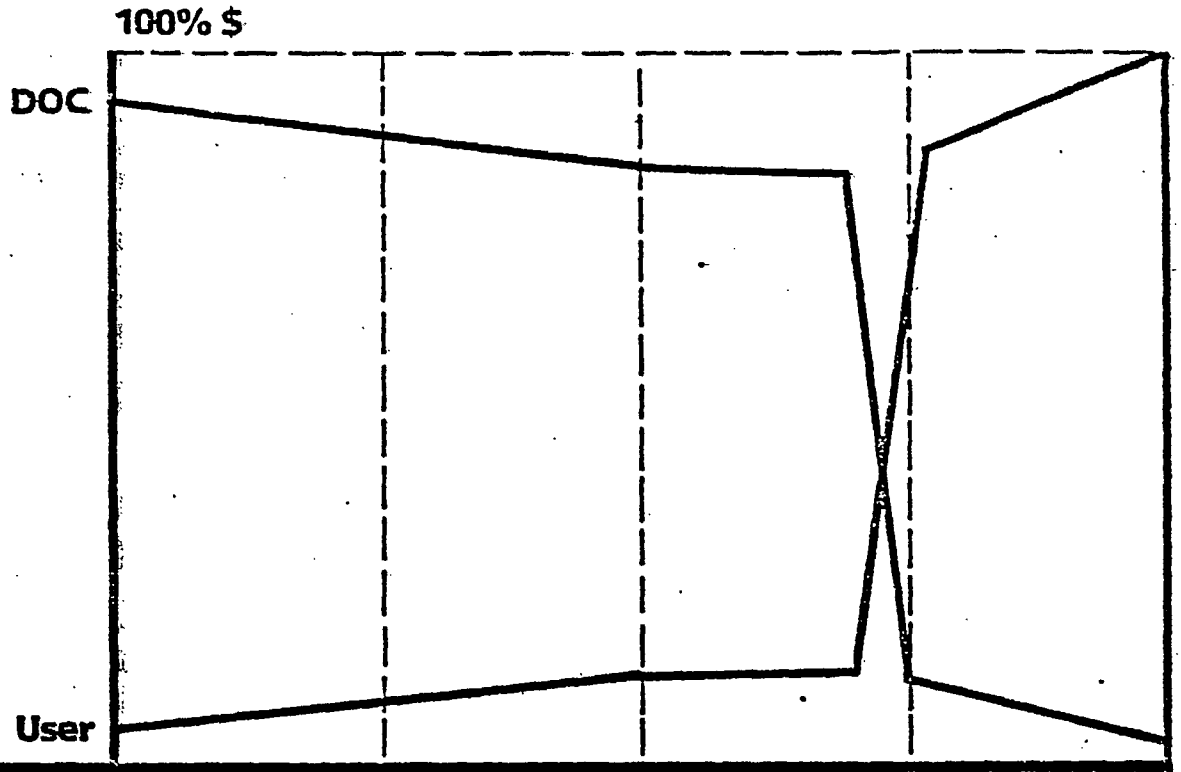
Industry Groups

- Office Communications Research Associates
- Bell Northern Research
- Systemhouse
- Officesmiths

Description

- Three large Integrated Field Trials
- Canadian content
- Visible across Canada
- Will involve in excess of 5000 workstations
- Suppliers strength in R & D, marketing and financing
- Clear benefit to chosen Department
- Department commitme

Proposed Mega Project Cost Sharing



Phase	Pre Pilot Feasibility	Pilot	Pilot Evaluation	Operations
Typical Total Cost	½–1 M $	2–3 M $	50 K $	9–15 M $
Typical User Contribution	Capital: 0–200 K Manpower: 3 P/Y +	Capital: 200–500 K Manpower: 6 P/Y +	Capital: 0 Manpower: 2 P/Y +	Capital: 8 M + Manpower: 10 P/Y +
No. of Workstations Installed	20–30	200 +	—	1,000 +
Typical Timing	6–12 Mos.	12–14 Mos.	1–3 Mos.	—

Recapitulation